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MAINSTREAMING OF NATURE-BASED SOLUTIONS FOR THE MITIGATION OF
HYDRO-METEOROLOGICAL HAZARD: GOVERNANCE ANALYSIS OF A SOCIO-
TECHNICAL CHANGE

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Abstract

In the last two decades, risk creation is outstripping risk reduction as natural disaster reported per year has increased significantly also as a consequence of Climate Change (UNDRR 2022). Hydro-Meteorological Hazards (HMH) are a constant threat to Social-Ecological Systems (SES) and the well-being of human communities and we are falling short in prevention and mitigation which is the most cost-effective way to manage risks. In addition, we are also falling short in the protection and enhancement of ecosystems and biodiversity which are at risk of collapse (IUCN 2020). The Nature-Based Solutions (NBS) concept was developed to simultaneously face multiple challenges and in 2016 they were defined by the International Union for the Conservation of Nature as “actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature”.

Given this potential, NBS were lately endorsed by major international organizations such as the EU, the FAO and World Bank who are pushing to enable a mainstreaming process. Naturalistic engineering or eco-engineering are a similar concept but, despite having a longer history, they have not been able of challenging the actual regime dominated by traditional engineering and “grey” solutions. There is thus the need to further investigate and identify barriers and enabling factor for the NBS mainstreaming process to succeed in specific social-ecological context.

The Emilia-Romagna Region face a high level of risk with respect to different HMHs such as landslide in the Appenine mountain area, hydraulic risk and draught in the Po valley and coastal erosion and salt intrusion in coastal area and in the Po delta. Moreover, the region scores poorly in ecological status indicators in most of its territory, being one of the most anthropized region in Italy and Europe. NBS would therefore be a strategic tool to reverse this trend and mitigate risks.

A shift from traditional engineering “grey” solutions to a wider and standard use of NBS encounter technical, social and governance barriers that has been identified with the Content Analysis of policy documents, reports and expert interviews.

NBS are still a “niche” and their perceived effectiveness is low among technician and decision makers. They are used to the grey approach and given the high-risk context of Emilia-Romagna and low risk acceptance in this specific sector, few are willing to risk with the implementation of innovative solutions they are not used too. The NBS approach require a paradigm shift that include change in cultural-cognitive institutions, a different and wider set of knowledge other than traditional engineering (ecological, social) and an adaptive management approach that are lacking within the current governance system. This paradigm shift must be inclusive since the opposition or acceptance of local powerful interest groups and stakeholder is relevant for the NBS implementation. Local decision-makers, farmers and tourist operators, if not properly engaged and informed tend to be anchored to the traditional engineering approach because of “perceived effectiveness” or in the case of “space demanding” NBS contrary to their short-term interests.

For these reasons, it has been found that the Disaster Risk Reduction governance system is prone to Path Dependency and the conservation of the status quo. Greater incentives for change and innovation are therefore needed, as well as effort to disseminate best practices and successful experiments. So far, from the national level there have been weak policy incentive to allow for the mainstreaming process of NBS, and the legal framework has been found to be a significant barrier. The Region has proved to be more sensitive to issue related to the ecological transition and has given inputs for the NBS mainstreaming such as renaturation guidelines. However, these policy input have ultimately proved to be ineffective.

In conclusion, the NBS mainstreaming process involves multiple variables of cultural, technical, institutional and social nature. It is therefore needed a paradigm shift that involves the reformulation of assumptions, values and practices within the DRR governance system. Given the complexity and multiple barriers that this change entails, more decisive top-down inputs (incentives and obligations) are needed to stimulate innovation and social learning processes first and foremost at the operative level.

Introduction

Despite progress, increasing natural hazard are outstripping risk reduction efforts as disasters reported per year have increased significantly in the last two decades at the global level (UNDRR 2022). Hydro-Meteorological Hazards (HMH) are a constant threat to Social-Ecological Systems (SES) and the well-being of human communities. Also due to climate change, HMH frequency and magnitude have already increased and will likely increase further in the near future (IPCC 2022). We are falling short in Risk Prevention and Mitigation which is the most cost-effective way to manage risk. In addition, we are also falling short in the protection and enhancement of ecosystems and biodiversity. The concept of Nature-Based Solutions (NBS) was developed and adopted in 2016 by the International Union for the Conservation of Nature as a response to these twofold challenges. NBS were lately endorsed by major international organisations such as the EU, the FAO and World Bank which identified the NBS as potential solutions to mitigate multiple-risks and provide multiple benefits. These institutions are pushing for the mainstreaming of NBS and the main aim of this research is to identify barriers and enabling factors for this process to succeed in the specific social-ecological context of the Emilia Romagna Region, in Italy.

NBS was born as a concept that encompasses all those land and water management interventions that aim at increasing the well-being of local communities and, at the same time, providing benefits to the ecological system and biodiversity (IUCN 2016). In the field of Disaster Risk Reduction (DRR) this translates into the twofold objective of risk mitigation and conservation and enhancement of ecosystems and biodiversity. This sector, but in general water and land management, has been dominated by what have been called “grey infrastructures”, which are those interventions that make an extensive use of reinforced concrete, steel, iron, rocks, walls and barrier of different heavy materials. River and coastal landscapes and ecosystem have been substantially altered by grey solutions with the aim of flood and storm surge protection, the conversion of floodplains into areas for settlement, the enhancement of navigation and the intensification of agriculture. On the one hand, grey solutions have served the purpose of economic development but, on the other hand, they contributed to impairing the ecological status of river and coastal areas and reduce the provision of ecosystem services such as: natural water retention capacity, drainage capacity,

carbon sequestration, local climate regulation, soil stability, natural coastal protection (dunes, seagrass, mangroves) and water quality equilibria.

In recent years, there has therefore been a push to reverse this trend and “bring nature back into our lives” as the new European Biodiversity Strategy is entitled (EU Commission 2020). The NBS are considered the right tool to reach this goal and they are presented as potential alternatives or complementary solutions to the grey approach. So far, NBS have been associated more with urban context, but many argue that they can also be valid tools in rural contexts (Soini et al. 2022) which have been marginalized in the NBS discourse without scientifically-sound reasons for. Rural NBS include interventions such as: the restoration of the river and coastal morphological dynamics; the restoration of natural drainage processes; the reconnection of ecosystems; the widening of riverbeds and canals; the creation of multifunctional basins; the installation of dune belts and natural buffer zone; and the vegetation of embankments and slopes.

It is evident that the two approaches are significantly different in many ways. NBS aim to be organically included into Social-Ecological system, they need multi-disciplinary knowledge to be properly design and implement interventions, and they have a dynamic nature rather than a static one. Furthermore, NBS are more flexible and can serve the purpose of managing the uncertainty inherent to risk management in a different way compared to the traditional static “command and control” regime. The NBS, in relation to grey solutions, are not just alternative technical solutions but a new approach that relies on a different paradigm, a new way of thinking about our relations with the environment and how to deal with natural hazards. The NBS approach can thus be considered a “Sociotechnical Change” since it implies change not just in the technical aspects, but also on values, knowledge systems, social practices and interactions within the arena of Disaster Risk Reduction. In this arena, NBS are still a marginal niche and are implemented on rare occasions. A mainstreaming process would imply their increasing and regular inclusion within the management activities of the most relevant implementing bodies. However, this process faces several barriers which are the main focus of this research:

Research Question: which are the barriers and enabling factors to the mainstreaming of NBS for the mitigation of hydro-meteorological hazard in the context of Emilia-Romagna?

The field of disaster risk reduction is a public policy driven sector, and it affects different types of stakeholders who are more or less involved in the practice of governance and managing disaster risk. This governance system is very articulated and cross-sectoral, and it involves many actors (organizations and individuals) placed at different levels within the system. The input that are coming from the international level for the NBS mainstreaming are supposed to reach the operational level and therefore pass through many governance layers and actors. Therefore, it was deemed necessary to adopt a multi-level governance perspective in order to identify barriers to the NBS mainstreaming process. The analysis thus includes regulative frameworks, cultural and normative institutions and the role and interaction of the most relevant actors, be they technical actors, decision-makers, interest groups, or associations. This, however, without forgetting the importance of technical issues related to characteristics of NBS and the features of the specific social-ecological context that will be taken into consideration in the assessment. The literature on NBS mainstreaming has mainly focused on “social acceptance” by local communities, whereas this research aims to bridge this gap by including an institutionalist view, and thus broaden the horizon of analysis to all the components of the governance system.

I have adopted a qualitative case-study research strategy identifying as a unit of analysis the governance system of Emilia-Romagna and its contextual Social-Ecological System. The case study allowed for a comprehensive analysis that includes multiple and intertwined variables, retains the holistic and meaningful characteristics of real-life events (Yin 2003) and reaches the root causes of complex phenomena such as socio-technical change.

The research will analyse the case of Emilia-Romagna, a region that face a high level of risk with respect to different HMHs and a poor ecological status in most of its territory, being one of the most anthropized areas in Italy and Europe. Moreover, a relevant EU H2020 NBS related project OPERANDUM took place in Emilia-Romagna. The aim of the project was testing NBS in rural settings to produce data and tools useful for the replication and upscaling of these solutions. I took part in OPERANDUM as a stakeholder engagement assistant for the Italian Open-Air Laboratory which consisted of three sites: one on the Panaro river, one in the Po Delta and the other on the coastline in the Ferrara province.

Assisting to the development of the OPERANDUM project, alongside expert interviews and document and report analysis, allowed me to obtain useful data for this research. It has been

conducted 19 expert interviews sampling respondents trying to cover all the main function of the Disaster Risk Reduction governance system and include different perspectives into the analysis. Actors included are from planning authorities, implementing bodies, decision makers, research organization, environmental association and private firms that deals with eco-engineering.

The questions in the interviews were guided by the existing literature dealing with natural resource governance and management and socio-technical change that are reviewed in chapter II. However, it was chosen an in-depth interview method for two main reasons: first, to arrive at the deep causes of phenomena and obtain honest and valuable judgment and preferences; second, to give the interviewee the opportunity of identifying previously undetected factors, since the specific topic of mainstreaming of NBS, analysed from a governance perspective, is a new field of research with little accumulated literature so far.

For the same reason, in the literature, there was not a readily available analytical framework. Therefore, the one adopted was inspired by the combination of some elements of different analytical frameworks including the Social Ecological System Framework (Ostrom and McGinnis 2014), the Management and Transition Framework (Pahl-Wostl 2009) and the Multi-level Perspective (Geels and Schot 2007). Analytical Framework are discussed in chapter III.

Chapters IV to VI describe diachronically the policy evolution at international, national, and regional level of the most relevant topic discussed in this research, i.e. Disaster Risk Reduction, climate change adaptation and biodiversity conservation and enhancement. The review allows for the description of the multilevel governance system and the assessment of the evolution of its main features. Finally, Chapter VII includes the Content Analysis of the expert interviews with the topics subdivided according to the adapted analytical framework mentioned Chapter III.

Chapter I

Disaster Risk Reduction and Nature-Based Solutions

1.1. The multifaceted nature of risk

It is intuitive how natural hazards have considerable and potentially highly destructive impacts on both human communities and ecosystems and compromise both development and the natural environment functioning. Reducing risk from natural hazard, now conventionally known as Disaster Risk Reduction (DRR), has thus always been a fundamental goal for every human community, and it is now a major challenge due to the ongoing global environmental change. Disaster risk reduction has been defined by the United Nation office for Disaster Risk Reduction (UNDRR) as a policy objective whose aim is “preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development”. The UNDRR thus highlights the strict link between disaster reduction and development, and it also stresses the need to prepare coping with “new” and projected risks mainly coming from changing climate.

Before getting into the more salient aspects of this work, it is deemed necessary giving some other definitions as, for instance, the same concept of hazard and risk have not always a shared meaning. A hazard is generally defined as a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation (UNDRR, undrr.org 2022). Hazards can have various nature and have natural or anthropogenic origins and they often can be “socio-natural” when they are the result of a combination of natural and anthropogenic factors. Among the main types of natural hazard Hydro-Meteorological Hazard (HMH) account for the vast majority (Debele, et al. 2019) and for over 87% in terms of the damages including casualties, economic losses, infrastructure damage and disruption to normal life (Bowyer, et al. 2020). McBean (2013) defined Hydro-Meteorological Hazards as “phenomena of the hydrological, meteorological, or oceanographic component, which have the potential to cause adverse effect on individuals or assets”. Among the most common we can mention floods, draught, storm surge, heatwaves and landslide of hydraulic origins. This kind of phenomena

can generally be described by a specific magnitude or intensity and occurrence probability. When a hazard actually occurs, it turns into a disaster if it causes serious disruption of the functioning of a community leading to human, material, economic and environmental losses and impacts (UNDRR, undrr.org 2022). Disasters can be categorized into rapid-onset events such as storm surges, earthquakes and flash floods and slow-onset events such as droughts, saltwater intrusion and desertification whose impact manifests over months or years. In both cases consequences might be devastating for local communities and the whole society. For instance, there were 16,585 disaster events during the period 1980-2018 resulting in \$5.08 trillion of damage worldwide, of which 80% were of hydrometeorological class (Munich-Re 2019).

The risk is therefore a combination of the probability of an event and its negative consequences, thus natural hazard risk refers to the expected consequences and impacts of a natural hazard. Indeed, the concept of “Disaster Risk” entails not just the physical dimension of the event but also its potential socioeconomic and environmental impact which depends on the exposure of people and asset to the hazard and their vulnerability. The UNDRR defines exposure as “people, infrastructure, housing, production capacities and other tangible human assets that are located in hazard-prone areas that are thereby subject to potential losses”. Measures of exposure can include the number of people, types of assets in an area and their economic value. Exposure, other than the socio-economic system, can also be related to the ecosystem and it is the extent to which systems are subject to pressures (floods, droughts, landslides, fire). The second dimension of risk is sensitivity to the hazard impact that is the degree to which a system is affected by, or responsive to, those effects. The third is the adaptive capacity of the system that is the ability to adjust or innovate in response to changing conditions (Seddon 2020). Hazard, Exposure, and sensitivity and adaptive capacity concur to determine the level of vulnerability in each specific settings. It is therefore possible to estimate the quantitative risks associated with that hazard in each specific location. Vulnerability is indeed defined by the UNDRR as “the conditions determined by physical, social, economic and environmental factors or processes which increase the sensitivity of an individual, a community, assets or systems to the impacts of hazards”.

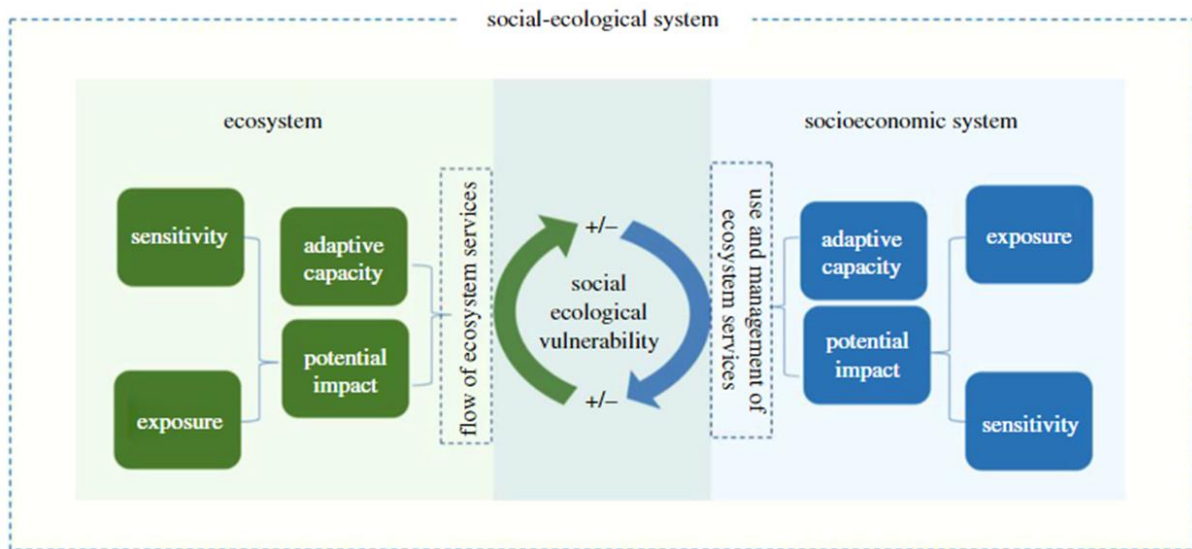


Figure 1 Vulnerability conceptual framework (Seddon 2020)

Vulnerability is thus itself a complex and multifaced concept which can embrace several variables of different nature varying from social, institutional, economic, and environmental factors. Vulnerability requires a lot of data to be measured, but its assessment is fundamental to evaluate priority of intervention in a world with scarce resources and how to intervene in contexts that face multiple societal challenges. Many frameworks and action for vulnerability assessment have therefore been developed and put in practice in the last decade (GIZ 2017; Renaud, et al. 2019; Shah, et al. 2020). Despite the great variety, most of the framework and approaches stresses the fact that the relation between the hazard and its potential impact, namely the risk, is not linear and deterministic but has a stochastic nature (Schweizer and Renn 2019).

The great relevance given to vulnerability in the definition of risk underline the social nature of disaster but also the high level of agency that humans have to increase or decrease the risks and prevent, mitigate and cope with natural disasters. This understanding highlights the complex nature of risks and identifies three dimensions: the first, hazard is more linked with physical climatological and meteorological processes; while the other two, exposure and vulnerabilities are more connected with contextual socioeconomic and environmental variables that will be discussed later.

1.2. Climate change and Hydro-Meteorological Hazards

Hydro-Meteorological Hazards have always been a threat to human communities and the surrounding environment, but unfortunately things are likely to get worse. The latest Intergovernmental Panel on Climate Change (IPCC) reports warn that without immediate and significant emission reductions it will be impossible to keep the global warming below the 1.5°C threshold and it also will be unlikely to achieve the 2° threshold (IPCC 2018). Moreover, it also highlights that some regions of the globe are climate change hotspots as they are predicted to suffer from higher increases of temperatures and higher incidences of extreme events when compared to the global average.

According to IPCC, human activities are estimated to have already caused approximately 1.0°C of global warming above pre-industrial levels (IPCC 2018), an increase that has already caused severe consequences. More and more studies indicate indeed that global warming has caused more frequent, long lasting and intense HMMs over the last century on the global scale (Guerreiro, et al. 2018) and disaster reported per year has increased significantly in the last two decades (UNDRR 2022). The IPCC Climate Change 2021 report clearly states that:

“Human-induced climate change is already affecting many weather and climate extremes in every region across the globe. Evidence of observed changes in extremes such as heatwaves, heavy precipitation, droughts, and tropical cyclones, and, in particular, their attribution to human influence, has strengthened since Assessment Report 5”

Indicators of Hydro-Meteorological Hazard such as mean temperature, number of summer days, number of dry days, duration of heatwaves, number of precipitations of over 20 mm per day, climatic water balance,¹ 95th or 99th percentile of extreme daily precipitation² are correlated with the concentration of Green House Gasses (GHG) in the atmosphere. Thus, these indicators value will likely change according to different GHG emission and

¹ The climatic water balance is the difference between annual precipitation and annual evaporation in mm/day

² The 95th or 99th precipitation percentile represent the value of total daily precipitation that is exceeded respectively on 5% or 1% of all wet days per year. It is used to assess the changing frequency of extreme precipitation

Representative Concentration Pathways (RPC) scenarios which are highly dependent on the emission reduction policies put in place. However, countries are not achieving the target imposed by the Paris Agreements yet and projected changes are believed to worsen the situation with a higher frequency and intensity of extreme events. Thus, the probability of occurrence of HMs and consequent disasters is likely to keep increasing in the future if proper emission mitigation as well as Disaster Risk Reduction strategies and actions are not developed and implemented (Masson-Delmotte and Zahi 2021) (Bowyer, et al. 2020). Nevertheless, the magnitude and scale of future climatic changes, and thus of HM at local level, is still very difficult to predict (IPCC 2018) and this uncertainty is a factor that should be taken into account when designing a and implementing a disaster risk reduction system and approaches (C. Pahl-Wostl 2007).

1.3. New approaches to risk mitigation: the Nature-Based Solutions

Nowadays, for what regard land and water planning and management, there is consensus that changes are necessary as traditional approaches are not suited to face the current and future environmental societal challenges. We are in a transition phase in which potential alternatives, both in terms of management paradigms and technical solutions, are competing or being integrated into previous approaches.

At least in the industrialized world, until the 1970s, it was deep rooted the idea of “human exceptionalism”: humans, contrarily to all the other species, even if embedded and dependent on the eco-sphere, have the innovative and technical capacities that would always permit them to manipulate and overcome the limits of the natural environment. Consequently, there has been a huge increase in human capacity to extract and exploit natural resources while environmental concerns were not at the center of the agenda. . From a scientific point of view, the study of the natural environment, natural resources, eco-systems and their management was based on an analytical and reductionist approach that tend to decompose parts into simpler units, divide disciplinary fields, and generating high level of specialization (C. Holling 1973). This approach was mostly focus on resource exploitation and not the conservation and protection of the natural environment, but things began to slowly change

during the 1970s when the attention to environmental issues grew. The emergence of environmental social movements from the 1960s onward, the publication of the groundbreaking “Limits to Growth” report published in 1972, and the United Nation Conference on Human Environment held in Stockholm in the same year contributed to start the process of increasing environmental awareness in many fields, including the scientific one.

However, the process of integration of concepts, theories, models, methods and practices has been slow and fragmented until the end of the 1990s. John Hunnigan, a prominent environmental sociologist, adopting a “soft constructivist” lens, reminded that even if environmental problems have a material reality, they are still acknowledged only through human processes such as scientific knowledge, activists' efforts, and media attention (Hunnigan 2014). Therefore, it takes time to build consensus to challenge traditional paradigm and practices. Since the Thomas Kuhn’s seminal work on scientific revolutions published in 1962, the term “paradigm” is now widely used to refer to the set of ontological and epistemological assumptions which provide a starting point for scientific enquiry (Kuhn 1962). A paradigm is thus a shared way of thinking and an agreed set of approaches used to investigating certain fields shared by any epistemic community (Pahl-Wostl, Brugnach, et al. 2011). A paradigm provides not just intellectual common ground but also an operational environment within which institutions and practitioners adopt an approach rather than another because it suits the paradigm’s assumption. Kuhn believed that paradigm shift occurs when scientists encounter anomalies which cannot be explained or solved by the universally accepted paradigm. Visibility of environmental issues, higher awareness about the finiteness of natural resources, biodiversity loss, pollution and (lately) climate change and the inability of current approaches to face such challenges have probably accelerated the questioning of traditional paradigm.

In the field of disaster risk reduction current approaches have proven to be unfit to reach two apparently conflicting objectives: reducing disaster risk and reduce biodiversity loss and environmental degradation at the same time. The scientific and international community are working to develop and implement approaches and solutions capable of decoupling the trade-off between these two societal goals.

In the field of water related Disaster Risk Reduction prevention and mitigation rely on structural and non-structural measures that include for example risk-informed urban

development and land use planning, multi-hazard forecasting and early warning systems, awareness-raising, drills, and education. Structural measures instead include mostly grey infrastructures and the so called “grey approach” with the construction of engineering structure such as dams, dykes, levees, seawall, canals, drainage pipes and tunnels, rock armouring, stabilization steel cages and other interventions that involve an extensive use of concrete, iron and steel. The grey approach usually has significant and multiple environmental impact: first, it may result in eco-system degradation and biodiversity loss which in turn might become a societal problem; second, it reinforces the feedback loop that increases the likelihood of disasters as the steel and concrete industries are characterized by intensive Green House Gasses emissions (Debele, et al. 2019). The grey approach responded to the need of reducing disaster risk and produce development and economic growth no matter the environmental and biodiversity cost. It mostly relies on deterministic engineering approach whose aim and goal were to exactly foresee and control the risk (C. Pahl-Wostl 2007). The grey approach was therefore not flexible as the infrastructure were designed to last decades and did not consider climatic scenario and future uncertainty. Now scientists are warning that future scenario are very uncertain, in particular for what regard extreme events, and that biodiversity loss and environmental degradation are also threats to human well-being. The traditional paradigm and approach need therefore to be questioned.

Nature-Based Solutions (NBS) have recently emerged and supported by relevant International Organization, such as the United Nations, the European Union, the World Bank and the International Union for the Conservation of Nature (IUCN), as promising alternatives or complementary solutions to face the climate change adaptation and mitigation challenges (Nesshöver, et al. 2017; Cohen-Shacham, et al. 2016). And this can be particularly true in the field of DRR where the grey approach is still dominant. NBSs are defined by the IUCN as:

“Actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits”.

In other words, solutions that are inspired and supported by nature and that provide benefits for both the local communities and the surrounding eco-systems. The NBS concept is therefore strictly linked to the concept of “Eco-system services” which were defined by the Millennium Eco-system Assessment (MEA 2005) as “the benefits people obtain from

ecosystems” (2005). A list of NBSs for different Hydro-Meteorological hazard is shown below (Debele, et al. 2019):

- Flooding and Droughts: ditches and retention basin, groundwater recharge trough check dams, infiltration trenches, renaturation of river banks small ponds and room for rivers, renaturation of riparian forest, mulching, greeneries to slow surface runoff in urban areas, and strengthening of river embankment through deep rooted plant.
- Storm surges: coastal wetlands, coral reefs, salt marches, mangroves, submerged break waters, and seagrass with the potential to reduce sea waves height.
- Heatwaves: urban greening as green spaces as parks and trees can reduce extreme temperature by as much as 4 °C.
- Land slide: forest management can optimize the hydrological effects of heavy rain and floods and thus reduce the risk and magnitude of a land slide, slope stabilization trough fascines and pile walls, snow fences, adjust grazing and meadow cycles to optimize seepage.
- Coastal erosion: slope re-vegetation, stabilization barriers with woods or bio-materials, artificial dunes.

Even if part of scientific community is working to develop innovative and effective NBS, it is clear by the aforementioned list, that not all NBS are innovative (technologically speaking) and neither a panacea as the same proponents often suggests a hybrid “grey-green approach” (Debele, et al. 2019). However, it can be argued that innovation is not an end, but a mean and it is desirable as long as it improves human well-being and contributes to environmental, social, and economic sustainability. It can happen that the innovation that NBS brings in the land and water management system does not stem from the level of technology, but from two other factors: first, the fact that the western industrialized world for decade has chosen the “grey” solution as standard for the reduction of Hydro-Meteorological risks, forgetting that nature already provides its own regulating strategies; second, the new assumption and approaches that are behind the concept of NBS. The classical engineering approach foresaw in fact the construction of an artifact that would remain there for decades regardless of the results and the social and environmental impacts that it generated. NBS imply a more iterative process in which uncertainty and the complexity of the socio-ecological system are taken into account (Nesshöver, et al. 2017). Moreover, NBS also imply a more comprehensive focus on the surrounding social and ecological system as literature highlights the co-benefit that an

NBS could bring beyond their main scope, in our case disaster risk reduction. Co-benefit might have different nature and here I am going to list some of the most cited: 1) Climate mitigation and carbon sink; 2) water management and quality; 3) adaptation and resilience; 4) conserving/enhancing biodiversity; 5) air/ambient quality; 6) urban regeneration; 7) participatory planning and governance; 8) social justice and social cohesion; 9) public health and well-being; 10) potential for new economic opportunities and green jobs (Giordano, et al. 2020).

Saddon (2020) and Shah et al (2020) highlight that NBS can have an effect on every dimensions of risk as they could: 1) reduce exposure and the extent to which systems are subject to pressures (floods, droughts, landslides, fires) 2) reduce Sensitivity by buffering communities from climate shocks by enhancing and diversifying ecosystem services and 3) supporting adaptive capacity supporting governance reform, new land management practice, empowerment and improving access to resources.

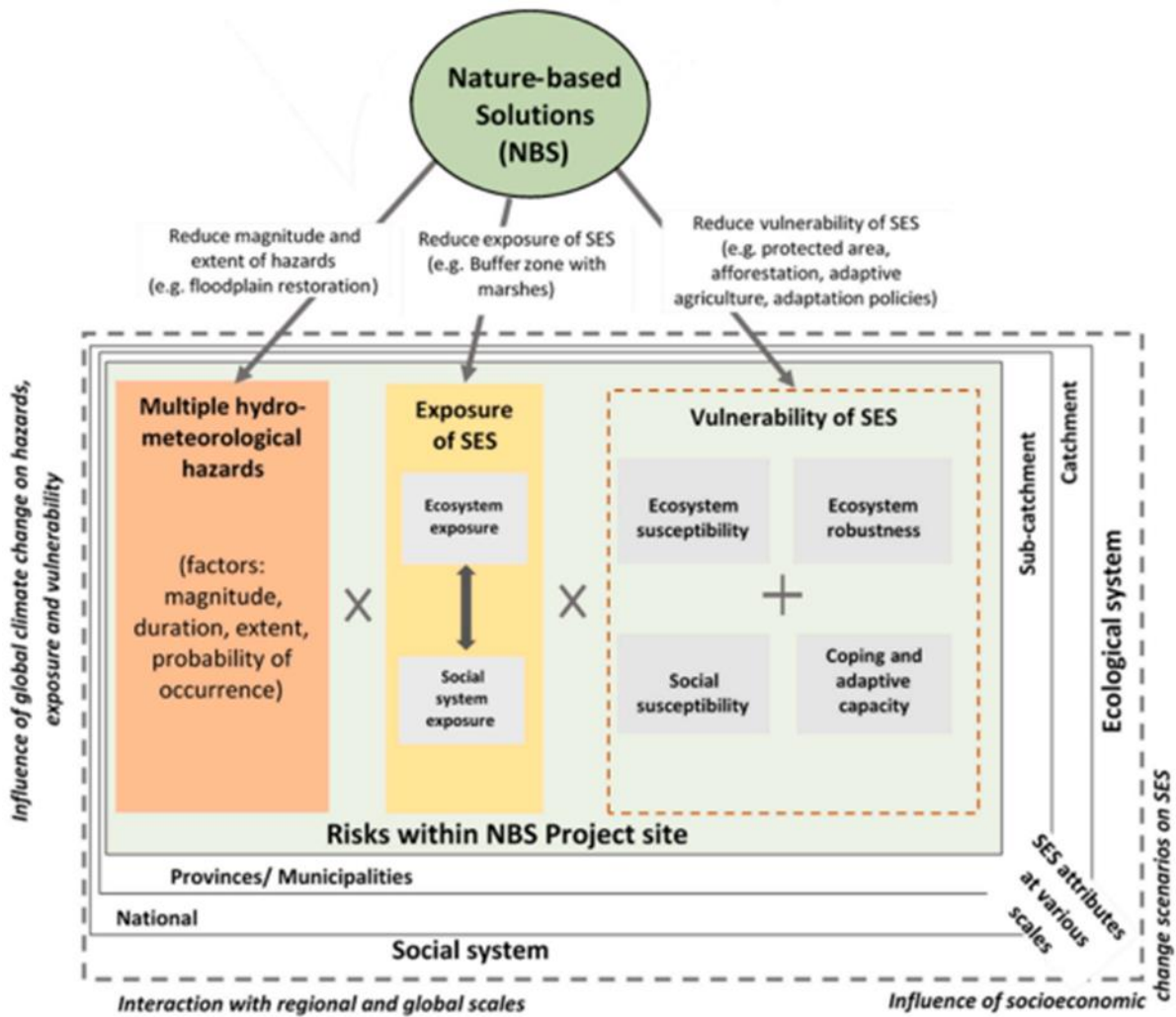


Figure 2 Conceptual framework for NBS impact on risk dimensions (Shah et al. 2020)

Therefore, the NBS represent not just alternative technical solutions but also a new approach and paradigm, a new way of thinking about our relations with the environment and how to deal with natural hazards in a different way. They represent what Sovacool and Hees define “Sociotechnical Changes” as NBSs imply changes not just in the technological aspects but also on attitudes, values, knowledge systems and social practices (Sovacool and Hess 2017). However, according to UNDRR definition, Disaster Risk Reduction is a policy goal which means that this field is deeply dependent on public policy and governance. Indeed, it can be argued that NBS to be mainstreamed faster and effectively need to find proper policy and governance frameworks. An analysis that aims to investigate pattern of mainstreaming and

potential barriers to the use of NBS cannot disregard analyzing the DRR policy and governance system.

1.4. Disaster Risk Governance

In general, many problems in water and land management, and thus in the Disaster Risk Reduction arena, can be associated with governance failures rather than ineluctability of damages caused by natural processes (Bakker 2011). Governance and mismanagement system may not just fail in reducing damages but even contribute to exacerbate the exposure and vulnerability of local communities, assets and eco-systems (Schweizer and Renn 2019). United Nations office for Disaster Risk Reduction underlines that relevant risk drivers include social factors: poverty and inequality, unplanned and rapid urbanization, poor land management, demographic change, rigid bureaucracies, weak institutional arrangements, non-risk-informed policies, lack of regulation and incentives for private disaster risk reduction investment, complex supply chains, limited availability of technology, and unsustainable uses of natural resources.

It is now agreed that is urgent to continue strengthening good governance in disaster risk reduction strategies at the national, regional and global levels and improving preparedness (UNISDR, Sendai Framework for Disaster Risk Reduction 2015-2030 2015).³ While the national and local risk governance system cannot have an effect on the hazard side of the risk, it can have a huge impact on exposure and vulnerability. Here we referred to governance with its broadest definition given by the United Nations Development Program (UNDP):

“The exercise of economic, political, and administrative authority to manage a country’s affairs at all levels. It comprises mechanisms, processes, and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations, and mediate their differences.”

In our case it is referred to the governance system that has as its main objective Disaster Risk Reduction in the field of land and water management. The one that the UNDRR call Disaster

³ The United Nations International Strategy for the Disaster Reduction was the predecessor of the UNDRR

Risk Governance and define as “the system of institutions, mechanisms, policy and legal frameworks and other arrangements to guide, coordinate and oversee disaster risk reduction and related areas of policy”. The relevance given to disaster risk governance issues is testified by the increasing academic literature on the matter and on the document produced by disaster risk related organization. For instance, it is indicative the title given to the last UNDRR Global Assessment Report, namely “Our World at Risk: Transforming Governance for a Resilient Future”.

All the feature of the system described above are resumed in the figure below. in which the concept of risk has been disentangled in its constituent concepts (hazard, exposure and vulnerability) while the variables that concur to its increase or reduction are summarized within the category “climatic” and “socioeconomic”.

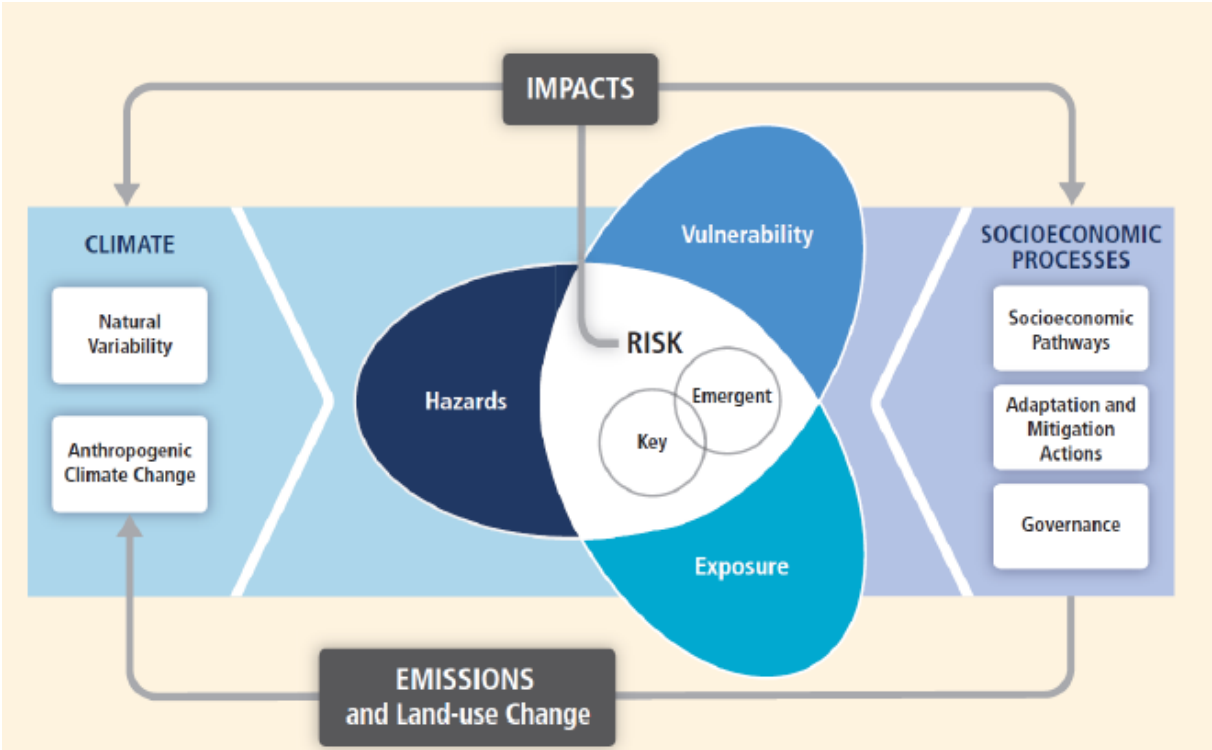


Figure 3 Risk components, drivers, and mitigating factors from the Vulnerability sourcebook application of IPCC AR5 developed by GIZ_EbA (2017)

The conceptual framework of figure 3 has been developed by the German Cooperation and development agency, commissioned by the IPCC with the aim of establishing guidelines on

how to apply the Vulnerability Sourcebook (2014), following the latest concept of Climate Risk according to the IPCC Assessment Report 5 (AR5). Indeed, in the AR5, Working Group II (WGII) replaced the concept of climate change vulnerability with the concept of climate risk (Zebisch 2016) widening its scope and including the three dimensions of hazard, exposure and vulnerability. As it is shown, governance, and in particular disaster risk governance, adaptation and mitigation action, are linked with exposure and vulnerability while hazards are dependent on other drivers. It is therefore crucial to find the link between governance and its articulation and exposure and vulnerability in order to reduce the risks in the most efficient but also ecological way, since the ecological transition also regard the disaster risk reduction arena.

1.5. Research question

The NBS and more specifically ecosystem-based disaster risk reduction measures (Eco-DRR), are strictly related to the adaptation discourse as they are believed to be, amongst other, a valid tool to make the system more adaptive and resilient. The NBS concept is becoming more popular among scholars and practitioner (Anderson, et al. 2021), it is already used in international and national high-level action plan for climate change adaptation, and it is promoted by relevant international organization such as the IUCN, the EU, UNESCO and the World Bank. This high-level policy input (that will be analyzed in following chapters), are supposed to reach the operational field and therefore pass through many governance levels. The transmission and implementation of policy input is not always straight forward and can encounter several barriers within a governance system (Cerna 2013). It is still unclear how much NBS are becoming popular within the governance and management system at the national, regional and local level where interventions on the land and water systems actually take places. What is certain is that we are assisting to an attempt to scale up and mainstream the NBS approach. One focus of this work is to assess at what stage of the mainstreaming process are we and which are the barriers and enabling factors for a faster or lower pace of NBS diffusion. The issue here is multidimensional as a socio-technical change in the field of

water and land management implies inputs and feedbacks from multiple governance level and actors. In order to have a clearer idea about the socio-technical change and mainstreaming process related to NBS, it is thus necessary to assess the current state of Disaster Risk Governance system including its structure, processes and main features. I am going to analyze the Italian/Po river basin/Emilia Romagna governance system because in this area there are one of the first experimental NBS project that would give me the opportunity to collect relevant data. The guiding research questions are the following:

RQ 1: Which are the main barriers and enabling factors for the NBS mainstreaming process in specific Social-Ecological Systems? The Emilia-Romagna case.

This broad research question will be refined consequently to the following literature review that will also allow to define the main feature of the governance system and how they interact with the mainstreaming process.

Chapter II

Theoretical Frameworks

Before starting with the analysis is necessary to make some steps back for three main reasons: first, to trace the evolution of the theoretical basis behind the main topic of the research, second, to identify the main feature of a water, land and risk governance system; and third, identify which are the most cited linkages between such feature and the process of NBS mainstreaming. As the issue under examination is complex, different reviews will be presented: the first is focus on environmental governance and management system and the related Social-Ecological system while the second is more focused on the conceptualization of NBS mainstreaming.

2.1. Environmental Governance Analysis

The concept of governance often appears vague and difficult to be applied to any object of analysis and there have been many attempts to conceptualize and theorize it. The term has emerged in the 1980s and 1990s as a means to describe key shifts in the nature and role of the state. “From government to governance” (Rhodes 1996), from “rowing to steering” (Mayntz 2004), from “hierarchies to markets and networks” (Sørensen and Torfing 2009). The term was very popular within liberal political theory as it enables to enlarge the view to those processes and actors that are independent from the formal authority of the central governments (Kennet 2008) implying a change in thinking about policy processes and practices. In this sense, government is associated with the use of command-and-control instruments as policy implementation tools, with governance being more closely related to

instruments requiring greater participatory input from the governed (Allan and Rieu-Clarke 2010). Thus, the term “governance” seems to be developed in contrast to a certain kind of government since at the time it was used to stress the necessity of developing less hierarchical and more inclusive way of exercise power and authority.

At the international level the concept of governance has also been deeply intertwined with development issues which have been more and more portrayed as “governance failure”. The term “governance” was often used in relation to the improper functioning of government or the need for more effective administration, mainly by international finance and development institution. This led to many definitions of “good governance” that usually include accountability, transparency, participation, rule of law, equity, strategic vision, and consensus orientation, principles mostly inspired by liberal democratic states (Allan and Rieu-Clarke 2010).

In other case the term assumed a more neutral stance without implying predetermined feature as in the definition given by the World Bank Institute (WBI) for example, defines governance as being “the traditions and institutions by which authority in a country is exercised for the common good”. The United Nations Development Programme (UNDP) instead has been more specific in identifying the main feature of a governance system defining “Environmental Governance” as “the system of policy, rules and norms that govern human behavior and it also addresses who makes decisions, how decisions are made and carried out, the scientific information needed for decision-making and how the public and major stakeholders can participate in the decision-making”. The UNDP definition has the merit of embracing the complexity of a governance system and its dynamic nature highlighting the relevance of interactions. It can be useful for analytical purposes without normative connotations. Water governance, land management, Disaster risk governance are subset of Environmental governance which have specific strategic objectives (e.g. water quality and quantity, sustainable land management and equitable distribution, disaster risk mitigation) and they are sometimes studied separately. However, since the majority of natural risks are water related and driven by hydro-meteorological hazard, water system are interrelated with land system and biodiversity, water and risk governance can be used as a synonym for the purpose of this research.

Carmel (2017) argued that complexity itself becomes the object of governance analysis: “if we are to do any analytical service, we must de-code this complexity”. This complexity also imply that every context has its own characteristics and both for analysis and implementation of a governance system and policy change it should be clear what is the system they are supposed to manage. In thinking of governance analysis as a mode of enquiry, contextualization is an integral part of the theoretical framework. In this case, the Disaster Risk Reduction arena, we should not forget that we are dealing with the natural environment, and we should therefore also conceptualize how environmental variables interact with governance ones. Therefore, in our case, for contextualization it is intended also the inclusion of the environmental and ecological context, as it is intuitive that the natural environment in which the governance system operates has a role in shaping structures, processes and outcomes of the system itself. Moreover, we are dealing with the mainstreaming of Nature-Based Solutions, an approach that lay its foundation on the idea of giving more relevance to environmental and ecological variables in many fields, including the Disaster Risk Reduction. Within the last two decades and more or scientific literature development, the theoretical and conceptual frameworks that can help us keeping together all the aspects highlighted before having converged within the umbrella of Social Ecological System studies.

2.2. Disentangling the complexity of Social Ecological System

Within the academia, in has been observed the emergence of bridging concept and research field such as “Social Ecological Systems”, as well as the development of multidisciplinary analytical frameworks that can help guide us in such complex matter. Berkes and Folke are considered the forefathers of the SES literature, and they are still the two most prolific authors in this field (Colding and Barthel 2019). They believed that resource management failures are often linked with governance and social issues, and therefore they argued in favor of knowledge integration between environmental and social science (Berkes and Folke 1998). Social-ecological systems were first considered by Folke and Berkes, as a part of new ecology that was called to better respond, understand and deal with complex and interrelated systems (Jasanoff 2004). They defined Social-Ecological Systems (SES) as nested, multilevel systems

that provide essential services to society. Using the term “social” rather than “socio” implying that the two sub-system, the social and the ecological, are equally relevant. Many definitions of SES exist in the literature but all of them underline the multilevel, interdependent, and complex nature of both social and ecological systems.

In 1998, Berkes and Folke presented the first SES analytical framework in their pivotal work “Linking social and ecological Systems for Resilience and Sustainability” trying to address the following question: what does confer institutional resilience, and how can institutional resilience be combined with ecological resilience for mutual benefit? Explicitly inspired by the work of Ostrom (1992) on common property analysis and Ostrom’s Institutional analysis (1990), the framework comprises five main dimensions to take into account: ecosystems, people and technology, local knowledge, property rights and institutions. Crucial is the analysis of the interaction between these dimensions and the outcome produced by such interactions.

Since then, Social Ecological System literature has grown exponentially (Colding and Barthel 2019) and several analytical frameworks have emerged (Turner, Davidson-Hunt and O’Flaherty 2003; Ostrom 2007; McGinnis and Ostrom 2014; Pahl-Wostl, Holtz, et al. 2010; Renaud, et al. 2019). These frameworks aim to understand the many dimensions and functioning of the SES and to develop and implement societal goal such as sustainability of resources management (Raworth 2012), climate change risk assessment (Birkmann, et al. 2013), improvement of adaptation and mitigation capacity (Garschagen 2014). According to Binder (2013) the SES frameworks differ for the following characteristics: the conceptualization of both the social and ecological system and their dynamics (e.g. the relation between macro and micro level, anthropocentric vs eco-centric perspective; the interaction between the two sub-system and the feedback loops dynamics; degree to which the social and ecological systems are treated in depth; and the main goal of the framework which can be action or analysis oriented.

However, with these broad aims and analytical divergencies, SES studies has become diverse, pluralistic (Miller, et al. 2008; Binder, et al. 2013; Partelow and Winkler 2016) and influenced by several disciplines and theories but most of them are aimed at analyzing or identifying better management and governance strategies and practices. Here it is useful to make some

steps back to trace its evolution and its conceptual basis with a greater focus on issues related to governance.

2.2.1 The Commons and Collective Choice theory

As pointed out before, failure in natural resource management can be usually ascribed to governance issue. When it comes to analyze a governance system it is necessary to have a clear idea of the nature of the goal that the system want to achieve. Mitigation of hydro-meteorological risk can be defined as a public good or a common good, a type of good which has generated a longstanding debate trying to answer the question: how should public goods be managed? Cox et al. realized a comprehensive synthesis of theories related to natural resources management and governance, finding that the two largest network clusters of theories are associated with the Commons and Collective choice theory (Cox, Arnold and Tomas 2010).

It is not easy to identify the very beginning of the Commons literature, but it is possible to affirm that this field of study received a considerable boost after the Garret Hardin's famous paper "The Tragedy of the Commons" (1968). The author reflected about the destiny of the commons, namely "shared resources" in a finite world where populations grow exponentially. Firstly, he affirmed that this is not just a "technical solution problems" as, independently from technological development, sooner or later, the share of per-capita resources would have shrunk leading to environmental degradation. Hardin blamed the *laissez-faire* logic both in population control and in the management of the commons as he sustained that: individuals, described as rational short-term maximizers, seek to increase personal gains by exploiting the commons as much as they benefit from it, while the "negative utility" or degradation brought by overexploitation are shared with all the community. This is the case for open pastures, forests, oceans, air, water and other common or public goods which are predicted to be overexploited.

Mancur Olson, despite the identification of some exceptions, came to similar conclusions. In its pivotal book “The Logic of Collective Action: Public Goods and the Theory of Groups” (1965) he argues that there is little rational incentive for individuals to contribute to the production or conservation of a public or common good. Indeed, individuals would prefer to “free ride”: enjoying the benefit of collective action without incurring the cost. The free rider hypothesis has a long history in economic and sociological literature as John Stuart Mill, already in 1848, identified this issue analyzing trade unions (Booth 1985).

According to Hardin the “tragedy” relies in the inevitability of such gloom prediction about natural resources and public goods. The only two exit strategy to cope with the tragedy present several problems: the first, consist in a top-down approach in which mutual coercion enforced by the state prevents the overexploitation. For Hardin, this is the least preferable as it is against its liberal view of society and economy. The second argument started from the study of enclosures, the process of enclosing farmland coupled with legal inheritance, namely privatization. Even recognizing the injustice implicit in the privatization, Hardin states that “the alternative of the commons is too horrifying to contemplate. Injustice is preferable to total ruin”. Hardin’s gloomy predictions have been challenged on several grounds, first of all for the conceptualization of Common-Pool Resources (CPR). Some authors like Edward and Steins believes that Hardin made an ambiguous use of the term “commons” that seem confounding CPR with “open access resources” which is a very rare case in the social reality and just one of many regimes used to manage natural resources (Steins and Edwards 2010). Therefore, is necessary to clarify what we intend for common pool or public goods.

Two attributes are frequently used to distinguish among four basic goods and services: exclusion and subtractability of use. Exclusion relates to the difficulty of restricting those who benefit from the provision of a good or a service. Sub-tractability refers to the extent to which one individual’s use subtracts from the availability of a good or service for consumption by others (E. Ostrom 2005).

| Difficulty of excluding potential beneficiaries | Subtractability of use | | |
|---|------------------------|--------------|-----------------------|
| | | Low | High |
| Low | | Toll goods | Private goods |
| High | | Public goods | Common-pool resources |

Table 1 Four types of goods. Adapted from Ostrom V. and Ostrom E. 1977

Where exclusion is costly, those wishing to provide a good or service face a potential free rider or collective-action problem (Olson 1965) which might lead to under-investments, lack of maintenance and conservation in both public goods and CPR. Instead, as highlighted in the table, subtractability is the attribute that distinguish Public Goods and CPR as it characterized just the latter (e.g. forest, fisheries, water withdrawal for agricultural use). It might lead to over-exploitation since users are tempted to obtain as much as they can because of the fear other would do the same. A conceptualization that led Olson to propose similar conclusion to those proposed by Hardin. Indeed, he argued that there are only two ways to overcome collective action problem: first, the “leviathan”, namely strict regulation enforced by public authorities, such as centralized management of natural resources or coercion to participate in collective actors like trade union and cooperatives; second, privatization or the provision of private goods and services to those participating in collective action with ancillary provision of the collective good as a “byproduct” (Booth 1985). Hardin’s paper and Olson’s book are still debated and have inspired a vast number of theoretical, experimental, and empirical contributions that have clarified the mechanisms of collective action problems for resource management and suggested ways to overcome them. (Diekert 2012).

Another critique on Hardin and Olson’s conclusions questioned the flawed assumptions about the human nature and behavioral model adopted. At the time, the model of “complete rationality” of social and economic actors, implied by Hardin and Olson in their works, was dominant in many branches of the social science. However, from the end of the 1970s, the complete rationality model has been questioned, especially by modern game theorist. Many scholars from diverse disciplines such as economics, political science, and sociology have used game theory as a tool for the study of the “tragedy of the commons” and “collective action problem” and define the set of rules and institutional settings that would foster cooperation and sound management of natural resources. Game Theory can be defined as the mathematical study of competition and cooperation in interdependent decision-making situations and it has proved to be a significant tool for research on collective action problems and social dilemma.⁴ Its beginning can be traced back to the publication of “Theory of Games

⁴ Social dilemmas are situations in which there is a conflict between individual and collective interests. It occurs whenever individuals in interdependent situations face choices in which the maximization of short-term self-interest yields individual benefit leaving all participants worse off than feasible alternatives. Social dilemmas are

and Economic Behavior” of Von Neumann and Morgenstern (1944). The payoffs to players determine the decisions made and the type of the game being played: zero-sum or constant-sum game if the payoffs sum up to zero or a constant then whatever one player wins, the other player loses; non-zero-sum games that can be divided in cooperative and non-cooperative game, differentiated by the possibilities to form coalition and external enforcements in the former (Diekert 2012). In a non-cooperative game, as in the Hardin’s example of farmers in open pastures, the main concern of players is to maximize their own benefit in the game knowing that the final outcome is the product of all the decisions made. The self-optimizing attitude of actors, represented in game theory, often results in non-cooperative actor behaviors even when cooperative behavior is more beneficial to all parties (Madani 2010). Indeed, even if a Pareto superior alternative exists, the results of the game is predicted at Nash equilibrium, where a less-valued collective payoff is achieved because no player can gain from unilaterally deviating from his strategy and cooperate and has no assurance that the other would not defect. For instance, in the simplest social dilemma in which individuals make independent choices in an interdependent situation, they have a choice of contributing or not contributing to a joint benefit. If everyone contributes, they get a net positive benefit. However, everyone faces a temptation to shift from the set of contributors to the set of those who do not contribute, and the theoretical prediction is that everyone will shift and no one will contribute (Diekert 2012). Beyond economics, the adoption of the metaphor of the game has changed the construction of theory even in political science and contributed to identifying issues that permitted to develop collective choice and the commons literature. Nevertheless, the deep reliance on “utility maximization model” and “complete rationality of actors” of the first generation of game theorists presented some criticalities to be solved to make it more applicable to the complexity of the social world.

Elinor Ostrom, with her pivotal book “Governing the Commons” (1990), emerged as one of the most influential authors in the field of natural resource governance and management. She found that the predictions obtained using complete rationality model ran against so many everyday experiences and empirical study, especially those examining the level of voluntary contributions to public goods (Lichbach 1995). Interestingly, the pessimistic prediction did not hold even in the one-shot experiment case in which a much higher than predicted level of

called by many names, including the public-good or collective-good problem, the free-rider problem, moral hazard, the credible commitment dilemma.

cooperation was found. Most experimental studies of social dilemmas with the structure of a public-goods provision problem, have found levels of cooperative actions in one-shot games, or in the first rounds of a repeated game, that are significantly above the predicted level of zero. Ostrom goes beyond the assumption on the human nature used in pure “rational choice theory” arguing for a second-generation model of rationality. The individual attributes that are particularly important in explaining behavior in social dilemmas include: 1) trust, the expectations individuals have about others' behavior, 2) reciprocity, the norms individuals learn from socialization and life's experiences, and 3) reputation, the identities individuals create that project their intentions and norms. Consequently, trust, reciprocity, and reputation should be included in formal models of individual behavior. Ostrom rejects the complete rational model of human behavior used by Hardin and Olsen and the overly pessimistic idea that individuals are incapable of restructuring their own situation of interdependence. Indeed, they do not include the possibility that individuals can learn to cope with social dilemmas (Lara 2015). These results made Ostrom propose a model in which actors are “fallible learners, norm-adopting individuals who pursue contingent strategies in complex and uncertain environments”. Actors are indeed presumed to be “boundedly rational” rather than “completely rational” as assumed by the first generations of game theorists. Indeed, even if they seek to achieve goals for themselves and for the communities to which they identify, they do so within the context of ubiquitous social dilemmas and biophysical constraints, as well as cognitive limitations and cultural predispositions (E. Ostrom 2005). Moreover, actors are able to learn heuristics, norms, rules, and how to craft rules to improve achieved outcomes in repetitive situations. These findings have constituted the intellectual basis for claims about the need to democratize and decentralize natural resource governance and management.

Another variable that has been deeply discussed in environmental and natural resources governance and management is the structure of the system. Since the 1980s, a common trend in public policy and political economy has been the rejection of the notion of the central government as the only decision-making authority and service providers. Following Hardin's arguments, the market was seen as the optimal institution for the production and exchange of private goods while for public goods or common pool resources, it was deemed necessary a strong central government capable of imposing regulations, rules and taxes to force self-interested individuals to contribute and refrain from self-seeking activities. Without a hierarchical government and strong top-down input, self-seeking citizens but also public

officials would fail to generate appreciable levels of any public goods. This notion has been challenged by the idea that a multilevel and polycentric governance system that include a wide number and type of stakeholders⁵ placed at different level can be more effective for the management of the territory and the natural resources.

In the commons literature, but more in general in the environmental governance literature, wide space has been given to the structure of the system and the level of polycentricity or centralization/decentralization (Lemos and Agrawal 2006). Many theories include the centralization variable and make either similar or contradictory arguments (Cox, Arnold and Tomas 2010). Many institutionalists argue that the hierarchical ordering of jurisdiction and the mutual exclusivity between jurisdictions operating at the same level with a “monocentric” center of control is not the only effective and sustainable way to manage natural resources. Already during the 1960s, researches in the field of public service industries carried out in the United States (V.Ostrom 1962, Weschler 1968, Warren 1966, E.Ostrom 1965), found that multiple public and private agencies, not organized in a clear hierarchical structure, had found out effective ways of organizing water resources at multiple scales (E. Ostrom 2010). Therefore, it was introduced the concept of “Policentricity” to define complex and hybrid governance systems. The notion of polycentric political systems was introduced by Vincent Ostrom already some decades before as a “system of many centers of decision making which are formally independent of each other” (Ostrom, Tiebout and Warren 1961). However, it is intuitive that each center does not act and operates with total freedom but in an environment that shape its own behavior. Polycentric systems are indeed social systems of many autonomous decision centers operating under an overarching set of rules which we are going to discuss in another paragraph.

In 1973, Elinor and Vincent Ostrom founded the Workshop in Political Theory and Policy Analysis at the Bloomington school of the Indiana University with the aim of examining further the collective action problem and thus cooperation in the management of common pool resources and public goods. This gave a further boost on publications regarding institutional settings and the concept of polycentricity. The first publications on polycentric governance were strongly concerned with the self-governing capacity of local communities,

⁵ Stakeholders can be defined as any person or group who influences or is influenced by a project (Durham, et al. 2014) a decision or a policy action (Madani 2010).

emphasizing their ability to manage resources and their territory. Lately, other works in this tradition (Oakerson 1999; Dietz, Ostrom and Stern 2003; Karkkainen 2004; Ostrom 2005) shifted their attention to the concept of institutional diversity and heterogeneity. The Ostroms operate from the perspective of pluralistic worldview in which diversity and heterogeneity are “social facts” and peculiar feature of the social world. Following this line, the institutional settings generated to managing heterogeneous context are necessarily diverse and pluralists. The previous assumption of homogeneity in institutional studies was made for theoretical reason but has been found to not fit the real world to an adequate level. Indeed, empirical work has shown that heterogeneity is a preeminent aspect. The definition of heterogeneity used by the Bloomington school focuses around three main dimensions of institutional heterogeneity: capabilities, preferences, belief and information. Then, the literature expanded into more detailed disaggregation of heterogeneity including many types of variables such as: economy, technological, social, cultural, racial, ethnic, linguistic, gender, community, education, and even personal experience. The problem on how to manage such heterogeneity, institutional diversity and pluralism are a major issue in the literature dedicated to institutionalism, governance and institutional design (Aligica and Tarko 2012). An answer to this challenge has been decentralization.

Since the 1980s, the concept of decentralization, closely related to the concept of polycentricity, has gained relevance in many fields including environmental governance and territorial planning. Decentralization means the devolution of authority from a central government to lower level authorities and actors which is therefore a precondition for polycentricity. In the last decades, many countries have undertaken a process of decentralization in the governance and management of natural resources (Bloomquist, Dinar and Kemper 2010). The reasons for the shift away from centralized forms of governance had to do with many factors and discourses focused on the fall of economies based on centralized control, the loss of faith about central government capacity, the lack of public funding, and the attempt of democratizing governance (Blomquist, Dinar and Kemper 2005). Ostrom’s work provided the intellectual grounds for this shift toward decentralized, community-based natural resource management (Lemos and Agrawal 2006). However, expert argues about the scale of this change, if it has been implemented properly and if it had really a significant impact in term of democratization and effectiveness.

One issue related to the structure of the governance system upon which there is more consensus is the adoption of a “bioregional” approach to resource management even when such a region crosses multiple administrative borders (Huitema, et al. 2009). Lee (1993) suggested that “seeing the ecosystem as a whole must precede efforts to manage it”. In the case of water and land management and DRR, the bioregion or the ecosystem of reference is the hydrological basin as several physical and biological dynamics in each basin area are strictly interlinked.

Decentralized and polycentric governance systems have been found to offer considerable advantages when complex problems, such as environmental management and in our case Disaster Risk Reduction, need to be addressed (Folke, Biggs, et al. 2016). They are believed to be more resilient and better able to cope with change and uncertainty and risks because of the following aspects:

- Decentralization and polycentricity imply a more flexible structure that can potentially be a better fit with the local Social Ecological System (Blomquist, Dinar and Kemper 2005; Folke, et al. 2016).
- Decision making is moved closer to the source of the problem as issues in the DRR field are inherently context specific (Renn and Schweizer, *Inclusive Risk Governance: Concepts and Application to Environmental Policy Making* 2009).
- Such structure would promote the development and reception of innovative solutions and practices. where innovations arise as a result of the interplay between different levels of the institutional structure and stakeholders (Edquist 1997).
- Enable wider and faster feedback and learning loops (Ostrom 2005; Pahl-Wostl 2007).
- Faster substitutions as if one unit fails others may take over its functions.
- It is a precondition for inclusive governance (Van Asselt and Ortwin 2011)
- Increase trust, cooperation and ownership among stakeholder (E. Ostrom 1997) laying the basis for the democratization of the natural resource use and management (Ribbot 2002; Renn and Schweizer 2009).

In some cases the governance structures have been found to have a strong influence on the nature of multilevel cooperation and social learning processes. Tippet et al. (2005) and Mosert et al. (2007) have shown from empirical analyses that centralized political and economic systems, rigid bureaucratic systems, and political secrecy and poor public access to

information can impede social learning. This imply that the system is less capable of “fixing” itself, it tends toward path dependency, and it is less prone to integrate and foster socio-technical changes.

Institutional diversity, polycentricity and decentralization are often considered normatively valuable themselves. However, despite the popularity of these concepts, a systematic enquiry and empirical research on their posited advantages are lacking (Carlisle and Gruby 2017). Some authors warn about the loss of democratic accountability in a system where responsibilities are very dispersed and multiple independent decision-making centers enjoy considerable freedom (Sørensen and Torfing 2005). For instance, it may occur with bodies such as intergovernmental committees or specialized agencies like the River Basin Organizations, technocratic organization that are set up to deal specific issues. Skelcher et al (2005) suggested that such bodies tend to prioritize goal achievement over democratic procedure and accountability. Moreover, in such governance regime problems of vertical and horizontal coordination might emerge, increasing the transaction cost of resource management. In this case economies of scale can be lost, especially if the basic units in the system are very small (Skelcher, Mathur and Smith 2005). Moreover, collective decision making is difficult because of the need to accommodate the “complexity of spatial patterning, multiple functional overlays, partial polity formation, and variable system coupling”. The answer is improved coordination, but the transaction cost of consultations, such as reaching and enforcing agreements might be high (Imperial and Hennessey 1999). Although decentralization may be undertaken in the hope of reducing the central government financial burden, the early stages of decentralization may be expected to require some additional expenses in order to make the transition. The central government often will need to assist basin stakeholders in establishing organizations and practices that will facilitate basin management (Blomquist, Dinar and Kemper 2005). If coordination fails, duplication of efforts and counterproductive actions may undermine the efficiency and effectiveness of the governance regime.

Analyzing the broad field of collective action and natural resource governance and management is difficult to grasp generalizable results regarding structural variable. Indeed, key structural variable like decentralization, institutional diversity and polycentricity may facilitate or impede collective action depending on circumstances, contextual and preexisting

factors. This explain why no general theory of collective action has been offered and may not even be possible. However, the main message that Ostrom provided us is that it is still possible to navigate within complex dynamics and conditional theoretical scenarios (Aligica and Tarko 2012). She had indeed enabled the transition from the “old institutionalism” focused on formal rules and institutions to “neo-institutionalism” where institutions are also informal and include norms, values and heuristics.

From the 1990s onward, also thanks to the work of Ostrom (1990) and t, the topic of “participation” and “inclusivity” in environmental management had gained momentum (Glasbergen 2000; Keohane and Ostrom 1995; Sandstrom, Bodin and Crona 2015; Schweizer e Renn 2019). The question about who and how should participate in decision making processes has stimulated a debate that continues to this day. Beyond the academic literature, many International Organizations, Conventions and international policy frameworks and guidelines (which will be discussed later) identified the opening up of the governance system and decision-making process as a mean to face the challenge of complexity and uncertainty of the Social Ecological System. The UNDP (1997) stated that good governance should be characterized by participatory, consensus oriented, accountable, transparent, responsive, equitable and inclusive structures and processes. These principles have been integrated also in frameworks related to water management and Disaster Risk Reduction, fields in which many have argued in favor of inclusive governance (Sendai Framework 2015; Schweizer and Renn 2019). Indeed, as said before, the nature of disaster risk is not only a challenge from a scientific perspective, but also and foremost a societal one.

Inclusive governance and decision making in the field of water and land management can be implemented following different approaches that can be categorized according to the following criteria:

- Objectives: the reasons why participatory governance and co-management practices are implemented.
- Role of the actors: the belief about the role that each type of actor should have in relation to others (Welp, et al. 2006). For instance, who has the leadership in the different phases of the decision making and engagement process.

- Type of knowledge: what kind of data and information are valued relevant varying from technical/scientific to local/traditional or social and political. According to different approach some might consider relevant just scientific and falsifiable data while other also stakeholder's value, opinion and perception.
- Science-policy interface: it is relevant for our case study because the water and land management field require a high level of scientific knowledge and expertise. Its interface with the policy dimension depends on the prevalent understanding of science which imply epistemic and philosophical questions such as: should science be detached from the social and political system and deal with self-referential questions or does science serve societal needs? Can science be neutral and objective or does it mirror societal and political developments and conflicts? How should scientists and technicians relate to "laypeople" including policy makers? Who is in charge of identifying societal problem to be solved? Answering these questions has relevant effect on belief about the way decision making should be taken and how and when stakeholders should be involved (Mielke, et al. 2016).
- Level of engagement: a certain degree of power can be assigned to different actors in different phase of the decision-making process. It may vary as stakeholder can participate with a peer-to-peer collaboration, consulted or just informed (Soini, et al. 2020).

The interplay of this criteria can be used to construct ideal types of engagement and inclusive governance approaches. Before going into more details it is better to clarify that ideal types are not meant to correspond to all of the characteristics of any one particular case of the real world but they are use with an analytical purpose to stress certain characteristic of a phenomenon. I am going to resume the most relevant:

- Technocratic: the engagement process in this case is aimed at increasing the amount of objective and falsifiable data and scientific skills in order to improve the technical output of resource management. The primacy of science is retained throughout the process from problem identification, that usually arise from the scientific and technical realm, to outputs of the decision making process. It is emphasized the ethical neutrality of scientific production and decisions are taken according to scientific output and they are thus legitimated by science. Policy makers can also directly delegate relevant decisions to technician or technical authorities. Other type of

stakeholder have a small amount of power and they are usually involved just in the phase of data gathering.

- **Functionalist:** this perspective stresses that participatory exercises are necessary in order to meet complex functions of society that need input as knowledge (Kates, et al. 2001) and values (Lang, et al. 2012) from different constituencies. This would increase the number of input and trigger learning process (Pahl-Wostl 2007) that would make decision making more effective in reaching its objectives (Renn and Schweizer 2009). There is the recognition that science and politics generate meanings in very different ways and also that the input exchanged by these two realms might sound as a “noise” for both. However, stricter collaboration is necessary to make science more sensitive to societal problem and politics more sensitive to scientific findings.
- **Rational/Deliberative:** participation is mainly influenced by Habermasian discourse theory that lays its foundation on the idea that modern societies are characterized by a plurality of values and worldviews and conventional decision-making cannot deal adequately with this heterogeneity. It is recognized the presence of power and interests in both decision-making process and in the production of science but the discursive approach seeks the common good through the rational competition of arguments. It is therefore necessary to find mechanisms that enable different kind of stakeholder, including those without a scientific background, to engage in joint rational decision making about water and land management. The objective here is to find the best possible consensus among moral agents about shared meaning of actions based on the knowledge about consequences and an agreement on basic human values and moral standards (Webler, Kastenholz. and Renn 1995). The main contribution of deliberative models to society is to enhance moral legitimacy and to reflect social and cultural values in collective decision making (Renn and Schweizer, *Inclusive Risk Governance: Concepts and Application to Environmental Policy Making* 2009).
- **Democratic/emancipatory:** in this case the objective is bringing together in an open arena a set of stakeholder representative of the highest number of social groups. The aim is also to integrate actors in systems that are touched by complex transformations. Recently, more focus has been given to equity and emancipation among stakeholder.

The principle of “Leave no one behind” is at the core of the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs). This principle has been integrated in all the major international framework and guidelines regarding water management but also disaster risk reduction. For instance, one of the last UN water report (2019), entitled “Leaving no one behind”, stressed the need to ensure that the less privileged groups of society are given the opportunity to have their voices heard and that participation provides the means to empower them developing more personal and collective agency. In this case the call to engagement is intended also in a proactive way as policy makers and scientist should also try to involve marginalized groups and not just those that are already relevant and active.

As said before these are ideal-types, while reality is more complex and real cases most likely present a mix of characteristics from different types of approaches. Although some of these concepts and models can be combined and integrated, there are at least differences in priorities and objectives that should be the starting point for the development of the engagement strategy. For instance, adopting a functionalist approach means that the main evaluation criterion is the quality of the output, whereas the models inspired by post-modernism and emancipatory schools are less interested in output, but rather on the observed change in participants for instance in terms of emancipation or shift in values, perceptions and mindset (Renn and Schweizer 2009). Consequently, these different views about objectives and evaluation criteria would influence the choice about which kind of stakeholder should be involved and how. A research carried out by the US National Research Council (2008) demonstrated that most participatory exercises are inspired by a functionalist or a deliberative model or a combination of both. Much and von Streit (2020) found that functional and expert-driven participation dominates even when initial intentions are different and inclusivity is an objective.

As said before, I am portraying the Nature-Based Solutions mainstreaming as a socio-technical change which thus assigns a high relevance to the innovations and experimental side of the matter. Transdisciplinary collaborative research is increasingly seen as good practice for planning and intervening in the Social Ecological System (Soini, et al. 2020) and it is becoming a standard in many research agendas. Research and experimental spaces aimed at addressing sustainability challenges have found to be most effective when knowledge is “co-produced” by scientists and non-scientists (Norström, et al. 2020) and this is believed to be true

also in the case of Nature-Based Solutions (Nesshöver, et al. 2017). Moreover, many are arguing in favor of integration of experimental approaches within the water and land management and disaster risk governance system as a way to better adapt to new challenges posed by climate change and the uncertain and unpredictable nature of the Social Ecological Systems.

These practices can be termed as “co-creation”, “co-management”, or “co-development” and can be briefly defined as a participatory and inductive approach that aims to stimulate collective creativity in order to jointly develop an idea or implement a project. Stembert (2017) argued that, ideally, the co-creative process consists of four phases: 1) the co-analysis and identification of the problem, 2) the co-design of the solution, 3) the co-evaluation, and 4) the co-implementation of the idea.

The engagement strategy usually begins with the stakeholder mapping, the process of identification of the stakeholder that should be included. Then stakeholder has to be analyzed assessing their background and expertise. In projects related to Nature-Based Solutions it can be argued that it is fundamental to cover the whole spectrum of expertise, competences and knowledge since the beginning, and that include: knowledge based organizations (engineering, ecology/biology, social science), policy-makers, representatives of the local communities, interests groups, associations, private companies. Then is possible to prioritize them according to different criteria and establish different level of engagement. Criteria can be for instance the power that they have to carry out the necessary tasks for the achievement of the objectives, their interest in the project and therefore the time and effort they are willing to invest (Soini, et al. 2020), and the level of vulnerability to the hazard the project is willing to mitigate. Tools for participative practices might include forums, living labs, Open Air Laboratories, workshops, information and data sharing, online consultations, public hearings and assemblies (Durham, et al. 2014). However also in this case the development and application of the engagement strategy (who, when and how) might vary according to criteria we have seen in the case of inclusive and participatory governance (objective of the engagement, role of actors, understanding of science and its relationship with the social realm, the power assigned to different type of stakeholder and their level of engagement) but also more practical one, time and resources destined to the engagement processes as it should be remembered that participatory processes are usually time and resource consuming.

Many scholars have debated about the potential benefits and shortcomings of broader participation and collaborative approaches (see e.g. Lang et al. 2012; Tschakert et al. 2016, Drooge and Spaapen 2017; Schöpke et al. 2018., Tobias et al. 2019; Fazey et al. 2018). The main topic identified in the literature are discussed below.

Co-production and harmonization of knowledge: public participation might improve the quality of decision making by opening up the decision-making process and making better use of the information knowledge and creativity that is available in society (Huitema, et al. 2009). Folke and Berkes (1998) pointed out that local stakeholders are able to provide ecological knowledge about the local eco-system able to reshape management practices that in turn were framed by local institutions, primarily of an informal nature (Colding and Folke 2001). Indeed, different types of knowledge, scientific local and traditional, might increase understanding regarding the current social-ecological system and scenarios of the future including the knowledge and perception of risks. Putting together various types of knowledge systems ranging from scientific, western, local and indigenous is necessary for a successful co-creation process (Tengö, et al. 2017). Indeed, a greater range of options can be explored, and challenges can be addressed unintended consequences identified and mitigated. Using participatory methods may also help to engage the marginal groups and tacit knowledge. Engagement with different experts may improve access to additional information or resources and support the analysis of the data. Involvement of local knowledge in the planning may improve risk management, both in research and in practical solutions (Pahl-Wostl, Brugnach, et al. 2011). Moreover, management itself may become less controversial when knowledge and information are disclosed and shared. In this case less conflictual behavior would take place, increasing trust and reciprocity (Ostrom 1998) and implementation of decisions would be much smoother (Huitema, et al. 2009).

Social and economic impact: engagement of the stakeholders may increase the social impact of the policy action or projects through increased relevance of the research that may be realistic to use. Knowledge co-production may improve decision making and policies as well as business opportunities through the identification of barriers to commercialization or shortcoming in the supply chain. I argue that this is particularly relevant in the process of NBS mainstreaming as in most of the case we deal with new solutions and prototypes which need to be scaled up. Participatory exercises are more likely to be socially relevant as they

may create new networks and social capital, including trust among participants, connections (Galanti 2017; Soini, et al. 2020) and a bulk of people that can act as agents of change throughout the lifespan of the policy or the project. Giordano et al (2020) also identified stakeholder engagement in NBS projects as a tool to improve socio-cultural conditions of communities and the better identification and communications of NBS co-benefit.

Legitimacy and acceptance: many scholars have pointed out that participation would improve public understanding of the management issues at stake and make decision making more transparent. This participation can also act as a stimulus for the involved government bodies to coordinate their actions and provide serious follow-up to the inputs received (Huitema, et al. 2009). Birkhoff (2003) conversely, found that when stakeholders are not fully involved in framing, analyzing, generating, and implementing solutions, their interest fade and they might seek other ways to pursue their interests, hampering the decision process. Lang (2012) found that collaborative efforts between researchers and non-academic stakeholders promises increase legitimacy, ownership, and accountability for the problem, as well as for the solution adopted (Gibbons, et al. 1994; Spangenberg 2011). Pagano et al. (2019) found that the participatory approach helped both to raise awareness about the efficiency of NBS, in particular hybrid measures. Irvin and Stansbury found that working with the stakeholders (from the start of the process) increases the likelihood that the stakeholders feel greater ownership to the project, and therefore the outcome is more readily adopted, applied and disseminated. It is also expected to increase trust among the stakeholders and help to mediate conflicts as the ability to break gridlock and prevent litigation increases (Anderson, et al. 2021).

Efficient use of resources: although the participatory processes themselves may take time and financial resources (compared to a top-down and expert driven planning and implementation) in the short-term, solutions that are co-designed and co-created may be more effective, lasting and cost-efficient as they utilize the local knowledge and alternative solution that single designer might not think about (Soini, et al. 2020). Begg (2018) and Zingraff-Hamed (2020) also found that wider participation lead toward improved outcomes.

Social Learning: working together may include changes in the pre-conceived ideas about the nature of problems and their solutions, deepening of knowledge and understanding of other perspectives and circumstances. The engagement may also establish new links and networks

between the stakeholders, sectors, science and society, which may lead to generation of new knowledge, research ideas and innovations. Pahl-Wostl et al. (2007) found social learning to be essential for developing and sustaining the capacity of different authorities, experts, interest groups and the public to manage the SESs, and in particular river basins. It is fundamental to give momentum to the learning loops that would permit to challenges assumption of traditional management paradigm in favor of new one not just on theoretical basis but also practical as we are dealing with a socio-technical change. Indeed, for the mainstream of NBS is necessary to develop and disseminate shared practices in many layers of the governance and management system.

Despite these posited benefits, some scholars argue that stakeholder engagement and formal inclusive governance structures are not sufficient to guarantee better results in term of inclusiveness, effectiveness, sustainability or equity. There is little empirical evidence regarding the actual value of wide participation to land and water management (Wamsler, et al. 2020). Conversely it may happen that enlarging the spectrum of participants the outcomes are worse off in term of efficacy and sustainability. For instance, Wamsler et al (2020) affirmed that under current conditions, citizen engagement often hampers sustainable outcomes. Key constraints might arise such as power structures or the lack of the cognitive and emotional skills, while relational capacities are required for improved democratic governance. Lang (2012) argued that scientists might be skeptical with respect to reliability, validity, and other epistemological and methodological aspects of collaborative research. As a result, both practitioners and stakeholders might be skeptical regarding the salience and the practical relevance of the results. Clarke et al (2016) reminded that the co-produced knowledge and output of the decision-making process needs to be legitimate, salient and credible for all involved stakeholder, but it is not always the case.

Some scholars highlight the time and resource consuming nature of participative practices as the process might be slow, muddled and costly (Lubell, Robins and Wang 2014). The answer is improved coordination, but the “transaction costs” the costs of consultations, reaching agreement, and enforcing such agreements can be high (Imperial and Hennessey 1999, Kemper et al. 2005). If coordination fails, unnecessary duplication of efforts and counterproductive actions may result. Furthermore, diverging interests and the politicized nature of resource governance is underestimated and might lead toward a paralysis of the

process, or worse, increased polarization (Huitema, et al. 2009). For instance, participatory practices might still reproduce the local power structure and be dominated by powerful actors (Kumar and Corbridge 2002) increasing the grievances of marginalized groups. Another criticism is that participative practices are implemented without an outcome-oriented strategy and proposed just as an end itself (Giordano and Shah 2014). Finally, stakeholders, according to their background, interest and values might differently perceive and evaluate the pros and cons of NBS and the associated co-benefits. The differences among stakeholder affect the kinds of benefits to be valued, and the values to be attached, which are strongly affected by individual or group perception of benefits (Jacobs et al., 2016; Small et al., 2017, Giordano, et al. 2020). It is not granted that these perceptions are conciliable or that people prefer the “greener” option.

Nevertheless, “stakeholder engagement”, “bottom-up approach,” “inclusive governance”, and an array of term following the prefix “co-,” are becoming commonplace especially in projects funded by international organizations. The increasing use of this terminology is indicative of the shift towards increased reliance on public support (Bubeck, et al. 2017; Puskás, Abunnasr and Nalbandian 2021) that has also been codified in relevant policy framework that will be discussed later. This shift has been significantly supported in the context of flood risk management in Europe (Begg, et al. 2017) and it is an integral part of the Nature-Based Solutions approach (Bark, Martin-Ortega and Waylen 2021). It promoted a departure from a “decide, announce, defend” decision maker-practitioner-public interaction model to an “engage, deliberate, decide” approach (Anderson, et al. 2021). However, if this approach is becoming a standard in research agendas and experimental spaces, it is not clear the extent to which it is implemented systematically in the field of water and land management and Disaster Risk governance system.

2.2.2. New Ecology and ecosystem approaches

As pointed out before, the study of eco-systems and their management was based on an analytical and reductionist and clearly separated disciplinary fields. Without undermining the relevance of mono-disciplinary, Spangenberg (2011) suggests the distinction between science

for sustainability and science of sustainability (inter-and transdisciplinary), affirming that the former has received much more attention than the latter until the end of the 1990s. Voices for the development of inter- and trans-disciplinarity and holistic approach to water, land and risk governance were growing (Ward and Elliot 1995; OECD 2011). Since the end of the 1990s, environmental science and ecology were already in a transition phase as highlighted by prominent authors, such as the Canadian ecologist Crawford Stanley Holling, who stated that “if the old ecology can be characterized as a science of the parts, the new ecology can be thought of as the science of the integration of the parts”. The roots and intellectual heritage of such a fundamental statement can be traced back to the work of General Systems Theory (von Bertalanffy 1968) and Systems Ecology (Odum 1983) and has still a wide resonance.

New ecology gives a relevant role to the concept of “Resilience” which has been reshaped since the 1990s. The old conceptualization focused on stability at a presumed steady state and stressed both the resistance to a disturbance and the speed of return to the equilibrium point. This is the conventional equilibrium centered, linear, cause and effect view of a predictive science. Holling and lately Folke and Berkes sustained, instead, that such conceptualization gives a misrepresentation of the function of eco-systems and can be useful just in the short term. They preferred to describe resilience emphasizing “the conditions in which disturbances (or perturbations) can flip a system from one equilibrium state to another”. This was the emerging, multi-equilibrium, non-linear view of Holling's (1986) "science of surprise", in which causal effects and predictions are not simple matters. Conversely, Holling affirmed that systems are complex and self-organizing, permeated by uncertainty and discontinuities as in “chaos” theories. This implies that success in the management of some variable may lead to surprising adverse outcomes in the broader system (Holling and Meffe 1996; Cifdaloz, et al. 2010). Carpenter (2012) highlighted the difference between specific resilience and general resilience. Specific resilience implies the achievement of a specific objective (e.g. resilience of crops and food security) without having an overall picture of the system. It may indeed happen that the achievement of such objective might worsen other ecological or social variables. For instance, if food security is achieved through excessive use of chemicals, this might decrease water quality for domestic use. Therefore, Carpenter argued that more focus should be given to general resilience which in this context is a measure of robustness and buffering capacity of the whole Social Ecological System to changing conditions (Berkes and Folke 1998).

This recent increasing focus on resilience can be explained by the rapidly changing boundary conditions of both ecological and social systems. What are these boundary conditions? The Holocene, the interglacial year that began ten thousand years ago, is considered a rather stable geologic and climatic era in which humans had the possibilities to thrive. The resilience of the planet has kept it within the range of variation associated with the Holocene state, with key biogeochemical and atmospheric parameters fluctuating within a relatively narrow range (Rockström, et al. 2009). However, the increasing impact of human activities on the Earth's climate (IPPC 2007) and ecosystems (Millennium Ecosystem Assessment 2005) has led earth scientists to claim that we are entering a new epoch, the Anthropocene, where humans constitute the dominant driver of change to the Earth System (Steffen, Crutzen and McNeill 2007). Rockström (2009) and the Stockholm Resilience Center identified nine key "earth system processes" and attempted to quantify for each process the boundary level and thresholds that should not be overcome in order to maintain the Holocene stability and the "safe operating space". The boundaries more related to our case are:

- Concentration of atmospheric CO_2 and the consequent climate change threshold have already been overcome. We have reached a point at which the loss of sea-ice is almost certainly irreversible which generate negative feedback in the climate system which will make temperature even higher.
- Hydrological cycle and freshwater use: the freshwater boundary is closely linked to the climate boundary and human pressure is now the dominant driving force determining the functioning and distribution of global freshwater systems.
- Land-system change: land-use change for agricultural, industrial and residential use is one driving force behind the serious reductions in biodiversity, it has impacts on water flows and on the biogeochemical cycling of carbon, nitrogen and phosphorus.
- Biosphere integrity: changes to ecosystems due to human activities have been very significant in terms of habitat destruction and ecosystem fragmentation in the last decades increasing the risks of abrupt and irreversible changes (Steffen et al. 2015).

Erosion of resilience manifests itself when long periods of seemingly stable conditions are followed by periods of abrupt, non-linear change, reflected in critical transitions from one stability domain to another when thresholds and tipping point are crossed (Rockström, et al. 2009). The old way of thinking implicitly assumes a stable and infinitely resilient environment, a global steady state. The new understanding, instead, recognizes that resilience

can be and has been eroded and that the self-repairing capacity of ecosystems should no longer be taken for granted (Folke, Colding and Berkes 2003; Gunderson 2000). Consequently, the growing human pressure on the planet translates into other biophysical processes that can undermine the resilience of local sub-systems (Holling 1973, Folke et al. 2004) as strongly stressed by the Millennium Ecosystem Assessment in 2005. Resilience was also intended as the capacity to resist and recover from perturbation and maintain the flow of ecosystem services (Seddon 2020). This concept of resilience is strictly related to the adaptation, vulnerability and disaster risk reduction discourse. It can be associate to the Nature-based Solutions discourse as NBS aims indeed contribute to increasing the resilience on the local level but also globally as they might contribute stop the path toward the threshold and tipping point individuated by the Stockholm school.

Finally, many argues that the focus should be extended to the relation between local bio-physical processes and the related social system and therefore to the concept of “Social-ecological resilience”. The term is intended as the capacity to adapt or transform in the face of change in social-ecological systems, particularly unexpected change, in ways that continue to support human well-being (Biggs, Schlüter and Schoon 2015). The concept of Social Ecological resilience, similarly to the concept of general resilience, contributes to enlarge the view on the whole system and the interplay between ecological and social variable, including those related with the governance system or economics.

In the field of water governance and disaster risk reduction this thinking has led to the development of different concepts that has at the core the idea of integrating competences and planning activity as water connects and water is connected to everything. Experts highlight the need for cross-sectoral policy integration and more vertical and horizontal coordination has been a recurring claim. The concept of Integrated Water Resources Management (IWRM) has been an attempt to integrate water with other policy objectives (Pahl-Wostl et al.,2011b; Newig and Challies, 2014; GWP, 2004) and has had a wide success in shaping international and national frameworks and guidelines. In include as principle, management at the bio-physical scale, inter-sectoral policy integration, participation in decision-making and the inclusion of social concern in natural resource management (e.g. equity). However, implementation on the ground which would translate principles into management practice and ultimately into an improved state of water resources and risk reduction has been slow (UN

Environment 2018; Biswas 2004). The Water-Energy-Food (WEF) nexus concept is another concept that has gained relevance in recent years (Benson et al. 2015) highlighting that guaranteeing water, energy and food security requires a cross-sectoral approach and innovative co-ordination instruments (Weitz et al. 2017; Pahl-Wostl 2019). From a risk reduction perspective, Renn (2021) argues that there is the need to develop and implement a concept for evaluation and management that ensures integration of social heterogeneity and multidisciplinary approaches and that allows institutional routines and standardized practices. This new challenge of risk management is testified by the emergence of a new concept of risk, called “systemic risks governance” (OECD 2003; Lucas, Renn, and Jaeger 2018, UNDRR 2022). Renn thus describe systemic risks as at the crossroads between natural events (partially altered and amplified by human action), economic, social and technological developments and policy driven action and it therefore require inclusive and participative practices. In conclusion we can state that there is agreement that the complexity of Social Ecological Systems poses challenges that requires multi-level governance and coordination across different governance levels and sectors, integrations of knowledges, inclusivity and more regard toward ecological and bio-physical variables. Otherwise it would be unluckily to increase the “general” or Social-Ecological Resilience

2.2.3. Environmental and Ecological Economics

It is self-evident that in the last decades there has been not enough economic resources and effort destined to environmental issue. Many experts and international organizations highlight the gap between desired targets and the resources allocates to reach them and urge to step up effort. Significant and worrying financial gap have been observed both in the field of Disaster Risk Reduction (UNISDR 2015, UNDRR 2022) and biodiversity and eco-system conservation (Deutz, et al. 2020). Investment in these sector needs to be considerably scaled up because of long lasting financial gap for risk mitigation but also due to climate change, which is projected to increase the frequency and intensity of hydro-meteorological hazards and the scale of loss and damage. High-level Experts and Leaders Panel on Water and

Disasters⁶ (HELP 2019) affirmed that, empirically, one dollar invested in flood and drought resilience measures saves multiple dollars in future avoided losses. There are indeed considerable costs of inaction. The costs of action against disaster can be classified into three categories: preparedness costs, risk mitigation costs and disaster relief costs. Disaster events lead to numerous economic, social and environmental costs of a magnitude modulated by social and household vulnerability and resilience to disaster. When a disaster occurs, bearing its costs while taking no action could increase the overall cost of damage, representing the cost of inaction, as compared to taking ex ante and ex post actions against disaster (Gerber and Mirzabaev 2017). Nevertheless, lack of investment and higher ex-post damage are a common feature of many area of the world. International institutions and experts are urging that ex-ante measures for water-related disaster risk reduction should be prioritized and incentivized involving in the process also the private sectors. Indeed, there is a growing awareness that responsibility and the burden of environmental protection should also be extended to every economic actors. However, how to foster investment in disaster prevention and biodiversity conservation, and therefore in NBS, is not a simple matter and adopting appropriate policy and financing mechanism is a priority of every disaster risk governance system.

Since the 1970s, a growing number of voices started to question the traditional economic approach to resource management arguing that it has contributed to unsustainable patter of development. It is difficult to question the assumptions that since the industrial revolutions the overarching societal priority has been “economic growth”, and that most policies and scientific effort have been catalyzed to this end. McNeill (2001) accused the economists of their total abstraction from nature and its finiteness and their extreme devotion to economic growth.

Starting from the basics, economics is the study of the allocation of scarce resources among alternative and competing ends. Therefore, the starting question of the inquiry should be: what is our final goal? Traditional economists would answer “utility” or human welfare, which depends on what people want (Daly and Farley 2004). However, if humans are assumed to be insatiable, welfare can be increased through the provision of an always

⁶ The Help panel was convened in 2007 at the request of the UN Secretary General’s Advisory Board on water and Sanitation (UNSGAB) and co-moderated by the World Water Council and the UN Secretariat for the International Strategy for Disaster Reduction (UNISDR).

increasing amount of goods and services. Economic growth was therefore considered an adequate and measurable proxy for the desirable outcome of our economic system and society. This is testified by the use of Gross Domestic Product growth as one of the main index to assess the success of a state and its economic policies.

Daly and Farley blame the Neoclassical economics school for this approach that led to overuse and exploitation of resources. Within neoclassical economics, in a world characterized by scarce resources “the good” consist in their “efficient” allocation to maximize welfare. Pareto efficient allocation is indeed a situation in which no other allocation of resources would make at least one person better off without making someone else worse off. Efficiency was therefore portrayed as a value-free and neutral societal goal. Neoclassical economists, under certain assumptions, identify the market as the best tool and strategy to efficiently allocate resources. However, new generation of economists become more aware that the efficiency criteria and the market, even without dismissing the relevance, were not value-neutral. Indeed, if the final goal is resource exploitation for economic growth, the efficiency parameter will not signal the unsustainable use of resources and the following degradation that others would pay. Economic studies have developed as a monodisciplinary field and portrayed the natural system as part of the economic system and not *viceversa*. The natural system was therefore conceptualized as a system in which the eco-sphere is the source of resources considered as stocks to be extracted to produce goods and services to satisfy market demand and the willingness to grow. This approach, even if it has been successful for the purpose of resource exploitation and economic growth, it is unfit to reach higher level of sustainability on the long term.

This led to the emergence of radical “Degrowth theory” from the 70s onward which aimed at a collective and deliberative process of an equitable downscaling of production and consumption (Sekulova, et al. 2013) and of the role of markets and trade as a central organising principle of human lives (Schneider, Kallis and Martinez-Alier 2010).

Already during the 1980s and 1990s tried to reconcile environmental concerns with economic growth. A group of scholars led by Joseph Huber from the Free University and the Social Science Research Centre in Berlin founded a school of thought called Ecological Modernization lately developed by Dutch environmental sociologists Arthur Mol and Gert Spaargaren (1999) which has attained near paradigmatic status within socioenvironmental

circles (Carolan, *Ecological Modernization Theory: What About Consumption?* 2004). Ecological modernization was in part developed as a response to “counter productivity”, “deindustrialization” and “degrowth” theories as it identifies the solution in the reshape of the production system with further industrialization and modernization to obtain eco-efficiencies and sustainable use of resources. This vision relies on Environmental economics principles, a subset of neoclassical economics that recognizes that welfare also depends on some environmental variable and suffers from pollution. It is still devoted to efficiency and adopt various techniques to assign a value to environmental degradation and pollution to include them in a market logic. Ecological modernization and environmental economics were firstly oriented toward a shift from top-down to soft, flexible and market-based regulatory regimes: polluter pays, open feedback loops between producers and consumers, diffusion of the precautionary principle, development of greener technologies; and closing the extraction-production-waste loop through recycling (Carolan 2010).

Ecological economists, such as Daly and Fairly (2004), criticized this approach starting from the idea that efficiency cannot overlap with the concept of sustainability. While increases in eco-efficiencies are clearly a step in the right direction, they are not in themselves a reduction in total “withdrawals” from the larger ecosystem. If we are more efficient in producing goods (less resources for the same good) but the total output and amount of goods continues to grow more than the gain in efficiency, we will still observe an increasing extraction from a closed system (the earth system). Traditional economics, but also the first generation of environmental economists, neglected the global scale and the (environmental) opportunity cost of growing. According to Daly and Fairly in traditional macro-economics there is no “when to stop rule,” nor any concept of the optimal and sustainable scale of the macroeconomy. Ecological economists are therefore more focused on a radical reconstruction of both the production and consumption processes and differentiate the concept of growth from the concept of development. They start their argument from the eco-sphere and the limits that should not be overcome as they state that economy should be a system included in the eco-sphere constraints and not *viceversa*. The goal of sustainable scale requires a social or collective limit on aggregate output to keep it within the absorptive and regenerative capacities of the ecosystem. However, this limit is not easily applicable since we are dealing with a classic case of public goods and social dilemma where the free rider problem is persistent (see chapter X). If the main social goal is maximizing profits and growth, local

businesses may show little concern for providing community public goods, local communities may show little concern for providing national public goods and States may show little concern for providing global public goods. Actors are indeed tempted to act as short-term maximizers, continue to extract resources, degrade the ecosystems and pollute. This market failure can be explained by the concept of external cost or “externality” which is the indirect cost or benefit to an uninvolved third party. A condition for efficient markets is that producers pay the costs of production, and they produce to the point where marginal costs are just equal to marginal benefits. This condition is not met when externalities exist, as in most productive processes. Indeed, in an unregulated market, environmental costs or negative externalities (pollution or degradation) are not internalized by the producer marginal cost. He will therefore continue increasing production and pollution until it is profitable regardless of environmental costs which are paid by the collectivity. The question about how these costs should be internalized and how to make inconvenient to pollute and degrade ecosystems has been one of the main focus of environmental and ecological economics.

It has been developed the concepts of “Natural Capital” which was defined by the Convention on Biological Diversity (UN, Convention on Biological Diversity 1992) as “the stocks of natural assets which include geology, soil, air, water and all living things” from where humans derive a wide range of services. Natural capital is thus a stock that yields a flow of natural services and tangible natural resources that are conventionally called “eco-system services”. We have seen before that “Eco-system Services” are defined by Millennium Eco-system Assessment (MEA 2005) as “the benefits people obtain from ecosystems” or as Fisher and Turner (2008) proposed “the aspects of ecosystems utilized (actively or passively) to produce human well-being”. MEA breaks down ecosystem services into four types:

- Life Support (soil formation)
- Supply (food and renewable natural resources)
- Regulation and risk reduction (climate and water cycle, water quality, nutrient and sediment levels, soil conservation)
- Cultural values (aesthetic or religious)

It is clear that nature can provide itself a variety of eco-system services including those related to disaster risk reduction, the idea at the core of the NBS concept. Regarding NBS it should also be notated that they could bring undesirable effect, the so-called ecosystem disservices

which are the potential nuisance or disturbance to existing eco-system or to citizens, for instance allergenic potential of plants, unsafety of green spaces, attraction fro undesired species, roots ruining the road surface (Larrey-Lassalle, et al. 2022).

MEA findings showed that human use of ecosystems is expanding while eco-system services have significantly decreased during the previous 50 years (1955-2005). As seen before, there is a fundamental asymmetry at the heart of economic systems that rewards short-term production and consumption of marketed commodities at the expense of long-term conservation and regeneration of the natural capital necessary for human well-being. Correcting this asymmetry will require transforming the use of natural capital through better understanding the role that natural capital plays in sustaining human well-being (Guerry, et al. 2015). Fairley and Daily (2006) argues that the problem arise as the majority of ecosystem services have no easily measurable value, and therefore there are no feedback from markets signaling their scarcity and degradation and no market incentive to conserve, restore and enhance them. The assumption behind eco-system services discourse is that if we adequately value, also in economic term, the services that the nature provide to society, and we include this assessment in the decision-making process, it would be possible to optimize the benefit, increasing the resilience of both the social and ecological systems. The transformation of Eco-system Services into exchange values continued to be motivated by the idea that nature will benefit if the external cost of actions that exploit or damage the ecosystem are made explicit for three main reasons:

- Nature will be preserved on account of its recognized true exchange value
- Gain if the higher price in the market caused by including external costs reduces demand for the damaging activities
- Be compensated to restore damage

Studies on NBS often focus on the utilitarian aspect of natural capital and ecosystem services provided by NBS and their effectiveness in reducing risk. What is missing is putting in perspective the positive and adverse economic and environmental impacts of these solutions in comparison to the alternative grey solution. Which means assessing trade-offs throughout the life cycle of solutions. Not only when the NBS is implemented and the ecosystem services are provided, but also during its fabrication/manufacturing, its installation, and its end of life with the disposal of wastes or the recovery of materials. Larrey-Lassalle et al. (2022) argue

that these impacts can be assessed through the Life Cycle Assessment (LCA) which is “a mature, robust, internationally applied multi-criteria analysis approach” developed by the International Organization for Standardization (ISO). The ISO 14040 and 14044 regard environmental management and the assessment includes the entire life cycle of the process or activity, including: the extraction and processing of raw materials; manufacture; transport; distribution; use, reuse, recycling; and final disposal. That that helps assessing the effect of all these activities on a wide range of environmental issues and eco-system services (e.g., climate change, eutrophication control, or resource depletion) over the entire life cycle of a product system. Indeed, a life cycle assessment is the only way to account for all the externalities of competing solutions. For instance, a grey solution might appear not that environmental damaging if we do not take into account its carbon footprint (concrete and steel are energy intensive industry) and the opposite carbon sink capacity of an NBS. Nevertheless, Life Cycle Assessment it is not yet widely adopted in public policy as it is not easily applicable and it requires a lot of data and technical skills to be carried out. Integrating this information into decision making and policy framework would arguably give incentives to reward long-term environmental protection (Guerry, et al. 2015) support a faster and wider expansion of NBS and other action to preserve eco-system services.

For what regard disaster risk, Life Cycle Assessment might also be useful to assess capital needs for the whole life cycle of an intervention. The High-level Experts and Leaders Panel on Water and Disasters (HELP 2019) suggest that capital and operative expenses required for proper disaster risk reduction should be considered in the estimation of lifecycle costs of infrastructure development projects from a design stage. The problem regarding NBS, in this case, is that they are an innovative practice and financial data regarding their implementation and maintenance cost can be uncertain.

Many approaches, theoretical frameworks and strategies have been proposed based on environment and ecological economics studies (Daly and Farley 2010). I am going to review the most relevant typology of policy solutions to externalities problems. The first distinction can be identified in “command-and-control” or “direct” regulation, which mandates that actors undertake specific actions and applies sanctions if they do not comply, and “incentive-based” or “indirect” policies that address externalities by altering the economic incentives economic actors face, while allowing those actors to decide whether and how much to change

their behavior (Jack, Kousky and Sims 2008). Incentive-based mechanisms can have a negative nature as in the case of charges (such as taxes, user fees, and deposit–refund systems), a positive nature in the case of subsidies, or mixed in which some is going to pay and other are to receive money like in tradable permits system. In the latter two case we are dealing with the so-called “Payment for Eco-system service” systems. Another distinction can be done between monetary and non-monetary police

Monetary Direct policy: this category includes the public authorities direct provision of structural and non-structural measures from the financing to the design and the tender phase. Public authorities can take initiative to directly conserving and enhancing eco-system services through different tools and activities undertaken by its bodies placed ad different governance level.

Non-monetary direct: regulatory instrument can take a variety of forms. Sometimes an activity or substance is considered to have unacceptable costs and is simply banned. Public authorities may issue regulations that can limiting through quota or other tools the quantity of a pollutant that can be produced or the action that cause damages, for instance limiting deforestation, fishing activities, and the use of certain chemicals. Moreover, authorities can institute a protected area in which a vast variety of economic activity are forbidden or limited; or they can set building and construction standard forcing all actors to use the best available control technology (BACT), mandate a certain share of Green Public Procurement, or adopt international standards (ISO).

Non-monetary indirect: regulations can also create non-monetary incentive. For instance, public authorities might establish different authorization procedures according to the projects and plans environmental impact. Simplified procedures for greener solutions might make it convenient as they become less time and resource consuming. The promotion of Certification systems that provides transparent sustainability report and disclosure might make consumers more aware of the environmental footprint of firms and consequently make firms more sensitive to Corporate Social Responsibility (CSR) issues. Moreover, international organizations, states, banks and funds might include criteria (e.g. Environment, Social and Governance, ESG;) in their investment portfolio to increase Social Corporate Responsibility. Firms are therefore incentivized to undertake sustainability actions, adopt sustainability certification system, issuing transparent sustainability reporting in order to ameliorate their

score and have more access to finance and/or increase their consumer satisfaction. An example can be the European Biodiversity credits or “biocredits” are units of measurement that track conservation actions and outcomes and can help to improve tracking and transparency. When they are well designed, they can make investments in biodiversity management more financially attractive, for example, by attaining private sector finance. They can be used by governments to monitor their actions and report on biodiversity commitments (UNDRR 2022)

Monetary incentive: at the core of this typology there is the idea of making economically inconvenient to produce harm to the environment and eco-system services. Already at the beginning of the last century, the economist A. C. Pigou began grappling with the problem of internalizing environmental externalities. Pigou came upon the simple solution of imposing a tax equal to the marginal external cost in order to make “polluters pay” and disincentivizing detrimental actions to environment. This policy action took the name of Pigouvian tax and it is at the core of “polluters pay principle” included in several policy and legal framework.

Subsidies are instead a bonus or payment for doing something in this case to economic actor for each unit by which it reduces environmental costs; it has many of the same attributes as the tax from the opposite perspective as, ideally, the subsidy should be equal the marginal benefit to society of abating pollution and degradation. It can be the cases of Payment for Eco-system Services (PES) policies compensate individuals or communities for undertaking actions that increase the provision of ecosystem services such as water purification, flood mitigation, or carbon sequestration.

Mixed and hybrid policy: some policy actions are more complex and may present features of different policy types. Tradeable permits require to set a quota, a maximum amount of pollution or resource depletion that it is allowed. Ideally, quota should be set so that the marginal benefit from one more unit of pollution or harvest is exactly equal to its marginal social and private cost. Once established, the quota is distributed among polluters and resource users in the form of permits or individual quotas. Lately who own the permits become free to buy and sell them. Actors will reduce their environmental damaging activity as long as the renounce is cheaper than the cost of a permit, and will buy permits when abatement costs are more expensive. This mechanism combines a direct tool, a limitation through a quota, with an indirect tool, an incentive mechanism that aim to change the actors’

behavior by internalizing marginal pollution or degradation costs. They are also called cap-and trade system. Examples are the European Union Emission Trading Scheme (ETS) trade reducing greenhouse gas emissions cost-effectively.

The aforementioned policy mechanisms have proven to be insufficiently adopted or at least not properly implemented to reach significant environmental gains and reverse the eco-system services degradation trend. Barriers for their adoption and implementation may come from multiple levels of the governance system and can have different nature. Ecological economic policies are not easy to implement because they pursue to achieve multiple goals such as sustainable scale, just distribution, and efficient allocation. One policy instrument cannot achieve multiple goal and it is therefore necessary to put in place a combination of policy tools which makes things more complicated (Daly and Farley 2004). Moreover, when trade-off between the attainment of environmental, economic and social (e.g. equity, emancipation) goals exist, the one that has to be privilege it is a matter of political negotiations and power distribution among actors. Some may act against ecological policies both in their formulation and implementation. For instance, some polices represent a cost that economic actors do not want to pay.

Policies must also recognize that we always start from historically given initial conditions. It is thus required an awareness of the current institutional settings and practices that must be reshaped and transformed. Context analysis and a certain gradualism in regime change are likely to be a precondition for successful policy formulation and implementation. Problem in implementing ecological policies and practices can also be the consequence of the governance structure that is characterized by rigidity, procedures and tools that favor the old logics and practices. This aspect might be entrenched in the ganglia of the bureaucratic system, in the mentality of decision-makers, in procedure or in the tools used for the analysis. Environmental governance systems are usually Multilevel governance system and include several different actors placed at different governance level. For a proper policy formulation and implementation is therefore relevant a vertical steering capacity and horizontal coordination (Sager and Gofen 2021).

The HELP panel (2019) also stressed that in order to mobilize private funds but also to make public fund more effective, the legal framework should be clear and enforceable. The Panel highlights that policies and incentives to encourage disaster risk reduction should be

harmonized to minimizing investment needs and avoiding future liabilities. Indeed, the lack of a clear policy framework might hinder investment on innovative technique because of unclear accountability and the produced inertia of public officials that have to choose or authorize projects. It asserts that it is crucial to define the roles and responsibilities, and to empower and enhance the coping capacity of different kind of stakeholders including residents, communities, and businesses.

In the case of eco-system services related policies, the main problem arises from their evaluation in monetary term which is usually not straightforward. Standards may be not yet available, and the evaluation is often a matter of interpretation and a choice between multiple criteria (Seddon et al. 2020). Moreover, eco-system service value assessment can be time and resource consuming and public authorities need to have enough trained personnel with multidisciplinary technical skills to perform it.

Barriers to policy related to ecosystem services might also stems from individual moral and ethical concern widespread in the society and in the political arena. Political scientist and philosopher Michael Sandel argues that society can and does choose not to place a price on certain things, and that it is morally right to reject market valuation in a range of important cases. For instance, the possibility that nature has an intrinsic, existential value of its own that is independent of its use to humans cannot be accommodated by the market because nature itself is not an actor in that market. Nature is therefore devalued by monetization and all non-commercial notions are invisible to “the one-eyed imperatives” of capital. Silvertown (2015) argues that once a price is put on a natural resource, a market of the “commodity” is created, and derivatives of the underlying Eco-System services become tradable assets. Thus, financialization becomes inevitable. Mace et al. (2012) wrote that in some cases biodiversity and ES are used synonymously which is confounding and can be even damaging for the ecosystem resilience. It is indeed not automatic that conservation and restoration of ES are beneficial to biodiversity (Redford and Adams 2009). Peterson et al. (2010) highlight instead that replacing the concept of ecosystem function with ES tend to obscure the role of the biota which are often downplayed. Redford and Adams (2009) argued that there is a widespread but erroneous assumption that ecosystem services are necessarily benign. Definitions of ecosystem services cite positive values for human society but only certain things in nature are therefore regarded as services. Nevertheless, not all ecosystem processes sustain and fulfill

human life but are fundamental for the ecosystem itself. There is therefore an ethical evaluation behind the choice about which eco-system service should be preserved and those that are not “worth” to be preserved.

Despite the critics and barriers, such concepts and interdisciplinary approaches contributed to reduce the gap between ecology and economic theories and models even if more effort are needed. The theoretical framework of ecological economics attempts to create interdisciplinary approach (Pearce and Turner 1991, Daly and Farley 2004) and have an impact on policy formulation and implementation. In traditional decision-making process, it is usually not taken into account the material and immaterial value of eco-systems. Therefore, it often happens that the negative environmental effects of policy, projects and economic activity are usually downplayed or accepted on the altar of economic growth (Daly and Farley 2004). This convergence between ecology and economy potentially increases the weight of ecological variables in the decision-making process and a path toward future sustainable development. For instance, as said before the concept of NBS itself is built upon the concept of Ecosystem Service and its proponents highlight the multiple co-benefit that NBS may provide beyond their main goal of risk mitigation. These benefits should therefore be accounted for to properly assess when and how NBS are more convenient than alternatives. Finally, if many argues in favor of private business involvement in disaster risk reduction to share the burden with the public sector, it is unlikely this to happen without strong regulative policy and incentive mechanism. NBS could be financed considering a portfolio of resourcing options such as market-based, public sector, voluntary commitments and actions to support regulatory compliance (IUCN 2020).

The big challenge of ecological economics consists to develop scientific approaches capable to provide an integration between ecology and economics and translate it into policy frameworks capable of reducing the trade-off between the sometimes conflicting societal goals of environmental sustainability, economic growth and equity.

2.2.4. A paradigm shift in water, land and Disaster Risk governance?

Over the past decades a series of major revisions to the generation of knowledge in the context of natural resources management has started to undermine basic assumptions on which traditional governance and management approaches were based. The literature on planning (Boyne and Walker 2004) describes the optimism about the “rational planning model” that pervaded the first decades after World War II in both industrialized and developing countries. In essence, the rational planning model posits that decisions must be based on a scientific analysis of the issue at stake with a centralized decision making, utilitarian decision logic, long-term planning, and a willingness to intervene in social-ecological systems on a grand scale (Pahl-Wostl, Brugnach, et al. 2011). Holling refers to such approach as “Command and control” contesting the assumption behind it, namely that ecological issues are well-bounded, clearly defined, relatively simple and generally linear with respect to cause and effect (Holling and Meffe 1996). But when these same methods of control are applied to a complex, nonlinear, and poorly understood natural world, and when the same predictable outcomes are expected but rarely obtained, severe ecological, social, and economic repercussions are likely to result. Holling affirms that adoption of “command and control” has resulted in a pathology that permeates much of natural resource management and precludes long-term sustainability and reduce resilience. Pahl-Wostl instead call this kind of regime as “Prediction and Control” and characterized it by the following attributes: control approach, goal oriented, optimal strategies, reduction of uncertainties, hierarchical, narrow stakeholder participation governance structure; scarce sectoral integration and sharing of data and knowledge between different agencies; massive and centralized infrastructure with single sources of design; and financial resources concentrated in structural protection (sunk cost).

Kuhn (1962) believed that scientific revolutions occur when scientists encounter anomalies which cannot be explained or solved by the universally accepted paradigm. Visibility of environmental issues and higher awareness about the finiteness of natural resources, biodiversity loss, pollution and (lately) climate change have accelerated the questioning of traditional paradigm. The process started during the 1970s as it testifies by the pivotal “the Limits to Growth” report published in 1972 in which different scenarios were depicted for different level of economic and population growth with a finite supply of resources. During the same year the United Nation Conference on Human Environment was held in Stockholm and, for the first time, environmental issues appeared in the International community agenda.

Water have been identified as one of the topics that was firstly worth of much attention and in 1977 the United Nation Water Conference took place in Mar del Plata (Argentina). Its goals were to assess the status of water resources, to ensure that an adequate supply of quality water was available to meet the planet's socio-economic needs, to increase water use efficiency, and to promote preparedness, nationally and internationally, so as to avoid a water crisis of global dimensions before the end of twentieth century. However, its long-standing relevance stands in the new vision that it gave to water management. Indeed, the report of the Conference made the first internationally explicit reference to an Integrated Water Management Regime, a concept or paradigm that would achieve a wide success in the following decades.

Art 94 of the conference report (UN 1977) states that “increased attention should be given to the integrated planning, development and management of water resources”. It stressed the necessity to develop and integrated planning system that put together water and land-use combining at least these two fields once considered separated from a policy and governance perspective. Art 95 promoted an integrated and interdisciplinary approach to the formulation of water policies and appropriate legislative and administrative arrangements were singled out as important components of national water management. It was agreed that consideration should not be restricted exclusively to the cost-effectiveness of planned water schemes but should also include consideration of optimum social benefits, environmental conditions and the protection of human health and well-being.

A dominant theme in many of the contributions reviewed above is the need to develop understandings of water resources and their management as a complex system of many systems (Pahl-Wostl, Brugnach, et al. 2011). However, paradigm shift took time, even decades to provide considerable practical outcome. Indeed, the principle established in the Mar del Plata Conference rarely become effective on the ground (Biswas 2004).

The consensus for a paradigm shift intensified during the 1990s when many experts began to observe that resources management issues were becoming even more complex, intertwined with other sectors, and sensible to the public opinion. Especially the water sector, have become multi-dimensional, multi-sectoral, and multi-regional and filled with multi-interests, multi-agendas, and multi-causes. Water problems will become more and more intertwined with other development sectors like agriculture, energy, industry, transportation, and

communication, and with social sectors like education, environment, health, and rural or regional development (Biswas 2004).

Writing in the broader context of land and water management, Cortner and Moote (1994) characterized the emerging paradigm as founded on two principles: ecosystem management and collaborative decision making that has been discussed before. Peter Gleick (2000) offered a concise characterization of the changing mentality in approaches to water resources management, describing a shift away from reliance on finding new sources of supply to address perceived new demands, an emerging emphasis on embedding ecological values into water policy, a re-emphasis on meeting basic human needs for water services, and “a conscious breaking of the ties between economic growth and water use”.

Such views have resulted in the codification of principles that would have influenced several policy frameworks. We can trace the beginning of this process starting from the meeting of experts within the International Conference on Water and the Environment (ICWE) hold in Dublin in 1992, a preparatory meeting for the UNCED also known as the Rio “Earth Summit”. From this meeting, four main principles emerged:

1. Water is a finite and vulnerable resource Fresh water is a finite and vulnerable resource, essential to sustain life, development, and the environment.
2. Participatory approach: Water development and management should be based on a participatory approach, involving users, planners, and policy-makers at all levels.
3. Inclusivity and emancipation: vulnerable and marginalized group should be empowered in the provision, management and safeguarding of water.
4. Social and economic value of water: water is a public good and has a social and economic value in all its competing uses that should be accounted for in decision-making process.

These principles remained at the core of the Global Water Partnership, founded in 1996 and one of the main proponents of the “Integrated Water Resource Management” defined as “resources management based on the equitable and efficient management and sustainable use of water and recognizes that water is an integral part of the ecosystem, a natural resource, and a social and economic good, whose quantity and quality determine the nature of its utilization”. The four main pillars of IWRM are:

- Integrated and inter-sectoral planning involving all the issues related to water management when is needed: land use, industrial production, wastewater, irrigation, disaster risks reduction.
- Management at the Eco-regional scale: institutional settings and design that follow environmental boundaries rather than administrative (e.g. Rivers Basin Organizations)
- Participation process for the design and implementation of policy, plan, and project with environmental impact. Including in the process the private sector, associations, NGOs, and academia.
- Transdisciplinary and holistic approach and higher attention to social issues

These pillars highlight the attempt to keep together the three dimensions of resource management, namely the social, economic and environmental that, in turn, can be translated into three strategic objectives: equity, effectiveness, and sustainability, enlarging the scope of water management compared to traditional paradigm. This specific focus on water were lately expanded in many other fields embracing the whole spectrum of Social Ecological System management, including the Disaster Risk Reduction.

Adaptive management (Gunderson and Holling 2002) has been another widely used concept used to identify regimes capable of facing the complexity, non-reducibility, spontaneity, variability, and collective quality of the ecological systems. Adaptive Co-management (Olsson 2004, Armitage 2007) represent an evolution and a combination of the learning dimension of adaptive management and the linkage and interaction dimension of co-management. Huitema (2009) identified four main prescriptions of Adaptive Co-Management: 1) collaboration in a polycentric governance system; 2) public participation; 3) an experimental and stepwise approach to resource management; 4) and management at the bioregional scale. Empirically Plummer et al. (2017) have found some support for the assumed positive effect of ACM. The idea underpinning ACM is that the independent traditions of collaborative management and adaptive management can be meaningfully combined in a unique approach to intervene or steer social-ecological systems towards resilience or transformation.

Adaptive Co-Management and Integrated Management has often been used interchangeably or in a complementary way to describe the new water and eco-logical paradigm management

paradigm. Pahl-Wostl (2011) describes the paradigm change as a shift from the traditional “prediction and control” regime towards “Adaptive and Integrated” regime. She characterized the two ideal-typical regimes that I have integrated according to feature identified in the literature reviewed before.

Table 2 Two ideal type of water and land regime adapted from: Pahl-wostl et al., “Analyzing Complex Water Governance Regimes : The Management and Transition Framework, 2010.

| | Prediction and control regime | Adaptive and integrated regime |
|----------------------------------|---|--|
| Management paradigm | Control approach, goal oriented, optimal strategies, quantification of risk and reduction of uncertainties | Evolutionary and process-oriented approach, robust strategies, accept and live with uncertainty of the SES |
| Governance structure | Centralized, hierarchical, top-down input, narrow stakeholder participation | Polycentric, horizontal, higher agency to informal networks, multi-directional input, broad stakeholder participation |
| Sectoral integration | Sectors analyzed singularly (e.g. water, land use, risk reduction), lack of coordination resulting in policy conflicts and chronic problems | Cross sectoral analysis, coordination for policy design and implementation, Systemic risk and multi-hazard approach. |
| Scale of analysis and management | Sub-basin, or administrative boundaries | focus on bio-regional scale, multiple scale of analysis and management |
| Information management | Gaps and lack of integration of information sources that are proprietary | Comprehensive understanding achieved by open, shared information source that fill gaps and facilitate integration. |
| Infrastructure | Massive, centralized infrastructure, single sources of design, mostly “grey infrastructure” | Experimentation and scaling up, decentralized, diverse source of design, Grey approach integrated by NBS |
| Type of environmental policy | Direct intervention and regulations | Direct regulation integrated with more flexible incentives/disincentives |
| Financing | Financial resources concentrated in structural protection (Sunk costs), focus on cost-recovery without environmental considerations | Financial resources diversified using a broad set of private and public financial instruments, natural capital and eco-system services value taken into account. Life cycle assessment |
| Experimental spaces | Marginal and not institutionalized. Few connections between academia and research institutes | Institutionalized and strict contact between scientist and policy makers |

Such distinctions have an analytical purpose as, on the ground, most management and governance system are hybrids and a continuum of different facets. However, there are clear trends in the literature that assign a higher grade of resiliency and less vulnerability to governance system characterized by the element in the right column. The two categories are sometimes not mutually exclusive as one may overlap with the other at different analytical scale. Many claim that approaches such as Adaptive Co-management have been found to be adopted in specific projects, and not in an institutionalized and structured way (Savacool and Hess 2017; Nölting and Mann 2018; Wang and Aenis 2019). These approaches can also be complementary to tradition governance regime rather than willing to replace them. Savacool and Hess sustain that ACM is a new and complementary form of governance and normative orientation and can be regarded as a strategy to counterbalance the disadvantages and shortcomings of land managed according to a reductionist, sectoral and non-holistic view.

These principles that comes from ACM, IWRM or Systemic/Inclusive Risk Governance are also at the foundations of the NBS discourse. The International Union for the Conservation of Nature, an international organization that is leading the promotion of the NBS, has issued global standard for NBS implementation (2020) which incorporated principles that are common to the aforementioned concepts and that I am going to resume:

Criterion 1 affirms that NBS should effectively address local societal challenges possibly identified by transparent and inclusive process of consultation. Criterion 2 highlights that NBS design should be “informed by scale” and recognizing and taking into account interactions between the economy, society and ecosystems. Designers should seek synergies across sectors and incorporates risk management tools. Criterion 3 stresses that NBS deployment should result in a measurable net gain to biodiversity and ecosystem integrity and connectivity to be considered a proper NBS. Criterion 4 deals with economic aspect related with NBS that should be “economically viable” and cost-effectiveness study should be provided to take into account externalities among alternative options. The global standard urges for the identification of both direct and indirect benefits and costs associated with the NBS, including assessment on who benefit and who pays. Criterion 5 states that NBS are based on inclusive, transparent and empowering governance processes actively involving all affected stakeholders considering their right and interests. Criterion 6 insist on finding an equitable balance between trade-offs regarding the achievement of their primary goal and the

continued provision of multiple benefits. Criterion 7 suggests managing NBS adaptively, based on evidence, with a proper framework for iterative learning and strategy for regular monitoring, evaluation and maintenance throughout the intervention lifecycle. Criterion 8 stresses that the jurisdictional context should be designed to sustain the NBS mainstreaming process. The NBS practitioner should be aware of policy, regulatory and legal limitations. If possible, he should be connected with policy makers to inform and improve facilitating policy frameworks to support NBS uptake and mainstreaming. Finally, the criterion 8 suggests highlighting how the NBS contributes to national and global targets for human well-being, climate change, biodiversity and human rights. NBS can indeed make significant contributions to national economic, social and conservation targets and help achieve national commitments. It is evident how such criterion are linked to the aforementioned literature and approaches regarding water, land and risk governance.

Many authors argue that despite these principles have had wide consensus in the academia and have been adopted by the major international organization and frameworks, they have suffered by implementation problem. However, will be interesting to observe how and concepts such as ACM; IWRM, Systemic Risk Governance and NBS might mutually reinforce each other and be mainstreamed. We can speculate that an adaptive and integrated system is more likely to mainstream the NBS, and that a process of NBS mainstreaming might make a system more adaptive and integrated.

2.3. Pattern of change

A fundamental issue that has to be addressed is how to define and conceptualize the process of NBS mainstreaming. As said before, the NBS mainstreaming implies the adoption of new approaches and a paradigm shift in the way of doing and applying science in the field of DRR. Driven by Thomas Kuhn's seminal work on scientific revolutions, the term "paradigm" is now widely used to refer to the set of ontological and epistemological assumptions which provide a starting point for scientific enquiry. A paradigm is therefore an agreed way of thinking about the world and an agreed set of valid approaches to investigating that world shared by any epistemic community. It shapes the nature of problems to be addressed as well

as the methods to be used and the interpretive lens through which the legitimacy and utility of findings are judged (Pahl-Wostl, Brugnach, et al. 2011) (Kuhn 1962). Consequently, a paradigm has an impact on the operative level where resource management effectively occur.

2.3.1 Socio-technical change

Today it is difficult to assess if NBS represent a scientific revolution but for sure they challenge traditional paradigm and the assumptions behind them. Sovacool and Hess (2017) would define the process of adopting and mainstreaming NBS with a less ambitious term than scientific revolution, namely a “Socio-technical change”. This term is sometimes used in the field of social innovation interchangeably with “diffusion”, “social acceptance”, “market acceptance”, “technological transition”, “community acceptance”, or “sustainable innovation” (Sovacool and Ratan 2012; Anderson, et al. 2021). Other term to describe mainstreaming and diffusion are “adoption”, “attitude”, or “support” (Huijts et al., 2012). Here, I adopted the term STC because it embraces the whole spectrum of possible variables that might affect NBS mainstreaming, both from the social and technical realms.

Now, the question is: which theories and concepts are most effective in explaining changes, in our case the mainstreaming or rejection of new technologies, techniques and approaches? Sovacool and Hess have found 96 theories and conceptual approaches drawing from 22 disciplines that seek to give an answer to the question. These massive number proves the width and complexity of the issue under analysis. Sovacool and Hess classifies theories related to STC into five categories according to the main focus, namely: agency, structure, meanings, relations and norms.

1. Agency: this set of theories is focused on the agency of actors (individual or organization) as the engine of change. This approach tends to analyze technology and society independently of social structure or within a constant structure, and they may understand social structure as an outcome of micro-social processes.
2. Structure: the second set of theories focus on structures which are intended as social construct that may include macro-social variables, institutional settings, technical infrastructure, culture and political environment. It is assumed that such macro

variables affect the preferences, behavior and choice of actors and are the highest impact in explaining STC. People are indeed constrained or influenced by external forces frequently beyond their comprehension and control (Jackson, 2005).

3. Meanings: this cluster focuses on the analysis of systems of meaning. Although all theories to some degree include some analysis of meaning, the theories clustered toward this pole focus on language, symbolism, narratives, rhetorical visions, and how people co-construct meaning related to technological changes. In this sense, also socio-technological changes are a product of reshaping of meanings, values and norms. The most theories within this cluster are Discourse Theory, Sociotechnical Imaginaries, and the Sociology of Expectations.

These three categories stem from the classic social theory triangle of “agency, structure, and meaning” which represent a classic divide in the social sciences for explaining societal change and social action. Savacool and Hess moved beyond this classical distinction as they identify two additional categories:

4. Relational/processual: this cluster include theories that tries to bridge the focus across agency, structure, and meaning emphasizing social relations and interactions. The analysis highlights the network of social structure and meaning in which actors are immersed and which they change through their action (Geels, 2009) in an iterative process between structures, agency and meaning. Geels et al. (2015) elaborate that relational and processual approaches conceptualize units of analysis as heterogeneous configurations with co-evolving elements, and envision agency as structured by routines, rules, habits and conventions. Sociotechnical Transitions, Social Practice Theory, Social Construction of Technology, and Actor-Network Theory can be considered the most influential within this cluster.
5. Normative: simplifying, this type of theories tries to answer the question of whether a technology is a net positive or negative for society and individuals. To do so, normative theories rely on evaluative criteria set by ethics, moral studies, social justice or political ecology. These theories are often not just descriptive/explanatory but often prescriptive by providing guidance for sustainability transitions. Here, I am not taking for granted that NBS are normatively good for society. Indeed, I am also going to investigate and point out criticalities of these kind of solutions.

Now some of these theories will be reviewed based on their capabilities to provide valuable concepts linked to the research questions of this work. The theory of “Sociotechnical Transitions”, sometimes called the “Multilevel Perspective” (MLP) on socio technical transitions and innovation (Schot and Geels 2008), suggests that diffusion or transitions occurs through interactions among three levels: the niche, the regime, and the landscape. The niche refers to a radical innovation that is emerging to gain diffusion or adoption, to move from invention and innovation to viable market introduction (Grin et al., 2010) or use. The regime refers to the incumbent sociotechnical system that the niche is willing to replace, and it is formed by cognitive, regulative, and normative institutions (Geels, 2004). The landscape, instead, refers to the macro arena where exogenous developments or shocks (e.g. economic crises, demographic changes, wars, ideological change, climate change and environmental degradation) occur and create pressures on the regime, which in turn create windows of opportunity for the diffusion of niche-innovations. This theory it is often focus on marketable product and processes, but it can also give us relevant insight about NBS as main proponents suggest that they should become competitive in the market in order to be mainstreamed (Soini, et al. 2020). This can be assumed to be true as, even if we are talking about public goods and mainly publicly funded interventions, NBS compete with other solution in an arena that can also be considered as a market. Moreover, it is possible to state that most public authorities, at least in the western industrialized world, think and act with a market mentality for their procurement and supply (Warrilow 1995) and effort have been made to create competitive procurement systems (Molander, Felleson e Friman 2018).

A key term elaborated within the framework of the MLP is the “transition pathway” as it includes in the analysis the temporal variable and potential pattern of change. Analytically, the claim is that different kinds of interactions among niche, regime, and landscape result in different kinds of alignments and output in which the niche may overlap or replace the regime or vanish. A central finding from the MLP is that transitions occurs when deep and broad learning and networks, or robust and specific expectations strengthen the niches sufficiently to change or challenge the regime (Sovacool and Hess 2017). The theory stresses the relevance of learning and co-evolution in a way that challenge the linear view of change with a more iterative pattern as transitions come about when multiple dimensions and levels coalesce simultaneously. The theory also focuses on size, stability and structure: niches and regimes are about networks of actors that subscribe to particular rules, but these are constantly

shifting in their scope, scale, maturation, and effectiveness. Also, successful niche innovations need what can be called “protective spaces” where experimentation and development of new technologies and approaches can take place within a supportive environment (Geels 2010). This theory is more focused on structure, and it is very valuable in identifying macro and meso pattern of change that I will specify at the end of the review. However, it does not explain choices made by individuals, for instance why people and organization get in the niche or get stuck with the old regime. Another shortcoming is that the MLP fall a bit short when it tries to look forward developing and testing complex patten of change. It is however a descriptive theory that helps with the conceptualization of socio-technical change, including NBS mainstreaming.

Social practice theory starts instead with the idea of a practice, a term that involves people, endowments, knowledge and skills about doing. Analysts have to move back and forth between those things (Shove, Pantzar and Watson 2012). The theory is recursive in the sense that it suggests that human action and social structure are mutually co-constructed. To make sense of this complex nature of practices, social practice theorists (Shove 2010) have argued that analysts must consider the following topic:

- Materials: technologies, tangible physical entities and other material objects.
- Competences: skills, habits, knowledge, tacit knowledge and technique.
- Meanings: ideas, symbolism, aspirations, and other cognitive dimensions.
- Connections: meant to describe how certain practices emerge, persist, shift, or disappear over time.

This theory is valuable as socio technical changes imply transition at the micro level, where people actually do things. Transition toward NBS also implies a new way of thinking and act, dealing with new materials, competences and new social relations and interactions and thus new social practice that may in turn affect the structure of the system. Some claims that practice theories tend to overemphasize agency and downplay structure in pattern of changes as it zooms in on the actions of people. However, it can be considered complementary to theory such as the Multi-Level Perspective which emphasis the relevance of structures at meso and macro levels.

The theory of Large Technical System also called the “social science systems approach” to technology (Hirsh and Sovacool, 2006), provides an approach for the explanation of how

humans organize to maximize the efficiency of a given technique, process or goal (Hirsh and Sovacool 2006). Systems are “coherent structures comprised of interacting, interconnected components” that are connected by a network that allow to control each node of the system. When these different constellations of components align, systems successfully diffuse (Sovacool and Hess 2017). LTS theory suggests that to achieve such operations and control, diffusion is a simultaneously social and technical process in at least two senses. First, systems require social institutions and technical artifacts to function. Second, systems possess both physical and immaterial components such as knowledge (Hughes 1987). Therefore, it highlights that push factors of technological change extend beyond the technical realm and have origins in the social world. Furthermore, LTS emphasizes momentum or path dependency. A system’s ability to continue along a given path or an alternative one results from the actions of numerous stakeholders, such as regulatory institutions, investors, practitioners, and users. Therefore, the approach tends to emphasize the dynamics revealed by interests, problems, and solutions of specific groups, especially system builders. It is believed that in most of the cases systems are hard to change and conservation may often prevail as “future choices are shaped by those who chose first” (Kirsh 2000). The theory lastly proposes that LTSs emerge and diffuse through a set of sequential phases: invention, development, innovation, technology transfer, system growth, momentum and style. LTS thinking, by its nature, emphasizes large, centralized, often supply-side infrastructure and can neglect aspects such as agency or change, as it sees agents as constrained within national and international structures (Rutherford and Coutard 2014). At first sight it can be considered unfit to NBS as they are decentralized and dispersed by their nature, however it can be valuable as national and international institution and system builder are still central for the creation of an environment for the diffusion and mainstreaming of NBS and it gives relevant insight regarding path dependency or momentum in socio-technical changes.

The Unified Theory of Acceptance and Use of Technology (UTAUT) it is an integration of eight other theories introduced to explain the adoption of new technologies in the workplace, and it appears primarily within management science and information studies. In its initial form, UTAUT hypothesizes that four main elements determine whether a user would adopt a new technology in the workplace (Venkatesh, Morris, et al. 2003): UTAUT proposes that: 1) perceived usefulness, 2) perceived ease of use (effort expectancy), 3) social influence (norms), and 4) facilitating conditions influence acceptance, change in behavior and adoption

or rejection of technologies (Sovacool and Hess 2017). The theory has been integrated with an additional element such as price value, a key predictor from economics, and habit, a key predictor from sociology (Venkatesh, Thong and Xu 2012). Finally, individual differences and variables such as age, gender, and personal experience have been found to be significant predictors of behavior.

Even if this theory was born mainly to look at the update of computing systems within offices it can be useful in our case, as the categories mentioned before can be significant predictors also in the case of NBS acceptance and mainstreaming. The decision on how to intervene and whether to adopt or not an NBS approach it is still probably dependent on decision taken in technical workplace where consideration about performance expected, effort needed, habits and social norm are likely to be relevant. It gives us the possibility to zoom on the microlevel.

Social learning theory is another relevant theory for our purposes. Originally, social learning referred to the learning of individuals in a social environment by observation and imitation of others (Bandura 1977). Because it focuses on the cognitive processes of individuals, the original concept does not consider group processes such as the development of shared meanings and values that provide a basis for joint action. Leeuwis et al. (2002) highlighted that for what regard natural resource management, it is necessary to move from individual “multiple cognitions” to interrelated “distributed cognition” and to an understanding of group processes to capture the essence of social learning. Indeed, such concept emphasize the development of shared meanings and practices that characterize the social entity as a whole. Social learning is also regarded as an important aspect that supports the transformation of water and land governance systems in time of climate change. Indeed, adapting to climate uncertainty requires experimentation and establishing processes to learn from those experiments and changes (Ananda, McFarlane and Loh 2020). In framework such as the Management and Transition Framework, change is conceptualized as social and societal learning (Pahl-Wostl, C., et al. 2010). The process proceeds in a stepwise fashion moving from single to double to triple loop learning as a reaction to changes in the ecological system. Single-loop learning refers to an improvement of operative strategies without questioning the underlying assumptions. It is thus a refinement of actions to improve performance without changing guiding assumptions and established routines. Double-loop learning refers to a revisiting of assumptions, for instance of cause-effect relationships, within a value-normative

framework. It implies a change in the frame of reference which means a reflection on goals and problem framing (priorities, include new aspects, change boundaries of system analysis, type of knowledge) and assumptions on how goals can be achieved. In triple-loop learning underlying values and beliefs, world views, and assumptions are reconsidered within a world view that do not hold anymore. It refers to a transformation of the structural context and factors that determine the frame of reference (Pahl-Wostl, Holtz, et al. 2010). This kind of societal learning refers to transitions of the whole regime and the paradigm supporting the regime. The concept of triple-loop learning become quite popular in management theory to guide concept and practice of managing change in organizations (Hargrove, 2002). The triple-loop learning concept aims at a refinement of the influence of governing variables in terms of governing assumptions and values. This theory is often incorporated in others as we have seen before, because learning and knowledge are intuitively at the core of socio-technical transition.

In conclusion this literature review gives us many insights and useful concept that may help in the analysis of NBS mainstreaming, from pattern of changes to factors that can facilitate or impede changes. Some are better fit to explain bottom-up or top-down changes, others structural change while other micro level changes. Social and sociotechnical innovation had been explored from many angles and perspectives; however, some gaps has emerged: very few studies about socio-technical changes regard what Rogga and Zscheischler (2021) call Sustainable Land Management (SLM) innovation, a concept that fit both Disaster Risk Reduction and NBS. A lot of research has been conducted on innovation processes in general, but it can be argued that SLM innovations differ from the more classic (product, process, marketing or organizational) innovations that are usually at the core of such studies. SLM innovations and NBSs have specific characteristic that should be taken into account. They pursue indeed general interests and the idea of common goods, and they pertain to a sector, the DRR, in which the public sphere and thus public policies are very relevant. It is therefore necessary to further deepen the understanding about the specific feature of socio-technical changes regarding specific goods, in this case the NBS, in specific context, in our case the Disaster Risk Reduction arena.

2.3.2 NBS Mainstreaming

From the socio-technical change and water and risk management literature, we can draw concepts that help guiding us in patter of changes. According to the multilevel perspective theory, Innovative niches (NBS) might appear questioning and challenging the old regime when there are disturbances on the system (increasing disasters, ecosystem degradation and biodiversity loss) that the old regime cannot deal with. There is a phase in which two alternative regimes co-exist or compete until one of the two prevails. If the niche resist and grows it becomes the new regime or it is incorporated in the new one otherwise it remains a niche or disappear.

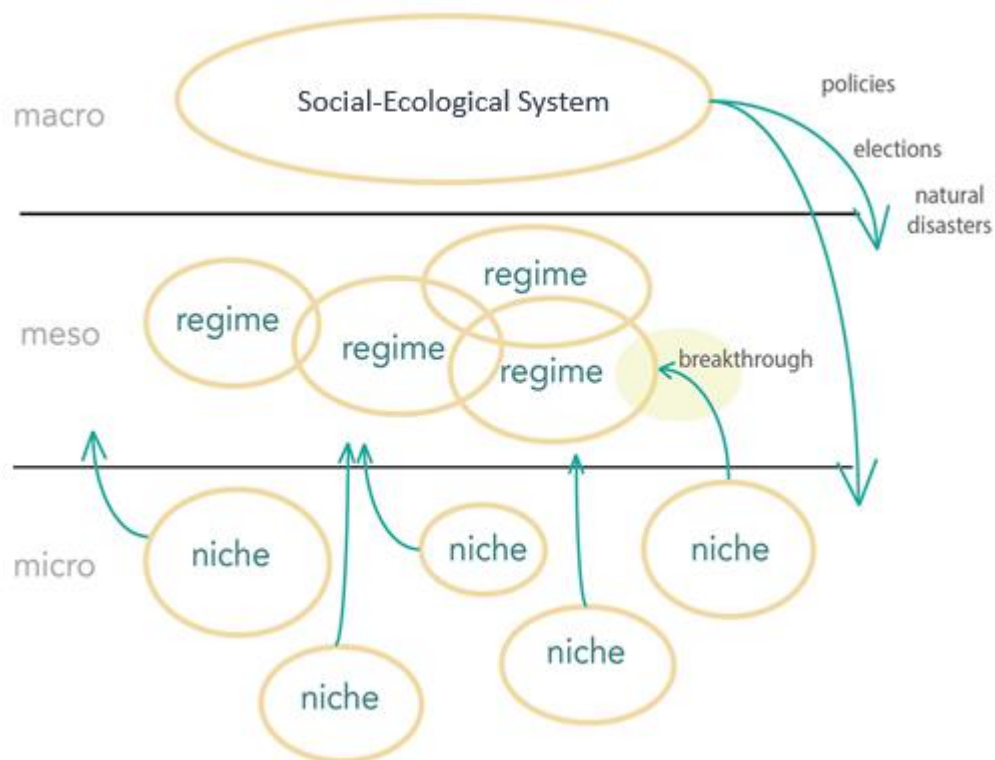


Figure 4 Adapted from the Multi-Level Perspective framework (Geel and Schot 2008)

The breakthrough point in our case can be the systematic inclusion of NBS in the major operative planning tool (that we are going to discuss later) and the systematic adoption of

these solutions by private companies operating on public land. The path toward these ends depends on many factors and barriers that should be overcome. Some obstacles may arise from the characteristics of each NBS and how they are perceived by different actors.

Perception of Effectiveness, as expected, has been found to be one of the main drivers for NBS acceptance or rejection. Anderson and Renaud (2020) found that, regarding to public acceptance (local stakeholder) benefits (primary function and co-benefit) and trade-offs are the most frequently mentioned among all the factors that influence NBS acceptance by local communities. Perception of effectiveness and benefit delivery can depend on both NBS characteristics and broader context. Potential drivers of hesitant attitudes regarding effectiveness related to NBS characteristics include: the complexity and novelty of NBS (Schernewski, et al. 2017) the difficulty to measure their effectiveness (Seddon, et al. 2020), and the degree of innovation that they bring in a certain social context. Lack of previous experience with certain type of NBS, lack of data and certainty about the effectiveness might hinder the acceptance level of policy-makers, implementers and local stakeholders (Seddon et al. 2020).

Technical viability: Grey solutions are well established in risk management systems and they are the technical standard. NBS in order to gain relevance compared to grey ones need to be supported by technical capacities that implies that data, knowledge, skills and materials are sufficiently developed to implement a new approach in a proper way. NBS can be broadly classified according to different criteria. Eggermont (2015) classifies NBS into three types along a gradient of the level and intensity of engineering applied and scale: Type 1 NBS approaches involve no or minimal intervention in ecosystems to maintain or improve the delivery of ecosystem services, type 2 measures aim at establishing sustainable and multi-functional landscapes and ecosystems, and type 3 NBS actions manage ecosystems in very intensive ways or create new ecosystems (Albert, et al. 2019). Seddon et al (2020) instead classifies NBS according to the spectrum of interventions and ecosystem services they provide the extent to which they support biodiversity. These classifications are both related the degree of complexity and the underlying skills required to obtain adequate results. The more multifunctional and biodiversity prone the interventions, the more diverse type of knowledges and skills are needed to guarantee effectiveness and prevent ecosystem disservices or other shortcomings. Technical skills should be spread to a wide spectrum of

actors including designers, implementers (public and private) and other stakeholder participating in the decision-making process.

Financial viability and cost-effectiveness: another fundamental aspect related to the NBS mainstreaming is linked to the financial viability of these solutions compared to the alternative grey solutions. Public funds are indeed scarce and it is unlikely that new approaches that does not prove to be cost-effective can gain spaces. The more innovative and the more complex and the more is it difficult to establish their ex-ante cost-effectiveness. Some NBS might be prototype and the lack of economies of scale might result in a relevant barrier for their mainstreaming at the initial stage as it happens in several socio-technical changes.

The breakthrough point would unlikely be achieved if NBS do not become technically and financially viable. Perception of effectiveness and viability has to grow in a wider network of actors placed at different level of the governance system, from decision makers to implementers. Zscheischler and Rogga (2021) affirm that in order to be able to develop and establish a mainstreaming process of innovative sustainable land management, it is required also “second-order” innovations since they challenge conventional paradigms, practices and institutions and eventually reconfigure regimes where previous technical and economic drivers have proven inadequate (Geels and Schot 2007). The development and enforcemen

t of sustainable innovations in environmental management can also be conceived as a social process (Currie et al.2005) and as a result of multi-level learning processes that involve different stakeholder groups and bring together knowledge resources (Ingram et al. 2015). However, many obstacles and barriers can arise on this path slowing down learning processes and mainstreaming. Barriers can have different nature and pertain to the realm of the context, the governance system, or the local and implementation level.

Chapter III

Analytical framework

As pointed out before, the experiences of various scholars have led to the insight that complex problems cannot be analyzed with disciplinary approaches alone. They have to be dealt with in an integrative, interdisciplinary way that considers the interaction between social and ecological systems (Binder, et al. 2013). Elinor Ostrom has been one of the most influential authors in the development of such frameworks. Starting from an institutional perspective, she developed two inter-disciplinary frameworks, the Institutional Analysis and Development (IAD) and the Social Ecological System Framework (SESF) and then, I will describe the Management and Transition Framework (MTF) that presents some similarities but also differences with Ostrom's work which will be discussed later. Concept adopted from these two frameworks will be finally merged and tuned to fit within the pattern of change proposed by the MLP framework about socio-technical changes discussed in paragraph 2.3.

A premise is necessary to clarify what Ostrom considers an “analytical framework” as the term is sometimes used interchangeably with theory and model. Ostrom, instead, explicitly distinguished between these concepts as she tried to develop an analytical framework capable to compare and test different theories and models. Indeed, she believes that a framework should provide the basic vocabular of concepts and terms that may be used to construct the kinds of causal explanations expected of a theory: “Frameworks provide a metatheoretical language that can be used to organize diagnostic, descriptive, and prescriptive inquiry while a theory posits specific causal relationships” (McGinnis and Ostrom 2014). Nevertheless, it is useful to bear in mind that even if Ostrom aimed to build an “a-theoretical” analytical framework, her work is deeply rooted in the Commons literature and a pluralistic perspective (Aligica and Tarko 2012).

Since one of the most critical aspects in SES studies is the lack of common understanding between disciplines, Ostrom undertook a collaborative process to build a shared vocabulary and a logical linguistic structure that would facilitate communication among SES scholars engaged with the problem of developing a coherent mode of analysis to apply to complex, nested systems operating at multiple scales (Ostrom 2007). Finally, a comprehensive analytical framework was necessary to collect empirical evidence to build and validate consistent theoretical explanation.

3.1. Institutional Analysis and Development Framework (IAD)

The framework has roots in previous works in institutional and policy analysis research, starting from the 1980s. Ostrom and Kiser already presented the Institutional Analysis Development (IAD), already in 1982 with the aim to integrate work undertaken by political scientists, economists, anthropologists, lawyers, sociologists, psychologists, and others interested in how institutions affect individual behavior and the resultant outcome. The Framework has constantly developed afterwards also thanks to scholars associated with the Vincent and Elinor Ostrom Workshop in Political Theory and Policy Analysis (E. Ostrom 2005). Substantial progress has been made in defining rules, norms, strategies and other key institutional term, as well as the capability to analyze complex governance systems (McGinnis 2011; Poteete, Janssen and Ostrom 2010). At the heart of the IAD framework there is the “Action Situation,” in which individuals (acting on their own or as agents of formal organizations) interact with each other and thereby jointly affect outcomes that are differentially valued by those actors. Thus, an action situation refers to the social space where participants with diverse preferences interact, ex-change goods and services, solve problems, dominate one another, or fight. The IAD framework therefore identifies the “Action Situation” as the dependent variable, and highlights the contextual factors that shape its interaction and outcome (Ostrom 2005).

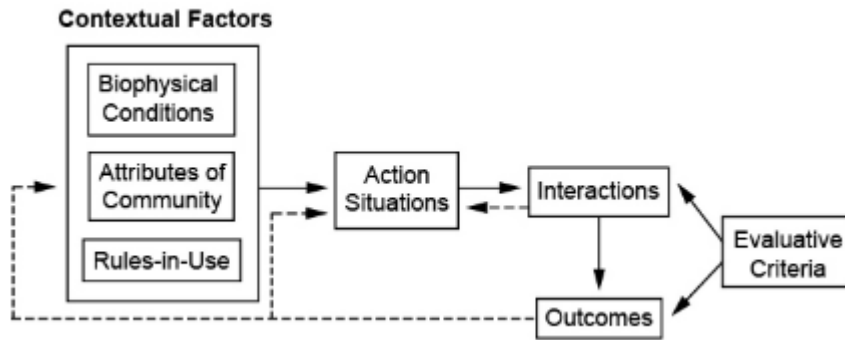


Figure 5 the IAD framework

The IAD framework highlights the social-cultural, institutional, and biophysical context within which all such decisions are taken. Specifically, this framework helps organize the task confronting a scholar or policy analyst approaching a policy issue by directing their attention to:

- Rules in use: thought of as the set of instructions for creating an action situation in a particular environment. All rules are the result of implicit or explicit efforts to achieve order and predictability among humans by creating classes of persons (positions) who are then required, permitted, or forbidden to take classes of actions. It is also important to recognize that rules need not be written or derived from formal legal procedure.
- The biophysical nature of the resource under consideration, as well as its material condition in terms of being a private, public, or a common-pool resource.
- The most relevant attributes of the community: size and composition, socio-economic background, homogeneity of preferences, accepted behavior, the levels of trust, shared norms of reciprocity and more in general cultural factors.

Ostrom argues that the regularized social behavior they observed at multiple scale is constructed from universal components organized in many layers. In other words, whenever interdependent individuals are thought to be acting with a certain degree of freedom there are always, instead, several layers of universal components that create the structure that affects their behavior and the outcomes they achieve.

The IAD framework explicitly distinguishes three levels of analysis at which different types of choice processes take place. At the operational level, actors make practical choices among their available options which are determined by both collective and constitutional level choices. The former includes the determination of which strategies, norms, and rules are available or not to actors fulfilling the specific roles and the latter relating to who should be empowered to participate in the making of collective and operational-level decisions. The critical insight behind this framework is that the outcomes of interactions in different levels of analysis are explicitly connected to each other (McGinnis and Ostrom 2014). The IAD framework is based on a dynamic view of policy processes as systems. Social, institutional, and biophysical factors are inputs to the decisions made by individuals (either acting on their own behalf or as agents of larger groups or organizations). Individual decisions are aggregated to constitute patterns of interaction that, when combined with exogenous factors, produce observable outcomes. Evaluations of these outcomes made by these actors (or by other observers) then feedback into all of the previous components of this continuous process. The IAD framework treats the dynamics of a resource system as a mostly exogenous force not directly under the actors' control. This separation between natural processes as drivers and policy processes as the core analytical concern might let think that the IAD framework is downplaying the continuous interdependence between the two sub-systems (natural and governance/policy). However, that was a necessary analytical simplification that served as a starting point to further inquiry the dynamics of complexly of social-ecological systems.

3.2. The Social Ecological System Framework

The Social Ecological System Framework (SESF), provides a framework for selecting the variables necessary to describe the dynamics of the social and ecological systems and the interaction between them. It provides a checklist of SESF variables for analyzing the potential sustainable development of a social-ecological system (McGinnis and Ostrom 2014). The SES framework builds on the foundation of the IAD framework, and the two are very closely related. The initial versions of the SES framework, proposed in 2007 by Ostrom implicitly incorporated the action situation within the box labeled as “interactions” and “outcomes”. On

the occasion of her Nobel Prize acceptance speech Ostrom (2010) changed the label of the Interactions and Outcomes to also include the broader term “Action Situations”. This simple step cemented a close connection between decades of work on the IAD framework and the newly established SESF. Similarly, to the IAD framework, the epistemology of the SESF framework (what is worth knowing about reality from the use of the framework) places an institutional and anthropocentric lens on the analysis of natural resource management in the commons. Its main focus is the need to verify which kind of governance arrangement and management practice foster cooperation (via collective action and institutions) and their ability to achieve sustainable outcomes. In the SES framework, the actors living in a Social-Ecological System, even if they have to comply with a certain set of overarching formal and informal rules, have a certain degree of agency. There is the presumption that humans can make conscious choices as individuals or as members of collaborative groups, and that these individual and collective choices can, at least potentially, make a significant difference in outcomes. As in the IAD framework, the SESF is permeated by a utilitarian logic portraying the biophysical environment through a lens of economic and institutional utility as it is testified by the name attributed to some of the core variable of the framework, namely resource system, resource units and users. Just one of the last revisions (Ostrom McGinnis 2014) changed from “User” to “Actors” in order to widen the scope of the framework to a larger set of cases. The SES Framework was designed to identify basic working parts and critical relationships among these elements that are essential to consider when studying social-ecological systems. It provides a general list of concepts that can be used to analyze all types of SESs core concepts and their sub concepts so that multidisciplinary teams of researchers can work together more effectively. The SESF proposes a list of generalizable variables that can be used as a diagnostic tool to help solve challenges with the governance of environmental problems (Ostrom 2007, 2009). The most recent version of the SESF from McGinnis and Ostrom (2014) is structured into tiers of nested and related concepts and variables that has already been discussed in the literature reviews, however, the more relevant

to our case study will be discussed further later. First-tier variables are depicted in figure 6.

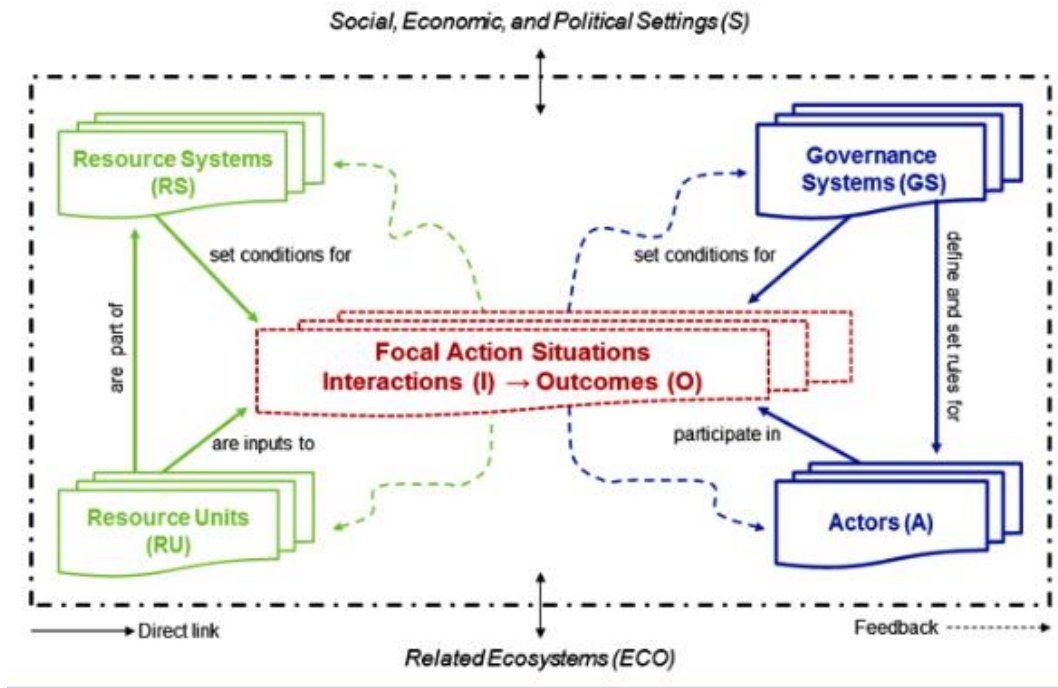


Figure 6 1 Representation of the Social-Ecological System Framework (McGinnis and Ostrom 2014)

The first set of variables are related to the Context in which the governance system is inserted and where Actions Situations takes place. They are divided into two main categories: 1) Social Economic and Political Setting and 2) Related ecosystem; which are subsequently subdivided into second-tier variables as follows:

Social, Economic and Political Settings

| Second-tier variables | Code |
|-----------------------|------|
| Economic development | S1 |
| Demographic trend | S2 |
| Political stability | S3 |
| Markets | S4 |
| Media Organizations | S5 |
| Technology | S6 |

Related Ecosystem

| Second-tier variables | Code |
|--------------------------------|-------|
| Climate patterns | ECO1 |
| Pollutions Patterns | ECO 2 |
| Flow into and out of focal SES | ECO 3 |

Then, the framework is composed by another set of variables that set conditions for the actors within the Action Situations and they are Resource System (RS), Governance System (Gov).

| Resource system | |
|-----------------------------------|------|
| Second-tier | Code |
| Sector | RS1 |
| Clarity of system boundaries | RS2 |
| Size of resource system | RS3 |
| Human-constructed facilities | RS4 |
| Productivity of system | RS5 |
| Equilibrium properties | RS6 |
| Predictability of system dynamics | RS7 |
| Location | RS8 |

| Governance system | |
|----------------------------------|------|
| Second-tier | Code |
| Government organizations | GS1 |
| Nongovernment organizations | GS2 |
| Network structure | GS3 |
| Property-rights systems | GS4 |
| Operational-choice rules | GS5 |
| Collective-choice rule | GS6 |
| Constitutional-choice rules | GS7 |
| Monitoring and sanctioning rules | GS8 |

Another first-tier variables category is Resource Unit (RU) that are part of the resource system but it identifies categories to distinguish the main features of the specific good under analysis.

| Resource Unit | |
|-----------------------------------|------|
| Second-tier variables | Code |
| Resource Unit Mobility | RU1 |
| Growth or replacement rate | RU2 |
| Interaction among resource units | RU3 |
| Economic value | RU4 |
| Number of units | RU5 |
| Distinctive characteristics | RU6 |
| Spatial and temporal distribution | RU7 |

The SES Framework describes the Actors with very different type of variables ranging from backgrounds, socioeconomic attributes, attitudes toward others, knowledge and mental models. Second-tier variables related to Actors are the following:

| Actors | |
|--|------|
| Second-tier | Code |
| Number of relevant actors | A1 |
| Socioeconomic attributes | A2 |
| History or past experiences | A3 |
| Location | A4 |
| Leadership/entrepreneurship | A5 |
| Norms (trust-reciprocity)/social capital | A6 |
| Knowledge of SES/mental models | A7 |
| Importance of resource (dependence) | A8 |
| Technologies available | A9 |

Finally, the framework identifies different types of “Actions Situations” related to a Social-Ecological system labelled as “Interactions” (I) and the related Outcomes (O) produced. They are respectively subdivided as follows:

| Action Situation | |
|------------------------------|------|
| Interactions | Code |
| Harvesting | I1 |
| Information Sharing | I2 |
| Deliberation Processes | I3 |
| Conflicts | I4 |
| Investment activities | I5 |
| Lobbying activities | I6 |
| Self-organization activities | I7 |
| Networking activities | I8 |
| Monitoring activities | I9 |
| Evaluative activities | I10 |

| Action Situation | |
|---|------|
| Outcomes | Code |
| Social performance measure (efficiency, equity, sustainability) | O1 |
| Ecological Performance Measures (Resilience, Biodiversity) | O2 |
| Externalities to other SES | O3 |

3.3. Management and transition framework

In 2009 Pahl-Wostl presented the Management and Transition Framework (MTF), an interdisciplinary conceptual and methodological framework supporting the analysis of water systems, management processes and multi-level governance regimes (C. Pahl-Wostl 2009). The framework is clearly inspired by Ostrom's work and it shares with the IAD and the SESF the lexicon and conceptualization of many variables. It falls within the SES studies as it identifies these two sub-systems as and their interactions as units of analysis.

Similarly to the SESF, the MTF includes all hierarchical levels of analysis, linked by bidirectional relation between the macro and micro level, and reciprocal relation between society and the environment. Furthermore, both frameworks entail similar dynamics including different types of feedbacks within the social system and between the social and ecological systems in different time and social scales, named single, double, or triple loop learning or primary and secondary feedback loops. Within the social system the frameworks also consider the duality between social structure and agency. Furthermore, they view the ecological system from an anthropocentric perspective, that is, they look at the ecological system from the point of view of its utility to humans. Finally, both frameworks are analysis oriented (Binder 2016).

However, some differences exist. The SESF and other framework based on an institutional approach mostly conceive governance as system of rules that shape the action of actors (Ostrom, 2005). It may be useful from an analytical perspective to make a distinction between these dimensions. However, according to Pahl-Wostl, such distinction may not do justice to the complexity of real-world governance regimes. Indeed, it may be virtually impossible to determine what is the dependent and what is the independent variable. The politics and polity dimensions are difficult to untangle. It is not always possible to establish whether the action situation is the dependent variable or not. Consequently, the MTF permits a formalized representation of action situations without using mathematical descriptions (Binder 2016). Pahl-Wostl adopts an approach more similar to an actor centered institutionalism conceptualized by Mayntz and Scharpf (1995) that combine an actor centered and an institutionalist approach into a more balance relations between these two dimensions compared to Ostrom's.

Pahl-Wostl portray regime changes in the field of water and land management as a dynamic interplay between policy cycles (usually top-down) and multiple learning loops (bottom-up) that involve operational experimentation and improvement, problem reframing and restructuring (values and assumptions) and ultimately regime transformation via new institutions and approaches.

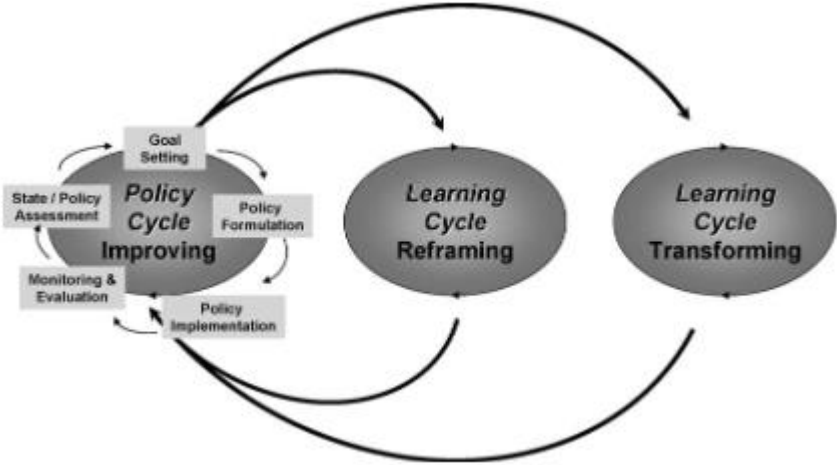


Figure 7 Pahl-Wostl in Global Environmental Change 19 (2009)

The concept of triple-loop learning applied to governance regimes assumed that different kinds of learning also require a change in the composition of the actor network and in the

institutional setting. The process implies knowledge sharing, changing practices, restructuring of values and assumptions (also scientific) and higher cooperation and integration (Pahl-Woslt 2009; 2020).

3.4. Adapted Framework

The framework adopted here is inserted in the line of Ostrom and Pahl-Woslt within the neo institutionalist school but present some variations. As Ostrom's framework has been mainly built and adopted for Common Pool Resources (water for irrigation system, fisheries, forestry, hunting), I argue that some changes are needed to tailor it to the NBS cases.

3.4.1. NBS features

Since we are dealing with socio-technical change, we cannot overlook to take into account the strictly technical issues that then also become social-economic and have a relevant weight in the choices that will then be made within the governance system. As discussed in chapter III, socio-technical change are successful when an "innovation niche" grow to replace or achieve the same status of the incumbent regime. In this case, the regime is represented by traditional grey engineering solutions while the niche by the NBS. It is therefore important to establish what these elements have in common and what differentiates them in order to assess how these factors do influence the mainstreaming process.

The criteria mentioned in paragraph 2.2.1 namely excludability and subtractability of use can be applied similarly to the NBS and grey solutions. Differently from the Common Pool Resources, in which one unit of resource extracted prevent other to use it, risk mitigation and ecosystem conservation and restoration interventions present a low level of subtractability. They pertain to the realm of non-extractive natural resource management intervention (Watkins, Gobster and Vining 2015) and can be considered public goods.

Before assessing the differences with the grey approach, it is also necessary to identify differences between the NBSs themselves as they do not all have the same characteristics One characteristic that differentiate NBS is the level of impact they have on ecosystems and

landscape. According to Eggermont et al. (2015) NBS approaches can be broadly classified into three types along a gradient of the level of complexity and eco-engineering applied. Type 1 NBS involve no or minimal intervention in ecosystems to maintain or improve the delivery of single/few ecosystem services; Type 2 NBS aim at establishing sustainable and multi-functional landscapes addressing multiple hazard and multiple ecosystem services, and type 3 NBS actions manage ecosystems in very intensive ways or create new ecosystems. This characteristic has likely an impact on mainstreaming because of the skills required to design and manage different NBS type.

Another issue that should be taken into account in relations to NBS mainstreaming process is their innovation degree (Baregheh, Rowley and Sambrook 2009) in specific socio-technical context. In a certain context one type of NBS can be: 1) totally new and experimental, 2) there have been similar intervention and the NBS is an upgrading of known technique, 3) NBS have been used and they need to be replicated and upscaled. These represent different stages of technological maturity in specific contexts, since innovation degree should be measured in specific social-ecological system as some interventions might be well established in certain regional context and a novelty in other which has likely to have an impact on mainstreaming. For instance, the literature points out that perception of effectiveness is a predictor of NBS acceptance and the fact that has been already tested and known might count. Finally, NBS scale and impact on the landscape might interfere with mainstreaming in several ways: for instance, through their visual impacts and the degree of landscape change that they request might affect attitude of local stakeholders “attached to the place” (Anderson and Renaud 2021), or the more land-use change is needed (flood protection, increasing drainage, natural barriers) the more likelihood of interfering with local interests (agriculture, fisheries, tourism). Scale can be considered according to the impact on landscape and the required land-use change and thus how much the NBS is “space demanding” which can have an interest in social ecological systems. It can be low medium or high. Variables related to NBS characteristics are codified with the letter N:

- Ecological intensity (N1): Type 1 “no or minimal intervention in ecosystems to maintain or improve the delivery of single/few ecosystem services; Type 2 “measures aimed at establishing sustainable and multi-functional landscapes addressing multiple

hazard and multiple ecosystem services”, and type 3 “NBS actions manage ecosystems in very intensive ways or create new ecosystems”.

- Socio-technical maturity (N2): in a given socio-technical context NBS can be 1) “new/experimental”, “improve/upgrade existing technique” or “NBS replication/upscaling” of existing one.
- Space demanding (N3): impact on landscape and land-use: low, medium or high.

It will be of much interest investigating the relation of this variable with the other that I am going to discuss. As said before, the aim of this research is to identify factors that contribute to foster or reduce the pace of NBS mainstreaming. Experts and proponents highlight that in some cases the NBS cannot replace the grey solutions, so we can consider a measure of the success of NBS their recognition as a standard and recurrent option within the main planning documents and disaster risk reduction intervention.

Finally, it is also necessary to introduce the cost variable into the discussion, which then intertwines with that of effectiveness. It is indeed necessary to assess how cost-effective an NBS is compared to the traditional grey counterpart.

- Perceived cost-effectiveness (N4): low, medium or high

This criterion is common in every socio-technical change process, and it includes considerations about technical feasibility and economic feasibility.

3.4.2. The Social-Ecological Context

Since we are dealing with public goods and thus mainly driven by public policies, understanding this process and assessing barriers and enabling factors requires an improved understanding of how such socio-technical change is embedded in a complex web of interactions within a given governance system. In order to have a comprehensive view of the water, land and risk reduction governance system, the proposed framework tries to keep together aspects related to structure, agency, meanings, relation and norms as well as the contextual factors of the social-ecological system. The main conceptual features are represented in figure 8:

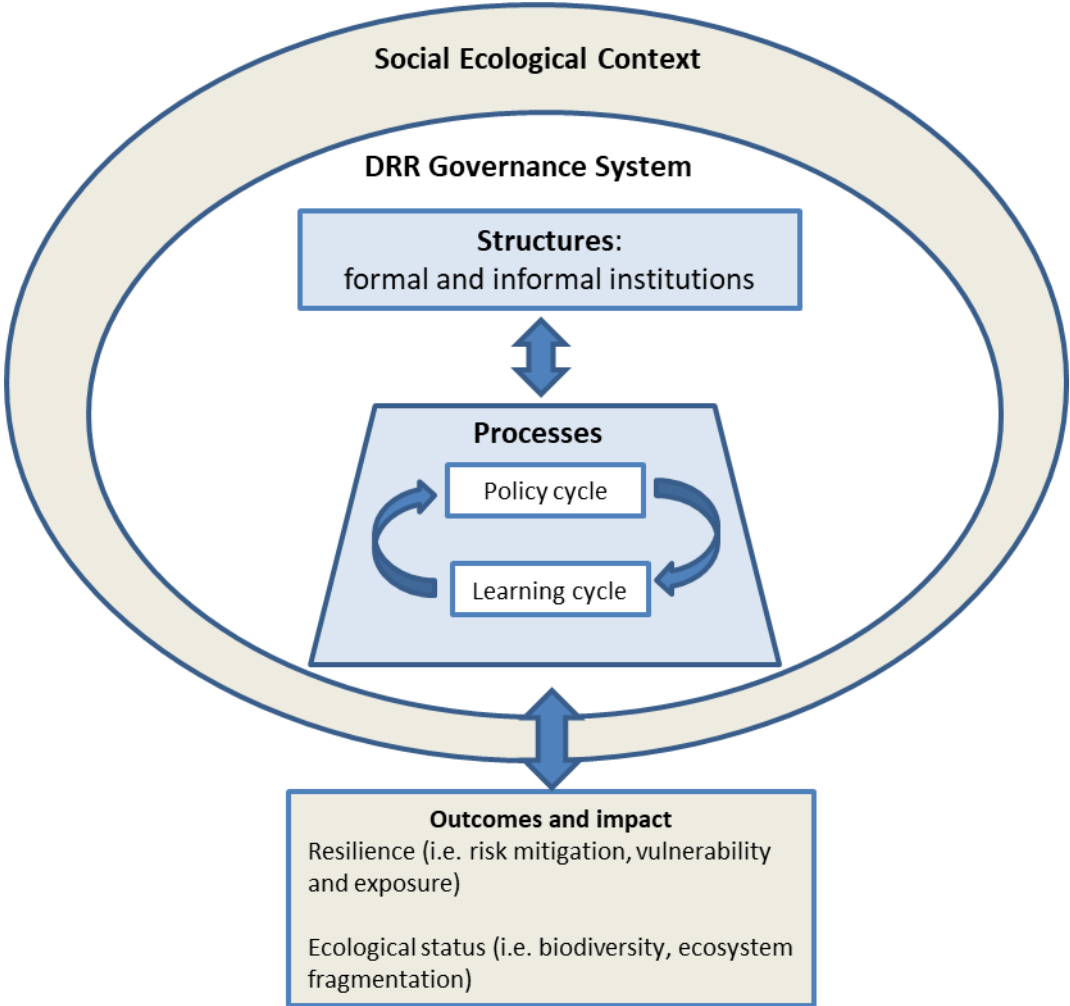


Figure 8 Adapted Analytical Framework

For the purpose of this research, it has been adopted a framework for guiding a transdisciplinary diagnostic approach, a context-sensitive assessment of multi-level disaster risk governance. This framework also adopted a regime change process that combines the dynamics of the MTF (Pahl-Wostl 2009) and the Multi-Level Perspective on Socio-technical changes (Geels and Schot 2008) discussed in chapter II. The focus is on the decision-making processes and contextual variables that underpin the choice of a technical solution rather than another, in our case grey solution or NBS. In this section we discuss the main contextual variables have been selected by the checklist provided by the SES Framework (McGinnis and Ostrom 2014) and MTF and readapted for this case study. The Social Ecological Context comprises all overarching societal and environmental factors that may influence the Disaster Risk Governance and management system and can in turn be impacted by it. It draws on the Social-Ecological framework adopted by Berkes and Folke and, in our case, includes categories explicitly related to natural risks (hazard, exposure and vulnerability) and later conceptualization made in the social ecological system literature. Main interrelated social-ecological contextual features are shown in figure 9:

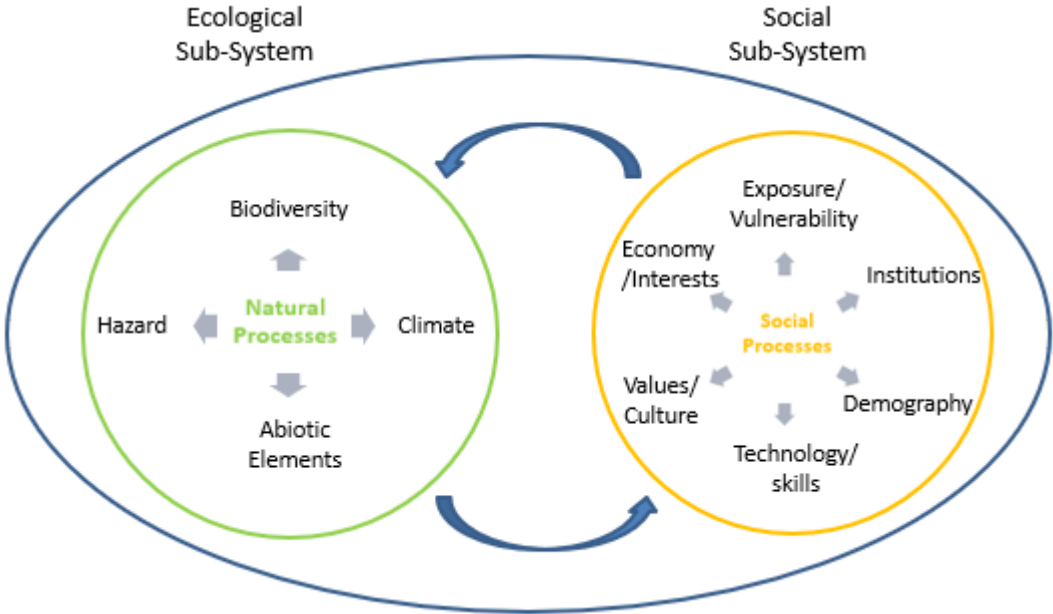


Figure 9 Social-Ecological Context Framework

The interplay of the social and ecological variables identified in figure 9 define the context in which a governance system operates and where decision are taken. Social-Ecological Contextual variables are codified with the letter C and are divided in three main categories: 1) Environmental-Social (Risks), 2) Socio-economic and 3) Institutional-political. As discussed in paragraph 1.1 risk is composed by environmental/physical and social components. It is the expected impact of hazard and its interplay with exposure and vulnerability. In this case risk relates with the components of hazard and exposure since vulnerability pertains more to the field of governance and management that will be discussed later. Since we are going to discuss mainstreaming and planning of preventive measure to mitigate risk, in this category it has been added the dynamic variables of expected climate pattern and predictability of system dynamics which are likely to interfere on the mainstreaming process. Finally, this category includes ecological status which is also dependent on environmental and social factors.

Environmental and social (Risk) (C1): as seen in paragraph 1.1 risk it is the expected impact of hazard and its interplay with exposure and vulnerability. Selected indicators (conditioned by data availability) are the following:

- Hazard (C1.1): can be classified according to: 1) type (flood, draught, storm surge, salt intrusion, landslide), 2) frequency in a given location through the indicator of the return period and can be low, medium or high.
- Exposure (C1.2): it is usually measured taking into account: population, buildings, economic activity, and cultural heritage
- Climate Pattern (C1.3): projected change of natural hazard: worsening, stable, improving.
- Predictability of system dynamics (C1.4): margin of error in short, medium and long-term hazard occurrence and can be low, medium or high.
- Biodiversity and ecosystem status (C1.5): it can include different indicators such the one used in the EU water framework directive “Ecological status of watercourse” which is determined based on biological quality elements and supported by physico-chemical and hydro morphological quality elements. It can take the value of: bad, poor, moderate, good, or high. Other indicators can refer to habitat degradation and

fragmentation and includes: land reclamation rate, soil erosion (RUSLE) and soil degradation, connectivity index, NDVI index, Palmer Drought Sensitivity index.

Socio-Economic: (C2): here the variables are not specific to the DRR governance system but refer to general features of the socio-economic context:

- Economic Development (C2.1): Gross Domestic Product and Gross Domestic Product per capita.
- Demography (C2.2): total population, percentage of active population/total.
- Land Property right and interest (C2.3): how land property and use right are assigned and who owns the land is fundamental in Social Ecological System management (Folke and Berkes 1998) and in particular with NBS as they usually require morphological reshaping of the land and land use-change. Land property right might therefore make it more or less favorable conditions for NBS implementation. Land can be: “private”, “public but in concession to private actors”, “public open access”, “public restricted access”, “contested” or “protected areas”.
- Technology and technical capacity (C2.4): firms and value chains able to sustain an ecological approach (materials, technological tools, eco-engineering software).

Institutional-political (C3): the following variable are again relevant to describe the institutional and political context within which the DRR system operates. The political arena is where multiple social and economic interest compete to gain relevance for funding allocation, favourable regulations and be at the center of the agenda. The output of the political arena, the policies, can reveal how different societal objective are considered and if they are deemed as strategic or ancillary:

- Relevance of Disaster Risk Reduction (C3.1): it can be assessed through the analysis of policy evolution and the amount of increasing or decreasing funds as a share of the GDP. It can be assigned the value of “low”, “medium” or “high”
- Relevance of Ecology (C3.2): for this case study is also useful to assess the relevance given to ecological aspects.

Institutional capacity (C3.3) category of variables was not mentioned in the SESF framework but are used in an evolution of the MTF framework (Pahl-Wostl 2020) and in this case it relates to the ability of institutions to perform assigned functions, investing, budget spending

and it can be measured by performance indicators of the public administrations such as the “public rating” index.

- Institutional Capacity (C3.3): public rating index and comparison with other regions.

Participative Culture of Planning (C3.4) as we have seen, co-design, co-management and co-planning are believed to be fundamental for NBS implementation and mainstreaming (IUCN 2020). However, different social context present different level of willingness to engage, positive or negative attitude toward policy-making and public interventions, trust in local authorities, capacities of the institutions involved (Wamsler et al.2019) past experiences, presence of facilitators or trained personal, available resources for participation, demographic and ageing trend and overall civic culture. The interplay of these factors produces a participate culture of planning in which is more or less easy to involve people, share knowledges, increase cooperation and ultimately, proper planning and implementation of NBS. It can vary from “very low” if participation is usually absent or lead to negative outcomes to “very high” in the case participative practices are the standard and they usually lead to positive results.

- Participative culture of planning (C3.4): from “very low” to “high”.

3.4.3. The Governance system

After the social-ecological contextual variables we are going into the details of the Disaster Risk Reduction governance and management system where decision actually take place. As it is shown in figure 8 in a governance system we can distinguish between structures and processes. By structures we mean those features of the system that are more static and define the foundations of the system, the constitutional rules, how it is composed, how power and functions are attributed but also prevalent value and normative structures. Governance structure comprises indeed formal and informal “institutions” or “rule” structures that regulate interdependencies between actors and provide stability but also inertia to water land and risk governance and management (Pahl-Wostl 2020). “Institutions”, according to the convention in institutional analyses, are the human-created prescriptions designed to affect incentives and

guide behavior. Institutions do not just refer to those linked with the official channels of governmental bureaucracies but also to informal way of governing. Institutions can indeed be formal or informal according to the nature of processes, codification of behavior, communication and prevalent enforcement mechanism. Ostrom identified institutions characterized by rules, norms or shared strategies which are differentiated by the level of enforceability and by the sanction associated with following or not following the prescription.

Formal and regulative institutions can be identified with policy and regulatory frameworks, formalized professional rules and standards of good practice as typically codified in handbooks and technical documents. They are codified in written documents with a certain degree of enforceability. A rule usually has a tangible effect (e.g. a reward or a fine) and a system for its implementation, monitoring and enforcement. They are therefore what we associate with the term “policy” and changes are negotiated and finalized with structured procedures. Rules can be of constitutional level when they established who is or should be empowered to participate in the making of collective and operational-level decisions and therefore when they assign governance tasks and functions. Collective choice rules instead are those that give to actors a set of possible option at the operative level.

Informal institutions can be divided in normative and cultural/cognitive. Normative institutions can be identified with informal societal norms, shared but not codified rules of good practice. Normative institutions reflect value structures and thus a norm has an emotional sanction such as pride or guilt. Contrary to regulative institutions change is not based on negotiations and formal agreements but is more gradual and emergent. The prevalent value structure is dependent on the overarching objectives that a society want to achieve. There can be trade-off between (short-term) economic growth, environmental concern and just distribution of resources, and choices to act in a way rather than another might depend on the dominant value structure and norms. Normative institutions are thus the moral boundaries that make actor prioritize one objective rather than another and thus shape behavior. Answering the following questions would be fundamental to foresee pattern of behavior regarding NBS acceptance.

Pahl-Wostl stresses the idea that other kind of institutions, that she called “cultural-cognitive”, are also relevant in shaping actors’ behavior. Cultural-cognitive institutions can be identified

with prevalent paradigms, mental models that strongly influence system understanding, how boundaries are delineated, the search space for problems and solutions are determined (Pahl-Wostl et al., 2007). These features are internalized by individuals through the membership of certain social groups, cultural background (level and type of education), the belonging to certain professional category. Prevalent and dominant scientific and management approaches or “Management Paradigm” determines for instance the approach to risk and uncertainty (stochastic or deterministic), the habits to implement certain kinds of technical solutions (Nature-Based versus Grey solution) or type of interactions (more or less inclusive). Similar to normative institutions, these are informal, and change is not negotiated but enacted in shared practices and the emergence of new networks that pushes for a paradigm shift.

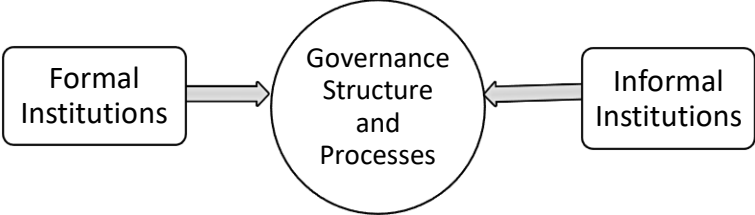


Figure 10

The interplay of these institutions therefore shape governance structures that to sum up can be governance jurisdictions and scope, strategic goals, administrative organization, power and functions assignment, prevailing management and scientific paradigm, prevailing values and norms. As it is shown in figure 8, process within a governance system can be conceived as policy cycles and learning cycles.

Formalized policy processes are represented in the MTF as a policy cycle, a tool used to analyze the development of public policy. In order to make it more suited to this case study and to the prevention and mitigation phase of disaster risk reduction system, some modifications have been made. As policy cycle is a tool usually adopted for specific policies here it is referred to governance cycle which is a term that implies a wider perspective on the system. It includes strategic goal settings, data gathering and current state assessment, rulemaking and policy formulation, funding, operational planning, project design and authorization, implementation, monitoring and sanctioning. It should be noted that these phases do not always follow each other chronologically but sometimes overlap. Finally, coordination can be considered an additional function that is cross cutting to each one of those in the figure below.

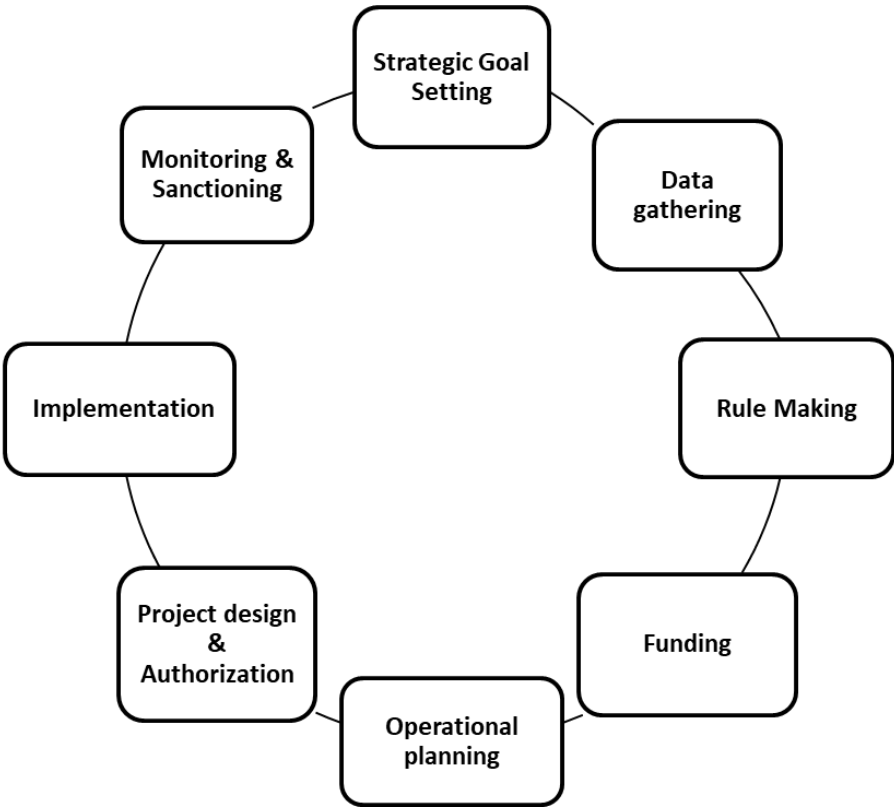


Figure 11 The governance cycle

Each of these phases are fundamental in a disaster risk reduction governance system and they can also be considered as functions that are performed by the different actors that make up the

system. These functions are assigned to actors (mainly bodies) by what Ostrom used to call constitutional rules which, in state with strong bureaucracies, tend to be formal and written. How these functions are attributed and to which governance level are fundamental characteristics of a governance system and its power structure (decentralization-polycentricity). In each of this phase or functions there are factors and variables that may facilitate or impede the adoption of NBS.

As said before, even in this sector where formal regulations are likely to be a relevant driver, outcomes are also shaped by informal institutions and processes. Pahl-Wostl used the learning loops conceptualization to describe the process of regime change in water management regime, a toll that can be applied also in this case with some modification. Regarding learning cycles, any kind of stylized representation is difficult due to the diversity and complexity, but the following phases can be assumed to represent major elements of learning processes regarding NBS. First loop implies changing practices to improve operative actions without challenging dominant assumptions and values. In our case it can be represented by the experimentation of NBS. In general, socio-technical change and innovations require a process of knowledge accumulations that serve as proof of effectiveness of the proposed solutions. In the field of Disaster Risk reduction, perception of effectiveness has been found to be very significant for NBS acceptance (Anderson et al 2021). These phase requires experimentations, trials and error and reflexive process to make step further (Huiteima et al 2009). Then positive results should serve as a basis to develop standardized and replicable approaches to reproduce them on a wider scale by upscaling and replication. In the meanwhile, the network supporting the niche should find additional support and linkages with higher level institutional actors where policies and large-scale operative planning occur. According to Pahl-Wostl, in order to obtain a regime change (in our case from grey to Nature-Based solutions) on a significant scale, it is necessary a wide problem restructuring and reframing that leads to changing structures, including assumptions, values, and institutions. These are usually slow changing variable and can be conceived as second and third learning loops.

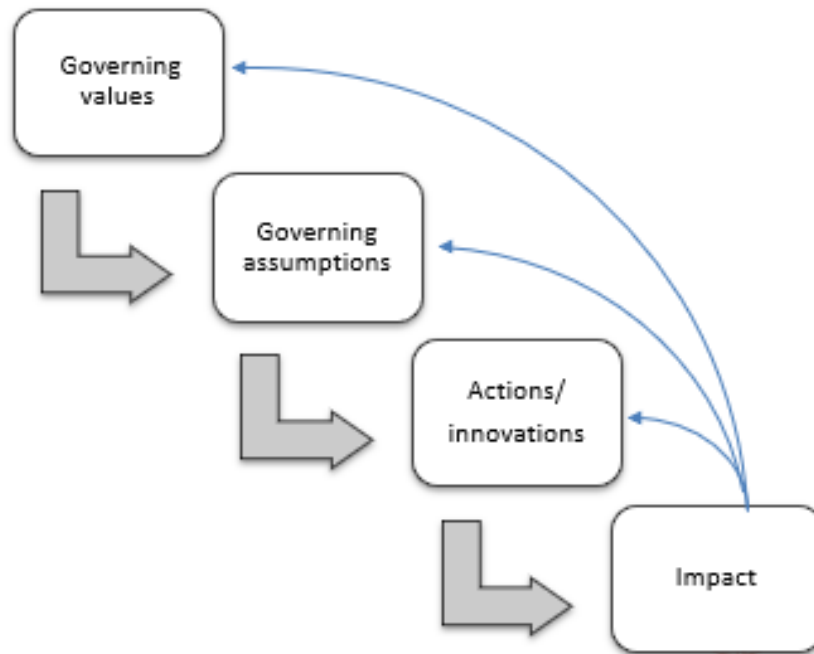


Figure 12 Triple Learning Loops from Pahl-Wostl 2011

A lesson taken from Pahl-Wostl is that policy cycle and learning cycle go hand in hand and policies to be effective should consider how learning processes work and vice versa. It is of major interest to analyze the relationship and interplay between structures and processes intended as policy and learning cycles to understand what are the features that impose constraints on learning or enable an innovation niche like the NBS to become part of the new regime or the new regime itself.

I am going to operationalize the conceptualizations discussed above through variables and indicators that will permit to assess the current status of the governance system. Then for each variable it will be assessed their relevance for the process of NBS mainstreaming according to expert judgment. They have been selected according to literature review presented in previous chapter regarding socio technical changes, management regime transition, water and risk management.

First, it is necessary to specify which is the “Action arena” or policy sector under scrutiny. The Action arena is embedded in the social ecological system and are issue specific political arena focused on a societal function and which have a specific strategic objective. In our case, the Action arena or policy sectors refers to the land and water governance system that has as

the main strategic objective Disaster Risk Reduction. Governance variables are coded with the letter G.

It is relevant to define the governance scale (G1) in order to give an initial idea about the complexity and dimension of the issue but also for comparative reasons. It is therefore necessary to identify geographical limit, the territorial extent and the population under the governance system jurisdiction. Moreover, it is relevant to specify whether the governance system under enquiry refer to a rural, urban or both urban and rural area as this may change attitudes toward NBS (Soini et. al 2022).

- The geographic range (G1.1): the jurisdiction extension of specific governance system in km²
- Size of the population (G1.2): the total amount of people potentially affected by decision taken in a certain governance system.
- Rurality (G1.3): does the governance system refers to urban, peri-urban, rural area or, if it includes different setting, the share of each one.

Secondly, as said before a governance system is characterized by one or more strategic objective. One is trivial and it is risk reduction but, since the focus of the research is the NBS mainstreaming process it is necessary assessing whether, alongside risk reduction, it can be observed an enlargement of strategic objectives also toward ecosystem conservation and enhancement. In DRR governance system, strategic objectives are formalized in regulative frameworks which are, however, the reflection of dominant value structure and results in certain practices. It will be assessed if strategic objectives are changing in both formal and informal institutions and into the resulting practices and where changes comes first.

- Strategic Objective (G2): to what extent ecological conservation and enhancement is considered a priority in the Disaster Risk Reduction governance system from “low” to “high”.

Disaster risk reduction system can be organized in several ways that it is useful to assess in order to identify at which level of the system relevant decision for this case study are taken. Governance organization (G3) includes the feature of the governance regime related to the

institutional setting, the attribution of functions at various level, the degree of decentralization and in this case, the degree of ecological fit.

- Decentralization (G3.1): where main government functions are assigned it can be measured through degree of decentralization and indicator such as the Local Autonomy Index (LAI) developed by Ladner, Keuffer and Baldersheim (2016). It includes eight variables clustered under Self-rule (SR) and three clustered under Interactive Rule. Self Rule: (IR) Institutional depth (ID), Policy scope (PS), Effective political discretion (EPD), Fiscal autonomy (FA), Financial transfer system (FTS), Financial self-reliance (FSR), Borrowing autonomy (BA), and Organizational autonomy (OA). Interactive Rule: Legal Protection (LP), Administrative supervision (AS) and Central or regional access (CRA). In this case it will be used a modified version of the LAI score in which Policy Scope is substituted by the aforementioned DRR governance function (strategic goal setting, rulemaking, planning, financing, project design and evaluation, monitoring and sanctioning) and all item value are normalized with value between 0 “centralized” and 3 “decentralized. Every specific item of this list will be deepened in the discussion section.

As pointed out in the review many authors highlight the relevance for the governance system to fit with the eco-region that in the case of Hydro-Meteorological Hazard is the hydrographic basin. This imply that the jurisdiction of the main competent authorities designed according to eco-system boundaries. The eco-fit (G3.2) variable can take the value of “total fit” if all the main authorities involved are organized according to the eco-region they are supposed to manage; “partial fit” if there are some jurisdictional divisions over the same interconnected eco-region; “no fit” if the competent authority follow just administrative boundaries. Literature usually associates higher fit with more sustainable results.

- Eco-fit (G2.2): “No fit”, “partial fit”, “Total fit”

Governance function coherence (G3.3): the backbone of the formal governance system are what Ostrom called Constitutional choice rules which are those that determine the competences and the range of functions delegated to lower administrative level, who participate in decision-making, the control range of the higher levels and discretion to perform this task, financial transfer system and therefore the level of decentralization, polycentricity and inclusiveness of the system. In this case it is difficult to make hypothesis about this

variable and NBS mainstreaming as correlation between decentralization/polycentricity and their result in resource management is often mediated by other variable such as coordination and cooperation that we will discuss later. However, for descriptive purposes I am going to assess the current status by assessing to which level and type of authority each governance function has been attributed. The main governance functions related to DRR are the following: Rule making (assignment, funds allocation, type of policy, sanctions), knowledge generation, planning, project authorization, conflict resolution, coordination, rules enforcement, and interventions implementation. The literature points out that if governance functions are not distributed coherently problem in planning and implementation arise (Weitz et al. 2017). Coherence can be measured through the concept of redundancy (overlapping) and lacunae (gaps) in governance functions assignment. To the following item it will be assigned a value of “no”, “very few”, “some” and “many”.

- Redundancy (G3.3.1): there are duplication and overlap in assigned governance functions.
- Lacunae (G3.3.2): some governance functions are not clearly assigned.

Regarding the distribution of governance functions, it is also relevant to verify if there are adequate human resources to fulfill the task and implement interventions at the level where functions are assigned. In this case, differently for contextual variables, “implementation capacity” are referred to the capacity of public authorities in charge of Disaster Risk Reductions. A distinction relevant to our case is between general technical skills and technical environmental skills (environmental engineers, ecologists, biologist).

Actors’ capacity and human resources (G4): are there enough trained human resources at the level where task have been assigned?

- Administrative (G4.1): Administrative personnel in charge of legal, procedural and economic issues, authorizations and other administrative functions.
- Technical (G4.2): technical personnel with background in engineering (hydraulic, civil, energetic), physics and geology.
- Environmental and ecological knowledge (G4.3): personnel able to work with a environmental approach (environmental engineer, biologist, ecologists)

The assessment here will be carried out through expert interviews and for each items it can be assigned the following label “Chronically understaffed”, “Understaff issues in most cases”, 2 for “Understaff problem just during emergencies”, “The staff is always adequate”.

Multi-level integration (G5) is another relevant feature of multilevel governance systems. The literature repeatedly stresses the need of cooperation and coordination for complex polycentric system to succeed. Coordination means that different actors develop strategies, plans and programmes separately, but take into account (inform and/or consider) the work and interests of other relevant stakeholders and mutually adjust their respective plans and strategies. It is more related with communication flow. Cooperation can be considered an evolution of coordination as it means the joint elaboration and implementation of strategies, plans and interventions since initial stages. Coordination and cooperations need to be achieved both vertically, across governance level, and horizontally, across sectors and administrative boundaries. To the following items it can be assigned the value: “very low”, “low”, “sufficient”, “high” and “very high”.

- Vertical Integration (G5.1):
 - Legal provisions provide means and spaces for vertical steering and coordination.
 - Legal provisions provide means for cooperation.
 - Actors from lower level actually participate in decision processes at higher level.
 - Knowledge produced at one level influences processes at another level.

- Horizontal integration (G5.2):
 - Legal provisions provide means and spaces for vertical steering and coordination.
 - Legal provisions provide means for cooperation (integrated planning)
 - Actors from different administrative sectors actually participate in joint decision.
 - The Stream of communications across sectors is functional.

Coordination and cooperation are also believed fundamental to achieve integrated management and coherence among policy instruments that may be put in place by different authorities in different policy sector that are interlinked. It is believed to be relevant also in the case of NBS, a multi-disciplinary concept by definition and that can be integrated in multiple policy tools.

In order to achieve higher level of integration and other objective discussed in paragraph 2.2.1 higher level of “Participation and Inclusiveness” (G5.2): governance system can also be classified according to the role and power assigned to different kind of actors in decision-making processes or governance function, including the degree of involvement of non-state actors. As a clarification, an “actor” or a stakeholder, might be not just an individual but also a collective participant such an authority or an interest group. Individuals and actor groups populate the “action arena” and actions situations with different roles. According to the literature it is possible to identify the following ideal-type: technocratic, the functionalist, the rational/deliberative and the democratic/emancipatory which can be differentiated according to the following criteria and variable.

Participation and inclusiveness (G5.3) can be analyzed with the following criteria:

- Objective of involvement: data gathering, improve decision making, legitimacy and acceptance, empowerment (formal, descriptive)
- Type of actors involved: Policy makers, Interest groups, Knowledge-based organization, Association, Individual Citizen, Operative companies. A score of 1 is assign.
- Type of knowledge: to what extent different kind of knowledge are taken into consideration. Type of knowledges can be divided into Scientific/Technical that for our purpose is useful to subdivide in 1) traditional engineering and 2) eco-engineering/ecology; 3) Local knowledge (local authority, citizens).
- Leadership: which of the aforementioned actors have a leadership role in each governance functions and participative action situation?
- Level of engagement: a certain degree of power can be assigned to different actors in different phase of the decision-making process. It may vary as stakeholder can participate with a peer-to-peer collaboration, consulted or just informed.

The role of actors group varies considerably among different contexts, and it is based on the interplay of formal and informal institutions. There can thus be discrepancies between formal provisions and effective inclusiveness on the ground and I am therefore going to assess it

through a review of policy frameworks, in depth expert interviews and participant observation of a case study.

Cultural and cognitive institutions concur in the formation of a management paradigms which has been exhaustively discussed in paragraph 2.2.4 and include criteria as uncertainty management and acceptance, the role of experimental spaces, the type of knowledge and actors considered valuable, the habits of adopting certain technical solutions and all the assumptions below the practice of risk management and preventions.

Management regime (G6): Pahl-Wostl argue that regarding water and land management the type of management regime can vary on a spectrum between the so called “Command and control” and “Integrated and adaptive”.

- Uncertainty and risk acceptance (G6.1): it can be assigned the following values: “very low”, “low”, “moderate”, “high”, “very high”.
- Adaptivity and experimental spaces (G6.2): can be classified according to number and their link with institutions which increase the possibility of knowledge spillover and they are classified accordingly: “very few”, “few and non-institutionalized”, “few but institutionalized”, and “many and institutionalized”.
- Inter-disciplinarity (G6.3): for instance, co-planning co-design, co-creation, living lab, citizen science. They can be classified by the number and frequency of such practices compared to the average activities in the DRR governance system. These practices can be: “Never adopted”, “Adopted in few exceptions”, “Often adopted” and “Adopted as a standard”.
- New open and integrated data management platform and tools (G6.4): these items might include for its evaluation the presence of harmonized data gathering, the presence of platform for best practice dissemination, ecological data are integrated in database and their level of accessibility. Data management can be classified accordingly: “data are managed sectorally and are not open access”, “integration process has started but data are not open access”, “data are mainly integrated and open access”, and “data are fully integrated and open access”.

Type of policy (G7): Regarding formal regulative institutions, relevant for NBS mainstreaming are the type and kind of policy implemented. Different type of policy can indeed give different kind of incentive to actors to deploy a NBS rather than a grey solution. First, I am going to review and categorized those related with NBS according to their type discussed in paragraph 2.2.3: monetary/non-monetary and direct/indirect and level of incentive in order to assess which is the prevalent policy approach toward the NBS and ecosystem services.

- Direct monetary policies (G7.1): top-down financing and provision of NBS through direct public authority interventions or procurement and tendering.
- Indirect monetary policy (G7.2): tax, subsidies, payments for ecosystem services, bio-credits.
- Direct non-monetary policy (G7.3): quotas, cap and binding targets
- Indirect non-monetary policy (G7.4): guidelines, information and awareness campaign.
- Hybrid: cap and trade scheme that include a direct non-monetary (cap or quotas) and indirect monetary (tax and subsidies).

Then it will be assessed which type of policy are considered effective or a barrier for the process of NBS mainstreaming assigning the following value: “counterproductive”, “not effective”, “moderately effective”, “effective” and “extremely effective”. With interviews I will also deepen “why” a policy is effective or not and what kind of policies experts believe are needed. Since response can be biased, I will take into account contextual variables and respondent background in a reflexive way.

Now it is necessary to clarify how the indicators presented above are linked with the main research question. Some indicators are descriptive and are necessary to identify the main features of the system. Others are associated by the literature to better social and environmental performance and constitutes the pillars of the so called adaptive and integrated governance system. I am going to assess the current state of the system and which specific feature is more relevant for the mainstreaming of NBS. Assessing the current state of these variables and how they are evaluated in relation with the mainstreaming process by expert of

the sectors can give us insights of what is missing for this process to succeed. The assessment will require different phases of analysis and expert interview that we are going to discuss.

3.4.4. NBS mainstreaming as a socio-technical change.

To make what we discussed earlier functional to our research question it is now useful to discuss theory of changes. Merging all the items discussed above related to the social-ecological context, the governance system and technical economic features of the NBS it has been obtained the following simplified graphical representation of the system and its main components:

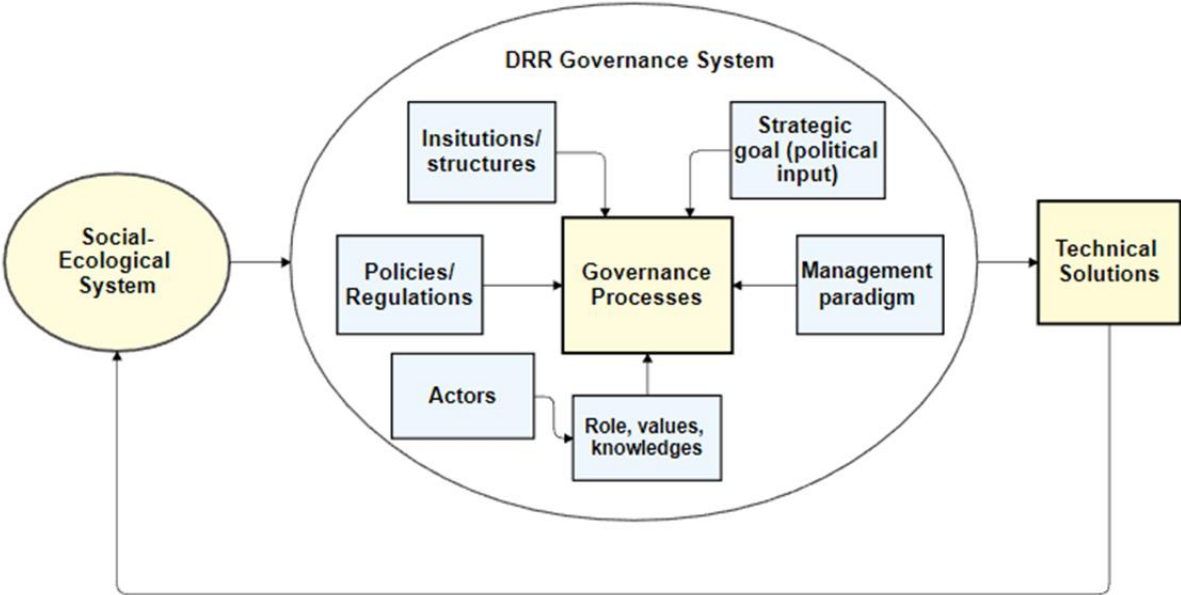


Figure 13 Decision making process in a disaster risk reduction arena

Adopting the conceptualization of a socio-technical change developed by Geels and Schot, the input for new governance and learning cycle start from the “landscape” that in our case can be considered the social-ecological system where environmental and social problem arise, they are perceived as socially relevant and produce space for changes and innovation (Geels

and Schot 2008). The initial input can be top-down if policy driven or bottom-up if driven by local communities, lower administrative level, scientists or businesses. Then social learning might remain confined in experimental phase if the governance system is not adaptive enough to accept uncertainty and innovation. In this case the reframing of the approach and does not have effect on a significant scale. The NBS mainstreaming process may overcome the double loop learning if the governance system incorporates and institutionalizes the new approach making it a standard in the way the risk are managed. Triple loop learning also explicitly address issues related to transformation of the structural context (formal and informal institutions) which is deemed to be essential to institutionalize the new regime which include NBS in a systematic way. This kind of social learning refers to transitions of the whole regime and the paradigm supporting the regime. Pahl-Wostl suggest that many kinds of double-loop learning can only be effective if accompanied by triple-loop learning since the dominating frame of reference is often strongly influenced by the structural context and effective reframing may not be possible without change in the structural and formal system. Indeed, structures of the system such as institutions, regulations, values, norms, scientific and knowledge set have to evolve to make the new approach part of the prevailing regime. In dealing with climate change and HMHs and DRR the changes represented by the loop learning can be combined with the concept of governance cycle in order to capture the linkages between top down and bottom-up interactions in an iterative way. To sum up the social-ecological system provide the context within which the governance system operates and decision about territorial planning and management takes place through policy and learning process. The decision and output of the processes includes also which kind of solutions have to be adopted and which kind of feedback are going to have an impact on the social-ecological system as it is shown in figure 13. It will be assessed which factors favour the adoption and mainstreaming of the Nature-Based Solutions.

In conclusion, this new framework inspired by the MTF, SESF and the MLP provides a guidance in disentangling the complexity of a governance systems and the contextual social and ecological system in a dynamic way. It allows analyzing pattern of change in the water and risk governance keeping together the contextual system, structural, and informal feature of the governance system and pattern of change that include social learning and policy cycles. It integrates concepts from several disciplines and theoretical framework. Most importantly for our case it can also be used to support scenario development and identify transition

pathways toward more sustainable and adaptive management approaches such as the NBS approach. It can help us identify at what stage of the transition we are in, what is missing and what should be done to scale it up. As a clarification, this framework has been inspired by previous one descriptive above but has been consistently modified to fit this case and it is replicable to describe all the relevant feature related to a governance system that might have an impact on land and water management innovative practices and mainstreaming process.

3.5. Research strategy and Methodology

3.5.1. Case study strategy

I have adopted a case-study research strategy approach identifying as a unit of analysis the Emilia Romagna governance system (including upper and lower levels). The case study method allows investigators to retain the holistic and meaningful characteristics of real-life events (Yin 2003) and arrived at the root causes of social phenomena. In fact, case studies seem to be the preferred strategy when "how or "why" questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon (Yin 2003; Kohlbacher 2006). The lack of consistent previous literature and the high amount of variables of interest (see the analytical framework), qualitative analysis of case study seems the best strategy for knowledge accumulation, hypotheses generation and theory building, without the presumption of finding universally generalisable results. A case study can be exploratory, descriptive or explanatory. Depending on the depth and range of the extant literature, the initial focus of the case study may also be broad and open-ended. Therefore, the case study strategy is ideally suited to exploration of issues in depth and following leads into new areas of new constructions of theory, and the theoretical and analytical framework at the beginning may not be the same one that survives to the end (Hartley 2004). The variables identified before are a comprehensive checklist of variable, however, how they are interrelated and how do they relates to the process under inquiry (NBS Mainstreaming) it is difficult to hypothesized a priori even if very general patter of change can be identified (Learning and policy cycle).

3.5.2. Data collection and analysis

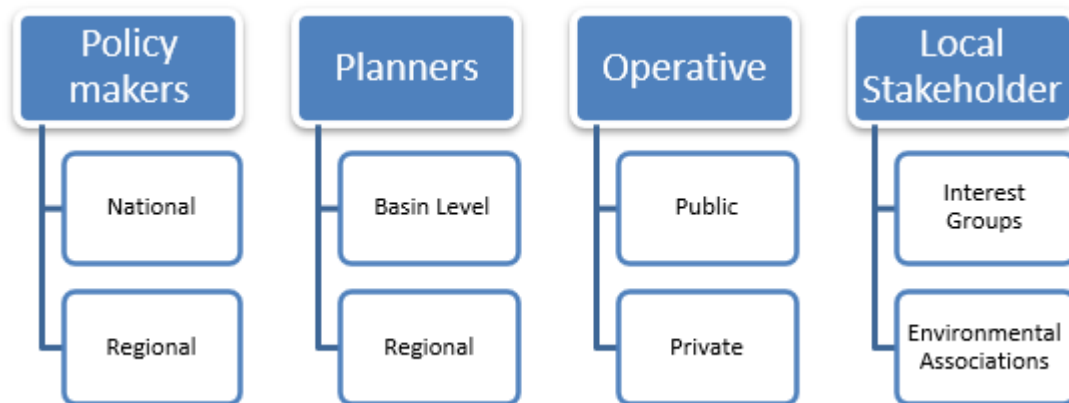
There are many possible sources of evidence for case studies including documents, archival records, interviews, direct observation, participant-observation, and focus groups. I have adopted multiple data collections methods.

The next two chapters, contain a review of all policy frameworks (document) related to water management, disaster and biodiversity conservation at international, national and regional level. The review has multiple purposes. First, to reconstruct the historical evolution of the field and to assess where input comes from, if and how they are transmitted to the different governance level, which are the most relevant actors and push for changes. The review will allow for the description of the multilevel governance structure and analyze the formal feature of the system such as formal strategic objective, the attribution of formal governance functions, provisions for participation and the other features described in the analytical framework discussed in the previous paragraph. The review will also serve for the description of the formal process and procedures of the governance system (figure 8) such as goal setting, planning and implementing (technical standard and permitting path). Finally, it has been identified the policy more related to the NBS to determine their type and the kind of incentive or disincentive they provide. It will be fundamental for the identification of pattern of change and processes.

The description of the formal structure, process and policy input will be complemented by in-depth expert interview and other data to include more information about “the practices of governance” beyond the formal provisions. These data will also be needed to asses which are the most relevant mechanism explaining the NBS mainstreaming process in our case study.

It had been conducted 21 expert interviews with an average length of 1.15 hour: in-depth interviews to collect data about experiences, preferences and judgment. Criteria for sample selection were to include representatives of every type of stakeholder according to the following classification:

Figure 14 Stakeholder classification for interviews and data collection



The initial questions were very broad to give interviewees the freedom to start with their most pressing issue. Then follow-up questions to gain a deeper perspective and understand the participant's viewpoint and to cover unaddressed issue. Moreover, in-depth interviews gave me the freedom to explore additional points and change the direction of the process when necessary.

Another data gathering method was the participant observation of activities carried out within the project OPERANDUM in which I have participated from February 2020 until December 2022. OPERANDUM is an EU H2020 project in which NBS are co-designed and tested with partners and local stakeholders in Open-Air Laboratories. In Emilia-Romagna, Operandum implemented and tested: 1) artificial dune to reduce coastal erosion, 2) deep-rooted plant to strengthen river embankments and 3) halophyte plants to reduce salt intrusion.

Within the framework of the project, in collaboration with the Open-Air Laboratory Italy research team I have organized four focus groups with 10+ stakeholder with the following aims: 1) assess knowledge, skills and interest, 2) discuss about regulative framework regarding disaster risk reduction, 3) Discussion about knowledge sharing (including digital platform as the GeoIKP) and 4) Dissemination and mainstreaming process.

All the interviews and focus groups have been transcribed and were the basis for the content analysis that allowed me to obtain the results of this research project. In order to ensure respect for privacy, in case of quotations I used a pseudonym for each respondent. Data have been extracted from the text following thematic content criteria according to the variable

identified in the analytical framework discussed in the previous paragraph. Then for each variable it has been assessed the relevance for the mainstreaming process according to the attitude and judgment given by respondents of the interviews or the focus groups. As data analysis means a search for patterns in data (Neuman 1997), I will assess if there are convergence or divergences of arguments between respondents. I will specify if there are consensus about single findings or disagreement and I will try to explain them through personal background, interests or contextual factors.

The combination of regulative and policy framework review and interviews and focus groups allowed me to keep together formal and informal structures of the governance system, the context but also individual and social relations, attitude and practices. It will therefore be possible to comprehensively identify in which phase the main barriers are, the root causes and possible solutions.

Chapter IV

International Policy Review

In this chapter it will be reviewed the main and most relevant principles, laws, and regulatory frameworks established both at international level in the field of Water and Disaster Risk Reduction governance and management and Climate Change adaptation. The review has been conducted with an historical perspective trying to capture the evolution of knowledge, principles and practices that have characterized this policy arena.

4.1. The evolution of UN environmental institutions and policies

The UN has often acted as a catalyst of scientist, policy makers and medias capable of changing the world views on global environmental issues. However, efforts not always led to success and the process to mainstream sustainable policies and practices has been slow and characterized by multiple obstacles of various nature: political, economic, social, technological. Several stages in this process can be identified, although it should be noted that in this case denominations and time delimitation are simplifications of a more complex matter.

4.1.1. Knowledge accumulation and consensus building

The idea that more than a century of industrial revolution and population growth put in danger the well-being of the environment on large scale and, as a consequence, human well-being, was already present during the 1960s. In 1969, the UN General Assembly decided to convene a global conference whose principal purpose was “to serve as a practical means to encourage, and to provide guidelines to protect and improve the human environment and to remedy and prevent its impairment”. The American diplomat and historians, George Frost Kennan, was

one of the first relevant international figure who called for an urgent response in his famous article “To prevent a world wasteland”, published in 1970, in which he made a fundamental observation: the reaction had to be a global reaction. He stated that:

“the entire ecology of the planet is not arranged in national compartments; and whoever interferes seriously with it anywhere is doing something that is almost invariably of serious concern to the international community at large”

The Conference was finally held in Stockholm in 1972 and led to the adoption of the Stockholm Declarations and the Action Plan for the Human Environment, the first statement of intent of the international community about the need to address the common environmental challenges. However, the Stockholm Declaration enounces mostly broad environmental policy goals and objectives rather than detailed normative prescriptions. The declaration had the merit to substantially increase global awareness of environmental issues, as did international environmental law-making. Before Stockholm only eleven countries had specific environmental institutions while two decades later, nearly all countries of the world equipped themselves with at least one (Hering, et al. 2010).

The 1972 was a critical year for international environmental policies also due to the creation of the United Nation Environmental Programme (UNEP). Due to the limited scientific understanding of environmental problems in the late 1960s and early 1970s, a number of governments banded together in an attempt to create a lean, flexible and agile entity that could effectively coordinates and enhance the environmental expertise already present in the UN system. The result was UNEP, formally created and mandated in 1972 (Ivanova 2010). with the following functions: first, the problem must be defined using scientific data; second, a policy goal and methodology should be identified; third, action must be catalyzed among disparate actors; fourth, the efforts of the multiple actors must be coordinated into a coherent response; fifth, capacity for implementation must be created at the level of individual nations. Finally, sound enforcement and dispute resolution procedures must be elaborated. In short, knowledge and information distribution and analysis as well as coordination of the previously fragmented activities related to environmental issues were at the core of UNEP’s mission since the beginning (Ivanova 2010).

In the same period, independently from the CC discourse it was already clear that some area of the world was already facing a water crisis in term of supply and quality. Therefore, in 1977, it was convened the Mar del Plata conference where detailed guidelines, principles and practices for water management have been established. A deeper revision of Mar del Plata outcomes will be given lately in a specific paragraph.

Studies carried out by the World Meteorological Organization (WMO) and the newly established inter-agency World Climate Program (WCP) were improving the knowledge about climatic trend confirming the general scientific expectation of global warming. The declaration signed at the end of the first World Climate Conference (WCC) in 1979 was the first call aimed at the national states to step up effort to increasing knowledge related to Climate Change and preventing potential human-made climate change that could affect well-being (Kellog 1987). Such process leads to a series of seminars and workshops culminating in the Villach Conference (1985) in which scientist made a highly influential statement affirming that temperature increases more in the 20th century than in any other period of the human history (Franz, 1997; Haas, 2000). Still more efforts were needed to prove the anthropocentric nature of the problem but the idea that human activities and the climate are interlinked by a bidirectional relation was gaining many supporters.

4.1.2. Politicization of environment and climate (late1980s-...)

Anthropogenic climate change started to evolve from a scientific to a public and political issue in the second half of the 1980s. The first highly debated issue was the “Ozone hole” that triggered a wave of environmental activism that began in 1987 (Cook, 1990). This "ozone diplomacy" would later emerge as the Montreal Protocol in 1987 (UNEP, 2006). The Montreal Protocol is generally acknowledged as the most successful environmental agreement ever (Gonzalez, Taddonio and Sherman 2015). In the same year, the World Commission on Environment and Development (WCED), also known as the Brundtland Commission, established by the UN General Assembly to study global environmental issues and their impact on development, issued the final report “Our Common Future”. The document, also known as the Bruntland report, emphasized the connection between environmental and social

issues, highlighting that climate change was a major threat to development (Borowy 2013). Within the Toronto Conference, held in 1988, governments have been invited for the first time to negotiating an international climate framework convention to protect the atmosphere. The Conference witnessed the first discussion of potential international action and public policy responses to climate change which included early targets for CO₂ emission reductions (Gupta 2010).

In 1988 the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) created the Intergovernmental Panel on Climate Change (IPCC) with the aim to review and assess scientific, socio-economic and technical information related to global climate change and to prepare assessment reports (Sands, 1996). In short, the IPCC has the responsibility to assessing the state of the climate and future scenarios to guide policymakers toward more informed decisions and thus more sustainable policies. In its 7-year reports, the IPCC has always warned about the risk connected to the exponential increase of Greenhouse Gasses (GHG) concentration in the atmosphere. The IPCC activities and scientific production have paved the way for the signing of several international convention, protocol and agreements on combating climate change and other environmental challenges. The IPCC has become one of the most relevant body within the UN system and every assessment published since its creation has had an enormous echo not just in the scientific arena but also on the global mass media and in the development of international climate and environmental policymaking (Bolin 2007). However, the IPCC is still a scientific and technical body and at the beginning of the 1990s in the UN system was still absent a permanent high-level platform of discussion and negotiation about climatic issues. In 1987, following the adoption of the “Environmental Perspective to the Year 2000 and Beyond” and the recommendation of the World Commission on Environment and Development (WCED), the General Assembly decided to convene the UNCED launching its preparatory committee process that would have led to the “Earth Summit” in 1992.

Before the 1992 it is worth mentioning other two events: the first was the recognition by the UN (GA resolution 43/53 of 1988) of climate change as a mutual concern of humanity and the need to appointing necessary and urgent action that should be taken to come through climate change (U.N., 1988); second, the Ministerial Conference on Atmospheric Pollution and Climate Change, held in the Netherlands in 1989, was the first major political climate

conference. The Noordwijk Declaration introduced for the first time, new concepts and goals to be discussed in the future conventions such as: CO₂ emission stabilization and future mitigation, funding mechanism, a global forest stock balance and future net forest growth, the principle of shared responsibility and the specific responsibilities of both developed and developing countries (Vellinga and Leatherman 1989).

The UN Conference on Environment and Development also known as the “Earth summit” was finally held in Rio de Janeiro in 1992 with the aim of building “a broad framework to guide national action and international co-operation in respect of environmentally sound development” (UNCED 1992). One of the main outcome of the conference was the Rio Declaration which reaffirms and builds upon the Stockholm Declaration principles and has proved to be a major environmental legal landmark. It has served as a guideline for subsequent global environmental meetings, conferences, and normative framework. Nevertheless, as diplomatic conference declarations, the document adopted in Rio, as well as the Stockholm declaration, are formally not binding.

Both declarations were characterized by an anthropocentric approach to the environment as testified by the first Rio Principle which proclaimed that “human beings at the centre of concerns for sustainable development [...] They are entitled to a healthy and productive life in harmony with nature”. However, the Rio Declaration expands on the sustainable development theme and significantly advances the concept by setting the stage for the mainstreaming of several principles lately adopted by international and national legal framework. One of the most significant provisions, common to the two declarations, relates to the “prevention of environmental harm”. This obligation is balanced by the declarations’ recognition of a State’s sovereign right to “exploit” its natural resources according to its “environmental and developmental” policies. The right to development, recognized by both declarations, has influenced the political-legal discourse and negotiations as it is frequently invoked as a counterweight to environmental conservation and protection objectives (Scholz 2019). The Rio declaration established at the international level “the precautionary approach” that shall be widely applied by States according to their capabilities. This principle implies that whenever there are threats of serious or irreversible damage, a lack of full scientific certainty shall not excuse States from taking cost-effective measures to prevent environmental degradation. Rio also introduced the concept of “common but differentiated responsibilities”

(CBDR) between developing and developed countries, a principle which is accepted as a cornerstone of the sustainable development paradigm but at the center of several disputes in the following international negotiations. Principle n. 10 of the Rio Declaration is another relevant development as it posits that “environmental issues are best handled with the participation of all concerned citizens, at the relevant level.” It then calls upon States the responsibility to ensure that individuals have access to information, public participation in decision-making and justice in environmental matters. Although the principle of participation has some antecedents within other regional international organizations, for instance the Organization of Economic Co-operation and Development (OECD), the adoption of principle 10 by the Rio Declaration represents its definitive affirmation at the global level. This concept that has been critical in the following decades of environmental management and democratic governance and it was mainstreamed by many other regulative frameworks which will be discussed later. Moreover, the Rio Declaration was the very first international instrument to explicitly recognize that the empowerment of women and, specifically, their ability to effectively participate in their countries’ economic and social processes, is an essential condition for sustainable development. Rio also reaffirm “vital role of indigenous people and their communities and other local communities” in the conservation and sustainable management of the environment given their knowledge and traditional practices. It then recommends that States “recognize and duly support their identity, culture and interests and enable their effective participation in the achievement of sustainable development”. It was one of the first global suggestions to make the governance of the territory coincide with the socio-ecological context in a way that the two were not separated. Finally, both the Stockholm and the Rio Declarations call for the further development of the environmental liability and compensation legislations. Nevertheless, States have tended to avoid addressing the matter comprehensively, preferring instead to establish a “private law regimes” which focus on private actors’ liability, while mostly excluding consideration of States’ accountability until more recent development (Handl 2012).

Rio was also the occasion to open the UN Framework Convention on Climate Change for signature after negotiations that started since the beginning of the 1990s (Hirst 2014). This treaty has served as a basis for future negotiation on Climate Change with the specific aim to reduce GHG emission, therefore more focused on mitigation. The treaty, as originally drafted, did not place binding limits on greenhouse gas emissions on individual nations and was

therefore legally non-binding in this respect. It did, however, include the possibility for the signatories to adopt additional acts (called “protocols”) at special conferences (Conference of Parties, COP) that would set mandatory emission limits. The COPs are annual conferences and serve as the official meeting of the UNFCCC Parties to monitor progress in implementing their treaty obligations and consider further action to address the threat to climate change.

During the meeting other important milestone for the global environmental management have been achieved: the opening for signature of the Convention on Biological Diversity (which will be deepened in a following paragraph as it is closely linked to concept of NBS), and the United Nations Convention to Combat Desertification.

4.1.3 Institutionalization of climate policy and the era of mitigation (mid 1990s)

The Rio summit started a process of institutionalization of international negotiation on environmental and climatic matters creating permanent platform of discussion establishing clear rules and procedures. The UN Framework Convention on Climate Change entered into force on 21 March 1994 after the 50th nation ratified the treaty and, by 2007, 192 countries joined the treaty.

The first period of the UNFCCC was strongly focus on climate change mitigation and emission reductions. In 1995, Berlin hosted the first Conference of Parties (COP) to the UNFCCC which accelerated the process for the establishment of binding target for GHGs emission reduction. Delegates also agreed on a number of other important decisions, including establishing a pilot phase for implementing joint projects and decisions on the Secretariat budget, financial procedures, and establishing the subsidiary bodies.

The UNFCCC established two main categories of action in response to climate change, namely mitigation and adaptation. Whereas mitigation refers to actions devised for reducing emissions of greenhouse gases in order to “prevent dangerous anthropogenic interference with the climate system” (Article 2), adaptation was not defined in the convention text. In fact, the word’s meaning has always been the source of much academic and policy debate (Burton, et al. 2002). Global adaptation governance has primarily been shaped by states within the context of the UNFCCC mainly through negotiations occurred in the COPs (Dzebo 2015). However, the first decade after

the entry into force of the UNFCCC have been clearly dominated by the mitigation discourse. Indeed, discussion have been focused on global GHG emission reduction.

In 1997, in parallel with the COP negotiations, the *Nairobi declaration* and GA resolution S/19-2, extended the mandate of UNEP “to be the leading global environmental authority that sets the global environmental agenda, that promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system and that serves as an authoritative advocate for the global environment” with the task of monitoring assessing and provide early warning on environmental issues, provide policy advice and working for further development of international environmental law aiming at sustainable development (Ivanova 2010). However, thus, while UNEP has a relatively strong scientific track record and is the natural forum for creating a coherent international system for environmental information and assessment, its work has actually not become the standard for quality, relevance, timeliness, and accessibility. (Ivanova 2010). Similarly, UNEP’s performance for what regard its role as advocacy organization with policy function are ambiguous. It was expected to be proactive, setting the global environmental agenda and prodding governments, international organizations, NGOs, and business into action. UNEP’s efforts led to the creation of a number of international environmental agreements, including those on ozone, biodiversity, desertification, and persistent organic pollutants. UNEP has played the role of scientific authority, expert leader, procedural foundation, facilitator, and political broker of successful international regimes (Chasek, Downie and Levy 2000). Once launched, most of the environmental conventions have become autonomous entities, each with its own Conference of the Parties, Secretariat, and associated subsidiary bodies, and with influence that often exceeds that of UNEP such as in the case of IPCC and UNFCCC and their bodies.

In 1996, the IPCC published its second Assessment Report, explicitly recognizing for the first time that "the balance of evidence suggests a discernible human influence on global climate". The report provided an essential stimulus to the negotiations under the Ad Hoc Group on the Berlin Mandate. The negotiations led to an agreement between the Parties that adopted the Kyoto protocol in COP 3 convened in Japan in December 1997. The protocol provided for a reduction of at least 8,6% of GHGs emission for the period 2008-2012 compared to emission registered in 1990 and targets are set at country level. The parties opted for a market-based approach to emission reduction. The economic basis for providing this flexibility is that the marginal cost of

reducing (or abating) emissions differs among countries.⁷ Therefore the so called “cap-and trade” scheme would have reduced emission in a cost-effective way. The protocol also established the so called “flexible mechanism” (Clean Development Mechanism, Emission Trading Scheme and Joint Implementation) for obtaining and trading carbon credits. Delegates, however, did not reach a consensus on the Rules of Procedure. This critical issue, including a decision on the voting rules and the Bureau's composition, was deferred until COP 5. Some of the most controversial issues remained unresolved until the end, including details on flexible mechanisms, the future role of developing countries under the protocol, and the scope, timing and nature of the GHG reduction targets for industrialized countries.

COP 6 surprised many observers by reaching an agreement on the most important political issues such as flexibility mechanisms, carbon sinks, compliance and financing, and the conference resulted in the adoption of the Bonn Agreements on the Implementation of the Buenos Aires Action Plan. Work on several operational details, which were forwarded to COP 7 for further negotiation, was still pending (Fletcher 2005).

Meanwhile, the 193 United Nations member states adopted in 2000 the Millennium Development Goals (MDG) which were eight main global objectives. The MDGs mark a historic and effective method of global mobilization to achieve a set of important social priorities worldwide. They express widespread public concern about poverty, hunger, disease, schooling, gender inequality, and environmental degradation and set non-binding target for the period 2000-2015. Even if inherently linked with climate change, the MDGs did not explicitly tackle climate change.

4.1.4. The rise of Adaptation in the climate change debate (2001-...)

Regarding adaptation, three main phases can be identified. The first was initiated by the Intergovernmental Panel on Climate Change (IPCC) and its First Assessment Report in 1990, which recognized climate change as a global problem requiring urgent action. However, adaptation was not yet a major concern of decision-makers and scientists dealing with climate change.

⁷ Marginal cost is the cost of abating the last tonne of CO₂-eq for an Annex I/non-Annex I Party

The second era started in 2001, with the release of the IPCC's Third Assessment Report (TAR), "Climate Change: Impacts, Adaptation, and Vulnerability". The TAR contained the most detailed and up-to-date scientific assessment of climate change adaptation's effects and responses and it was here that climate change was recognized as a development problem. TAR considered evidence that recent climate changes had already affected several physical and biological systems. In particular, five "reasons for concern" and risks were introduced to communicate the threat of climate change: 1) Risks to unique and threatened systems, 2) Risks associated with extreme weather events, 3) Risks associated with the distribution of impacts, 4) Risks associated with global aggregate impacts, 5) Risks associated with large-scale singular events. This framework became a cornerstone of later IPCC evaluations (O'Neil, et al. 2017).

The ongoing effects of climate change and their recognition as obstacles to development were transformed into policy at the 7th Conference of the Parties (COP 7) in Marrakech in 2001 that can be considered a watershed event for the mainstreaming of Adaptation in the UN system. Adaptation implies many dimensions and in the documents, it is often used in relation to capacity building, vulnerability and impact assessment, and technology. The COP insisted that action related to adaptation should follow an assessment and evaluation process, based on national communications and/or other relevant information, so as to prevent maladaptation and to ensure that adaptation actions are environmentally sound and will produce real benefits in support of sustainable development. COP7, in order to contrast the adverse effect of Climate Change, among other provisions, urged "to implement adaptation activities promptly where sufficient information is available to warrant such activities, inter alia, in the areas of water resources management, land management, agriculture, health, infrastructure development, fragile ecosystems, including mountainous ecosystems, and integrated coastal zone management". For such purposes, the Parties agreed to create the Adaptation Fund to finance those activities related to primarily assist developing countries in better adapting to climate change. The Fund would also be used for capacity building through technology transfer (Pedroni, 2005). The increasing attention toward Adaptation is also testified by the establishment of the National Adaptation Programmes of action for Least Developed Countries (LDC), and other two funds for adaptation, the LDCF and the SCCF (UNFCCC 2016). Notwithstanding the augmented efforts to bring adaptation to the climate change agenda, most of these steps were nominal, with the emphasis of the UN systems heavily inclined towards mitigation as it still had not the same consideration compared with regard to target-setting, financing, and institutional frameworks (Lesnikowski and Ford 2017). Indeed, the

International Community was still focused on the implementation of the Kyoto protocol. In 2002 Canada ratified the Kyoto Protocol, making Russia the last major Annex I emitter whose ratification could meet the treaty requirements for entry into force (Kreienkamp, 2019). On 16 February 2005, the Kyoto Protocol entered into force after Russia's ratification pushed Annex I countries' emissions beyond the required 55% mark. This can be seen as a "great diplomatic victory" (Oberthür 2011) for the EU, which made the ratification of the protocol an essential precondition for its consent to Russia's accession to the World Trade Organization.

Coming back to Adaptation, the international community, after a period of observation of impact, assessment of risk and vulnerabilities, recognized that it was the time to move toward planning and pilot implementation of adaptation projects.

COP 11 held in Nairobi in 2005 established the Nairobi Work Programme (NWP) on impacts, vulnerability and adaptation to climate change, to facilitate and catalyse the development and dissemination of information and knowledge that would inform and support adaptation policies and practices, with a focus on developing countries. Since then, the NWP has engaged countries and a growing network of partner organizations, experts and other relevant organizations from all fields and world regions in sharing the latest information and knowledge, to bridge knowledge gaps and scale-up action in response to the adaptation knowledge needs identified by the Parties to the UNFCCC and Paris Agreement. The parties adopted a five-year work plan to support the adaptation of developing countries to climate change. They agreed on the principles and structure of the Adaptation Fund, which has been placed under the direct authority of the COP.

The IPCC's Fourth Assessment Report in 2007 (AR4) initiates the third era of the adaptation regime (Ayers et al., 2012): 2007 The IPCC Assessment Report 4, which stated that the warming of the climate is unequivocal, and that climate change impacts are already taking place (IPCC 2007), identified adaptation needs in different sectors and regions. The AR4 defined adaptation as "adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (IPCC 2007) In other words, adaptation refers to measures that enable the social-ecological systems to cope with a changing climate and increase its resilience. In the COP 13 held in Bali, in response to the findings of the AR 4 of the IPCC, the parties adopted an action plan with the aim of accelerating the implementation of the Convention. The Bali Action Plan raised the political status of

adaptation as a whole section of the Conference was dedicated to it. From now on, mitigation and adaptation received the same relevance and the two terms have been used as if they were a binomial. The COP urged to:

“Enhanced action on adaptation, including consideration of international cooperation to support urgent implementation of adaptation actions, including through vulnerability assessments, prioritization of actions, financial needs assessments, capacity-building and response strategies, integration of adaptation actions into sectoral and national planning, specific projects and programmes, means to incentivize the implementation of adaptation actions, and other ways to enable climate-resilient development and reduce vulnerability of all parties”.

The COP 13 put great emphasis on Risk management and risk reduction strategies, including risk sharing and transfer mechanisms such as insurance, Disaster reduction strategies and means to address loss and damage associated with climate change impacts. COP 13 established the Adaptation Committee, national adaptation plans, a mechanism to address loss and damage, and the Green Climate Fund. Moreover, it highlighted the advantages of economic diversification to build resilience and the need to encouraging multilateral bodies, the public and private sectors and civil society, to building on synergies among activities and processes, as a means to support adaptation in a coherent and integrated manner. The action plan put at the same level mitigation and adaptation in various occasion such as the need to increase financial resources or technology development and transfer, giving the same importance to both as the best way to respond to climate change.

In the meanwhile, negotiation on the implementation and renewal of the Kyoto protocol stalled and the Montreal Action Plan expand the life of the Protocol after 2012 in order to gain time for further negotiation on GHGs cuts (Wittneben et al., 2006). The third WCC took place in Geneva, Switzerland, from 31 August to 4 September 2009. Its main emphasis was on seasonal to multi-decadal climate forecasts and knowledge for decision-making. The goal was to develop a global system that would link scientific developments in climate predictions with the needs of their users for better decision-making in the face of changing conditions. Predictive capacities are crucial to develop more precise risk assessments and thus information on where is more urgent to intervene and how. Third WCC outcomes also intended to contribute to the U.N. Millennium Development Goals' achievement and broader U.N. climate goals, including the Hyogo Framework for Action on Disaster Risk Reduction.

At COP 16 in Cancún the Parties agreed on the Adaptation Framework which provided for new institutions and actors in adaptation governance to promote adaptation action with the same level of priority as mitigation. At Cancún, countries established the Green Climate Fund, agreed on a mechanism to promote the transfer of technologies for mitigation and adaptation in developing countries, established a process of preparing National Adaptation Plans (NAPs) to identify medium and long-term adaptation needs and develop strategies to address those needs, put in place an Adaptation Committee to offer technical support and share information and agreed on a work programme on “Loss and Damage” associated with climate impacts in particularly vulnerable countries.

Global adaptation governance has mainly been made manifest through the establishment and financing of specific projects, which indicates a step away from the calls for the “mainstreaming of climate change adaptation” into a general development agenda (see e.g. Smith et al., 2011; Persson and Klein 2009). In theory at least, the project-driven approach, which is delimited and easily monitored, should be able to facilitate accountable and transparent forms of governance, though in practice the decision-making process is more complicated. The general tendency is that while decisions about adaptation finance (how much and to which countries) are made at the highest level of a national government or an international organization, decisions about which particular projects to support are made at lower administrative levels (Persson and Remling 2014; Transparency International 2014).

4.1.5. Disappointment on environmental policy results (end of 2000s-first half 2010s)

The first years of the 2010s were characterized by a disappointment about environmental results both in term of mitigation and adaptation. Kyoto’s target had not been met and the condition for a more ambitious agreement seemed lacking. The protocol, initially perceived as a great success of the international community, is nowadays considered a failure for several reason: first, the emission reduction commitment and time frame were modest; second, largest emitters has been excluded by obligations (the US have never ratified the treaty while India and China were not obliged by the protocol as they were considered developing countries); Third, the mandated countries did not achieve their respective reduction target and lack of enforcement mechanism; fourth, the choice to measure emission reductions using net emissions rather than gross emissions;

fifth, the protocol, according to Kehoane (2008) led to a “path dependency” for what regard policy tools as it gave limited incentives for innovation and policy experimentation; indeed, the Emission Trading did not function properly and overall little trading has taken place. Countries have mainly concentrated on meeting their targets domestically, and through the use of the CDM (World Bank 2011). Finally, the Kyoto protocol was considered as an imposition by some states because of its commitments and its binding nature, and the effort to increase public support for its implementation was low. The increasing awareness about the risk derived from biodiversity loss, the UN declared the 2010 the International Year of Biodiversity (2010) which led to the adoption of the Strategic Plan for Biodiversity and the Aichi Biodiversity Targets at the 10th Conference of the Parties to the Convention on Biological Diversity, in Nagoya, Japan. In 2011, the United Nations General Assembly declared 2011–2020 the United Nations Decade on Biodiversity (Resolution 65/161) in order to supporting the implementation and achievement of the Aichi targets. However, again results have been disappointing.

In those year there was a serious reflection within the UN system as there was a widespread feeling among policy makers and civil society that progress against poverty, hunger, and disease was remarkable and that the Millennium Developments Goals have played an important role in such progress. In a world already undergoing dangerous climate change and other serious environmental issues there was a growing understanding that also environmental objectives needed a higher profile UN support. Consequently, the UN Secretary General Ban ki-Moon in the high-level global sustainability panel, appointed to the Rio+20 summit in 2012, issued a report recommending that the world adopt a set of Sustainable Development Goals (Sachs 2012).

4.1.6. New impetus: Sendai Framework, Agenda 2030, the Paris Agreements (2015)

The 2015 can be considered a watershed year for what concern International environmental policies and a new push after years of disappointments. The Sendai Framework for DRR (SFDRR) in March, and the more famous Agenda 2030 in September and Paris Agreement in December gave momentum to the international response for both adaptation and mitigation to Climate Change.

Regarding Disaster Risk Reduction, in the context of limited success following the Hyogo Framework for Action (2005), many hopes were pinned on new agreement making a difference

where its predecessor could not: at the local level and with a systematic focus on root causes of disasters. The Sendai Framework underlines the context and local dependency of vulnerability to hazards and it also highlights the interlinked nature of DRR with development presenting risk and loss as outcomes of development decision-making. Linkages between development and DRR are also reflected in the use of the term resilience, almost as a synonym of adaptation in SFDRR to encourage development alongside or within risk management and not just to describe post-disaster development gains. Moreover, this understanding of resilience, offers the DRR community a connection point to other UN agencies and agreements and an opportunity for enhancing the relevance of DRR in the wider development agenda. The document set 7 main targets: substantial reduction of global disaster damages, number of affected people, direct economic loss in relation to GDP, disaster damage to critical infrastructure and disruption of basin services, and a substantial increase of number of countries with national and local disaster risk reduction strategies, international cooperation to developing countries, availability of and access to multi-hazard early warning systems. I will discuss further the Sendai framework in a specific paragraph.

In 2015, the year of expiring of the Millennium Development Goal objectives it was completed the process started by Ban Ki Moon in 2012 in the Rio+20 summit which endorsed the idea to replace the MDG with the Sustainable Development Goals (SDGs). The UN Resolution called the *2030 Agenda* include 17 interlinked SDGs and 169 global targets that should be achieved by 2030 and designed to be a "blueprint to achieve a better and more sustainable future for all". Sustainable development embraces the so-called triple bottom line approach to human wellbeing which is composed by a combination of economic development, environmental sustainability, and social inclusion. Compared to the previous approach adopted in the MDG, the SDGs have a significant greater focus and attention to environmental issues.

almost every SDG can be somehow related to DRR but, for the purpose of this research, the following are the ones deemed more relevant: SDG 6 "clean water and sanitation", 11 "sustainable cities and communities", and 15 "life on land" deserved to be mentioned. Every SDG is composed by sub-targets and indicators to monitor progress.

SDG 11, "Make cities inclusive, safe, resilient and sustainable", target 5 states that "by 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations". Target 11.b aims instead to "By 2030 substantially increase the number of cities and

human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels".

SDG 15 "life on land" aim instead to: "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. Conserve and restore terrestrial and freshwater ecosystems; end deforestation and restore degraded forests; end desertification and restore degraded land; ensure conservation of mountain ecosystems, protect biodiversity and natural habitats; protect access to genetic resources and fair sharing of the benefits, and integrate ecosystem and biodiversity in governmental planning.

Interestingly within SDG 9, industry innovation and infrastructure it fails to cite Green Infrastructure but it mentions a rather general sustainable and resilient infrastructures. Finally, the agenda also reinforces the universal and collaborative nature of the process pledging for an equitable way to sustainability.

From the analysis of the SDG and the multitude of targets it is therefore clear the all-encompassing nature and the high ambitions of the agenda 2030 as well as its capacity of identifying linkages among different objectives as it often remarks the deep relations between the various social and environmental objectives. The agenda 2030 achieves at least the objective of putting sustainability at the top of global priority alongside other UN more traditional priorities such as poverty eradication.

Going back to the COPs, the 15th held in Copenhagen should have been the occasion to include an ambitious global climate agreement for the period starting in 2012, in which the first commitment period under the Kyoto protocol would expire. As negotiators were unable to reach an agreement, a small group of government leaders headed by the United States instead worked out a political deal "the Copenhagen Accord" that was not based on the official negotiation text and would only be acknowledged rather than adopted by the COP plenary (Falkner, Stephan and Vogler 2010). By proposing a more flexible bottom-up architecture based on voluntary commitments, COP 15 laid the foundations for what will eventually become the *Paris Agreement* (Bodansky 2016). Copenhagen also began to dilute the stark differentiation between developed and developing

countries as major emerging economies submitted mitigation commitments, marking the first time that a large group of countries agreed on a global target to keep average temperature increases below 2 °C. The main achievement was adopting an amendment to the Kyoto Protocol that sets a second binding target for GHG emissions for Europe, Australia and a small number of developed countries. Parties have reached final agreements on financing, assessment, adaptation, and technology, as well as 94 countries' voluntary emission commitments (C2ES, 2012). The COP 19 held in Warsaw in 2013 established the Warsaw International Mechanism for Loss and Damage to address damage associated with impacts of climate change, including extreme events and slow onset events, in developing countries that are particularly vulnerable to the adverse effects of climate change. However, allocations and procedures has been an unresolved issue that would have been deeply discussed in following COPs without significant step forward. The COP 20 meeting, which held in Perù in 2014, got off to a good start, following pledges of nearly \$ 10 billion for the new Green Climate Fund and the joint announcement by the United States and China of their emissions targets for the post-2020.

Finally, in December 2015, international leaders convened at the COP 21 in Paris for more than two weeks reaching an Agreement that remains a significant milestone in global climate action at the highest level. The *Paris Agreement* was signed and ratified by 195 Parties which constitute 97% of world emissions and it aimed to combat and adapt to climate change. The Agreement succeeded the *Kyoto Protocol* in 2020 and constitute a cornerstone of global climate governance for the coming decades. The agreement is intended to significantly reduce global emissions of Green House Gasses in order to keep the global warming below the 2 degrees Celsius compared to pre-industrial levels at the end of the current century, and possibly limit the increase to 1.5 degrees. A very relevant fact is that, contrarily to Kyoto, all major emitting countries have agreed to reduce their climate pollution and to strengthen those commitments over time.

Paris kept the emphasis on mitigation, but increased the relevance of adaptation recognizing the ongoing and present effect of CC. The Agreement strengthens adaptation in four ways: first, broadening the normative framing around adaptation, integrating stronger adaptation commitments from state actors, affirming the multi-level nature of adaptation governance, and strengthening mechanisms for enhanced transparency on assessing adaptation progress. The Pact creates a framework for transparent monitoring, reporting, and ratcheting up countries' individual and collective climate mitigation and adaptation efforts. The Paris agreement explicitly refers to adaptation in (Article 7) where it urges to enhance adaptive capacity, strengthening resilience and

reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuring an adequate adaptation response in the context of the temperature goal. Parties recognise that adaptation is a global challenge faced by all with local, subnational, national, regional and international dimensions. Paris goes beyond enunciation of principles, and it highlighted priority activities for adaptation:

Priority 1: Comprehensive and community risk assessment and management (CRAs) which include food production, poverty and inequalities, natural resource scarcity. In the field of Disaster Risk Reduction CRAs can help fostering community engagement in climate risk reduction. Climate change can also be explicitly incorporated in CRAs by making better use of CRA tools to assess trends (Van Alst, Cannon, Burton 2008). Tool mentioned in the Paris agreement such as CRA, Collaborative Climate Actions (CCA), risk insurance facilities and climate risk pooling are important tools not only for the Paris Agreement, but also for the DRR Sendai Framework. DRR can indeed learn from the long-term perspectives of CCA in order to ensure that DRR activities align with shifting climatic realities, and not just historical experience (Shamsuddoha et al. 2013)

Priority 2: Resilience of communities, livelihoods and ecosystems. In this case the link between Paris and DRR is straightforward as resilience is a focal concept in the DRR discourse. Resilience to climate change impacts provides common ground for DRR and Climate Action. Building the culture and practice of resilience means reducing the consequences of foreseeable events, but also the capacity of systems to recover and adapt when adverse events occur. Climate actions contribute to closing the “resilience gap” by managing unavoidable and helping to avoid unmanageable changes” (Mysiak et al. 2018).

Priority 3: early warning system, emergency, preparedness: the need for better climate and weather information, including early warning systems, is recognized in Article 7 and funded by the Green Climate Fund (GCF). During UNFCCC negotiations, the Climate Risk and Early Warning Systems (CREWS) initiative was launched with the aim of significantly of guaranteeing the access to multi-hazard early warning systems and disaster risk information to people by 2030. The agreement established that by 2020, all relevant Least Developed Countries (LDCs) and Small Island Developing States (SIDS) are expected to have at least moderate early warning system.

Priority 4: Slow onset events that may involve irreversible and permanent loss and damage. The Paris agreement highlights that technical cooperation and new financing mechanisms, in particular at regional level, are needed to reduce disaster risks and improve resilience. However, funding was a major constraint to address these needs (UNFCCC, 2017). It finally pointed out the significant interactions between rapid onset and slow onset events that increase the risk of loss and damage, emphasizing the relevance of integrated risk management approaches and the necessity to develop both short- and long-term planning.”

The Paris Agreement also aim to increase the monitoring of adaptation measures and requested the secretariat to prepare annually a technical paper on opportunities to enhance adaptation action, as well as options to support their implementation. The Technical Examination Process on Adaptation (TEP-A) was launched to identify concrete opportunities for strengthening resilience, reducing vulnerabilities and increasing the understanding and implementation of adaptation actions in the context of enhancing action prior to 2020. It seeks to facilitate the sharing of good practices, experiences and lessons learned; identify actions that could significantly enhance the implementation of adaptation actions, including actions that could enhance economic diversification and have mitigation co-benefits: promote cooperative action on adaptation; identify opportunities to strengthen enabling environments and enhance the provision of support for adaptation in the context of specific policies, practices and actions. The section about “Reducing vulnerability and mainstreaming climate change adaptation and the process to formulate and implement national adaptation plans”, was broken down into two separate topics. The first topic dealt with the implementation of adaptation action with emphasis on gaps, needs, challenges, options and opportunities for implementation on the ground; means of implementation, including for the improvement of climate information services and understanding of scientific information at the national level; and good practices for reducing vulnerability. Topic two dealt with effective policy frameworks and institutional arrangements for adaptation planning and implementation, including for multi-level governance and monitoring and evaluation. The Agreement also requires all Parties to devise National Adaptation Plans in order to increase planning and implementation capacity. The plan requires to include vulnerability assessments, monitoring and evaluation, and strategies for economic diversification. The agreements also establish a platform for communications regarding their priorities, plans, actions, and the support needs.

The Paris Agreement takes a significant step forward in strengthening the adaptation pillar of global climate policy. It widened the normative framing around adaptation, it required stronger

adaptation commitments from states and increased level of ownership by every level of the governance system (including citizen and privates), and it devised stronger transparency mechanisms for assessing progress. The Agreement can thus be considered as a significant milestone to make adaptation as relevant as mitigation. However, a lot of work remains to be done to clarify how the long-term goal for adaptation set out in Article 7 will be meaningfully realized (Lesnikowski and Ford 2017).

After Paris, the COP 22 reinforced the UN focus on water scarcity, clean water and water sustainability, one of the most visible effects of Climate Change and a significant problem in the developing world, including many African and Middle Eastern states but also some area of the developed world such as southern Europe. Suddenly, in 2016, an event interrupts the enthusiasm around the new wave of international environmental policies. The election of Donald Trump as US President casted serious shadows on the process. In June 2017, its administration, composed also by Climate Change deniers, announced the withdrawal of the USA from the Paris Agreement ceasing the enforcement of the agreement, including the National Determined Contributions and financial contributions (Tollefson, 2017). Delegates to COP 23, held in Bonn, Germany, on 6-18 November 2017, made progress on the Paris "rulebook" to be implemented next year, in the most crucial test of the Paris Agreement since the United States declared its plan to withdraw. However, renewed conflicts over perennial issues separating developed and developing countries foreshadowed a challenging year ahead (Corsi 2018). After the stalemate, step forward were made at the 2018 COP 24 in Katowice, Poland, where fundamental operational details of the *Paris Agreement* were finally agreed. Two significant outcomes emerged from the conference. The first was the Paris "Rulebook" adoption, an important milestone that successfully turned the Paris Agreement into a functioning multilateral system. The rulebook set rules and procedures for mitigation, transparency, adaptation, finance, periodic stocktakes ⁸, and other Paris provisions. The second outcome was the conclusion of the Talanoa Dialogue, a year-long assessment of progress towards the long-term goals of the Paris Agreement, which was intended to inform the parties as they prepare for a new round of Nationally Determined Contributions (Northrop, et al. 2018). However, the parties have once again failed to adopt rules for international carbon trading, the last central element of the "rulebook" for the implementation of the Paris Agreement.

⁸ The global stocktake of the Paris Agreement (GST) is a process for taking stock of the implementation of the Paris Agreement with the aim to assess the world's collective progress towards achieving the purpose of the agreement and its long-term goals

Moreover, vulnerable developing countries have expressed growing exasperation at the scarce resources available to help them cope with worsening climate impacts (Newell and Olivia, 2020).

At the 2018 Global Climate Action Summit, under the aegis of UNFCCC, hundreds of non-state actor groups businesses, cities, states, investors, local communities, indigenous peoples, and civil society, came together to demonstrate and commit to action on forest, food, and land, and in so doing elevated the critical role of nature in the global climate discourse. One year later at the 2019 UN Secretary General's Climate Action Summit, alongside governments, a growing coalition further solidified the potential of nature, by endorsing the Nature-Based Solutions Manifesto, a plan to unlock the full potential of nature for climate action, including Disaster Risk Reduction. And one year beyond that, countries rallied further action for nature by signing on to the Leaders' Pledge for Nature, a commitment to decisive action to reverse nature loss to protect human and planetary health.

One of the main sponsors of the NBS has been the Union for the Conservation of Nature, an international membership union that was created in 1948 and located in Geneva but active globally. It has evolved into the world's largest environmental network and memberships include expert and influential government, non-government and Indigenous Peoples' Organisations from over 160 countries, and the Commissions draw upon more than 15,000 experts worldwide. The organization is very active in advocating for nature and biodiversity conservation at different level including within the UN Conference on Biodiversity Conservation. At the 2016 World Conservation Congress, IUCN Members, with resolution WCC-2016-Res-069 adopted the definition of the NBS concept which would have become very influential in the adaptation discourse within academia and policy-makers realm. According to the resolution, Nature-based Solutions are defined as:

“Actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits (Cohen-Shacham, et al. 2016).”

The IUCN, in July 2020, launched the first-ever Global Standard for Nature-based Solutions to support the mainstreaming process of this solutions in many fields including Disaster Risk Reduction. The Global Standard has been discussed in paragraph 2.2.4. Through these efforts, the NBS are becoming a hot topic at the international level as nature is believed to be fundamental to

achieving the race to zero carbon and climate resilient economies and achieve the target of becoming nature positive by 2030.

Going back to the COPs, the 25 held in Madrid in 2019 was a disappointment mainly due to the failure to find an agreement about the rules for international carbon trading. In 2020, a positive development was the election to the US presidency of the democrats Joe Biden that signed an executive order in February 2021 that reinstated the United States' participation in the Paris Climate Agreement.

The United Nations Environment Programme (UNEP), in 2021, endorsed the Nature-Based Solutions as a mean to reduce emissions, ensure human well-being and promote biodiversity benefits. In 2021, the United Nations General Assembly has proclaimed the UN Decade on Ecosystem Restoration sponsored by UNEP, the Food and Agriculture Organization (FAO) and over 70 countries from all latitudes. The UN Decade aims at building a strong, broad-based global movement to ramp up restoration, fostering political momentum for restoration as well as thousands of initiatives on the ground including governmental actors but also the private sector, NGOs as well as individuals. the UN called for nations to deliver on existing ecosystem restoration commitments, which in total add up to an area bigger than China of over 1 billion hectares. The UN report points out that restoration could contribute to about a third of the climate change mitigation effort needed by 2030, and protect nature and biodiversity, with significant benefits to humans in terms of physical and mental health, but also economically, through the creation of green jobs and new business opportunity.

Over the past few years, beginning with the transition to implementation of the Paris Agreement, the world has come to understand and embrace the extraordinary importance of natural ecosystems to ambitious climate mitigation and adaptation, to the immense potential for carbon storage, and to the increased resilience and improved livelihoods of highly vulnerable people and ecosystems. More conviction arose that adaptation, mitigation, conservation, restoration and resilience might go hand in hand developing an integrated eco-system management which takes into consideration all the objectives implied by those terms. Nature-Based Solutions is a concept that goes in that direction.

4.2. Other relevant UN Conference, convention, and policy

In the previous sections, some relevant conference, conventions and policies have just been briefly mentioned for two main reasons: first, to not to lose the thread of the discourse, and second, they go beyond the climate discourse. However, this postponement it is not related to the relevance of the documents, as some of them remain milestones in international environmental governance and management frameworks.

4.2.1. UN Conference on Water - Mar del Plata 1977

During the 1970s, the increasing worldwide water stress and other water related issue like natural hazard has led scientist and the international community to fear a water crisis in the next decades. Thus, the first intergovernmental was convened in Mar del Plata (Argentina) in 1977 where more than 116 state delegations as well as representants of non-governmental organizations were present. Notably, contrarily to the UN conference on Human Environment held in 1972, also the USSR and its allies participated in the event. The goals of the conference were to assess the status of water resources, to ensure that an adequate supply of quality water was available to meet the planet's socio-economic needs, to increase water use efficiency, and to promote preparedness at national and international level to avoid a water crisis. The action plan was divided in two parts: a set of recommendations that covered all the essential components of water management, and twelve resolutions on a wide range of specific subject areas: assessment of water use and efficiency, natural hazards, environment, health and pollution control, policy, planning and management; public information, education, training and research, and regional and international cooperation. The action plan was the first internationally coordinated attempt to lay the foundation of an integrate water resource management regime (Biswas, 2004) as explicitly pointed out in section D of the report that deals with policy, planning and management (1977). Art 41 established that:

“Increased attention should be paid to the integrated planning of water management. Integrated policies and legislative and administrative guidelines are needed so as to ensure a good

adaptation of resources to needs and reduce, if necessary, the risk of serious supply shortages and ecological damage, to ensure public acceptance of planned water schemes and to ensure their financing. Particular consideration should be given not only to the cost-effectiveness of planned water schemes, but also to ensuring optimal social benefits of water resources use, as well as to the protection of human health and the environment as a whole. Attention should also be paid to the shift from single-purpose to multipurpose water resources development as the degree of development of water resources and water use in river basins increases, with a view, inter alia, to optimizing the investments for planned water-use schemes. In particular, the construction of new works should be preceded by a detailed study of the agricultural, industrial, municipal and hydropower needs of the area concerned. Water-management plans may be prepared using systems analysis techniques and developed on the basis of already adopted indicators and criteria. This analysis would take into account the economic and social evolution of the basin and be as comprehensive as possible; it would include such elements as time horizon and territorial extent, and take into account interactions between the national economy and regional development, and linkages between different decision-making levels. National policies must provide for the modernization of existing systems to meet the requirements of the present day.”

It was clear the attempt to create a multisectoral and integrated planning system with an eye to social issues. In order to do so, it was necessary to intervene also on the institutional dimension of water management, fragmented at the time. The conference strongly stressed the need to strengthen the Institutional arrangements. with Art. 46 acknowledged that in many countries, water interests and management have been divided among numerous agencies without adequate co-ordination and without adequate links to other aspects of national planning”. Art 47 urged for the adoption by each country of national planning tools to ensure that the development and management of water resources take place in co-ordination among all bodies responsible for the investigation, development and management of water resources. It also urged the state to monitor the creation of institutional infrastructure and starting to consider the establishment of water authorities to provide proper co-ordination. In art 48 (d) there is the first mention, as a matter of urgency, to the creation of Water River Basin Organizations “with a view to achieving a more efficient, integrated planning and development of the river basins concerned for all water uses when warranted by administrative and financial advantages”. Functions that were fragmented among different ministries and authorities.

Natural hazards are discussed in section E. where it is stated that with preventive plans, the damages produced by severe hydrometeorological phenomena can be reduced with appropriate combinations of engineering and structural works and non-structural measures. The conference stressed the urgency to increase the studies of hydro-meteorological phenomena alongside the losses in the most affected areas taking into account their physical, economic and social characteristics, in order to forecast the likely nature and frequency of damage. It therefore foresees the risk map and vulnerability assessment that would be developed in the following decades.

Regarding flood loss management, Art 65 identified the priorities to mitigate and prevent damage of floods:

- i. Provide the maximum feasible scope for flood mitigation in reservoir design and operation, having regard, however, to the main function of the particular reservoir;
- ii. Take into consideration the effect of catchment use on the amount and timing of run-off;
- iii. Make provision for the zoning and management of flood-prone lands with due regard to the economic and social consequences of the different uses;
- iv. Plan well in advance and provide effective flood protection by structural and non-structural measures proportionate to the magnitude of the risk;
- v. Provide adequate financial resources to improve catchment areas for the retention of flood waters and soil erosion control and encourage local participation in the implementation of such measures;
- vi. Provide adequate funds for satisfactory maintenance of flood protection works;
- vii. (b) Develop flood forecasting and warning systems as well as flood-fighting
- viii. and evacuation measures to minimize loss of lives and property in case of flooding. Disaster assistance which includes preventive health services should be included in developmental processes;
- ix. (c) Improve the collection of data on damage caused by floods so as to provide a better basis for the planning, design and management of measures for the mitigation of flood loss, and to evaluate the performance of measures taken;
- x. (d) Develop flood-risk maps as a basis for public information programmes and action by governments to regulate development in flood-prone areas;

- xi. (e) Give appropriate consideration to structural measures such as dikes and levees and also to non-structural measures like flood-plain regulations, flood zoning, the preparation of flood-risk maps, flood insurance, etc. and integrate measures for up-stream watershed management into over-all flood control plans.

The report was innovative in many instances, but here it seems to identify grey solutions (damns and levees) as the main and only structural measure against flooding.

From art 66 to 68 the report specifically addressed draught loss management underlying the need to improve the knowledge base for planning to make optimum use of land and water resources in areas subject to severe drought. Comprehensive intervention programmes should be formulated for drought-affected areas with specific short-term and long-term objectives and targets. There is also a need to increase the study on basic meteorological processes and agronomy in order to formulating long-term weather forecasts and define the best means of extending and intensifying rain-fed cultivation while incurring a minimum of risk from scarcity of rain. Moreover, Art. 68 recommended that countries should:

- a) Make an inventory of all available water resources, and formulate long-term plans for their development as an integral part of the development of other natural resources, and within this framework prepare medium-term and long-term plans for the development of these water resources. These activities may require co-ordination with similar activities in neighboring countries;
- b) Consider the transfer of water from areas where surplus in water resources is available to areas subjected to droughts;
- c) Intensify the exploration of ground water through geophysical and hydrogeological investigations and undertake on a regional scale large-scale programmes for the development of wells and boreholes, to be explored in groups where appropriate for water for human and livestock consumption, taking into account the needs of pastures while preventing overgrazing and avoiding overexploitation of underground aquifers;
- d) Determine the effect of drought on aquifers and in the assessment of the response of ground-water systems to drought, basing such assessment on concepts such as storage/flow ratio in order to characterize ground-water flow regions in periods of drought;

- e) Arrange to complete as expeditiously as possible feasibility reports for well-defined surface water projects and for the implementation of projects deemed to be feasible;
- f) Make arrangements for the proper maintenance of existing wells and the development of new ones, using the resources and energies of the affected population in rural areas on the basis of self-help, supplemented by State assistance and external resources;
- g) Undertake studies on technologies geared to the improvement of water pumps, efficiency of uses and the reduction of losses from evaporation, seepage, transpiration, etc;
- h) Develop drought-resistant plant species;
- i) Set up systems for the observation and control of the processes of desertification and carry out research on the basic causes of drought;
- j) Strengthen institutional arrangements, including co-operation among various agencies, for the preparation and dissemination of hydrological, hydrometeorological and agricultural forecasts and for the use of this information in the management of water resources and disaster relief;
- k) Wherever possible, institute a deliberate policy for the transfer of population from drought-prone areas to other suitable regions with the view of reducing harmful effects on the ecosystem and promoting long-term rehabilitation programmes;
- l) Evolve contingency plans to deal with emergency situations in drought affected areas;
- m) Study the potential role of integration of surface and underground phases of water basins utilizing the stocks of water stored in ground-water formations in order to maintain a minimum supply under drought conditions.

Section F. from art. 70 to 79 deal with “public information, education and training” recognizing that the development of human resources and public participation were among the critical elements in water resources development.

It is possible to state that the conference produced some cutting-edge results for the times, as it introduced at the international stage principles such as integrated management and planning, participation and the need to increase the focus on social impact of interventions and the assessment of local vulnerabilities. However, it did not have significant effect on national and local governance and management system as it was a non-binding document that did not provide for the creation of operative tools such as national action plan and it did not establish targets and monitoring mechanisms. Another point of attention is that the Mar del

Plata conference seems not take into account the implications of disaster risk reduction and environmental and biodiversity conservation.

4.2.2. The Convention on Biological Diversity

The renewed attention toward conservation measure and protection of biodiversity which we are assisting nowadays with the emergence of NBS in field previously dominated by grey infrastructure, concrete, and invasive intervention has its roots decades ago. One of the milestones for this process to gain momentum was again the Rio Earth summit of 1992, in which the Convention on Biological Diversity was opened for signatures.

The convention (CBD), proposed by UNEP, had three main goals: the conservation of biological diversity (or biodiversity); the sustainable use of its components, and the fair and equitable sharing of benefits arising from genetic resources. Its objective was to stimulate the development of national strategies for the conservation and sustainable use of biological diversity. The convention recognized for the first time at the international level that the conservation of biodiversity is "a common concern of humankind" and is an integral part of the development process. The agreement covers all ecosystems, species, and genetic resources. It links traditional conservation efforts to the economic goal of using biological resources sustainably. The Convention acknowledges that substantial investments and costs are required to conserve biological diversity but it also argues that conservation will bring significant environmental, economic and social benefits in return, especially in the long term.

The Convention provided the basis for the later development in international conservation effort. In 2002, representatives of 190 countries convened in Johannesburg for the World Summit on Sustainable Development committed themselves to "achieving by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional, and national level". Conversely to Stockholm and Rio declaration, in paragraph 1 of the Convention, it is recognized the "intrinsic value" of every form of life regardless of its worth to human beings. By adopting the 2010 target, governments are explicitly recognized the value of biodiversity, setting goals for its conservation, and holding themselves accountable even if the agreement remained non-legally binding. Part of the challenge lied in

establishment of indicators of biodiversity and ecosystem functions and services that were rigorous, repeatable, widely accepted, and easily understood. In early 2004, parties to the Convention on Biological Diversity (CBD) established a framework for assessing progress on the 2010 target and lately after a period of consultation 18 indicators have been identified to provide not yet a comprehensive knowledge, but useful information about the status of ecosystems (Balmford, et al. 2005).

The CBD identified the need for a global scientific ecosystem assessment which saw the light in 2005 with the Millennium Ecosystem Assessment (MEA). It has already been discussed in paragraph 2.2.3 about the new conceptual framework introduced by the MEA to understand the effect of environmental change on ecosystems and human well-being. To recap, it viewed ecosystems through the lens of the services that they provided to society, how they benefit humanity and how human action alter ecosystems and the services they provide. Moreover, the MEA warned that all of the major drivers, climate change, land use change, invasive species, overexploitation, pollution, population increase, and economic growth, continue to grow, and the trends have taken us beyond the bounds of human experience (Carpenter, et al. 2009).

The 2010 was also the International Year of Biodiversity, and the Secretariat of the CBD was its focal point. Following a recommendation of CBD signatories at Nagoya, the UN declared 2011 to 2020 as the United Nations Decade on Biodiversity. The Convention's Strategic Plan for Biodiversity 2011-2020, created in 2010, include the Aichi Biodiversity Targets. The twenty headline Aichi Biodiversity Targets for 2015 or 2020 are organized under the five strategic goals:

- a) Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society
- b) Reduce the direct pressures on biodiversity and promote sustainable use
- c) To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity
- d) Enhance the benefits to all from biodiversity and ecosystem services
- e) Enhance implementation through participatory planning, knowledge management and capacity building

The goals and targets comprise both aspirations for achievement at the global level, and a flexible framework for the establishment of national or regional targets. Parties are invited to set their own targets within this flexible framework, taking into account national needs and priorities, while also bearing in mind national contributions to the achievement of the global targets. Parties are also invited to incorporate this information in their national biodiversity strategy and action plan.

Sadly, targets have not been achieved and 2020 should have been a paramount year to relaunch the strategy but the pandemic has slowed down the process. The next UN Biodiversity Conference, also known as the Fifteenth meeting of the Conference of the Parties to the Convention on Biological Diversity (COP15), should have been held in Kunming (China) in 2021. It is an extremely important event, which will set the course for global biodiversity conservation for the next decade and beyond, with an aim to realize the 2050 Vision of “Living in harmony with nature”. The main target was to reverse the biodiversity loss trend. However, due to the covid pandemic, it has been postponed several times and ultimately moved to Montreal in Canada where the CBD secretariat is located. It will take place at the end of December 2022.

According to journalist sources, the UN biodiversity conference appears to have found its main target of protecting 30% of land and sea by 2030. But 30x30 is actually just one of more than 20 targets that will be discussed at the Cop15 biodiversity conference and it also seems one of the most divisive. There is still no consensus about the most high-profile target and what it should mean: for some it is not ambitious enough, for others it is impossible to enforce, but the main criticism is that area-based conservation violates human rights of local communities and indigenous people (Weston and Greenfield 2022).

4.2.3. the Aarhus Convention

The United Nations Economic Commission for Europe (UNECE) Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters was adopted in 1998 in the Danish city of Aarhus at the Fourth Ministerial Conference and entered into force in October 2001. The convention is the first legally binding

instrument at the supra-national level guaranteeing access to information, public participation in decision making and justice in environmental matters (Morgera 2005). Its membership is not close to UNECE States, but also to any other UN Member State, upon approval by the Meeting of the Parties (MOP).

The Convention is based on three pillars: access to Information, public participation in decision-making and access to justice in environmental matters. The Aarhus Convention establishes a number of rights of the public (individuals and their associations) with regard to the environment. The Parties to the Convention are required to make the necessary provisions so that public authorities (at national, regional or local level) will contribute to these rights to become effective. The Convention provides for:

- Access to environmental information: the right of everyone to receive environmental information that is held by public authorities. This can include information on the state of the environment, but also on policies or measures taken, or on the state of human health and safety where this can be affected by the state of the environment. Applicants are entitled to obtain this information within one month of the request and without having to say why they require it. In addition, public authorities are obliged, under the Convention, to actively disseminate environmental information in their possession;
- Public participation in environmental decision-making: the right to participate in environmental decision-making. Arrangements are to be made by public authorities to enable the public affected and environmental non-governmental organisations to comment on, for example, proposals for projects affecting the environment, or plans and programmes relating to the environment, these comments to be taken into due account in decision-making, and information to be provided on the final decisions and the reasons for it.
- Access to Environmental justice: the right to review procedures to challenge public decisions that have been made without respecting the two aforementioned rights or environmental law in general.

The Aarhus convention and lately the 2010 UNEP “Guidelines for the Development of National Legislation on Access to Information, Public Participation and Access to Justice in

Environmental Matters” and various other resolutions of international organizations and conferences, have contributed to enhance the normative provisions of Principle 10 of the Rio Declaration on public participation to a point that it can be considered legally binding. The relevance of Aarhus derives from being the first international agreement providing legally binding obligations on the three pillars of public participation that have lately been mainstreamed in other international (EU) and national policy frameworks.

4.2.4. Disaster Risk Reduction: from Yokohama to Sendai

In 1989, the UN general Assembly proclaimed the following decade the “International Decade for Natural Disaster Reduction” (IDNDR). In 1994 the Yokohama Strategy for a Safer World was issued after the work of the first World Conference on Disaster Reduction. The Document contained guidelines for Natural Disaster prevention, preparedness and mitigation and its Plan of Action was adopted on the mid-term review of the International Decade for Natural Disaster Reduction.

In 1999, the General Assembly endorsed the creation of the International Strategy for Disaster Reduction (ISDR) as international framework for responding to the challenge presented to the international community by the increasing incidence and scale of disasters. Initially, the UNISDR was created as an inter-agency secretariat of ISDR but its mandate was then expanded to serve as a focal point within the United Nations System for the coordination of disaster reduction including with regional organizations and activities in socio-economic and humanitarian fields. Further mandates were to promote public awareness and commitment, to expand networks and partnerships, and to improve knowledge of disaster causes and options for risk reduction. The Johannesburg Plan of Implementation provided by UNISDR in 2002 gave a concrete set of objectives for integrating and mainstreaming risk reduction into development policies and processes.

The Hyogo framework for action: the second world conference on DR took place in Hyogo (Japan) in 2005 and led to the “Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters.” It was already recognized the need to open up DDR to a wider set of stakeholders and a consultation process begun including

government representatives, NGOs, scientists, practitioners, private sector, and UN organizations to share experiences, identify remaining gaps, formulate strategic guidance and advice for the implementation of the framework. After the process of consultation five priority areas have been identified in Hyogo Framework for Action (HFA):

- To ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation.
- To identify, assess and monitor disaster risks and enhance early warning.
- To use knowledge, innovation and education to build a culture of safety and resilience at all levels
- To reduce the underlying risk factors.
- To strengthen the disaster preparedness for effective response at all levels.

The 2015 Sendai Framework: in the context of limited success following the HFA, many hopes were pinned on new agreement making a difference where its predecessor could not: at the local level and with a systematic focus on root causes of disasters (Pearson and Pelling 2015). On 18 March 2015, at the UN World Conference on Disaster Reduction, 187 members states signed the Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR) replacing its processor. Notably, it was the first major agreement for the post-2015 development agenda. The document underlines the context and local dependency of vulnerability to hazard as well as the advantages for policy making of transferable risk reduction approaches; it also highlights the interlinked nature of DRR with development presenting risk and loss as outcomes of development decision-making. DRR can be considered a concern, a driver but also an outcome of development (Pearson and Pelling 2015). This is a step forward compared to the HFA testifies, for instance, by the inclusion of response and reconstruction periods as opportunities for risk reduction and building back better. Linkages between development and DRR are also reflected in the use of the term resilience in SFDRR to encourage development alongside or within risk management and not just to describe post- disaster development gains. Moreover, this understanding of resilience offers the DRR community a connection point to the SDGs and an opportunity for enhancing the relevance of DRR in the wider development agenda. Finally, SFDRR offers a concrete agenda for evidence-based policy and for international technology transfer.

The framework clearly adopted many of the IWRM principles, including a higher relevance given to governance and institutional issues and stakeholder involvement. Indeed, the document highlights four priorities among which “strengthening DR governance to manage disaster risk” aiming at integrating governance issues across the disaster cycle from preparedness to response and recovery. The other three priorities are: first, “understanding disaster risk” which imply a firm support for evidence based policy making, through calls for structured data collection, multi-hazard interactions and for capacity building and technology transfer; second, “financing and investing disaster reduction for resilience” covers a wide range of issues including support for risk sensitive land-use planning, health systems, promoting insurance, employment safety and safety for people with disabilities and for financial systems, and; third, “enhancing disaster preparedness for effective response, and to Build Back Better in recovery, rehabilitation and reconstruction” focuses on building capacity for preparedness but also calls for government to integrate post-disaster reconstruction into the economic and social sustainable development of affected areas reasserting the opportunity disaster risk management offers for sustainable development gains. Throughout the document there are several references to the need of cross-sectoral, integrated and participative approach:

Art 27 (a): “disaster risk reduction within and across all sectors and review and promote the coherence and further development, as appropriate, of national and local frameworks of laws, regulations and public policies, which, by defining roles and responsibilities, guide the public and private sectors”.

Art 27 (f): “to assign, as appropriate, clear roles and tasks to community representatives within disaster risk management institutions and processes and decision-making through relevant legal frameworks, and undertake comprehensive public and community consultations during the development of such laws and regulations to support their implementation”

Art 27 (g): “To establish and strengthen government coordination forums composed of relevant stakeholders at the national and local levels, such as national and local platforms for disaster risk reduction”

Art 27 (h): “To empower local authorities, as appropriate, through regulatory and financial means to work and coordinate with civil society, communities and indigenous peoples and migrants in disaster risk management at the local level;

Art 27 (j): “To promote the development of quality standards, such as certifications and awards for disaster risk management, with the participation of the private sector, civil society, professional associations, scientific organizations and the United Nations.”

Moreover, the Sendai framework is also sensitive to linkages between risk reduction and ecosystem and biodiversity conservation as mentioned in:

Art 5: “it is urgent and critical to anticipate, plan for and reduce disaster risk in order to more effectively protect persons, communities and countries, their livelihoods, health, cultural heritage, socioeconomic assets and ecosystems, and thus strengthen their resilience”.

Art 28 (d): “to strengthen the sustainable use and management of ecosystems and implement integrated environmental and natural resource management approaches that incorporate disaster risk reduction”.

Art 24 (b): “to encourage the use of and strengthening of baselines and periodically assess disaster risks, vulnerability, capacity, exposure, hazard characteristics and their possible sequential effects at the relevant social and spatial scale on ecosystems.

Art 28 (g): “to promote the mainstreaming of disaster risk assessment, mapping and management [...] of areas prone to droughts and flooding, and at the same time preserving ecosystem functions that help to reduce risks.

Art 30 (n): to strengthen the sustainable use and management of ecosystems and implement integrated environmental and natural resource management approaches that incorporate disaster risk reduction

Whereas the HFA had no targets, the SFDRR presents seven global targets:

- a) Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020–2030 compared to 2005–2015.
- b) Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020–2030 compared to 2005–2015.
- c) Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.

- d) Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030.
- e) Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.
- f) Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030.
- g) Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030.

However, these targets are not legally binding and there is no sanction for failure at the national or international level. Another problem is the lack of clarification and guidance on the quantitative assessment of the term “substantial” and its interpretation.

4.2.5. Discussion

The evolutions of the UN actions in the last decades showed a tendency to increase the spectrum of topics covered and the increasing attentions to environmental field. However the recognition that social and the various environmental issue are interrelated and connected has led to the convergence of its policy frameworks and agencies action. The UNFCCC and the COPs, born as platform for climate negotiations, emission reduction and climate change mitigation increasingly started to deal with adaptation measure which are more in the realm of environmental, biodiversity and disaster risk reduction field. The 2030 Agenda for Sustainable Development recognizes and reaffirms the urgent need to reduce the risk of disasters and make direct references to the outcomes to the Sendai Framework as there are specific opportunities to achieve SDGs through reducing disaster risk. Disaster risk reduction cuts across different aspects and sectors of development and there are 25 targets related to disaster risk reduction in 10 of the 17 sustainable development goals, firmly establishing the role of disaster risk reduction as a core development strategy. All these frameworks are

increasingly focus on governance issue arguing in favor of cross-sectoral integration, inclusiveness and transparency and have the aim of changing and directing decision makers toward greener solutions. The biodiversity strategy also highlighted the potential of mitigation emissions and climate change, as well as increase human health and other benefit. This process has ultimately led to the identification of Nature-Based Solutions as a practical tool and approach that can contribute reaching some of these objectives. However, at the UN level this has been a recent development and effect are unlikely to be already there. In this sense the UN system has arrived later to this concept compared to other international institutions such as the IUCN. Nevertheless, this new impulse might give an extra boost to the mainstreaming process in the future.

4.3 The evolution of EU environmental policy

The European Union actions in the environmental field has been characterized by a gradual expansion and consolidation within the last sixty years. A significant feature that characterizes the European integration process is the extension of EU “material” jurisdiction in areas which fall outside the strict realm of the original economic mandate.

4.3.1. Early stages (1960s and early 1970s)

According to the principle of conferral, which governs EU action internally and on the international level, the EU may legislate only on the basis of explicit powers endowed by member states through the treaties and within the objectives, procedures and conditions set out therein. The existence of an appropriate legal basis is therefore crucial in appraising the scope of EU powers in a given field. The Treaty establishing the European Economic Community (EEC) in 1957 did not include the protection of the environment among the policy field that pertain to its jurisdiction. However, the absence of environmental legal basis in has not prevented EU action in this field.

With specific respect to the protection of the environment, the first measures adopted by the ECC in the 1960s and early 1970s were very much influenced by the need of guaranteeing the functioning of the internal market. The aim was the harmonization of the legislation so as not to harm competition among states. The first ECC environmental measures were indeed grounded principally on former article 100 of the ECC Treaty which enabled the Council to unanimously issue directives for the approximation of member state laws which directly

affect the establishment or functioning of the common market. Overall, until the 1970s the European environmental rules were not set in a coherent legislative framework. Legal scholars tend to describe the ECC's attitude to environmental protection at this stage as "incidental", "responsive" and "unarticulated" (Brinkhorst 1993).

The original EEC Treaty did contain some indications that EU competence could potentially extend far beyond the common market objective (Rehbinder and Stewart 1985). It included among the principles and objectives of the newly established Community the promotion of "harmonious development of economic activities", the "raising of the standard of living", and "the constant improvement of the living and working conditions of their people" (Treaties 1957). These provisions enabled the Council, with the crucial support of the European Court of Justice (ECJ), to adopt environmental measures also thanks to former article 235 (2) a provision which facilitates the adoption of EU legislation when it is necessary in order to attain one of the objectives set out in the Treaty (Orlando 2013).

The increasing public environmental concern and international developments such as the 1972 Stockholm Declaration on the Human Environment, served as important incentives for a more direct ECC role in the environmental sector. Thus, in 1973, upon invitation of heads of state and government, the first Environmental Action Programme (EAP) was adopted providing only broad framework of principles and objective (Krämer 2012). This EAP is often identified as the starting point of common EU environmental policy. Soonafter, the first wave of European water legislation began with standards for rivers and lakes used for drinking water abstraction in 1975, and continues until 1980 with the establishment of binding quality targets for drinking water. It also included quality objective legislation on fish waters, shellfish waters, bathing waters, groundwaters and dangerous substance emission control.

4.3.2. Consolidation of the ECC environmental competences

The early 1980s have been fundamental for the consolidation of environmental policy as a European competence. The European Court of Justice has played a pivotal role as, with its case-law, legitimized EU internal and external action in the environmental field. The court highlighted that environmental measures could be based on article 114 of the Treaty establishing the European Community (TEC)⁹ to the extent that they aimed to fulfil the

⁹ The Treaty of Lisbon in 2009 renamed the TEC as the Treaty on the Functioning of the European Union (TFEU)

internal market objective (ECJ 1980), or on article 352 when interventions are necessary to achieve EU objectives “in the sphere of the protection of the environment and the improvement of the quality of life” (ECJ 1982). The third EAP (1982–1986) contributed to shaping the direction of EU environmental legislation and policy, It emphasized prevention and a more strict approach on emissions reduction and environmental objectives as a quality-oriented approach would instead have left it to the member states to much discretionary space to determine their strategy (Hanf 1997, Knill and Liefferink 2007).

The Single European Act (SEA) of 1986, finally introduced an explicit legal basis for European environmental legislation, representing a significant step forward in the process of consolidation of European environmental policy. With the now Art. 192-93 of the Treaty on the Functioning of the European Union (TFEU) the Council, deciding unanimously and in consultation with the European Parliament (EP), was empowered with specific competences over environmental policy. This development encouraged a more pro-active decision-making process in this field. The SEA also introduced some of the key principles of EU environmental policy, such as the “preventive action” principle, namely the idea that environmental damage should be impaired at the source, and the “polluter pays” principle in cause the damage occurs. The EU proved to be at the forefront in the global environmental challenges as it introduced such principles even before the UN Rio Earth Summit of 1992. The single act also confirmed the EU external relations competence in environmental field in close collaboration with the member states. The integration of environmental competences reflected the emerging ecological modernisation theories discussed in paragraph 2.4.3, and found official recognition in the Fourth EAP (1987-1992), that stated that “environmental regulations are the pillars for a lasting economic and social progress” (EU 1987).

In the late 1980s and early 1990s, also due to the ineffective implementation of the first era policy framework, the European Commission began to develop “new” instruments of environmental policy. It looks for incentives to facilitating the involvement of private actors in the achievement of environmental objective. Thus, EU established innovative measures, including those on eco-labelling, public access to environmental information, Environmental Impact Assessments and a proposal liability for waste (Orlando 2012). The EU, in 1990, endowed itself with the European Environment Agency (EU 1990) in charge of carrying out studies and recommendations.

As a evidence to the renewed proactivity of the European Community, in 1992 it was issued the Habitat Directive (92/43/ECC) which remains up to now a cornerstone of the EU's nature conservation policy. The directive will be further discussed in a specific paragraph.

4.3.3. Further Integration and flexibility in EU environmental policy (1990s)

The 1990s has been a relevant period for the European integration process. The then-twelve Member State of the European Communities signed the Treaty on European Union, commonly known as the Maastricht Treaty, which is the foundation treaty of the European Union (EU). It provided for a shared European citizenship, the introduction of a single currency, and (still not precisely determined) common foreign and security policies. The EU legal system is characterized by primary EU law, (the Treaties that establish the EU and its functioning) and by secondary EU law (Regulations, Directives, Decisions, Recommendations, Opinions) where the EU legislates in more specific policy fields. Directives set the objectives that are binding, but each Member States can decide about the best approach to reach the goals. Institutional and procedural administrative laws are not regulated by the EU and the administration of EU law is governed autonomously by each country, with the EU supervising the results.

The progressive consolidation of the EU environmental foundations was accompanied during the 1990s by a general trend towards greater decentralization. As Gerring et al (2007), put it “decentralization is quite possibly the dominant political trend of our time” with many devolutions of authority from national to subnational levels while no democracy has moved from a federalist to unitarian constitutional status (Stoa 2014). The decentralization and flexibility trend also involved the EU, its methods of governance and the input it gave to member state, namely a delegation of powers to local authorities and the affirmation of the subsidiarity principle. Subsidiarity suggests that regulation and law-making should take place at the lowest appropriate governance level. The aim of the principle is to promote efficiency and local ownership over policies and regulation. The EU adopted this principle as a cornerstone of its legal framework and as a general principle of European Union law, in

which supranational action is only justified when individual state action is incapable of effective governance (Stoa 2014).

There has already been critics regarding the integration process in the environmental field questioning for instance the need for water resources regulation or disaster risk reduction at the supranational level. Critics suggested that for context specific aspects of environmental management would be better to be left to national or subnational governance structures, such as flood control for non-transboundary waters. This has sparked a debate in Europe regarding the appropriate level of governance in a wide range of policy areas, and the role of the supranational state in general. Overall, most of the sectors regulating environmental issue like water management and floods control are governed by directives since institutional and procedural autonomy allows a certain degree of policy freedom (Priest, et al. 2016). EU Directives are the most common form of EU legal act and require member states to achieve a certain result, but it is up to the individual countries to plan their own laws on how to reach these goals. The EU also took action issuing long-term strategic plan such as biodiversity strategy or climate change adaptation and mitigation plan and funding programs tied to certain objectives, including environmental one. These are other flexible mechanism that allows member state to develop their own national plans in collaboration with the European commission and in line with European targets.

The Treaty of Maastricht (1992) and the Treaty of Amsterdam (1997) introduced no substantial changes to the environmental legislative layout set up by the Single European Act. Both Treaties contributed to further strengthen the environmental foundations of EU environmental law and policy. Maastricht introduced for the first time a specific reference to environmental protection among the objectives of the European Union. While Amsterdam adding a reference to sustainable development among the Union's objectives and expressly mentioning the achievement of "a high level of protection and improvement of the quality of the environment" among the tasks of the EU (Orlando 2013). The Treaty of Amsterdam also moved up the principle of environmental integration from the specific Environmental Title to article 6 in the section outlining the general principles of EU policy. Although both treaties represent a step further in the integration process, they also reflect the political resistance by the member states towards the fast expansion of centralised EU supranational power. It can be noted by the "generalisation" of the subsidiarity principle in the Maastricht Treaty and the

Protocol on Subsidiarity and Proportionality annexed to the Amsterdam Treaty (Chalmers, Davies and Monti 2010). This means that the member states have primary responsibility for the protection of the environment, and the EU may act “only in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States” but can “be better achieved at Union level” (article 5 TFEU). Within this framework, differentiation and flexibility gradually became main features of EU environmental governance. Subsidiarity becomes relevant not only “vertically”, in the definition of the appropriate level of intervention, but also “horizontally” in determining the scope of EU intervention (Philippart and Sie Dhian Ho 2000) and encouraging the participation of an increasing number of actors and stakeholders, in line with the idea of “shared responsibility”, a theme that the Commission advances in the Fifth EAP and in line with the ratification of the Aarhus convention. The new approach to environmental governance translated in practice to a marked “proceduralisation” of the relevant environmental obligations (Von Homeyer 2009), and a greater use of framework directives and horizontal measures. Focusing on procedural requirements such as permitting, planning and reporting obligations, instruments that allow greater flexibility and differentiation not only at the regulatory level, but more specifically in the implementation of environmental obligations (Scott 2000). The European Council adopted the Lisbon Strategy in 2000 to give a further boost on the adoption of such principles and find concrete ways to reconcile the objectives of competitiveness and economic growth with the protection of the environment.

A clear example about the adoption of such approach has been the establishment of the Water Framework Directive, one of the backbones of EU environmental law. The directive is focused on water protection and quality achieving “good status”, and it includes also provision regarding institutional settings (the establishment of River Basin Authority and plan), citizen participation, right pricing. The central requirement of the Treaty is the adoption of an ecological approach and that the environment should be protected to a high level in its entirety. The directive will be further discuss in a specific paragraph.

The input from the European Commission’s White Paper on European Governance (2001a) also influenced legislative developments in the environmental sphere (Hjerp et al. 2010), fostering initiatives aiming to promote a more effective dialogue with civil society concerning EU policy-making (“better involvement”), as well as codifying and

recasting existing legislation, and streamlining administrative and regulatory burdens (“better regulation”) (European Commission 2001c). Efforts in this direction were particularly apparent in the fields of water quality, air quality and integrated pollution prevention and control.

4.3.4. Stepping up effort for emission mitigation (2000s)

The Sixth EAP identified the objectives and priorities of the EU over the 2002-2012 decade in four thematic areas: climate change; nature and biodiversity; environment and health; and natural resources and waste.

Legislative measures and strategies in the field of biodiversity and nature protection featured interesting developments in the fields of marine protection and sustainable use of marine resources (European Commission 2007, EU 2008a and 2008c), including action promoting EU adherence to international initiatives

The most prominent aspects of EU environmental policy in this phase however remain the actions and initiatives in response to climate change, defined in the Sixth EAP as the “outstanding challenge of the next 10 years and beyond” (EU 2002). In 2005 the EU launched the first world greenhouse gas Emissions Trading Scheme (ETS) to fight global warming. Under the EU ETS, the governments of the EU Member States agree on national emission caps which have to be approved by the EU commission. Those countries then allocate allowances to their industrial operators, and track and validate the actual emissions in accordance with the relevant assigned amount. They require the allowances to be retired after the end of each year. The operators within the ETS may reassign or trade their allowances by several means including: 1) a spot market on one of EU climate exchanges, 2) over the counter using a broker or 3) private exchanges. The ETS was initially created to operate apart from international climate change treaties such as the pre-existing United Nations Framework Convention on Climate Change (UNFCCC, 1992) or the Kyoto Protocol (1997) which came into force when the phase I of the EU ETS had already become operational. The EU later agreed to incorporate Kyoto flexible mechanism certificates as compliance tools within the EU ETS through the "Linking Directive" allowing operators to use a certain amount of Kyoto

certificates from flexible mechanism projects to cover their emissions. A Directorate-General for Climate Action (DG CLIMA) was created separated from Directorate General for Environment and Directorate General for Energy. The DG Clima become responsible for EU's international negotiations on climate, development and implementation of the EU Emissions Trading System and production of the “European Green Deal” transformation plan some years later. A related side-effect of the growing prominence and autonomy acquired by EU climate policy is its progressive detachment from the field of environmental policy. To what extent this had contributed to reduce the space for adaptation efforts can be at the center of an interesting debate.

The Treaty of Lisbon entered into force in December 2009 and maintains the structural change and most of the institutional innovations. It eventually introduced a specific EU competence in the field of energy policy and investments, and extended the ordinary co-decision procedure to the fields of transport, energy, fisheries, external trade, regional and agricultural policy.

4.3.5. EU approach to Disaster Risk Reduction

The EU extended its competences also in the field of Disaster Risk Reduction starting from 2007 when it issued the Flood Directive (2007/60/EC) that establish a framework for the assessment and management of flood risks to reduce the negative consequences of flooding on human health, economic activities, the environment and cultural heritage. The directive will be further discussed later.

The Commission tried to develop a comprehensive and integrated approach to disaster risk reduction as part of its commitment to sustainable development. The Communication on “Next steps for a sustainable European future” refers to this integrated approach. Communications on an “EU Strategy for Supporting Disaster Risk Reduction in Developing Countries”, a “Community Approach on the Prevention of Natural and Man-Made Disasters”, and an “EU Approach to Resilience” underline the increasing importance of DRR and resilience into EU policies and international agreements (Faivre, et al. 2018). The EU directly endorsed the Sendai Framework for Disaster Risk Reduction 2015-2030 and the EU Action Plan on the

Sendai Framework for Disaster Risk Reduction represents an important cross-cutting contribution to many EU policies to developing a risk informed approach. It is related to both Member States and Developing Countries and it sets out an agenda for enhancing risk prevention, building the resilience of societies and leveraging investments through different EU policies. The Action Plan seeks to implement the SFDRR within the EU to help reinforce ecosystem and societal resilience to current and emerging risks by creating a comprehensive approach to disaster risk management.

Within the EU, the regulations governing the European Structural and Investment (ESI) Funds, which account for almost half of the EU budget, stipulate that disaster resilience must be horizontally promoted with the participation of multiple kind of stakeholder, including citizen and private companies. The link between the DRR agenda and other sectoral policies (e.g.environment and biodiversity, energy, health, urban policy) was becoming clear, with climate change and natural disasters acting as threat multipliers that can exacerbate the impacts of environmental degradation, undermine livelihoods opportunities, and force people to relocate.

4.3.6. Multi-sectoral development and integration (Biodiversity, Adaptation, DRR)

EU environmental policy have developed on multiples lines embracing a growing set of policy sectors. The last decade has witnessed a step up in efforts in single sectors and an attempt to find synergies across them.

In 2010 the EU issued the 2020 biodiversity strategy with 6 main targets: 1) implementation of the Habitat and Bird directives, 2) maintain and restore ecosystem and their services, 3) increase the contribution of agriculture and forestry, 4) sustainable fisheries, 5) combat invasive alien species and 6) tackle the global biodiversity strategy. The second target focuses on maintaining and enhancing ecosystem services, and restoring degraded ecosystems across the EU, in line with the global goal set in 2010 to restore at least 15% of degraded ecosystems. The strategy acknowledged that “healthy ecosystems provide a stream of goods and services vital to society, such as food, fibres, clean water, healthy soils, protection against floods and erosion”. The linkages between ecosystem conservation and enhancement and

disaster risk reduction was therefore explicit. The Strategy should have been implemented through strategic actions. It required to improve knowledge, map and assess ecosystems and their services (action 5) and to better integrate the value of ecosystem services into national and EU reporting systems. The strategy called for the development of green infrastructures reconnecting fragmented natural areas and improve their functional connectivity within the wider countryside (action 6). Most importantly, it also encourages a better use of “Nature-based approaches” to tackle climate change and to improve resource efficiency, for instance through more integrated spatial planning and the development of multifunctional zones that are capable of delivering benefits to both biodiversity, the land user, and to society at large. This can be considered as a primordial definition of Nature-Based Solutions. Finally, action under this target will also seek to promote a wider “no net loss approach” to biodiversity and ecosystem services. This will be achieved by “biodiversity-proofing” of EU-funded projects, plans and programmes and by ensuring that any unavoidable residual impacts are compensated for or offset. For this purpose a methodology for assessing should be developed and initiative for compensation or offsetting schemes should be adopted (action 7).

In 2013, the Commission adopted an EU-wide strategy promoting investments in green infrastructure, to restore the health of ecosystems, ensure that natural areas remain connected together, and allow species to thrive across their entire natural habitat, so that nature keeps on delivering its many benefits to local community. The strategy promotes the deployment of green infrastructure across Europe as well as the development of a Trans-European Network for Green Infrastructure in Europe (TEN-G) with the aim of enhance the health and wellbeing of citizens, provide jobs, and boost the economy. The Green Infrastructure Strategy is supported by other actions under target 2 of the Biodiversity Strategy, such as work underway to establish a Restoration Prioritization Framework (RPF) (action 6a) or on biodiversity-proofing the EU budget (action 7a). MAES, the Mapping and Assessment of Ecosystems and their Services (Action 5) will help provide an accurate valuation of the benefits that nature provides to human society, so that investments in green infrastructure can be measured.

Meanwhile, the European Environmental Agencies and the scientific community pointed out that climate change impact were already becoming significant on the European territory with the mean temperature increasing, and extreme weather events becoming more frequent. The increasing urgency of adaptation strategy stems from this increasing awareness. The EU

commission, in 2013, have thus issued the first EU Adaptation Strategy which sets out a framework and mechanisms for preparing the EU for current and future climate impacts. The strategy has three main objectives: promoting action by Member States; promoting better-informed decision-making; and promoting adaptation in key vulnerable sectors. On a national level, many Member States have adopted National Adaptation Strategies (NAS) a cross-sectoral planning instruments to inform and prioritise actions and investments towards climate change adaptation. This shifting attention was also testified by the willingness of the commission to reorientate the LIFE and Horizon programme toward adaptation. Apart from NASs, local adaptation strategies plan are also encouraged (Action 3) with initiatives such as the Covenant of Mayors framework and the Mayors Adapt initiative aims to develop comprehensive local adaptation strategies. The EU Adaptation Strategy recognized the many knowledge gaps and aims reduce them (Action 4), particularly in relation to information on damage and adaptation costs and benefits, regional and local risk assessments, tools to support decision-making. The risk discourse was thus becoming prominent in Eu strategic documents.

The 2013 has also been the year in which the term “Nature-Based Solution” has first appear in a EU document, namely the Communication from the commission “Green Infrastructure (GI) Enhancing Europe’s Natural Capital”. The Commission stated that “the failure to protect our natural capital and to give a proper value to ecosystem services will need to be addressed as part of the drive towards smart, sustainable and inclusive growth which is the EU’s priority Europe 2020”. The documents mainly refers to Green Infrastructure (GI) and propose to identify the mas investment priorities for the Cohesion Fund and the European Regional Development Fund (ERDF). The document expressly mention NBS in section 2.1 where it stated that “GI can make a significant contribution to the effective implementation of all policies where some or all of the desired objectives can be achieved in whole or in part through nature-based solutions”. Lately, the European Commission gave the input to foster research on NBS with EU-funded projects under the Horizon 2020 research and innovation program that contributed to the creation of the OPPLA Repository of NBS. The Horizon program adopt a participative approach to NBS design and implementation as the Commission often stress the need to involve local citizien and private business.

In 2019 the EU adopted the European Green deal, a set of policy initiatives proposed by the European Commission with the overall goal of achieving climate neutrality in Europe by 2050. Targets extend to many different sectors, including construction, biodiversity, energy, transport and food. The EU intends to finance the policies set out in the Green Deal through an investment plan “InvestEU”, with funds of at least €1 trillion. A core part of the European Green Deal, it is the biodiversity strategy which has been updated in may 2020. The new strategy “Bring Nature Back into our lives” sets new targets and tool for the attainment of the main objectives which are: to legally protect at least 30% of land and 30% of sea by 2030 ensuring all ecosystems are in a good condition by 2050, with measurable results by 2030. The strategy is accompanied by an action plan that highlights actions for unlocking funding for biodiversity, strengthening governance framework to ensure better implementation and track progress, improve knowledge, financing and investments and better respecting nature in public and business decision-making trough measurable indicators. The Commission proposed the EU’s first ever Nature Restoration Law which includes an overarching restoration objective for the long-term recovery of nature in the EU’s land and sea areas, with binding restoration targets for specific habitats and species. The European Institutions lately adopted the new EU strategy on adaptation to climate change on 24 February 2021. The strategy builds on the 2018 evaluation of the 2013 EU Adaptation Strategy. The new strategy sets out how the European Union can adapt to the unavoidable impacts of climate change and become climate resilient by 2050. The Strategy has four principle objectives: to make adaptation 1) smarter, 2) swifter, 3) more systemic, and 4) to step up international action on adaptation to climate change. The third principles implies that climate change will have impacts at all levels of society and across all sectors of the economy, so adaptation actions must also be “systemic” a term that is close to the concept of integrated planning and management. The Commission aims to mainstream climate resilience considerations in all relevant policy fields. It will support the further development and implementation of adaptation strategies and plans at all levels of governance with three cross-cutting priorities:

- Integrating adaptation into macro-fiscal policy
- Nature-based solutions for adaptation
- Local adaptation action

The strategy's four objectives are underpinned by 14 actions and the steps to be taken to deliver them. There is an explicit mention of NBS as the Council recognises the importance of the climate-water nexus and emphasises the key role that NBS can play in building resilience to climate change, helping to preserve or enhance biodiversity, and protecting and restoring ecosystems. Among other actions it aims at restoring 25,000 km of free-flowing rivers, to protect 30% of land and 30% of sea, while creating stronger protections for new and old forests. The goal is to plant 3 billion trees by 2030, so that ecosystems and their biological levels can be restored.

Finally, one of the more recent development is the creation of the Next Generation EU (NGEU), also called the "European Union Recovery Instrument" which is an economic recovery package to support the EU member states to recover from the COVID-19 pandemic. It was adopted in the end 2020 and it will operate from 2021 to 2026. It is tied to the regular 2021-2027 budget of the EU's Multiannual Financial Framework (MFF) and they are projected to reach €1824 billion in loans and grants. Among many objectives, the funds also aim to assist the green transition, the social and territorial cohesion, preparedness, recovery, and resilience (via the Recovery and Resilience Facility) and biodiversity conservation.

4.4 Relevant EU policy framework

In this section some of the most important policy framework are discussed in a more details.

4.4.1. The Habitat Directive

European territories presents a great variety of biophysical environment, geological and climatic history, and an outstanding biological diversity. It is distributed unevenly into nine terrestrial and four marine biogeographical regions, dozens of rural land and seascapes, and hundreds of natural and semi-natural habitat types (Born, et al. 2015). Its importance for society is crucial, as expressed in the preamble of the Convention on Biological Diversity (CBD), which affirms "the intrinsic value of biological diversity and of the ecological, genetic, social, economic, scientific, educational, cultural, recreational and aesthetic values of biological diversity and its components. As seen before, terrestrial, freshwater, coastal and marine ecosystems offer, through their functioning, a wide range of benefits for human communities, today known as "ecosystem services". Beyond the utility of species and habitats for humans, the diversity of life, as a result of billions of years of evolution, also deserves

respect because of its intrinsic value. Conservation measures and legal framework are moved by these two overarching value-laden ideas, one more anthropocentric and utilitarian view of nature and the other more naturalistic as it emphasizes its intrinsic value.

The embryo of the EEC policy for biodiversity conservation takes its roots in the first Environmental Action Programmes adopted in 1973, 1977 and 1982, and reaches its peak with the Habitat Directive (92/43/ECC). As said before, the Habitat Directive is a cornerstone of the EU's nature conservation policy alongside the Birds Directive. It established the Natura 2000 ecological network of protected areas, to ensure the conservation of a wide range of rare, threatened or endemic animal and plant species safeguarded against potentially damaging developments. 1,000 animal and plant species, as well as 200 habitat types, listed in the directive's annexes are protected in various ways. The Directive provides for special legal regimes within the Natura 2000 network areas which include Sites of Community Importance (SCIs), and Special Areas of Conservation (SACs) enlisted in Annex I. For what regards water and land planning, any plan or project likely to have a significant effect on a Natura 2000 site should be in line with the Habitats Directive and undertake the assessment procedures established within art 6:

Par. 1: "For special areas of conservation, Member States shall establish the necessary conservation measures involving, if need be, appropriate management plans specifically designed for the sites or integrated into other development plans, and appropriate statutory, administrative or contractual measures which correspond to the ecological requirements of the natural habitat types".

Par. 3: "Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, shall be subject to appropriate assessment of its implications for the site. In the light of the assessment the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public"

Par. 4: "If, in spite of a negative assessment and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all

compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted”

The assessment tool of the Habitats Directive can be found in article 6 of the Directive. It is composed of 4 stages: screening, appropriate assessment, assessment of alternative solutions, and assessment where not alternative solutions remain and where adverse impacts remain (Kalas, et al. 2018).

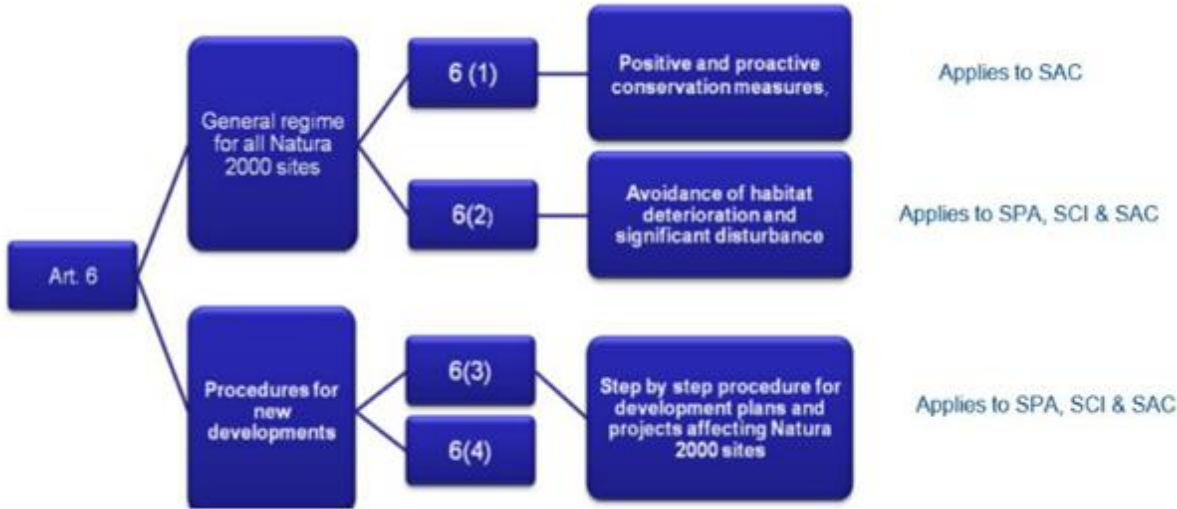


Figure 15 Project and plan appropriate assessment from OPERANDUM deliverable 2.1. (2018)

The Directive therefore set the need to enforce stricter rules and direct regulations for specific areas that according to the biodiversity strategy 2030 should cover the 30% of European territory by 2030.

4.4.2. The Water Framework Directive

Early European water legislation began in a “first wave” during the second half of the 1970s mainly through standard for drinking water abstraction and fresh water quality and then expanded to fish waters, bathing waters and groundwaters. However, it was a scattered and non-organic legislation. In 1988 the Frankfurt ministerial seminar on water reviewed the

existing legislation and identified a number of improvements that could be made and gaps that could be filled. This resulted in the second phase of water legislation, the first results of this were, in 1991, the adoption of:

- the Urban Waste Water Treatment Directive, providing for secondary (biological) waste water treatment, and even more stringent treatment where necessary.
- the Nitrates Directive, addressing water pollution by nitrates from agriculture.
- Other legislative results of these developments were Commission proposals for action on a new Drinking Water Directive, reviewing the quality standards and, where necessary, tightening them (adopted in 1998),
- The Directive for Integrated Pollution and Prevention Control (IPPC), adopted in 1996, addressing pollution from large industrial installations, later transformed into the Industrial Emissions Directive

Pressure for a fundamental rethink of Community water policy came since the beginning of the 1990s after the Earth Summit and the emergence of renewed environmental paradigm calling for a more integrated and holistic ecological management. Concretely, the EU institutions concluded that, while progress had been made in tackling individual issues, the water policy was fragmented, in terms both of objectives and of means. All parties agreed on the need for a single piece of framework legislation to resolve these problems. The process started in Frankfurt led to a first proposal of a Directive on the ecological quality of water in 1993 which stalled until the 1996 when a Commission Communication on “European Community Policy” started the procedure for the presentation of a formal proposal of the WFD in 1997. The final text has been approved 3 years later after the procedure involving the European Parliament's Environment Committee, the Council of Environment Ministers and a broad process of consultation (Kallis and Butler 2001). Since the approval of the WFD (2000/60/EC) water can be considered one of the sectors with the most comprehensive coverage in EU environmental regulation and a cornerstone of EU environmental policy.

The Directive aims to protect and improve the quality of water putting aquatic ecology at the base of management decisions shifting from merely pollution control to the preservation of the ecosystem integrity as a whole.

Art 1 of the Directive set objectives and it establishes a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater with the following

aims: a) prevents further deterioration and protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems; b) promotes sustainable water use based on a long-term protection of available water resources; c) enhance the protection and improvement of the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances; d) ensures the progressive reduction of pollution of groundwater and prevents its further pollution, and e) contributes to mitigating the effects of floods and droughts.

The WFD set out rules to halt deterioration in the status of water bodies and achieve “good status” for Europe's rivers, lakes and groundwater by 2015, lately postponed to 2027. Good status is defined in Art 2 as the status achieved by a surface water body when both its ecological, chemical and quantitative status are at least "good" according to parameters indicated in Annex V. Quality elements for assessment of the status of the river basin are divided into biological elements (e.g. composition and abundance of flora and fauna), hydromorphological elements (e.g. quantity and dynamics of flow, river depth and width variation) and supporting physico-chemical elements (e.g. thermal/oxygenation conditions, salinity, nutrients, etc.). The directives specify that where more stringent requirements are needed, “protected zones” should be established with higher objectives and standard within the framework of the Habitat Directive and Natura 2000 sites. In practical terms this implies the protection of all forms of water, prevention of deterioration, the restoration of the ecosystems in and around these bodies of water, the reduction of pollution in water bodies, guarantee the sustainable water usage by individuals and businesses (art 4 environmental objective).

As pointed out before, the directive institutionalized ecosystem-based objectives and planning processes at the level of the hydrographic basin as the basis for water resource management. From an institutional and policy point of view, it implies the creation of authorities, the River Basin Organization (RBO), and River basin management plan, whose scope transcend the local, regional and in some case national administrative boundaries in order to manage the whole catchment area from upstream to downstream. Art 3 stated that “Coordination of administrative arrangements within river basin districts” establishes that Member States shall

identify the individual river basins lying within their national territory and, for the purposes of this Directive and assign them to individual river basin districts. Where groundwaters do not fully follow a particular river basin, they shall be identified and assigned to the nearest or most appropriate river basin district. Same principle for coastal water. Member States shall ensure that a river basin covering the territory of more than one Member State is assigned to an international river basin district.

The directive also includes provision for public and stakeholder participation which is foreseen in the formulation, review and updating of the river basin plans. The Directive obliged to periodically monitoring (art. 8) and reporting (art. 15) about the status of the water and each river basin, practices that gave impulse for the harmonization of indicators and methods in the whole EU. Finally, the Directive affirm the recovery of the cost principle in water management including environmental and resource cost in accordance with polluters pays principle (Art 9). More details about the economic analysis is provided in annex III. In short, the legislation places clear responsibilities on national authorities as they have to:

- identify the individual river basins on their territory, that is, the surrounding land areas that drain into particular river systems;
- designate authorities to manage these basins in line with the EU rules;
- analyse the features of each river basin, including the impact of human activity and an economic assessment of water use;
- monitor the status of the water in each basin;
- register protected areas, such as those used for drinking water, which require special attention;
- produce and implement river-basin management plans to prevent deterioration of surface water, protect and enhance groundwater and preserve protected areas;
- ensure the cost of water services is recovered so that the resources are used efficiently and polluters do effectively pay;
- provide public information and consultation on their river-basin management plans.

The WFD has thus changed water management in all member states but its influence transcends the EU frontiers as it has inspired water management in neighboring regions. In line with the WFD the Groundwater directive (2006/118/EC) established a regime which sets

groundwater quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater. The directive establishes quality criteria that takes account local characteristics and allows for further improvements to be made based on monitoring data and new scientific knowledge. The directive thus represents a scientifically sound response to the requirements of the Water Framework Directive (WFD) as it relates to assessments on chemical status of groundwater and the identification and reversal of significant and sustained upward trends in pollutant concentrations.

4.4.3. The Flood directive

Between 1998 and 2009, Europe suffered over 213 major damaging floods, including the catastrophic floods along the Danube and Elbe rivers in summer 2002 and other severe floods in 2005. The European Environmental Agency estimated that between 1998 and 2009, floods in Europe have caused some 1126 deaths, the displacement of about half a million people and at least €52 billion in economic losses. This developments further reinforced the need for concerted action and where the input for European Institutions to reinforce their role in the Disaster Risk Reduction policy arena. In 2007 the Directive (2007/60/EC) on the assessment and management of flood risks entered into force. It is considered a “daughter directives” of the EU WFD and it applies to inland waters as well as all coastal waters across the whole territory of the EU. The directive requires that all “Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk”. It therefore aims at including exposure and vulnerability on risk maps.

Art 1: the purpose of this Directive is to establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods in the Community.

Chapter II established the guidelines for the preliminary risk assessment while chapter III set the standards for the flood hazard maps and flood risk maps. Chapter IV, instead regulate the Flood risk management plan focusing on the reduction of potential adverse consequences of

flooding for human health, the environment, cultural heritage and economic activity. Art 3 established that flood risk management plans shall take into account relevant aspects such as costs and benefits, flood extent and flood conveyance routes and areas which have the potential to retain flood water, such as natural floodplains, the environmental objectives of Article 4 of Directive 2000/60/EC, soil and water management, spatial planning, land use, nature conservation, navigation and port infrastructure. Flood risk management plans shall address all aspects of flood risk management focusing on prevention, protection, preparedness, including flood forecasts and early warning systems and taking into account the characteristics of the particular river basin or sub-basin. The directive established a 6 years planning cycle in which maps and operative planning tools should be updated in participative way involving all public authorities at all level and also private actors. With this Directive it is therefore reinforced the rights of the public to access information and to be involved or consulted in the planning process as regulated in Chapter V. Art 10: “in accordance with applicable Community legislation, Member States shall make available to the public the preliminary flood risk assessment, the flood hazard maps, the flood risk maps and the flood risk management plans” and “Member States shall encourage active involvement of interested parties in the production, review and updating of the flood risk management plans”.

The flood directive integrates the water framework directive with disaster risk reduction focus and another planning tools that can be considered as a sub-plan of the Basin Plan that deals also with water quality and so on. It obliges states to develop risk maps that include not only hazards but also the exposure and vulnerability of territories. Thus, it calls for the integration of the social dimension to risk management. On the other hand, there are no references to the ecological dimension, which is covered more deeply by the WFD.

4.4.5. The Environmental Impact Assessment Directives

The Directive 2001/42/EC on Strategic Environmental Assessment (SEA) and 2011/92/EU Directive on Environmental Impact Assessment (EIA) are crucial in the project design and permitting stage. The difference between the two is that SEA is applied for plans and programmes while the EIA in the case of single projects.

The EIA Directive (85/337/EEC) firstly entered in force in 1985 and it has been amended five times, in 1997, 2003, 2009, 2011, and 2014. It applied to a wide range of defined public and private projects, which are defined in Annexes I and II. It is currently governed by the terms of EU Directive 2011/92/EU, amended by Directive 2014/52/EU on the assessment of the effects of certain public and private Projects on the environment. The 2014 version of the EIA Directive (2014/52/EU) lays down some amendments and addenda. Firstly, it amends article 1 as regards the definition of the process of environmental impact assessment. Relevant amendments concern the need to address certain shortcomings in implementation, reduce unnecessary administrative burden, simplify the assessment procedure and give more relevance to factors such as: population and human health; biodiversity, with particular attention to species and habitats protected; climate change; and disaster risk prevention.

The Directive foresees a mandatory EIA procedure for all projects listed in Annex I which are considered as having significant effects on the environment and require an EIA (long-distance railway lines, motorways and express roads, airports with a basic runway length ≥ 2100 m, installations for the disposal of hazardous waste, installations for the disposal of non-hazardous waste > 100 tonnes/day, waste water treatment plants > 150.000 p.e.). For projects listed in Annex II, the national authorities have a certain discretion to decide whether an EIA is needed or not according to criteria based on Annex III. This is done by the "screening procedure", which determines the effects of projects on the basis of thresholds/criteria or a case by case examination. In this case project have to go through the EIA procedure if they are likely to have significant effects depending on their nature, size and location (sensitive ecological areas) and potential impact (surface affected, duration). The directive establishes that the project proponents and developers are responsible for preparing and submit an Environmental Impact Assessment Report (EIA Report) as established in Article 5(1) which sets out the minimum requirements that should be included in the EIA Report. In short, this includes the following:

- A description of the Project: this is an introduction to the Project, and includes a description of the location of the Project, the characteristics of the construction, and the operational phases of the Project, as well as estimates of the expected residues, emissions, and waste produced during the construction and operation phases (Article 5(1)(a) and Annex IV point 1);

- **Baseline scenario:** a description of the current state of the environment, and the likely evolution thereof without the implementation of the Project. This sets the stage for the subsequent EIA, and Member States shall ensure information for the Baseline scenario held by any authorities is available to the Developer (Annex IV.3);
- **Environmental factors affected:** a description of the environmental factors impacted by the Project, with specific emphasis being placed on climate change, biodiversity, natural resources, and accidents and disasters (Article 3, Annex IV points 4 and 8).
- **Effects on the environment:** this section addresses the concept of ‘significant effects’ (More details on how to understand the concept of significant effects have been provided in the EIA Guidance document on Scoping) and the importance of cumulative effects (Article 5(1)(b), Annex IV point 5);
- **Assessment of Alternatives:** Alternatives to the Project must be described and compared, with an indication of the main reasons for the selection of the option chosen being provided (Article 5(1)(d) and Annex IV point 2);
- **Mitigation or Compensation Measures,** i.e. features or measures to avoid, prevent or reduce, and offset adverse effects should also be considered (Article 5(1)(c) and Annex IV.7);
- **Monitoring:** Monitoring Measures proposed should be included in the EIA Report, where significant adverse effects have been identified. This monitoring should be carried out during the construction and operation of a project (Annex IV.7);
- **Non-Technical Summary,** an easily accessible summary of the content of the EIA Report presented without technical jargon, hence understandable to anybody without a background in the environment or the Project (Article 5(1)(e) and Annex IV.9);
- **Quality of the EIA Report:** as well as presenting the Report well, complete with the Non- Technical Summary, experts preparing the EIA Report should be competent, and the Competent Authority reviewing the EIA Report should have access to sufficient expertise to examine it. Failure to include all necessary information can result in the Competent Authority requesting supplementary information (Article 5(3)).

Then the procedures foresee different phases as illustrated by figure 18. The screening and the EIA procedure have clear rules and the content of the project documentation and assessment

is the responsibility of the authorized person. Depending on the project, EIA screening may affect the process in terms of change and supplementation of the drawings or part of the project documentation, but also modifying the initial idea or concept project.

As pointed out before, the determination of whether a project should be made subject to an EIA must be made through a case-by-case examination, thresholds or criteria set by the Member State or a combination of the approaches. The EC guidance document defines the EIA Screening thresholds to be typically related to the quantitative characteristics of the Project (e.g. a development of a function of more than 20,000 m²), whereas criteria often relate to qualitative characteristics of the project or its impacts (e.g. a development that is deemed to have significant visual impacts on the surrounding environment, due to its architectural characteristics).

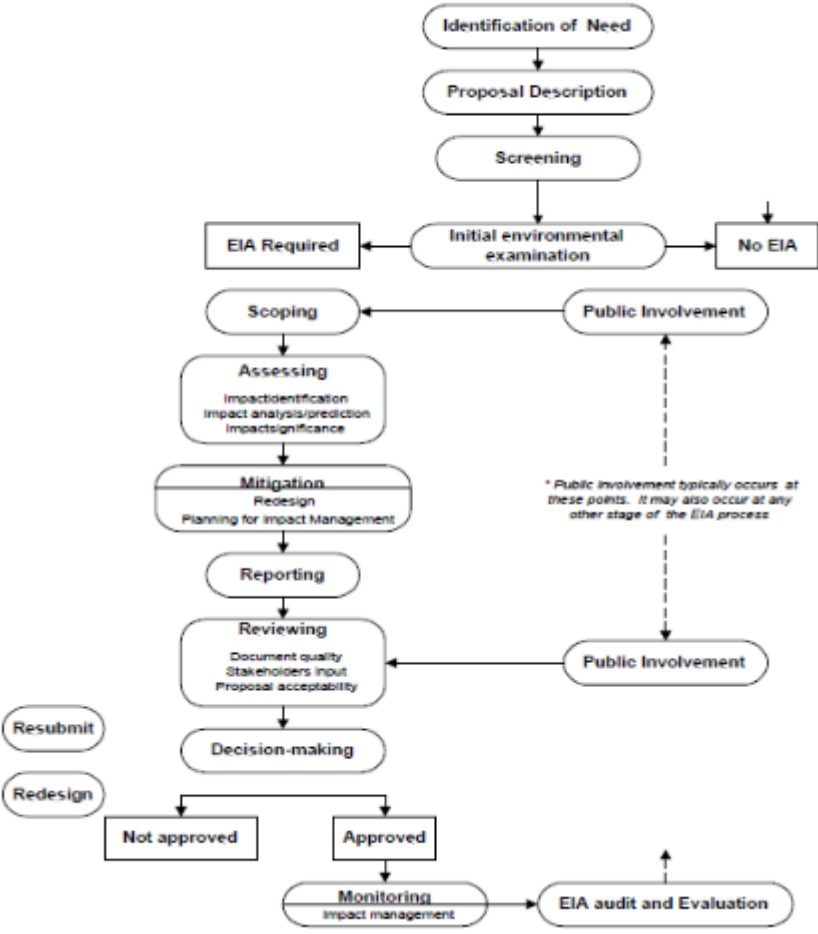


Figure 16 EIA procedures

This process aims at improving project design, generate environmental benefits and maximize transparency and social acceptance of projects (Commission 2021). The EIA instruments is one of the main tools through which the EU aim to operationalize the principle of environmental integration in decision-making process in this case regarding the operative level, where project are design and implemented.

The SEA Directive, instead, deals with plans and planning tools and it entered into force in 2001. It aims to assess the effects of certain plans and programmes which are likely to have significant effects on the environment. The Directive applies to public plans and programmes subject to preparation and adoption by an authority and which are required by national legislative, regulatory or administrative provisions.

According to article 3 of the SEA Directive, an environmental assessment is applicable for all plans and programmes, prepared in the fields of agriculture, forestry, fisheries, energy, industry, transport, waste management, water management, telecommunications, tourism, town and country planning or land use. Moreover, it is applicable to all those plan that make a framework for projects listed in the EIA Directive or which may affect the Natura 2000 sites. If the plan or programme are likely to have a significant effect, the assessment must be carried out during the preparation of the plan and in any case before its approval. Plans and programmes which fulfil the above requirements but which determine the use of small areas at local level and represent minor modifications to plans and programmes fulfilling the above requirements, are not automatically assessed: Member States have to determine, through case-by-case examination or by specifying types of plans and programmes or by combining both approaches, which plans and programmes have to be subject to an environmental assessment. The screening process is based on criteria set out in Annex II of the Directive. Member States may decide to apply the same approach to plans of other sectors, not mentioned in the Directive, which set the framework for future development consent of projects that are likely to have significant environmental effects. Again, this policy as its rationale on ensuring that high-level planning tools include environmental concerns in their development and implementation.

4.4.6. Green Finance

In accordance with the environmental integration principle (art 11 TFUE) the EU undertook a process of making its traditional financial instrument “greener” and a structural support for the ecological transition.

The Common Agricultural Policy, which include the biggest EU financial fund, it was included options for Green Infrastructures development, which are directly linked to NBS in Pillar 1, with the Greening package, and in Pillar 2 with priorities including “restoring, preserving and enhancing ecosystems related to agriculture and forestry”. Within the Cohesion policy, the EU's main investment policy, the European Regional Development Fund (ERDF) has a specific focus on “adaptation to climate change and risk prevention”: it supports adaptation measures by promoting ecosystem-based solutions and approaches, developing new infrastructures or retro-fitting existing infrastructures. Moreover, it contributes to developing disaster resilience at regional and local level, also for other types of risks. Through the investments to this objective, which amount to 8 billion euro, Cohesion Policy can address various types of risks, whether or not related to climate change adaptation. The predominant focus is on flood prevention. Investments from Cohesion Policy funds allow addressing specific risks through disaster resilience and disaster management systems. For instance, measures to address the “knowledge gap” such as the necessary academic research, studies and reports, strategy development, ICT support or awareness and education measures can be co-funded. Twenty Member States have selected risk prevention as a priority for the 2014-2020 funding period, depending on their specific needs. In addition, risk prevention, disaster resilience and climate change adaptation are integrated into other cohesion policy funding priorities, such as innovation, energy efficiency and water management. Cohesion policy support is complemented by other EU instruments, such as the Civil Protection Mechanism, the EU Solidarity Fund, Horizon 2020, and the LIFE program.

The EU has been also active in the attempt to orient private funds toward sustainability, biodiversity conservation and disaster risk reduction. The European Commission published its action plan on sustainable finance in 2018, with the aim of creating a roadmap for sustainable finance across three categories: 1) reorienting capital flows toward a more sustainable economy, 2) integrating sustainability into risk management, 3) fostering transparency and

long-termism. The European Union has now successfully implemented three major related regulations (EURONEXT 2022):

- Climate Benchmarks Regulation (EU 2019/2089) to enhance the transparency and comparability of benchmark methodologies relating to environmental, social and corporate governance (ESG) metrics, providing investors with clarity on the environmental sustainability of their investments.
- Sustainable Finance Disclosure Regulation (EU 2019/2088) to re-orient capital flows towards sustainable investments by increasing transparency by financial market participants and advisers on sustainability risks, whilst ensuring a more uniform protection of end investors.
- Taxonomy Regulation (EU 2020/852) which establishes a harmonised taxonomy to classify financial products as sustainable at EU level, further promoting investments in sustainable activities whilst addressing “greenwashing” concerns.

A range of ESG-related regulatory measures have since been introduced or announced that affect the manner in which companies operate within the European Union. Others are in phase of discussion and relates to: 1) strengthening Corporate Sustainability reporting with mandatory ESG standards, 2) strengthening the role of Green Bonds by clarify the definition of green economic activities based on the Taxonomy Regulation 3) Corporate Sustainability Due Diligence Directive (CSDDD) increasing companies responsibilities regarding negative ESG impacts in their own operations and value chains.

4.5. Discussion

European Union decision-making and policy implementation has then been described as a multi-level governance system where supra-national, national, regional, local authorities and interest groups are intertwined in a single governance polity (Hooghe and Marks 2001). How these levels interacts and where functions should be assigned has been at the center of a long-standing academic and political debates. EU environmental law at the initial stage developed not towards a complete harmonisation of domestic legislation but rather, it normally sets common minimum environmental standards aimed at achieving convergence among national legislation and ensuring “the optimum environmental improvement of the different regions” (Krämer 2001). However, its scope and field of application has grown as a response to cyclical crisis and the inability of Member State to obtain substantial result in several

environmental field including emission reduction, biodiversity conservation, disaster risk reduction.

The EU law has brought standardized practices all over Europe which present some degree of differences due to the extensive use of a flexible legislative tool such as directives and pre-existing features of the institutional and governance system. A first type of divergence in implementing directives, in particular in the environmental sector, into national systems derives from the political organization of each country with some systems like federal states delegating more powers to the regions or local governments, other countries centralizing environmental issues at central governments and a third group with a mix of the two (Kalas 2018).

Planning activities have been assigned to water basin authorities in all EU countries while for authorization and implementation there is more freedom given to member states. For instance, authorization functions can be managed by governmental agencies dealing with environment or even more specific agencies created for the purpose and rather autonomous. In any case it is possible to argue that the EU has had a relevant role in shaping a more decentralized and inclusive governance system at least in relation to formal institutions and policy frameworks.

A common trend is the increasing relevance given to environmental issues in EU policy that with the mainstreaming of environmental integration principles in every policy framework has become a cross-cutting issue and a pivotal principle of EU action. The many and scattered environmental policy frameworks seem to converge and try to identify synergies among them. In this attempt, the NBS has been identified by EU institutions as an instrument that can help in bridging many policy frameworks and EU objectives as they can potentially increase resilience and adaptive capacity, reduce disaster risk, and reverse the biodiversity loss trend. EU has started with innovation and research programs and is now looking for strategies to increase NBS mainstreaming on a large scale. At the EU level, NBS uptake and implementation is supported through policies to varying degrees. Policy frameworks that explicitly mention nature-based solutions include the European Green Deal, the Biodiversity strategy for 2030, the Green Infrastructure Strategy, the Action plan on the Sendai Framework, the Adaptation strategy, the Urban agenda and the Farm-to-Fork strategy (European Environmental Agency 2018). Nature-based solutions are a core element of the European Green Deal and recent major European policy initiatives, such as the EU

Biodiversity Strategy for 2030 and the new EU Strategy on Adaptation to Climate Change. They play a key role in the new EU Forest Strategy, the overarching Water Framework Directive, and the European Zero Pollution Action Plan for air, water and soil. Nature-based solutions also contribute to objectives established as part of international agreements, such as the Sendai Framework for Disaster Risk Reduction and the United Nations' Sustainable Development Goals. Through their role in the new European economy, nature-based solutions can also contribute to the targets established in the EU Bioeconomy Strategy and the EU Circular Economy Strategy and in the "Fit for 55 package" on the transformation of the EU economy and society to meet climate ambitions. They are a key element of the transformative changes needed towards a sustainable future (Cardinali, et al. 2021).

Key instruments within the European legal framework for NBS include the Environmental Impact Assessment (EIA) the strategic environmental assessment (SEA), the Habitats Directive, the Water Framework Directive (WFD) and the Floods Directive (FD) as they all set standard that, at least in theory, should represent an incentive to propose NBS projects and in some case an obligation. Provision to boost Green Finance and reduce bureaucratic requirement for green projects, aim to unlock private capitals by giving actors incentives in term of simplified procedures for authorizations, ameliorate the company ESG score and its brand position, and most importantly decreasing the cost of capital for green investments. For instance, companies might see NBS as a strategic frame to reach their carbon neutral objectives as a way of offsetting their greenhouse gas emissions to meet the Paris climate goal.

In conclusion, from the EU level it seems evident the increasing push for NBS mainstreaming, identified as a tool to fulfill its international obligations and improve the wellbeing and the ecological status within the EU territory.

Chapter V

The Italian Disaster Risk Reduction and Biodiversity Conservation Governance system

Due to the Italian peculiar morphology, composed of significant mountain ranges, complex river basins and the huge extension of coastal areas, its territory is exposed to multiple hazards, recently exacerbated by climate change. Is it therefore of outmost importance to build a governance system capable of adequately facing these frailties in a complex environment. The Italian institutional settings, in this specific field, has changed consistently over time as administrative reforms have reshaped the system several times. These features makes the Italian case a peculiar one that is worth to be further analysed to grasp lessons learnt and elaborate recommendations.

Environmental protection and risk mitigation in Italy are tasks assigned to a multitude of bodies and actors placed at different hierarchical and horizontal level. The system, intended as legal framework, governance structures and processes, has been built following multiple input coming from the Global, European, National and local levels and it is in constant evolution. If we adopt a long-term historical perspective, we can consider environmental and Disaster Risk Reduction (DRR) policies as “newcomers” in the national legal and governance system. Therefore, is not unusual that institutional settings, bodies, policies and planning tools are tested for the first time and are often revised according to their results or the changing contextual conditions. Therefore, in order to describe the system, it is preferable to analyse its dynamic evolution, as the snapshot given at present time would tell us just part of the story and would make it even more complicated to venture any potential future pattern of change.

In this chapter I am going to undertake a review of formal institutions,¹⁰ namely those that are written, codified and enforceable, thus the main legislative acts and tools of governance and management upon which the system is built. It will be done in four sections that represent the relevant thematic areas that compose this policy arena:

- Institutional settings of the water, land and DRR governance system
- Biodiversity protection and restoration
- Permitting path and Environmental authorizations for plans and projects
- Financing Disaster Risk Reduction interventions

For each thematic area, the main policy and legislative act are described, trying to adopt a diachronic and historical perspective. Finally, within every thematic area, there will be highlighted all the aspects that are potentially related to the NBSs which remain a cross-sectional topic throughout the chapter.

5.1. Institutional settings and planning tools

5.1.1. The Italian Constitution and the distribution of competences

The starting point of the review is the Constitution adopted in 1948, the backbone of Italian institutional and administrative settings and the main source of competence and power attribution among the different administrative levels. The Constitution in its first draft foresaw the administrative division of the territory in Regions, Provinces and Municipalities. However, Regions have been effectively established just in 1970 with Law n.281. Since then, it has been observed a period of expansion of structures and competences of local autonomies. In 1983 it was established the “State-Region Conference” with the aim of strengthening the coordination among administrative level through information sharing and consultations regarding general policy guidelines that may affect regional and local level.

¹⁰ Defined by Ostrom as written and enforceable rules

The process of expansion of local autonomies stalled at the end of the 1980 but regain strength in the second half of the 1990s reaching the peak with the “Bassanini reform” of 1997-1998 and the Constitutional reform of 2001. The first introduced the principle of subsidiarity¹¹ into the Italian administrative system and comprehensively redraws the map of competences, transferring to the periphery functions previously reserved to the central state apparatus. Constitutional Law No. 3 of 18 October 2001 completely reformed Chapter V, Part Two, of the Italian Constitution operating a new and different division of regulatory competences between State, Regions and Local Authorities, in response to the principles of subsidiarity and federalism, but also of partnership and participation, a principle set out at European level in the *White Paper* on Governance (2001). This document, indeed, proposed a change in the way power should be exercised. It promoted a less top-down and centralised model, in favour of greater openness to different actors in the policy-making process. The aim was to ensure broader participation of institutions and citizens, in the elaboration and definition of policies.

After the 2001 reform, Art. 117 of the Constitution assigned to the state the exclusive competence for the protection of environment, ecosystems and cultural heritage. Instead, regarding Civil Protection, land and spatial planning and valorisation of cultural and environmental heritage are matters of concurrent legislation between the State and Regions that will be analysed with more details in the following paragraphs. The reform had not a great effect in this policy arena as a law of 1989 had already assigned to the regions and interregional authorities the main competences and functions in water and spatial planning. Regarding environmental policies, the Constitution, in its original wording, did not contain any provisions explicitly aimed at protecting the environment, biodiversity and ecosystems. The only references to the concepts of “environment” and “ecosystems” were introduced with the 2001 reform as discussed before. Nonetheless, the doctrine and jurisprudence had already attempted to attribute a constitutional basis to environmental protection policies through innovative interpretation of other provisions. The Constitutional Court first started from Article 9 of the Constitution, whose second paragraph identifies the protection of the landscape and historical and artistic heritage as one of the tasks assigned to the Republic.

¹¹ Principle of Subsidiarity: the central state intervenes in matters involving environmental interests when objectives cannot be sufficiently achieved by the lower administrative levels of government

With the emergence of environmental concerns, the notion of “landscape” was interpreted extensively by the Court, moving from a concept that “aims solely at landscape values”, and thus merely aesthetic dimension, to a concept of landscape that implies an intrinsic value of nature “nature as such, and therefore fauna and flora itself” (C. Cost. 106/76). Therefore, since the 1980s, “landscape” has come to coincide more and more with the “the environment”, laying the foundation for proper environmental protection policies (Carrara and Martorana 2021). Lately, with Constitutional Court ruling No 210/1987, the right to health established in art 32 has been also understood as the right to a healthy environment strengthening the constitutional basis for environmental protection. Indeed, with Constitutional Law n.1 of 11 February 2022, voted by the vast majority of the parliament, a new paragraph has been inserted in article 9, elevating the protection of environment, biodiversity and ecosystem as a fundamental principle and task of the Republic. This can be considered an historical turning point given that the constitutional chart had never been modified in the Fundamental Principles section¹² before. Furthermore, Constitutional Law n.1/2022, includes in art. 41 of the Constitution, among the rights and duties of citizens in the sphere of free private economic initiative, the provision that business must be carried out “not to damage health and the environment”. Moreover, business must be directed and coordinated also “for environmental purposes”. With this constitutional amendment, Italy has set a milestone on the path of change and awareness on the part of public administrations, but also of civil society on environmental values.

5.1.2 Framework law for the defence of the soil n.183/1989

The first comprehensive law for integrated land and water management has been the Framework Law for the Defence of the soil (n.183/1989). It has been the result of a very long and complicated process. During the 1960s, Italy was shocked by extreme events in the Vajont valley (1963), Florence (1966) and Venice (1966). The disasters triggered a period of fierce debates about land and water management system and institutional settings carried out with the coordination of the so-called “De Marchi inter-ministerial Commission”, established in 1967. However, Italy was in the middle of administrative rearrangement which made extremely complicated to find a solution about the assignment of competences between the state, region and local authorities. Although the work undertaken by the “De Marchi inter-

¹² The Fundamental Principles Section of the Italian Constitution is composed by the first 12 articles

ministerial commission” and the Water National Conference did not find immediate application, their final report remained a milestone for further development in this policy arena. It indeed adopted a wide-ranging systemic and integrated vision of soil protection, through a multidisciplinary approach and a 30-year planning of hydraulic and forestry works (Rusconi 2019). Principles that had been partially incorporated in the law “Rules for the organisational and functional arrangement of soil protection” (*Norme per il riassetto organizzativo e funzionale della difesa del suolo*) n.183/1989. The law had been finally issued to ensure soil protection, water reclamation, the use and management of water resources for uses of rational economic and social development, as well as the protection of the environmental aspects connected with them. Law 183/1989 is of particular importance since, for the first time, the entire water cycle was taken into consideration, thus laying the foundations for an integrated management of water resources and land planning. Among the main innovations of this law were the identification of “hydrographic basins” in which the entire national territory has been divided. River basins were classified into basins of national, interregional and regional relevance establishing management authorities for each of them. In order to manage the hydrographic basin of national relevance, the law established the Basin Authorities, composed by three main bodies:

- Institutional Committee: chaired by the Minister of Public Works/Environment, composed of representatives of other ministries, and regional council.
- Technical Committee: it was the consultancy body of the Institutional Committee, chaired the General secretariat and composed by officials designated by both state and regional authorities according to the composition of the institutional committee. It could also be integrated by external high-level scientific experts.
- General Secretariat and Technical-Operational Secretariat: they were appointed for five years by the institutional committee, proposed by the Ministry of Public Works in accordance with Ministry of the Environment.

For what regards the Interregional hydrographic basin, the administrative functions in the field of hydraulic works and water resources had been transferred to the regions. The regions exerted such functions after an agreement among them, defining the formation of the Institutional Basin Committee and the Technical Committee, as well as the modalities of

planning activities and interventions. For basins of regional relevance, Art. 16 assigned directly to the regions the administrative functions of water resources.

One of the main tasks assigned to Basin Authorities was the drawing of the “Basin Plans” which are the territorial planning tool that aims to perform data gathering and assessment, regulatory, and technical-operational functions. According to art. 3 of Law 183/89, the activities of programming, planning and implementation of the interventions had to focus on a wide spectrum of specific objective and actions and the one more related to this case study are resumed below. Point “a” mentioned a focus on “the arrangement, conservation and recovery of the soil in river basins, with various types of interventions including naturalistic, botanical and faunal recovery processes”. The explicit mention of naturalistic recovery and intervention in the first point of the list, showed that sensitivity to an ecological approach from the side of the legislator already existed in 1989, and arguably even before. Other objectives mentioned in art. 3 focused on: the defence, arrangement and regulation of watercourses, the terminal branches of rivers and their mouths in the sea, as well as wetlands; the moderation of floods; the defence and consolidation of slopes and unstable areas; the containment of soil subsidence phenomena and the rising of sea water along rivers; the protection of the coasts from the invasion and erosion of seawater; the nourishment of the sandy shores, also by means of works for the reconstitution of the dune belts; the restoration of surface and underground waters; and, finally, the reorganisation of legal hydrogeological constraints.

The Law 183/89 regulated the procedure for the drafting and adoption of the plan. The Institutional Committee had to adopt criteria and methods for the elaboration of the basin plan in accordance with the guidelines established by the Law. The Institutional Committee also had to establish when and how to adopt the basin plan, including how to divide it into sub-basin plans (*Piani Stralcio*). The river basin plans may indeed be drawn up and approved by sub-basins or by fragments relating to functional sectors, which in any case must constitute sequential and interrelated phases among each other. The Technical Committee is then responsible for the elaboration of the basin plan with the support of the Technical-Operational Secretariat. The institutional committee is lately responsible for the approval of the plan that should be officially approved by a Decree of the President of the Council. The Institutional Committee has also the task of overseeing the implementation of the plan’s provisions and the

intervention programmes. The most relevant section that the Plan must contain are the following:

- Organised and updated informative framework of the physical system, of the land uses, as well as the special constraints imposed by the laws insisting on the basin.
- Identification and quantification of current and potential situations of degradation and their causes.
- Indication of the necessary works needed to mitigate the risks.
- Planning of water, agrarian, forestry and mineral resources use.
- Preliminary assessment of intervention including environmental impact, financial requirements and cost/benefit analysis in order to justify choices among alternatives.
- Priorities of the interventions and their organic development over time, in relation to the severity of the instability.
- Indication of the areas to be subject to special protection, environmental and urbanistic constraints.

In short, the Basin Plan should have drawn a picture of the situations of degradation, instability and risk, as well as overuse of water resources. Then, the plan had to identify interventions, structural and non-structural, necessary for the pursuit of the objectives set by the law.

Within the variety of planning tool existing in various policy sectors and regional or local administrative level, the basin plan and its sub-plans have been placed at the top of the hierarchy. The provisions of the approved basin plan are immediately binding for public administrations and bodies, as well as for private subjects and within 6 to 12 month, the other planning tools should be modified in order to abide to the plan provisions. The law 183/89 established that the basin plans had a lifespan of three years and intervention programmes should have been periodically included in annual Financial Laws. Law 183/89 had also provided for the reorganization of the State Technical Services (Hydrographic and Tidal, Geological, Dams and Seismic) by transferring them to the Presidency of the Council. However, the reform of the State Technical Services was not implemented. On the contrary, their functions were subsequently distributed, in a fragmented manner, among the Regions and some State Ministries.

Despite the effort, the formation of basin plans proved to be a complex and difficult achievement. Beyond the overall administrative reorganization, a critical issue was the enactment of subsequent regulations that interferes, often in a un-coordinated manner, with the original path of the law (Rusconi 2019) The basin plans, approved only in very few cases in the following years after long and exhausting technical-administrative processes, then failed to find concrete implementation. They ended up forgotten in the archives, while the three-year intervention programs were never drafted. A bicameral commission, appointed by the Parliament in 1999, published its conclusion confirming "a substantial ineffectiveness" of Law 183. It was alleged that the partitioning of hydrographic basin in three class (national, interregional and regional) created an excessive fragmentation of operations for land and water management. Moreover, the juridic nature of basin authority, its functions, and its relationship with other Institutions was unclear and sometimes planning tools overlapped. Finally, some provision of the law had never been applied such as the establishment of the National Technical services at the state level.

Nevertheless, the bicameral commission concluded affirming that law 183/89 needed some corrections but its structure was sound and rational. It is the first law to pursue the goal of soil protection and represented the first attempt to adopt an integrated approach between soil, water and spatial planning. The Law has been amended several times to adjust the shortcomings that have arisen in its application and to comply with European directives. Decree Law No. 398 of 5 October 1993 amended Article 17 of Law No. 183/89 by introducing and defining the Hydrogeological Structure Plan (*Piano Assetto Idrogeologico*, PAI) as a sub-plan of the basin plan. The plan delineated hydraulic and geological hazard areas and introduced strict standards according to the different hazard levels highlighted in special watershed maps.

The Galli law (n.5/1994) is another relevant act for water resources management. It is more related to abduction, distribution and treatment and thus water quantity and quality rather than Disaster Risk Reduction, but still it is worth mentioning it as some aspects are interrelated. The Law aimed at the vertical unification of the various management segments and avoid fragmentation. It established the Integrated Water Service ("IWS"), understood as the set of public services for the collection, adduction and distribution of water for civil use, sewerage and wastewater treatment. The law provided that the IWS has to be managed within "Optimal

Territorial Areas” (*Ambiti Territoriali Ottimali*, ATO), identified by the regions, which have also the task of creating an authority for each ATO. The organization of the Integrated Water Service is based on a clear distinction of functions and actors to which such functions are attributed, in particular and schematically: a) the activities of general guidance and planning are the responsibility of the Central Administration and the Regions; b) the functions of government, organization and control are the responsibility of the local authorities, namely the ATO; c) the management and operational activities to the operators that can be public, private or hybrid. The Galli law did not directly cope with Hydro-meteorological risk mitigation, but it might have indirect effect on this management field. Indeed, how the planning and management activities at the ATO level interferes with other planning tools such as the Basin plan and PAI might be an interesting aspect to deepen further.

Going back to amendments of the Framework Law for the defense of the soil 283/1989, the so-called “Sarno law” n. 267/98, introduced a real power of substitution for the Council of Ministers, which operates in the event of inertia on the part of the competent local administrations. This law also set the first deadline for the adoption of the PAI which was the 31 of December 1998. Deadline that was postponed several times soon after as the plans were often drafted with significant delays. Lately, the so-called Soverato Law n. 365/00, regarding the adoption of basin plan and subplans introduced a planning conference between the Region, Provinces, municipalities and the Basin Authority. The aim was to ensure consistency between basin planning and territorial planning through the instrument of consultation between all the actors involved. The system was then significantly modified due to the inputs that came from the EU Water Framework Directive n.2000/60/CE that has been transposed into national law 6 years later with the Legislative Decree 152/2006, also known as the *Environmental Code*, that we are going to discuss in the next paragraph.

We have seen that the path toward the setup of an institutional apparatus and governance system has been problematic since the beginning of the 60s. We can identify a period of negotiation and administrative reshuffle that from the late 1960s culminated with the law n.183/1989 which represent the first comprehensive attempt to give a rational structure to the institutional settings. Soon after it started a period of experimentation as the new bodies and planning tools needed years of adjustments to become fully operational, correct shortcomings and flaws. However, the constant reshuffling of regulations, deadlines and delays in

implementation remained. A positive development certainly was that Disaster Risk Reduction planning was progressively integrated into “general” spatial planning and gained relevance into every administrative and political level. Another pattern clearly observed is that changes and developments of the system are often due to responses to disasters. As in the 1960s, DRR come at the centre of the political debate after disasters had occurred, as it is clearly testified by the name assigned to legislative acts. For instance, The “Sarno” and “Soverato” decrees owe their name to disasters in which dozens of people lost their life. Laws were thus often enacted immediately after a disaster and not harmonized and planned according to disaster prevention approach. Despite progress in the legal framework and institutional structures, at the operative level there was still a lack of a systemic approach that considers the three phases of disaster prevention, planning, and management as a whole. There was lack of capability in planning despite the laws provided some tools. It is possible to argue that the abrupt and messy devolution of power to local authorities played certainly a role in this regard. The regions, that become the focal point of the system, needed time to organize themselves and, while some obtained better results, others remained far behind, especially those in southern Italy that lacked the technical expertise and administrative capability to fulfil such complex tasks.

5.1.3. The Environmental Code (D.lgs 152/2006)

Legislative decree 152/2006, or *Environmental Code*, and subsequent amendments are still the backbone of Italian environmental law. It was issued to rationalize and harmonize the previously scattered and fragment legislation concerning environmental management. It has also been the normative tool through which Italy transposed into the national legal system the Water Framework Directive, the Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) directive discussed in the previous chapter. The declared objective of the code was the promotion of human wellbeing, to be achieved through the preservation and improvement of environmental conditions and the prudent and rational use of natural resources. It reiterates the principles of precaution, preventive action, corrections against damage caused to the environment, as well as the polluters pay principle. Moreover, every activity juridically relevant for the purpose of the environmental code has to conform to sustainable development principles established at the international level. The law stated that public authorities, at all levels, must observe these principles and operationalize them into the

decision-making process. The Environmental Code also reiterates the principle of subsidiarity, namely that the lower administrative and political levels are tasked for environmental management unless there is a lack of capacity to reach the objectives, or the scale and magnitude of the issue are too wide and should be tackled at higher level.

For this case study, the part III of the Code “Soil protection and combating desertification, protection of water from pollution and water resources management” is of utmost relevance. This section abrogated Law n.183/89 and significantly reformed the land and water governance system. Art. 64 reshaped the administrative division of hydrographic basins as it subdivided the national territory into River Basin Districts bringing together various regional and interregional river basins established by Law 183/89. The Po River Hydrographic District after the reform comprised the Po, Reno, Fissero/Tartaro/Canalbiano, Conca Marecchia, Montone/Ronco/Savio/Rubicone/Usò, and minor basins of the Romagna coast River Basin. Article 63 established the District Basin Authorities (DBA) for each Hydrographic District while the Regional and Interregional Basin Authorities were suppressed. The interregional authority of the Conca-Marecchia and the regional authority of the Romagna basins, on the other hand, was only effectively abolished in 2017 following the Ministerial Decree of 25 October 2016. In order to achieve cost efficiency, they have been merged with the Po River Basin District Authority even though these basins are separate from the Po River basin. According to paragraph 10 of art. 64 of the environmental code, the Basin Authorities has two main tasks which resemble those attributed by the abrogated law:

- a) Draw up the District Basin Plan and its subplan, including the River Basin Management Plan, foreseen by art. 13 of Directive 2000/60/EC, and the Flood Risk Management Plan established with art. 7 of Directive 2007/60/EC, as well as the Intervention Programmes.
- b) Express an opinion on the coherence with the objectives of the Basin Plan of European Union, national, regional and local plans and programmes relating to soil defence, combating desertification, water protection and water resource management

The bodies of the newly established Basin Authorities partially changed compared to the law of 1989 and are now the following: the Permanent Institutional Conference, the General Secretary, the Operational Conference, the Technical Operational Secretariat and the Board of Auditors. The Permanent Institutional Conference is the political steering body within the

Basin Authority. It replaces the previous Institutional Committee and inherits its task, mainly the adoption of policy and planning acts and the coordination and monitoring of activities. It is convened by the Secretary-General and it is participated by the Presidents of the regions whose territory is affected by the river basin district, the Minister of the Environment and the Minister of Infrastructure and Transport, the Head of the Civil Protection Department and, if necessary, the Minister of Agricultural, Food and Forestry and the Minister of Cultural Heritage and Tourism. Regional Presidents and Ministers may be represented respectively by delegated councillors and undersecretaries. Finally, representatives of the most relevant agricultural organisations and one representative of ANBI (National Association of Irrigation Land Management and Protection Consortia) may be invited with advisory capacity. The Operational Conference is composed by the same share of representatives of the administrations present in the Permanent Institutional Conference and it is still convened by the Secretary General, who chairs it. The Conference decides by a three-fifths majority of those present and, for its informative activities, it may draw on the advice of experts from public bodies, research institutes and also private companies. The Operational Conference has to deliver an opinion on the District Basin Plan and its subplans and programmes and it also issues directives, including technical directives regarding the activities referred to in paragraph 10, letter b, discussed above. The Technical-Operational Secretariat is composed of the Secretary General, the managers of the central and sub-district structures or territorial directorates of the authority, and the head of the Secretary General staff office. It is supplemented by the executives identified by the Regions who operate with district functions in the territorial structures. The Technical-Operational Secretariat is the body that in practice draws up the District Basin Plan in accordance with the law and the input of the political body. Finally, it also contributes to express an opinion on the coherence between the various planning tools. The board of auditors instead is a new body that was not present before and it exerts functions of control and monitoring of both financial and operational aspects.

The Law 152/2006 also partially innovates the content and procedures of the Basin Plan. The new version, compared to the previous one, also contains:

- A specific focus on works required for drought risk demonstrating that attention for drought was increasing in Italy and Europe.

- Reward mechanisms in favour of owners of agricultural and woodland areas who implement suitable interventions to prevent hydrogeological instability phenomena: this is an innovative policy tool to make privates more sensitive and responsible for land management.
- The requirements for the Basin Authorities to promote the active participation of all interested parties in the elaboration, review and updating of the basin plans, ensuring that, for each river basin district, they are published and made available for possible comments from the public, including users, allowing a minimum period of six months for the submission of written comments (art. 66).

Regarding the final adoption of the plan, it is worth noting a relevant novelty compared to the previous procedure. Given that Decree 152/06 implemented the Strategic Environmental Assessment directive, the Basin Plan must now overcome a structured assessment procedure at the State level, carried out by the Ministry of Ecological Transition, before being finally approved by decree of the President of the Council. The law clarifies that Basin Plan may be articulated in sub-basin plans or by means of sectoral plans relating to functional sectors (art. 65, paragraph 8). These plans maintain the same nature of territorial plan and their role of coordination for other sectoral planning instruments. They are placed by the law at the top of the hierarchy of territorial planning tools. Indeed, socio-economic and development, land use, urban, agricultural, zootechnical, forestry, water protection, waste management, and site reclamation plans must be coordinated, and in any case avoid conflict, with the approved basin plan (art. 65, paragraph 4). The District Authority can also issue a binding opinion on the consistency of these plans with the objectives of the basin plan. In case of observed conflict, the competent administrations must adapt their plans and programme within one year after the approval of the Basin Plan.

Alongside the Basin Plan, art 117 of the Environmental Code, in accordance with provision of the EU Water Framework Directive, established that for each hydrographic basin, the Basin Authority has to draw a Water management Plan, also known as *Water Plan* or *Management Plan*. It represents an internal articulation of the Basin Plan that focuses more on water quality and it is adopted with the same procedure as the other planning tools. The Management Plan

is composed by elements indicated in part A of Annex IV to the part III of the Environmental Code and they include:

- General description including the cartographic representation of superficial and groundwater body and the ecoregion.
- Reporting of the condition for every water body according to criteria set in Annex III.
- Synthesis of pressure and significant impact exerted by anthropic activity on the water body status.
- Representation of protected area.
- Map of monitoring stations.
- List of environmental objectives for water bodies and protected area.
- Synthesis of economic analysis of the water use.
- Synthesis of the set of measure adopted and how to put them into practice.
- Action needed to abide to EU directives.
- Synthesis of action undertaken for information and consultation
- List of competent authority within the area.
- Responsible for the procedure to obtain the documentation and information

Again, it is evident how such plans are demanding in terms of information needed, the number of institutions, bodies and actors to be involved for its drafting, approval and implementation and the level of technical capacities and expertise required. Nevertheless, once the system is functioning and oiled and the level of details increase, these plans might become a paramount tool for the management of water and land resources. In order to do so, for the public administrations, would be fundamental to employ adequate human resources and integrate processes and practices, including innovative technological planning tools.

The management plans (art. 117) are approved with the same procedure as the district basin plans and with the contents indicated in annex 4 to part III of the Environmental Code, and they are to be considered as sub-part of the Basin Plan. The EU directive established that all the plans has to be revised every 6 years, doubling the planning time span compared to the time span foresaw by Law 183/1989. In the meantime, between the 6-year programming cycle, the basin authority has the power to adopt variants and updating. Legislative decree

49/2010 transposing the Floods Directive regulates the activities of evaluation and management of flood risks and establishes the procedure for planning at the basin and sub-basin levels with the Flood Risk Management Plan (*Piano di Gestione Rischio Alluvioni*, PGRA). The decree faithfully reproduced the EU directive, and it did not introduce substantial novelty compared to the structures envisaged by Law 183/89 and 152/06. Worth of mentioning is that it introduced for the first-time the definition of floods and flood risk into the Italian legal framework (Testella 2011). The PGRA are built upon the risk maps, which are an evolution of the “perimetrations” envisaged by previous laws and represent the informative and tools through which interventions and their location are decided. The law reiterated and stressed the relevance of participation and stakeholder engagement in the planning process. The PGRA constitutes a sub-plan of the basin plan and, as the other, is adopted by the Basin Authority with the same procedure discussed before. It includes all the intervention required for risk mitigation and it is also revised every 6 years through a participated process.

5.1.4. River contracts

River Contracts were introduced in Italy following the second World Water Forum held in The Hague in 2000, organised by the World Water Council. The Forum defined river contracts as forms of agreement that allow "the adoption of a system of rules in which the criteria of public benefit, economic performance, social value and environmental sustainability intervene equally in the search for effective solutions for the redevelopment of a river basin". River contracts are strategic planning tools, negotiated on a voluntary base, supposed to raise the quality of the environmental management of river, implementing an integrated management of hydraulic-geological risks and maintenance of watercourses (MATTM 2017). They can be a useful tool for a more efficient and effective implementation of the objectives of good environmental quality and safety identified at EU level by the Water Framework Directive, the Floods Directive, the Habitats Directive, and the Marine Strategy Directive.

The River contracts are regulated in the Italian legal system by Article 68-bis of the Environmental Code. They are designed to not undermining existing competences, regulatory frameworks and planning tools, but promotes their greater integration and synergy (Ridolfi, Montaletti and Santolini 2018). In the Basin District Plan, River

Contracts are indeed mentioned as non-structural management tools. The River Contracts, to be operational, are articulated in eight main phases, coordinated by regional authorities, that lead to the definition of an Action Programme (AP). The AP are characterised by a well-defined and limited time span, usually intervals of a maximum three years. At the expiry of the AP, on the basis of the monitoring results, it will be possible to update the river contract or approve a new AP. Together with the objectives for each action, the AP must also indicate the actors participating and their role, as well as the respective obligations and commitments, the timeframe for implementation, the necessary human and economic resources and the financial plan. On the main objective of river contracts is the promotion of multi-stakeholder governance, active participation, and the integration of knowledges, disciplines, objectives, and policies. These tools aim to a constant involvement of actors operating in the territory, including private actors, encouraging sharing, support and ownership in water and land management. Finally, River Contracts also aims at fostering greater awareness of local communities on the value of water and aquatic ecosystems and protection and prevention action (Ridolfi, Montaletti and Santolini 2018).

River contracts can play a relevant role in preserving biodiversity, eco-systems and their functions, and in reducing vulnerability to extreme natural phenomena. For their own nature, these tools have been envisaged in the awareness that the river should be considered as an ecosystem extended on a territorial scale, whose functionality is the main guarantee of reproducibility of the water resource and protection from hydrogeological risk (Ridolfi, Montaletti and Santolini 2018). River contract can thus be a means for the mainstreaming of Nature-Based Solutions. As they foresee open participative processes the actors and networks that are insisting on NBS have a chance to make their voices heard. It is probably a more open tool but the assessment of its efficacy will be tested with expert interview.

River contracts have inspired similar agreements for other ecosystems such as lakes, wetlands, coastal lagoons, seashores and aquifers. Today in Italy there are more than 250 river contract processes in place at different stages of development and, among them, several dozen signed and in the process of implementing their respective action programmes. However, there is the need to mainstream their adoption and refine their use, as it the first time that such tool have been implemented. For instance, the Chamber of

Deputies, with the resolution n. 8-00092 of 13 October 2020, commits the government to promote, also through river contracts, in cooperation with the regions and district authorities, sustainable and periodic hydraulic maintenance interventions in river basins and sub-basins that aim at maintaining the natural characteristics of the riverbed, the proper maintenance of river mouths and river sections.

Moreover, beyond the need to strengthen the adoption and implementation of river contracts, it would be useful to clarify their nature, for instance, their practical relations with other planning tools, their binding and enforceable mechanism, which are the actors who participate and really have a say in the process. It has been identified the need to foster greater synergy and continuity between the strategies and choices made by the river basin district authorities (Adbd), the outlines of regional policies and the demands of local communities on river basin management in the next phase of updating the management plans of river basin districts. Finally, the resolution n. 8-00092 also urged including in river contracts more emphasis on initiatives related to correct information and multidisciplinary training. Again, the can be considered as a tool to promote a more integrated and inclusive management of river basins.

5.1.5. Civil protection

The Civil protection is another fundamental actor not just in disaster response but also for risk mitigation activities. As wide portions of Italian territory are characterized by frailties and are hazardous prone, it has been necessary to build a flexible system with response and preventive capacities on the whole Italian territory. This is why, in Italy, the Civil Protection is not a task assigned to a single body, but a function attributed to an integrated system composed of public and private, central and territorial structures: the National Service, was first established in 1992 by Law n. 225 and reformed in 2018 by the Civil Protection Code. The Civil Protection activities now cover the whole spectrum of the risk cycle and tasks, listed in art. 2, of the Code and comprises forecasting, preventing and mitigating risks, managing emergencies and overcoming them. Prevention consists of all structural and non-structural activities such as early-warning, awareness activities, network creation and coordination. Civil Protection participates actively to the elaboration of national and regional guidelines, as well as to the definition of planning tools and policies for the definition of

structural prevention policies of natural or man-made risks and for their implementation. The main planning tools are the Civil Protection Plan that are drafted at different administrative level and are the set of measures and operative procedures of intervention to face hazards in a given territory. The plan is articulated in three main sections:

1. General part: gathers all information on the characteristics and structure of the territory;
2. Planning guidelines: they set out the objectives to be achieved in order to provide an adequate civil protection response to any emergency situation, and the competences of the various operators.
3. Intervention model: assigns decision-making responsibilities to the various levels of command and control, establishes a rational use of resources, defines a communication system that allows a constant exchange of information.

The civil protection plan can be constantly revised according to the evolving scenario and requirements of the territory. Furthermore, the Civil Protection assist the competent authority for the drafting of planning documents such as PAI, PGRA, local civil protection plan (municipal, supra-municipal level). It can contribute to every phases, including risk assessment and intervention planning and evaluation phase.

Civil protection also has the task of improving strategies for reducing hydrogeological and hydraulic risks by strengthening governance, cooperation between the different levels of government, and the capacities and skills of the territory. Which takes place both through coordination tables at provincial or regional level, or specific programmes such as the National Operational Programme Governance and Institutional Capacity (*Il Programma Operativo Nazionale (PON) Governance e Capacità Istituzionale*). The latter financed by the European Union and mainly aimed at regions with poor administrative capacities.¹³

The Civil Protection can indeed play a central role for Nature-Based Solutions mainstreaming in its dual role of actors involved in planning activities but also with operative functions. The Civil Protection has for instance the task of drafting tenders for interventions and thus the power to decide which type of intervention better suits the need of specific cases, which can be NBS or not.

¹³ PON Governance is one of the 2014-2020 cohesion policy instruments financed by the European Union through the European Structural and Investment Funds - EIS Funds

5.1.6. Coordination bodies and normative simplification

Due to the plenitude of authorities and bodies, as well as the variety of planning tools that has been shown before, the Italian system has proven to be lacking both vertical and horizontal coordination which, alongside other factors, slow down the implementation of preventive measures. Thus, during the 2010s, arose the need to simplify the legislative framework and create coordinating bodies trying to harmonize the system. Decree-Law No. 91/2014 established the mission structure “Sae Italy” (*Italia Sicura*) with the task of carrying out a work of integration of competences and coordination of the Ministries of the Environment, Infrastructure, Agriculture, Cultural Heritage, Economy, the Regions and the 3,600 other entities scattered throughout the territory that are involved in the mitigation of hydrogeological hazards. It was aimed at ensuring the preparation, in agreement with the Regions, of a National Plan for the planning of works and interventions to counter landslide and flooding phenomena for the years 2014-2020 and a financial plan for investments. The structure, therefore, had to ensure the integration of the phases relating to the planning, the rational allocation of resources to the various levels of government and finally the effective implementation of interventions (Corte dei Conti 2019).

A relevant development happened with Decree-Law 12 September 2014, emblematically called “Unlock Italy” (*Sblocca Italia*), appointed the Presidents of the regional Council as commissioners for risk mitigation with additional administrative power in order to overcome bureaucratic barriers for the implementation of urgent interventions. The President then delegates to an appointed official within the regional administration all the technical-administrative activities necessary for the implementation of the Programme Agreement between the government and the region.

Lately, the new government, appointed after the 2018 elections, decided to shut down the Mission Structure *Italia Sicura* defined by the Ministry of Environment Costa as a “useless body”¹⁴ and transferred its functions back to the Ministry of the Environment. Lately, with the Decree of the President of the Council of Ministries 15 February 2019, it was established

¹⁴ Quote from newspaper article: Ulivieri V., “Dissesto, il governo chiude Italia Sicura: “No a enti inutili”. Gli esperti: “Utile per coordinare, Regioni da non lasciare sole”, *Il Fatto Quotidiano*, 12 luglio 2018

the Steering Committee *Strategia Italia (Cabina di regia strategia Italia)* with very similar objective compared to the mission Structure *Italia Sicura*. It indeed has the task of coordinating and improve public policies aimed at mitigating risks related to hydrogeological hazards and environmental degradation. It has the task of verifying the state of implementation of public works, plans and infrastructures and investment programmes and to adopt appropriate initiatives to overcome obstacles and delays. The Steering Committee also carries out tasks of coordination, monitoring and control in relation to the correct, effective and efficient use of the economic and financial available resources (Servizio Studi Camera dei Deputati 2022).

The Steering Committee should therefore guarantee the political, strategic and functional connection to facilitate an effective integration between the planned investments and to favour the acceleration of the financed interventions. It acts with the impulse of the Presidency of the Council of Ministers, with the technical, informative and organisational support of the Department for Planning and Coordination of Economic Policy (*Dipartimento per la Programmazione e il Coordinamento della Politica Economica, DPCPOE*) and in coordination with the Mission Structure called “Investitalia”¹⁵. The Steering Committee is chaired by the President of the Council of Ministers or by the Undersecretary of State to the Presidency of the Council of Ministers. It is composed of the Minister of Economy and Finance, the Minister of Infrastructure and Transport, the Minister of the Environment and Protection of Land and Sea¹⁶, the Minister for the South and the Minister for Regional Affairs and Autonomies. It can be integrated, if necessary, by the Ministers concerned with the matters in question, as well as the President of the Conference of Regions, the President of the Union of Italian Provinces and the President of the National Association of Italian Municipalities.

However, these structures and the additional powers entrusted to the president of the region were focused on speeding up major interventions of a grey nature. Little or nothing was done to promote these solutions since the strategic objective at the time was to reduce the risk as quickly as possible due to the delays accumulated over the years.

¹⁵ Established with art. 1, paragraph 179, of Law No. 145 of 30 December 2018.

¹⁶ Now Ministry of Ecological Transition

5.1.7. Piano Nazionale per la Mitigazione del rischio idro-geologico (dpcm 20 febbraio 2019)

The attempt to rationalize and harmonize the system also led to the approval of the National Plan for Hydrogeological Risk Mitigation, Restoration and Protection of Environmental Resources (so-called *ProteggItalia*).¹⁷ The plan pursues indeed the formation of a unitary, orderly and taxonomic framework, concerning the needs, the relative breakdown of the areas of intervention and measures of intervention identified as follows: I) emergency; II) prevention; III) maintenance and restoration; IV) simplification measures; and V) governance and organisational strengthening measures.

With action 5, the National Plan provided for the elaboration of an extraordinary operative plan or “*Piano Stralcio*” for the year 2019 with the aim of catching up on accumulated delays with intervention implementation. It indeed aimed to accelerate with the more readily executable interventions. The drawing and implementation of the *Piano Stralcio* was coordinated by the Steering Committee *Strategia Italia*, the mission structure *investitalia* and the Inter-ministerial Committee for the Economic Policy and Sustainable Development (CIPESS). According to the National Plan, the operational plan on hydrogeological instability for 2019 includes: a) the synthesis of the available financial resources; b) the overall list of proposed interventions, confirming, modifying those already provided in previous Plans or agreements with the Regions; c) the distribution of the operational competences and responsibility; d) the system of operational governance and institutional partnerships e) the timetable of the activities; f) the expected results also in terms of social and economic impacts and benefits; g) a more precise and transparent criteria for the selection of the interventions; h) a monitoring, reporting and management control system, suitably strengthened with the integration of the existing databases.

Interestingly, the Operational Plan or *Piano Stralcio* 2019 acts in derogation of the Decree of 28 May 2015, namely the decree that previously established criteria and procedures for the financing of projects related to hydro-meteorologic risk mitigation. The lists of intervention, drafted for each region, established by the plan are thus defined by the competent Ministries, through special Conference of Services¹⁸, on the basis of the needs and proposals of the

¹⁷ Prime Ministerial Decree of 20 February 2019,

¹⁸ Conference of Services are discussed in subsequent paragraph

interested regions, with the contribution and participation of the commissioners for the emergency, the extraordinary commissioners for hydrogeological instability, and the district basin authorities. This is paradigmatic on the mechanism that leads to confusion within the system as the attempt to rationalize it and standardize procedures and criteria often clashes with the need to catch up with delays and respond to emergencies or disasters. The figure of Commissioners become then fundamental, but the discretion given to the regional president to speed up the processes can be considered an extraordinary emergency measure. The system therefore still needed an organic reform to develop a structured, standard and well functioning procedures to increase implementing capacity.

Nevertheless, despite the emergency legislation, the National Plan aimed also to standardize and harmonize the system in the medium and long term. It for instance, gave the input for the redrawing of the mechanism for allocating resources more efficiently. Subsequently, the Ministry of the Environment, in agreement with the Ministry of Infrastructures, was therefore engaged in updating the DPCM 28 May 2015, concerning the identification of the criteria and modalities for resource allocation destined to hydrogeological risk mitigation interventions. It will be further discussed in the section dedicate to financing of mitigation intervention.

Another fundamental problem identified by experts, practitioners and also the National Court of Auditors (*Corte dei Conti 2019*) was the lack of project design skills and capability. The Plan, with action 6, foresaw the strengthening of engineering and technical capacities for the design of interventions. The Project design fund (*Fondo Progettazione*), established with Collegato Ambientale (law n. 221/2015), have been thus increased and assigned to the Presidents of the regions due to their role as Government Commissioners against hydrogeological risks.

The plan, with action 7, also commits the Government, in cooperation with ISPRA, the District Basin Authority, the National Civil Protection System, land reclamation consortia and irrigation bodies to draw an Ordinary Land Maintenance Plan. The plan also urges to harmonize and systematise the Hydrogeological Structure Plans (or PAI), on the basis of guidelines or methodologies to systematise all the elements available to date relating to the estimation of landslide and coastal risk. Finally, for what regard preventive measures, the plan expressed the need to verify the state of effective functionality and full operative capacity of the District Basin Authorities and the completeness, updating, adequacy and systemisation of

the Flood Risk Management Plans and River Contracts. Within area of intervention III of the plan, namely “maintenance and restoration measures”, it was foreseen the strengthening of the Small Municipality Risk Mitigation Plan assigned to the Ministry of the Interior. It provided the preparation of a hydrogeological defence plan for mountain areas, agriculture and forestry, including: the reconstruction or extension of hydraulic and hydrogeological works, new hydrogeological defence works for canals and watercourses, measures to protect slopes from landslides and avalanches, and the restoration of landslide areas, including drainage. The plan also foreseen the intervention for maintenance and restoration of irrigation infrastructure and their integration within a risk mitigation perspective. These new planning activities might potentially be another occasion for the mainstreaming of NBS.

Interestingly, for the purpose of this research, the intervention area IV of the annex C to the Plan, contains guidelines and actions for process simplification, organisational and governance strengthening (Servizio Studi Camera dei Deputati 2022). For this purpose, the plan indicated to improve the connection between the Steering Committee *Strategia Italia*, the competent Administrations at State and Regional level and also the steering committee *Investitalia*. This would permit the creation of a sort of unified finance, to make the allocation of resources easier, the implementation of the actions more effective and the adoption of forms of valorisation/penalisation to responsible bodies. Moreover, action n.28 gave the input for a revision and rationalization of the power of government commissioner. It stressed the need to anticipate the participation of other authorities since the early stages of projects design, with definite timeframe, and a precise attribution of responsibilities. For instance, for each intervention, it will be compulsory the individuation of a specific Implementing Subject to be identified among the officials of the regional administration. The plan also foresaw the establishment of a task force for accelerated interventions that can support each region in overcoming technical and administrative criticalities. It finally identified the need to streamline legislation with explicit repeals of unimplemented or ineffective regulations, the revision of the Environment Code and Decree-Law No. 109 of 2018, in particular Article 40.

Other input for the reform of the system came from the National Recovery and Resilience Plan (Piano Nazionale di Ripresa e Resilienza PNRR). The plan is a financial aid programme established at EU level with the aim of financing strategic projects to help countries overcoming the pandemic, economic and environmental crisis. The allocation of the PNRR

funds is conditioned to several reforms set out in the plan itself. Within the framework of the required reforms to obtain the PNRR funds, one was aimed at simplifying and accelerating the procedures for the implementation of actions against hydrogeological risk. This requirement was included within Section II of the plan measure (M2C4.2- R.2.1-1) and it was due to June 2022 and it was finally approved in 2021 with a decree that will be discussed later. The suggested reform aimed at overcoming procedural criticalities linked to the absence of an effective governance system in actions to combat hydrogeological instability. The following actions were envisaged: the simplification and acceleration of the procedures for the financing of interventions; the strengthening of the technical support structures of the extraordinary commissioners; the strengthening of the operational capacities of the District Basin Authorities; the systematisation of information flows and the interoperability of information systems. Those provisions have been partially integrated in the national legal system by the decrees. Decree Law No. 77/2021 provided that measures for the prevention and mitigation of hydrogeological risk, have to be qualified as works of pre-eminent national interest, having priority character. It was also established that the Ministry of Ecological Transition shall submit an annual report to Parliament, by 30 June of each year.

Article 17 of Decree-Law No. 80/2021 “Urgent measures to strengthen the administrative capacity of public administrations functional to the implementation of the National Recovery and Resilience Plan modified the regulations regarding the delegation of functions of the Presidents of Regions, in their capacity as hydrogeological instability commissioners, to specific implementing subject, as indicated in the National Plan. It is also envisaged that a contingent of non-managerial staff in the maximum total number of 200 people will be distributed in each Commissioner structure until December 2026 to support risk prevention and mitigation activities.

Lastly, it is interesting to point out the provision contained in Article 4 of Decree Law 22/2021, which introduced a new art. 57-bis into the Environment Code. The latter established the Inter-ministerial Committee for Ecological Transition (CITE) at the Presidency of the Council of Ministers with the task of ensuring the coordination of national policies for ecological transition and the related programming. This includes, in particular, the approving of the Plan for Ecological Transition, which cover a number of matters, including the mitigation of hydrogeological risk and the conservation of biodiversity (Servizio Studi Camera dei Deputati 2022).

5.1.8. Data integration and management

The plan strongly stressed the need for further effort in database integration and a more efficient use of data and the new data gathering instruments. One of the most important databases in the Italian system is the ReNDiS, National Directory of Soil Protection Interventions (*Repertorio Nazionale degli interventi per la Difesa del Suolo*) developed and managed by ISPRA since 2005. It was initially used to monitor the implementation of plans and programmes for the mitigation of hydro-geological risks financed by the ministry. The main objective of the ReNDiS was the formation of a unitary framework, systematically updated, of the works and resources committed in the field of soil defence, shared by all the Administrations operating in the planning and implementation of interventions. Now, the ReNDiS system is also fundamental for the procedures for the financing of interventions as the region has to start the procedure by uploading documents on the platform. Then the system catalogues the list of interventions according to priority assigned by criteria established by the DPCM 28 May 2015. The ReNDiS is proposed as a cognitive and operative tool potentially able to improve the coordination and, therefore, the optimisation of national expenditure for soil defence, as well as to promote transparency and public access to information.

The National Plan for the mitigation of hydrogeological hazard, with action n. 25, gave the input for the improvement of the ReNDiS systems. At first, it proposed the simplification of the content of DPCM 28 May 2015 “Criteria for allocating resources to hydrogeological risk mitigation interventions” (*Criteri di attribuzione delle risorse agli interventi di mitigazione del rischio idrogeologico*) with the following aims: to simplify and speed up the ReNDiS system and the preliminary procedure and to involve the District Authorities from the moment interventions has to be entered into ReNDiS for the verification of consistency with district planning. Finally, the plan suggests the integration of the ReNDiS system and the project reporting mechanism with the Public Administration Database (BDAP) of the Ministry of Economics and Finance, which act as a unique database of financial and work progress information. From an informatic aspect, , it was necessary to apply the principle of “uniqueness of submission”, to the benefit of contracting stations by ensuring that ReNDiS automatically accesses the data transmitted to the Public Administration Database (BDAP).

In regard to irrigation, integration of data which can enable the localisation of the areas of planned and implemented interventions by irrigation agencies in order to link them to the intervention needs related to risk mitigation. To this purpose the plan provided for the integration of database from the EU programme COPERNICUS with the National Agricultural Information System (*Sistema Informativo Agricolo Nazionale*, SIAN), used for the management of all measures related to the Common Agricultural Policy and, and the National Information System for the Management of Water Resources in Agriculture (*Sistema Informativo Nazionale per la gestione delle Risorse Idriche in Agricoltura*, SIGRIAN) in relation to the location of irrigation and land reclamation infrastructures.

The attention on data is also focused on the development of data gathering technology and infrastructures. The Plan suggest a better exploitation of space-based earth observation capabilities and technologies for the development of an Environmental Technology Infrastructure (ITA). It is therefore stressed the need for a broader and more efficient utilisation of the national COSMO-SKYMed satellite system capabilities. Furthermore, the plan also provided for the realisation of an innovative metadata system for the management of geographical and environmental information, implementing the European INSPIRE directive. This tool has to be made available to local authorities at every administrative level, to those responsible of territorial planning, to university research structures and bodies, to the business system, to technical professional bodies, and to active citizenship activities.

The plan also gave an input for the implementation of the National Meteorological Agency established by a decree in 2017. The Agency is tasked with rationalising, organising and aggregating the Italian weather sector, which was characterised by highly fragmented competences in the hands of a multitude of public actors at various territorial levels. It can thus foster the predictive capabilities of the system, a fundamental feature for the purposes of preventing and combating the effects of hydrogeological hazards and the activation of climate change mitigation and adaptation measures.

5.2. Permitting path and procedures

The environmental assessment required for the permitting path of projects and plan is another pillar of the EU and Italian environmental policies. It regulates procedures and define standards that should be respected for the design and implementation of projects and the

adoption of plans and programmes with potential environmental impact. They can therefore be considered as direct non-monetary policy as the classification discussed in chapter III. They indeed provide obligation to actors and thus a direct (non-monetary) incentive to direct the actor's behaviour. In Italy the environmental assessment is regulated by part II of the Environmental Code Decree 152/2006 and subsequent modification. In art. 4 of the code, it is stated that the purpose of environmental assessment of plans, programs and projects is:

“To ensure that human activity is compatible with the conditions for sustainable development, and thus respecting the regenerative capacity of ecosystems and resources, the preservation of biodiversity, and the equitable distribution of benefits associated with economic activity”.

Part two of the Code and its annex and further modification have established the criteria that determine which procedures must be adopted for the authorization of projects and plans. How the procedures are conceived, the results they obtain, and how the standard are set are all fundamental features of the system, as they affect practices and behaviour and choices of actors within the governance system. For instance, they may produce incentives or disincentives for innovative or greener solutions like Nature-Based Solutions. It will be therefore described how these procedures are conceived within the Italian legal system. Part II of the Code includes three different typologies of environmental assessments, introduced into the Italian normative framework through the transposition of EU directives examined in previous paragraphs.

- The Strategic Environmental Assessment (SEA): consists in the assessment of plans and programmes which have an environmental impact. It aims to guarantee a high level of environmental protection, coordination among different sectoral plans and programmes, and the integration of environmental concerns during the drawing, adoption and approval of the plans and programmes.
- The Environmental Impact Assessment (EIA): aims to assess and mitigate the effects of projects in advance, in order to protect human health, contribute to the quality of life, provide for the maintenance of the species and preserve the reproductive capacity of the ecosystem. To this end, for each case, it identifies, describes and evaluate the direct and indirect impacts of a project on the following factors: 1) man, fauna and flora; 2) soil, water, air and climate; 3) material goods and cultural heritage; 4) the interaction between the above factors.

- Integrated Environmental Authorisation (IEA): the purpose of the IEA is the integrated prevention and control of pollution from the activities listed in Annex VIII of the Code and provides for measures aimed at avoiding or reducing emissions into the air, water and soil, including measures relating to waste, in order to achieve a high level of environmental protection. The IEA replaces other authorizations previously required. The IEA is just indirectly related to our case study as it can influence water quality, however, for our case study, it is the less relevant among the three procedures and it will not be discussed further.

In addition to complying with European directives, these authorisation procedures are also compatible and integrated with the provisions of Law n. 241 of 7 August 1990 and successive modification, concerning rules on administrative procedures and the right of access to administrative documents. The competent authority, when it is deemed useful, shall convene one or more “Conferences of Services” in order to acquire information and opinion of every public authorities concerned all at once. Within the Conference of Services, the competent authority may sign agreements with the proposer and the other actors to establish which activities are needed to simplify and increase the efficiency of the procedure.

5.2.1. Strategic Environmental Assessment

The Strategic Environmental Assessment (SEA) has been introduced following the transposition of the SEA directive 2001/42/EC and it is aimed at evaluating plan and programmes. The SEA is initiated by the proceeding authority at the same time as the process of drawing the plan or programme. The procedure includes the following steps (art. 12-18 of the Code): 1) screening to assess whether or not the SEA is necessary; 2) preparation of the environmental report; 3) consultations phase; 4) Assessment of the environmental report and the results of the consultations; 5) Decision; 6) Information on the decision; 6) Monitoring.

The competent authorities for the assessment are the Ministry of Ecological Transition or the Region depending on the scope of the plan. They have the task of:

- Expressing an opinion about the screening deciding whether or not the SEA is necessary when there are doubts.

- collaborating with the proposing authority in order to define: 1) the forms and subjects of public consultation; 2) the approach and contents of the environmental report; and 3) the monitoring methods.
- expressing a reasoned opinion on the proposed plan and programme and on the environmental report as well as on the adequacy of the monitoring plan and with reference to the existence of financial resources.

The environmental report has to identify, describe and evaluate the significant impacts that the implementation of the proposed plan or programme may have on the environment and cultural heritage, as well as the reasonable alternatives that may be adopted in view of the objectives and the territorial scope of the plan or programme. A modification of the procedure was adopted by Decree-Law No. 152 of 2021 implementing the National Recovery and Resilience Plan. The deadlines for the consultation phase, unless otherwise communicated by the competent authority, have been reduced from 90 to 45 days from the submission of the preliminary report with the aim of speeding up the process. Also, in this case the attempt was to reduce the time needed for the approval because of previous accumulated delays.

The SEA procedures might be a tool for the mainstreaming and diffusion of greener and more sustainable approaches. Throughout its drafting, the authority responsible of the assessment, might indeed impose prescriptions to make it more suitable to the affected social-ecological systems. Moreover, during the consultation phase, both public authorities and other types of stakeholders may advocate for an increasing share of Nature-Based Solutions intervention included in programmes and plans.

5.2.3. Environmental Impact Assessment

The Environmental Impact Assessment procedure has a longer and more troubled history compared to the SEA. The EIA was firstly implemented in Italy with Law n. 349 of 8 July 1986 integrated by technical standards introduced with DPCM 27 December 1988. Since then, EIA Directive has been amended five times at EU level and subsequently in the Italian legal framework. The first amendment came with Directive 97/11/EC which broadened the

scope of EIA by increasing the types and number of projects to be subject to the procedure. It introduced the screening and scoping phases (Annex III) and minimum information requirements. It was a critical review and adjustments of early applications of EIA. Directive 2003/35/EC aligned the provisions with the Aarhus Convention for public participation in decision-making and access to justice in environmental matters. The Directive and its amendments were codified by Directive 2011/92/EU, which harmonised environmental legislation, strengthened the quality of the procedure and the coherence and synergies with other EU legislation and policies. In the Italian legislation an attempt to integrate and harmonize the EIA decrees and their amendments has been undertaken with the adoption of environmental code with Decree 152/2006. The updating process continued with the enactment of the EIA Directive 2014/52/EU, born of the need to adapt the EIA to the evolving political, legal and technical context as well as the repeal of outdated Technical Regulations.

According to Decree 152/2006, an EIA is required for the types of projects enlisted in Annexes II and III and those projects in Annex IV that fall, even partially, within protected natural areas as defined by Law No. 394 of 6 December 1991. Annex II includes projects that should be assessed at the state/ministerial level, which are those with the highest environmental impact such as thermal power stations, high-voltage power lines, heavy industry, chemical plants and large infrastructures. With regard to the management of water resources, the only types of interventions included in this annex are: 1) hydroelectric power plants; 2) dams and constructions intended to retain, regulate or accumulate water on a durable basis, with a height of more than 15 m or a volume of storage greater than 1.000.000 m³; 3) plants intended to retain, regulate or accumulate water for energy purposes on a durable basis, with a height of more than 10 m or that determine a volume of storage greater than 100.000 m³; 4) works and interventions relating to water transfers that involve or may involve the transfer of water between different regions and that go beyond the reference catchment areas.

Projects under the jurisdiction of the regions are enlisted in Annex III to the decree 152/2006. Those relating to land and water resource management are the following:

- Reclamation of land from the sea in an area exceeding 200 hectares.

- Non-energy use of surface water where the derivation exceeds 1.000 litres per second and of groundwater including mineral and thermal water where the derivation exceeds 100 litres per second.
- (r) Water purification plants with a capacity exceeding 100.000 population equivalent.
- (s) Dams and other installations designed to hold, regulate or store water on a long-term basis for non-energy purposes, with a height exceeding 10 m and/or a capacity exceeding 100.000 m³, excluding physical confinement works for the purpose of making polluted sites safe.
- Ae) Artificial groundwater recharge systems where the annual volume of recharged water exceeds 10 million cubic metres.
- Af) Works for the transfer of water resources between catchment areas intended to prevent water shortage, for a volume of water transferred exceeding 100 million cubic metres per year.

This list does not make differences between traditional/grey approach and Green/Nature-Based approach of the intervention. Indeed, the action/interventions labelled with the letters a), s) Ae) Af), for instance, may be undertaken with one approach or the other, but the procedure remains the same.

The Environmental Code regulates the phases and requirements for the Environmental Impact Assessment, which comprises, according to the provisions of Articles 19-28, the following steps:

1. EIA screening: in this phase the proponent has to submit the preliminary project and the preliminary environmental study to the competent authority. In the procedure it is assessed whether a project produces potential significant impacts on the environment, and therefore has to be submitted to the EIA procedure. The criteria for the screening assessment are set out in Annex V of Decree 152/2006 that we are going to discuss later. After the submission of preliminary documentation, the competent authority may, on a one-time basis, request clarifications and additions from the proposer, within 30 days. The Screening procedure, both in the case the assessment established the need for the EIA or not, obliges the proponent and all the administration involved to conform the project to the environmental conditions contained therein.

2. **Scoping or Pre-scoping:** this phase was introduced by Lgs. Decree n.104 of 16 June 2017 transposing the directive 2014/52/UE. Since then, the proposer has the option of instituting various consultation, pre-scoping and scoping phases, in which the competent authority and other public actors in the environmental sector can define the scope of the information to be transmitted, the level of detail, and the methodologies to be adopted for the preparation of the project documents and the Environmental Impact Study (EIS). In order to define the contents of the EIS and other documentation, the competent authority shall convene a preliminary Conference of Service gathering all the competent administrative bodies required for the issuing of authorizations.
3. **Environmental Impact Study (EIS):** the definition its contents is determined in Annex VII of the Code as amended by decree n. 104/2017. It has to contain information regarding 12 main subject area, including: 1) the description of the project (location, land-use requirements, resources needs and consumption, waste and discharge, the best available technique, mitigating and compensatory measures; 2) description of the main alternatives in term of project design, technology, location, size and scope considered by the proponent, including the “zero alternative”; 3) The description of relevant aspects of the current state of the environment (baseline scenario) and evolution in case of inaction, 4) A description of the factors potentially subject to environmental impacts caused by the project with particular reference to population, human health, biodiversity, territory, soil, water, buildings, cultural heritage, 5) potential environmental impact and the other six that are less relevant for our case study.
4. **Presentation and publication of the project:** after the verification of the completeness of the presented documentation, the competent authority shall publish the notice to the public on its website.
5. **Consultations:** anyone interested should have had access to the acts and have the opportunity to submit observations, which must be at least answered. The consultation phase may also take place through a public enquiry for the examination of the environmental impact study. The law also provides that the environmental impact study should contain a non-technical report with the rationale of permitting the participation of non-technical...or professional? stakeholders.
6. **Evaluation:** the EIS and the results of the consultations are evaluated by the competent authority after technical-investigative activities are carried out. The competent authority

convenes a decisional Conference of Services in which all the competent or interested administrations take part in order to issue the EIA and the necessary permits. The service conference jointly examines the project and the SIA.

7. Decision: this phase concludes the EIA procedure with an express and reasoned decision expressed by the competent authority. The competent authority adopts the single authorisation measure containing the motivation behind the assessment. The single authorisation measure includes the EIA measure and the authorisations necessary for the realisation and operation of the project.
8. Information: the EIA measure contains the conditions for the realisation, operation and decommissioning of the work, as well as the measures to avoid, reduce, prevent significant and negative impacts also due to malfunctions
9. Monitoring: finally, the EIA measure identifies the characteristics of the monitoring and control of environmental impacts, also aimed at verifying compliance with the prescriptions imposed and the verification of compliance.

It is intuitive that EIA involves substantial production of complex documentation and administrative burdens, and it is thus time and resource-consuming both for the proposer and the competent authorities responsible of the assessment. Therefore, a system capable of processing efficiently the EIA applications is fundamental for the effective deployment of a multitude of interventions that are necessary to reduce the vulnerability of a complex territory such as the Italian one. Conversely, if the system is too slow, having to undertake an EIA or not can make the difference between implementing interventions in a reasonable timeframe. It is thus strictly related with resilience and adaptive capacity of the socio-ecological system. In any case, it is fundamental to set criteria for the EIA screening that are clear and that can identify projects with significant environmental impact. Clarity is necessary because, in the proposer perspective, it can be of great help understanding from the beginning which procedure and burdens he has to cope with. Furthermore, how criteria are selected can help incentivize more sustainable solutions. Hypothetically, making certain kind of NBS explicitly exempted of the EIA, or subject to simplified procedures, might be a critical boost for their mainstreaming. In this case, both proponents and public authorities might indeed find preferable to choose this kind of solutions instead of the grey one that would be more time and resources consuming in terms of administrative burdens. Criteria are now defined in

Annex V (previously Annex IV) of Legislative Decree 152/2006 and successive modification and integration, such as Decree 16 January 2008, Decree n.104/2017 as well as guidelines introduced by the Annex to the MATTM Ministerial Decree 30 May 2015. They are summed up as follows:

1. Project characteristics must be considered, taking into account: a) size of the project; b) cumulation with other project; c) use of resource; d) waste production; e) pollution and environmental disturbances; f) accident risk; g) human health (added with decree n.104/2017) connected for instance to water and air pollution
2. Localisation of projects taking into account: a) land use; b) relative wealth, quality and regenerative capacity of the area's natural resources; c) The load-bearing capacity of the natural environment, with a focus on the following areas: I) wetlands; II) coastal areas; III) mountain or forest areas; IV) nature reserves and parks; V) classified or protected areas; VI) areas in which the environmental quality standards laid down by Community legislation have already been exceeded; VII) areas with a high population density; VIII) areas of historical, cultural or archaeological importance; IX) areas with agricultural production of particular quality and typicality.
3. Characteristics of the potential impact, taking into account: a) Extent of the impact (geographical area and population density affected); b) Nature of the impact (DL 104/2017); c) Transboundary nature of the impact; d) magnitude and complexity of the impact; e) likelihood of the impact; f) duration, frequency and reversibility of the impact; g) cumulation of the impact of the project in question with the impact of other existing and/or approved projects; (DL 104/2017); h) possibility of reducing the impact effectively (DL 104/2017).

It is worth mentioning that the regions and autonomous provinces, in certain environmental situations, on the basis of criteria enlisted in Annex V, might adopt stricter criteria for EIA screening.

As seen before the EIA procedure has been revised several times. According to a ministerial survey of 2017 the average duration of an EIA procedure under state jurisdiction is about three years, while it takes about 11.4 months to complete an Environmental Impact Assessment (EIA) at the regional level despite the fact that the regulations in force provide for

shorter deadlines, namely from 150 days to a maximum of 390 days. The slowing down of the project assessment seems to be due to the failure of the bodies responsible for issuing opinions to respect the preliminary deadlines, as well as the fragmentation of legislative, regulatory and administrative competences between the State and the Regions (Galotto 2017). The Legislative Decree No.104/2017, transposing EIA Directive 2014/52/EU, tried to cope with the aforementioned issue and other criticalities through the simplification and harmonisation of EIA procedures with other environmental authorisations, the strengthening of the quality and effectiveness of the procedure, and, finally, with the revision of the sanction system in case of non-compliance.

As for what simplification is concerned, the directive removed the obligation for the proponent to submit certain project documents (preliminary project or feasibility study), instead of which it will be sufficient the preliminary environmental study (Galotto 2017). As seen before, it has been introduced the option for the proposer to open a phase of discussion with the competent authority aimed at sharing the definition of the level of detail of the project documents necessary to carry out the procedure. The proposer can also request a preliminary assessment from the competent authority in order to identify the possible procedure to be initiated, the so-called “pre-screening”. The DL n.104/2017 also abrogated the technical standards for the drafting of Environmental Impact Study of the previous EIA regulations, which is replaced by the new Annex VII of Part Two of the Environmental Code. The decree finally provided for the harmonization of EIA rules for the whole national territory reducing the discretion of the regions. Indeed, the region only retained the power to regulate the organisation and methods of exercising their administrative functions in the matter of EIA.

5.3.3. Landscape authorisation

The landscape authorisation, regulated by Legislative Decree n. 42/2004, namely the Cultural Heritage and Landscape Code (from now onward the CHL Code), is another compulsory act for all interventions on buildings and areas of landscape interest, protected by the Environmental Code Art. 142. In this case, the proponents, in addition to the building permit and the EIA (if required), also applies for a landscape authorisation. The administration responsible for issuing the landscape authorisation is delegated by the Region and they

usually are Municipalities or Park Authority. The need for the landscape authorisation is verified on a case-by-case study, and it depends on the type of intervention. The procedure starts when the proposer submits the application to the competent authority, accompanied by the necessary project documentation and the landscape report, drawn up by a qualified technician in accordance with the provisions of the CHL code. The competent authority examines the request carrying out investigations, verifying completeness of the documentation and, if necessary, requesting appropriate integrations. The same administration shall transmit this documentation to the local branches of the Ministry of Culture, namely the Superintendency, within 40 days, accompanying it with an illustrative technical report and proposal for measures. Subsequently to the receipt of the documents, the Superintendent expresses his binding opinion, communicating it to the administration within 45 days. Within 20 days from the receipt of the opinion of the superintendent, the competent administration shall act in accordance.

Since the Decree of the President of the Republic DPR n. 139 of 2010, some interventions, defined as “minor”, are subject to Simplified Landscape Authorisation, while the latter is not required for cases enlisted in art. 149. Regulation introduced by DPCM n. 31/2017, resumes all the interventions and works that are not subject to landscape authorisation (31 categories in Annex A), as well as those that are subject to the simplified procedure (list of 42 categories in Annex B). Regarding the simplified procedure, the proposer submits the application, consisting of the simplified landscape on the online platform “Sportello Unico per l’Edilizia” usually managed by the municipality, that proceed with the examination. If the assessment is negative, it immediately notifies the applicant. If the assessment is positive, the administration proceeds within 30 days to send the documentation to the Superintendency. The latter, once it has received the documentation, expresses a binding opinion on the request, and communicates this to the administration within 25 days of receiving the documents. The simplified authorisation procedure concludes with a decision, adopted within the strict deadline of sixty days from the receipt of the application, otherwise the proponent can proceed by tacit approval. Moreover, the opinion of the Local Commission for the Landscape is not mandatory. In the following section, it has been resumed the intervention related to water and land management subject to special procedures. Annex A included interventions and works in restricted areas excluded from landscape authorisation:

- A.14. replacement or planting of trees and shrubs carried out with adult specimens of the same species, native or in any case historically naturalised species typical of the area.
- A.15 the construction and maintenance of underground works that do not entail permanent changes to the morphology of the land and do not affect the vegetation.
- A. 19 interventions on agricultural hydraulic systems without historical or testimonial value.
- A.25 maintenance work on the riverbeds, banks and embankments of watercourses, including work on riparian tree and shrub vegetation, aimed at guaranteeing the free flow of water and which does not entail permanent alterations to the overall view of the morphology, maintenance and functional restoration of drainage and water disposal systems and hydraulic works in the riverbed.
- Art 26 is the most relevant for our case study as it explicitly mentions “naturalistic engineering interventions aimed at water regulation and/or soil conservation that foresee the use of autochthonous plants, also in combination with inert materials of local origin or biodegradable artificial materials”.

Annex B instead includes minor interventions subject to the Simplified Landscape Authorization, such as:

- B.22 tree cutting, subject to authorisation by the competent offices, where required; replacement or planting of trees and shrubs.
- B.39. modification of water defence structures on the banks of watercourses and lakes for functional adaptation.
- B.40. Systematic natural engineering works aimed at water regulation, soil conservation or slope protection from landslides and avalanches.
- B.42. Limited beach nourishment of eroding stretches of sand, maintenance of artificial dunes to prevent erosion, restoration of existing coastal defence works.

The debate here is about the level of detail of the list as some practitioner and actors within the system states that it is often difficult to previously assess in which category the interventions would fall. If in doubt, they all apply for the standard procedure nullifying the supposed advantages of the reform. This can be particularly true for NBSs that are new or

rarely implemented and can raise more doubts. Indeed, it is not always easy to classify them in determined category.

Another relevant issue related to the landscape authorization is its relationship with the EIA procedure, which has been debated in courts and among experts, as it was not always clear in which cases both are necessary. At first sight, the EIA may result potentially appropriate to include an assessment of all possible effects of the intervention on the environment, including the landscape component. After the amendments introduced by Decree n.104/2017 the environmental impact assessed through the EIA procedure explicitly include Cultural Heritage and landscape. However, the Administrative Court of Lombardia (2019)¹⁹ and Puglia (2019)²⁰ agreed that the potential inclusiveness of the EIA procedure, does not necessarily also fulfil the specific need of protecting the landscape when the intervention affects assets that, due to their high intrinsic value, are protected by law. In this case, according to the court, the law n.42/2004 imposes the activation of a special procedure that acts as an institute of environmental protection placed to safeguard values of primary and undisputed constitutional importance and converging in the landscape authorisation, an autonomous and prerequisite act (Tumbiolo 2019). Nevertheless, with art. 26 of the Environmental Code, it has also been established that, if an act of coordination is adopted at the regional level, the EIA can also include the landscape authorisation with due integration. In this regard, in 2019, the Constitutional Court recalled that the single regional act, introduced by Legislative Decree No. 104 of 2017, is aimed at “simplifying, streamlining and speeding up the regional EIA, with a view to improving the effectiveness of the action of the administrations involved in the implementation of the project” (Constitutional Court 2019). However, that provisions do not replace the various measures needed for the administrative proceedings which may affect the implementation of the project but includes them in the determination concluding the Conference of Service (Constitutional Court 2018). However it is clear that this can be considered a redundancy within the system in which different provisions overlaps creating redundancy, confusion and ultimately delays (Interview 6).

5.3. Ecosystem and Biodiversity Conservation and Restoration

¹⁹ Lombardy Administrative Court Sentence n.820 - 12 aprile 2019, Milano

²⁰ Puglia Administrative Court sentence n.403 of 19 marzo 2019, Bari

It is intuitive that biodiversity and ecosystem conservation and restoration are cross-cutting issues that are present in various policy sectors. However, they are addressed as a specific topic in a relatively recent stream of legislation that will be discussed in this section. The two main pillar of this policy arena are the establishment and management of protected areas, and specific action aimed at preserving and restoring biodiversity.

5.3.1. Protected area

The first regulatory instrument that lays down fundamental principles for the establishment and management of protected areas was Law n.394 of 1991 and subsequent amendments and integrations, the “Framework Law on Protected Areas” a. The law defines natural heritage as the physical, geological, geomorphological and biological formations, or groups of them, that have significant natural and environmental value. Such area must be subject to a “special regime of protection and management” which implies the implementation of action aiming at the conservation of animal or plant species, geological singularities, paleontological formations, biological communities, biotopes of scenic and panoramic values, natural scenic and panoramic values, natural processes of hydraulic, hydrogeological and ecological balances. Law n.394/1991, also support the application of management or environmental restoration methods suitable for achieving an integration between man and the natural environment. Finally, the law makes also explicit mentions to defence and reconstitution of hydraulic and hydrogeological balances. This kind of policy can be classified as a direct non-monetary policy since it provides obligations and constraints on actor’s behaviour with the strength of the law without monetary incentive.

The law classifies protected areas in National, Regional parks and Natural reserves, and according to their purpose, for instance the protection of nature or the protection of the marine environment. Regarding the governance of this policy arena, the law, amended in 2007, established the creation of two bodies at the state level, the Committee for Protected Natural Areas composed by representatives of ministries and regions and the Permanent Conference State-Regions and the Technical Council for Protected Natural Areas. the former was responsible of the definition of guidelines for spatial planning, while the latter expressed technical-scientific opinions on the subject. The committee examines the proposal of new protected area adopt the three-year programme for protected areas based on data from the “Chart of nature” and allocates the financial resources provided by law. The ministry of the

Environment monitors the implementation of the programmes and has substitutive power in case of non-compliance. The management instruments at the local and operative level are the park regulations, the park plan, the “nulla osta” permit (authorisation measure required for any work within the park) and the multiannual economic and social plan for the promotion of compatible activities (P&S Legal 2021). Articles 8-21 regulate planning of national parks while articles 22-28 regulate regional protected areas. The law n.349/1991, as amended in 1998, provides that municipalities whose territory is comprised within protected area has priority of financing for certain interventions among which: water, air and soil sanitation and hygiene works, land conservation and environmental restoration works, including agricultural and forestry activities

Even this policy sector is heavily influenced by both International and EU legislative frameworks that we have seen before. The first example is the transposition of the Habitat Directive 92/43/ECC with DPR n.357 of 8 September 1997 modified and integrated by D.P.R. n. 120 of 12 March 2003. It provided for the creation of Natura 2000 site which are the main instrument of the European Union's policy for the conservation of biodiversity. It is an ecological network spread over the entire territory of the Union, established to ensure the long-term maintenance of natural habitats and species of flora and fauna that are threatened or rare, at Community level. The *Natura 2000* network is made up of Sites of Community Interest (SCI), identified by Member States in accordance with the Directive, which are subsequently designated as Special Areas of Conservation (SAC), and also includes Special Protection Areas (SPA). Decree n.120/2003 is another relevant act as it established and clarified guidelines for the management of *Natura 2000* sites. The law provided for a set of measures necessary to maintain or restore natural habitats and populations of species of wild fauna and flora in a state defined as “satisfactory” which imply that:

- Its natural distribution area and the surface area it encompasses are stable or expanding.
- The structure and specific functions necessary for its long-term maintenance exist and can continue to exist in the foreseeable future.
- The conservation status of typical species is satisfactory and corresponds to:

- Data on the population trends of the species indicate that it continues and can continue in the long term to be a viable element of the natural habitats to which it belongs.
- The species' natural range is neither declining nor likely to decline in the foreseeable future.
- Sufficient habitat exists and is likely to continue to exist for its populations to be sustained in the long term

The identification of the Special Area of Conservation (SAC) is regulated by art.3 of the DPR n.357/1997. The regions have the task of identifying the habitat and species specified in Annex A and Annex B of the Habitat Directive, notify the Ministry of the Environment that, in turn, proposes the sites to the EU Commission as “Sites of Community Importance” (SCI). The site becomes a SAC after the approval of the Commission which ratifies their inclusion in the *Natura 2000* network. Within six months from the establishment of a sites, the Region shall adopt the required conservation measures for the SAC, including, if necessary, specific management plans or integration with other planning tools such as the PAI, PGRA and so on. The region shall also adopt all the required regulatory measures in accordance with the ecological needs of the habitats. Specific Management plan should be adopted just if other planning tools already in force are deemed inadequate to guarantee a “sufficient” conservation status of the habitat. This also means that the Natura 2000 network is not intended to replace the National Park Network, but to complement it in order to ensure the full functionality of habitats. The regions carry out the assessments necessary to decide whether management plans should be adopted or not and they also have the task of identifying the implementing bodies.

An innovative element of the Habitat Directive was the focus on enhancing the functionality of habitats and natural systems. Indeed, the objective is not only the maintenance of the current quality status of the site, but also the potential for habitats to reach a higher level of complexity. In the guidelines established with Decree 120/2003, it is clear that the objective is not only conservation but also renaturation and restoration. This focus oriented also toward renaturation and restoration in line with ecological management, can be considered an *ante litteram* NBS, which in theory allowed for NBS deployment at least in protected area. It will

be discussed if it has been effective in the discussion section. The guidelines, in accordance with the habitat directive, strongly stressed the need to integrate the set of conservation measures with planning at different levels of the land and water governance system, including the national, urban area, hydrographic basin, region (sector plans, financial planning, use of structural funds, sector and general regulations) planning tools. In this sense, the plan should become the instrument that determines the use of all the resources present in a given territory and, consequently, should be a tool to promote an integrated approach to planning, one that can best consider all the needs for the protection and enhancement of environmental systems also in relations to other societal needs.

5.3.2. Environmental Impact Assessment in Protected Area (VINCA)

Another relevant policy tool introduced by the Habitat directive is the specific Environmental Impact Assessment for protected area (*Valutazione di Incidenza Ambientale*, VINCA). In the SCI, SAC and ZPS, every intervention must take into account the naturalistic and environmental value of the area and need a specific authorization, the VINCA, regulated by art 5 of the Decree 357/1997 and successive modification and integration such as Art 6 of DPR n.120/2003. The VINCA is required for both plans and project with potential impact on SCI, SAC and ZPS. It should be noted that the impact assessment applies both to interventions that fall within *Natura 2000* areas (or in sites proposed to become *Natura 2000* areas), and to those that, although are located outside them, may have repercussions on the conservation status of the natural values protected within the site.

The proponents of territorial, urban and sector plans, including agricultural and faunal-venistic plans and their variants, prepare, according to the contents of Annex G of Decree 357/1997, a study to identify and evaluate the impact that the plan or project may have on the site, taking into account its conservation objectives. The territorial planning tools and projects subject to the VINCA are submitted to the Ministry of the Environment or Regional Authorities depending on whether it is of national or regional/municipal relevance. For what regard projects, the proponents of interventions also must submit, for the purposes of the assessment, a study aimed at identifying and evaluating the potential impacts. According to Annex G, the Study for the Impact Assessment must contain:

- a detailed description of the plan or project indicating the type of actions and works, size, complementarity with other plans and projects, use of natural resources, waste production, environmental pollution, and risk of accidents.
- an analysis of the interference of the plan or project with the related environmental system, taking into account biotic and abiotic components and ecological connections. In the interference analysis, the quality, regeneration capacity of natural resources and the load bearing capacity of the environment must be considered.

It is therefore similar to the EIA but it requires more skills and knowledge about biological and ecological issues to be properly carried out. This is a key issue since many public administrations lack personnel with this kind of knowledge and the same applies to projects proposers. Regarding the procedure to obtain the VINCA, the law divided the procedure into four main steps:

1. Verification (screening): is the preliminary step to verify the need of the full assessment in the case of possible significant impact.
2. Appropriate assessment: analysis of the impact of the plan or project, according to the conservation objectives of the site, and identification of any mitigation measures that may be necessary.
3. Analysis of alternative solutions: identification and analysis of possible alternative solutions to achieve the objectives of the project or plan.
4. Definition of compensatory measures: identification of actions, including preventive ones, capable of balancing the expected impacts. They should be implemented in cases where alternative solutions do not exist or negative impact are unavoidable, but for imperative reasons of overriding public interest, the project or plan must be implemented.

The Regions have the task of defining the procedures for submitting the study and other documents, identifying the authorities responsible of verifying them, the timeframe within which such verification is to be carried out, and the modalities of interactions in case of interregional plans. Competent authorities have to carry out the assessment within 60 days from the submission of the study and may request, on a one-time basis, some integrations or prescriptions that the proponent must comply with. In this eventuality, the deadline for the

impact assessment shall start again from the date the authority receives the requested integration back. The whole process might thus take 120 days plus the time needed for the drafting of project documents. The procedure is always carried out through the engagement and consultation of the Site management body which in most of the cases are the Park authorities.

Contrarily to the case of the Landscape Authorization, the relation between the VINCA and SEA and EIA are clearer and regulated by law, namely the Decree 104/2003 that has amended the Decree 357/1997. Indeed, it clearly states that “For projects subject to an EIA procedure, the VINCA is included in the EIA itself, that in this case also considers the direct and indirect effects of the projects on the habitats and species under protection”.

5.3.3. The National Biodiversity Strategy

In 2010, in compliance with the commitments made with the ratification through Law n. 124 of February 14 1994 of the Convention on Biological Diversity (CBD, Rio de Janeiro 1992), Italy has adopted the “National Biodiversity Strategy 2020 (NBS2020)”. The NBS2020 had thus a 10-year life span and it represented the first pieces of strategy for the achievement of the international goal of make all the world ecosystems restored, resilient and adequately protected by 2050. The vision of the 2020 strategy stressed the need to “conserve, value and restore the natural capital, biodiversity and ecosystem services because of their intrinsic value and ability to sustain economic prosperity and human well-being in a lasting way despite local and global disturbances”. To achieve this vision, the Strategy was articulated around three pivotal themes and correspondingly strategic objective to be achieved by 2020:

- Biodiversity and Ecosystem Services: ensure the conservation of biodiversity, understood as the variety of living organisms, their genetic variability and the ecological complexes of which they are part, and ensure the preservation and restoration of ecosystem services.
- Biodiversity and climate change: substantially reduce the impact of climate change on biodiversity in the national territory by defining appropriate measures for adaptation to

and mitigation of its effects and increasing the resilience of natural and semi-natural ecosystem

- Biodiversity and economic policies: integrate biodiversity conservation into economic and sectoral policies, including it as an opportunity for new employment and social development, by strengthening understanding of the benefits of ecosystem services derived from it and awareness of the costs of their loss (Ispra).

The achievement of the Strategic Objectives is addressed within 15 work areas, among which, the most related this case study are: 1) species, habitats, landscape; 2) protected Areas; 6) inland Waters; 7) marine environment; 9) urban areas; 13) research and innovation; 14) education, information, communication and participation; 15) Italy and biodiversity in the world.

At first sight is interesting to note the change of vocabulary used in the National Biodiversity Strategy 2020 compared to previous acts related to biodiversity. Indeed, natural capital, ecosystem services have become terms that have been mainstreamed in national legal frameworks since the Millennium Ecosystem Assessment of 2005. It reflects the integration between conservation and restoration measures and economic concerns. As it has been discussed in previous chapters, the idea of “ecologic economization” gained prominence among policymakers. It is also clear the attempt to portray biodiversity conservation and restoration as an economic opportunity rather than a cost that the socio-ecological system has to sustain. Finally, in 2010 it was finally becoming evident the risk posed by climate change in this field, a perspective that was lacking in previous legal acts.

The strategy gave input for the creation of new institutions, actors and procedures within the biodiversity Governance arena. The Decree of the Ministry of Environment n.143 of 6 June 2011 of the Ministry of Environment established the Strategy's operating bodies: the Joint Biodiversity Committee (*Comitato Paritetico per la Biodiversità*), the National Biodiversity Observatory (*Osservatorio Nazionale per la Biodiversità*), and the Consultation platform (*tavolo di consultazione*). The Joint Committee is a body composed of representatives of the central Administrations and the Regions and support the State-Regions Conference in the matter of biodiversity conservation and restoration. A Select Committee is set up within the Joint Committee to ensure maximum operational effectiveness in the implementation and

review of the Strategy. The National Observatory for Biodiversity (ONB) is established to provide the necessary multidisciplinary scientific input and support the activities of the Joint Committee. The ONB is chaired by the Ministry of Environment, now Ministry of Ecological Transition and it is composed of representatives from the regional biodiversity observatories or offices, the main scientific associations, the academic world, ISPRA and the Protected Areas. Finally, the consultation platform was established to promote the full and constant involvement of stakeholders in the implementation and review of the Strategy. It includes the Joint Committee, representatives of the main private interest associations, public authorities at various level, environmental associations and it is open to other kind of stakeholder. Here it is clear the attempt to foster the multilevel and participative governance approach suggested by global and EU institutions.

Despite the effort it seems that the targets had not been reached. As highlighted in the final report of the National Strategy for Biodiversity to 2020, the overall assessment of the state of biodiversity conservation in Italy was not positive as there has been no success in halting its decline. The causes are many and are linked in particular to land fragmentation and soil consumption, intensive agriculture, pollution of environmental matrices and habitat degradation, overexploitation of resources and species, illegal harvesting of species, competition from invasive exotic species and climate change (Ministero della Transizione Ecologica 2021). The National Strategy revision process started late because of the reorganization of the Ministry of the Environment into the Ministry of Ecological Transition and the outbreak of the Covid-19 pandemic. However, the review process, carried out with a participative and open approach through specific territorial workshops, finally culminated in the National Biodiversity Conference and the first version of the 2030 strategy that will be discussed as follows. It should be noted that the Strategy presented below is a draft that has yet to be approved, but principles and the main structures and content will likely not be radically disputed during the approval phase. The SNB 2030 confirms the Vision to 2050 of the Strategy 2020 and its contents are built upon the results assessment of the previous strategy, from the conclusion of the IV Report on the State of Natural Capital and in coherence with the ambitious objectives of the new European Strategy for Biodiversity. The new National Strategy 2030 envisages the identification of two main strategic objectives declined in 8 thematic area and related targets to be achieved in 2030:

- Strategic Objective A: to build a coherent network of protected areas on land and at sea, broken down into 1 Field of Action: protected area
- Strategic Objective B: restoring terrestrial and marine ecosystems. This objective has been broken down into 7 specific field of action: 1) species habitat and ecosystem; 2) food and Agricultural system; 3) forests; 4) urban green; 5) inland waters; 6) sea; 7) soil.

Target for strategic objective A is to legally protect at least 30% of the land area and 30% of the sea area through an integrated system of protected areas and *Natura 2000* network. The strategy also establishes that at least one third of the legally protected areas should be strictly protected. Moreover, protected areas have to be ecologically e functionally connected, and effectively managed by defining clear conservation objectives and measures and ensure the necessary financing. Regarding Strategic Objective B “Restoring terrestrial and marine ecosystems”, targets have been set as follows:

- At least 30% of protected area must achieve a satisfactory conservation status.
- To guarantee no deterioration of any ecosystem and restoration of vast area of degraded ecosystems, particularly those more suitable for carbon capture and mitigation of natural hazard impact.
- Assure a 50% reduction of the number of species on the national red list, those most threatened by invasive exotic species.

For each of the 8 thematic area a summary of the status is provided, specific actions, are indicated and indicators are selected to assess achievements.²¹ Among the many specific objectives, those that are more related with our case study are the following:

B11 restore freshwater ecosystems and the natural functions of water bodies and achieve “good status” of all waters by 2027. In this field, the report highlights the improvement achieved in Italy for what regard water management, attributing merits to the new institutional setting and the creation of authority at the basin level and the development of new technological solutions. Most interestingly, the strategy identifies Nature Based Solutions as

²¹ Ministero della Transizione ecologica, “Bozza Strategia Nazionale Biodiversità”: <https://www.mite.gov.it/pagina/strategia-nazionale-la-biodiversita-al-2030>

crucial tools and priority actions to be undertaken to achieve targets and objectives. The National Strategy stresses the fact that NBS can bring benefits in terms of rehabilitation of aquatic ecosystems (with particular regard to functional aspects and longitudinal continuity and lateral connectivity), improvement of hydro morphological processes, mitigation of hydraulic risk, climate resilience and protection of biodiversity. Specifically, it will be crucial to carry out a hydro-morphological analysis of the river network and to identify water bodies in which specific measures such as the removal or adjustment of predominantly obsolete barriers and the restoration of floodplains and wetlands can be carried out. In this case is fundamental to follow a data-driven approach that might be fostered by the more efficient use of data and the new data-collection technologies discussed before.

A reference to NBS is implicit in Action B11.2 as it refers to the restoration of freshwater ecosystems through the adoption of “integrated measures” that simultaneously contribute to risk mitigation, biodiversity conservation and human health protection. Integrated interventions had been classified, as shown below, by decree 28 may of 2015 and are those that obtain priority of financing according to the same law. They are:

1. Morphological restoration: a) removal of embankments to reconnect the watercourse to the floodplain; b) Restoration of the flood plain through morphological remodelling; c) Interventions for the widespread increase in riverbed roughness; d) Reactivation of lateral dynamics through work on bank defences with possible widening of the riverbed; e) Recovery of sinuosity.
2. Naturalistic Interventions: a) forestation of the flood plain to slow down runoff; b) reconnection of relict river forms; c) re-opening and redevelopment of flood lanes and branches.
3. Artificiality Reduction: a) reshaping and forestation of floodplain embankments; b) removal or structural modification of weirs and thresholds; c) removal of culverts.
4. Sediment management: a) increased sediment supply from banks or slopes; b) construction of transverse structures to promote sediment retention and raise the riverbed level; c) nourishment with sediment input into the riverbed.

Even if some of these interventions cannot be classified as NBS is clear that the suggested approach goes in the same direction of increasing attention to biological and ecological factors.

In Sub-action B11.2. it is stressed the need to prioritize those restoring intervention that has the potential to simultaneously achieve objectives of different directives (habitat, water, floods) such as mitigation of soil degradation and disruption and river regeneration, through planning tools such as river contract, too. It is almost self-evident how NBS, even if not mentioned explicitly, are crucial for this action and sub-actions and play a pivotal role for the achievement of objective in water and land management at national and sub-national level. Regarding land use, Action B.13 aims of achieving neutrality of land degradation and a net zero increase in land consumption, as well as making significant progress in the protection and restoration of ecological and agricultural productivity of soils and the remediation and restoration of sites with degraded and contaminated soils. The Strategy highlights that soil degradation is a process dependent on multiple causes such as surface loss, sealing, deforestation, fires, intensive grazing and agriculture, erosion, groundwater salinisation, contamination and, last but not least, the progressive increase of extreme climatic events (droughts, heavy rains, floods, etc.). Therefore, even in this, case, NBSs and green infrastructures are indicated as crucial tools to achieve the targets for 2030.

The 2030 strategy, on the basis of the previous decade failure and shortcomings, identifies area of improvement, even in the strategies' governance bodies. It is deemed necessary to increase co-responsibility for implementation and make participation more active and proactive. To this end, the composition of governance bodies will be redefined, envisaging more detailed and effective operating mechanisms such as working groups for the various areas of implementation. It has been established to organise the governance system articulated in management committee, made up of ministries and regions representatives, a technical support body and a stakeholder consultation table. The activities of these Governance Bodies will be supported by a secretariat provided by a directorate of the Ministry of the Ecological Transition. The first executive action of the SNB 2030 will be the preparation of an "Action Plan" that will identify in detail how every activity will be carried out, the timetable, the implementing actors, the financial resources and the monitoring activities to assess achievements.

The strategy finally recommends integrating objectives of biodiversity conservation and functional and structural recovery of ecosystems, into other strategic and planning policy tools including agricultural policy, forestry and fisheries policy, policies on combating and adapting to climate change, sustainable development and the circular economy, as well as spatial planning. Challenges that will require broad knowledge sharing, institutional cooperation and effective governance action. The nature of the strategy as a non-direct policy requires direct regulatory (monetary or non-monetary) instrument to be applied as the social-ecological system itself does not provide the necessary incentives to actors to fulfil by themselves enough conservations activities.

5.4. Funding Disaster Risk Reduction

Over the past decades, calamitous events related to hydrogeological risk have led to several deaths and billions of damages, causing an increased awareness of the topic. The years 2011, 2014 and 2018 have been characterized by multiple disasters. These events, together with the shock caused by the collapse of the Morandi bridge in Genoa, have made the public opinion and policy makers much more sensitive to the prevention of risks, both natural and other risks. This has been reflected in a substantial increase in the funds allocated to risk mitigation activities which can be classified as a direct monetary policy.

According to a study by the Court of Auditors, regarding hydro-meteorological risk mitigation the previous programming period from 2000 to 2014, had concerned 1,781 interventions, for a total amount of allocation of € 9.5 billion, averaging € 630 million per year. For the new programming cycle the region, as of 2015, had reported more than 7,000 hydrogeological risk mitigation interventions, worth about € 22 billion, 90% of which represented works yet to be designed. After two years, in May 2017, the presumed need for works requested by the Regions had increased to 9,420 interventions, for a value of about € 28 billion. Despite the evident financial gap between need and effective allocation that still remain, we have witnessed a substantial increase in funding. For instance, just for the year 2019, the DPCM 20 February 2019, allocated € 3 billion for the preparation of an executive

plan containing lists of projects and interventions that could be immediately executed, having the character of urgency. This plan was born out of the need to catch up with the delays accumulated in previous years for project design, approval and implementation. It can thus be considered as “emergency legislation” a term that will be used to define a piece of legislation not programmed in the standard policy cycle put made out to respond to urgent needs (Corte dei Conti 2019).

5.4.1. Budget Law and European Funds

The regular programming of expenditure for hydro-meteorological risk mitigation is mainly carried out through allocations of national funds by budgetary law and by various European funds with a multiyear perspective. Funding are mainly allocated according to the European cohesion policy programming cycles that have a duration of 7 years corresponding to the EU's Multiannual Financial Framework. These national and European funds have different natures and purposes ranging from structural strengthening of buildings and infrastructures, land and rural morphological intervention, adaptation of agricultural and irrigation infrastructure and practices, project designing, and also non-structural measures. The most important funds and their main features are shown below.

The Fund for the Financing of Infrastructural Investment and Development (*Fondo per il finanziamento degli investimenti infrastrutturali e di sviluppo*) has been established by the 2017 Budget Law, paragraph 140, which also states that the allocation has to be made by Decrees of the President of the Council of Ministers, at the proposal of the Minister of Economy and Finance, considering programmes and plans submitted by the central administrations. The fund includes, among the expenditure sectors, soil protection, hydrogeological instability, and environmental restoration, to which allocated € 161 million for the three-year period 2017-2019, plus another € 700 million allocated for the period 2020-2032. Thus, the Investment Fund, for the 2017-2032 period, allocates € 860 million for soil protection out of total endowments of € 46 billion. The 2018 Budget Law refinances it with an additional € 70 million for hydrogeological risk mitigation interventions in the regions of the Centre-North.

Development and Cohesion Fund (*Fondo di Sviluppo e Coesione*, FSC): is the main financial instrument through which policies for economic, social and territorial development and the removal of economic and social imbalances between different areas of the country are implemented. That is why 80% of its endowments have to be allocated to the less developed regions. The FSC is a national fund that acts jointly with the European Structural Funds by following their multiannual programming. It is intended for the financing of strategic projects of national, and regional relevance. The FSC could initially count on an endowment of € 50 billion, established by the 2020 Budget Law, lately increased with additional €23.5 billion in 2022, reaching the highest amount ever recorded. The management of the Fund has been assigned to the President of the Council of Ministers, who makes use of the Department for Development and Cohesion (DPCOE). The fund was previously distributed by resolutions of the CIPE, now the Inter-ministerial Committee for Economic Planning and Sustainable Development (Comitato Inter-ministeriale per la Pianificazione economica e lo sviluppo sostenibile, CIPESS). Article 44 of Decree-Law No. 34/2019 introduced a simplification in the governance of the Fund, and the allocation of its resources. It introduced the “Development and Cohesion Plans” (*Piani di Sviluppo e Coesione*, PSC), which replaced the multiple instruments that existed until then to draw on the resources of the FSC. The Agency for territorial Cohesion (*Agenzia per la Coesione Territoriale*) proceeds to draw a Development and Cohesion Plan for each administration entitled of resources, broken down by thematic areas. There are national PSC managed by ministries and regional PSC managed by regions. Among the 12 thematic area and expenditure sectors for the 2021-2027 programming period, the FSC includes the environment and natural resources: namely interventions aimed at protecting biodiversity, reducing pollution, including through the reclamation of polluting sites, favouring adaptation to climate change, and enhancing the sustainable management of natural resources. With specific reference to hydrogeological instability, the Fund aims to finance interventions in:

- restoring the full functionality of the territory and making communities safe through widespread extraordinary maintenance and hydrogeological risk prevention and mitigation;
- safeguard coasts and rivers and reduce fire risk;

- strengthen Green Infrastructure: due to its importance in preventing flooding and landslide phenomena and fire risk;
- consolidate adaptation to climate change, giving priority to interventions to reduce the vulnerability of the territory.

In regard to nature and biodiversity, the FSC foresees the financing of the following type of intervention:

- preservation and restoration of the qualitative state of ecosystems;
- enhancement of ecological connectivity to counteract the fragmentation of natural environments;
- creation of green and blue infrastructure and urban forestation, also to mitigate heat waves, promote CO₂ absorption and prevent HMH damage prevention.

The European Agricultural and Rural Development Fund (EAFRD) is another relevant financial facility for the policy arena analysed in this research. Rural development is the second pillar of the EU's Common Agricultural Policy (CAP) whose contribution to EU rural development objectives is supported by the EAFRD through Rural Development Programmes (*Programmi di Sviluppo Rurale*, PSR).²² The National Rural Development Program is co-financed by the EAFRD and it is the tool through which the Ministry for Agricultural, Food and Forestry Policies (*Ministero delle Politiche Agricole, Alimentari e Forestali*, MIPAFF) aims to sustain and promote the potential of the Italian rural areas. For the planning period 2023-2027,²³ Italy is entitled to 10,6 billion coming from EU budget and NextGen fund, a consistent increase compared to previous planning periods (Bolli, Varia and Cagliero 2021). RDPs are co-financed by national budgets and can be prepared on a national or regional basis. While the European Commission approves and oversees RDPs, decisions on project selection and implementation are taken by Member State authorities at national or regional level. Resource allocation is indeed negotiated and decided within the state-region conference. Each RDP, as stated by EU regulation 1305/2013, must aim to achieve at least four of the six

²² EU regulation 1306/2013 – on the financing, management and monitoring of the common agricultural policy

²³ Due to the pandemics and long lasting negotiations about the EU Pluriannual Financial Framework, it has been established a two year transition period for the CAP, postponing the start of the new planning period to 2023

EAFRD priorities including preserving, restoring and enhancing ecosystems related to agriculture and forestry, promoting risk management in agriculture, and a shift toward a climate-resilient economy in agriculture.

The Natural Capital Financial Facility (NCFE) is a financial instrument which was set up by the European Commission and the European Investment Bank that became operational since 2017. It offers loans (from 2 to €15 million) and technical support (up to € 1 million) to projects that are expected to have a positive impact on biodiversity and adaptation to the impacts of climate change, namely:

- Public buildings or housing: green roofs, green/hanging walls, greening of grey surfaces, permeable parking, rain gardens.
- Green infrastructure: creation of green corridors, planting of trees, shrubs parks and also urban gardening/farming, resident planting, rehabilitation of industrial sites or abandoned land.
- Blue infrastructure: nature-based flood protection, sustainable urban drainage systems, retention basins, lakes, ponds, watershed management, re-naturalization of rivers and others.
- Payment for ecosystem services.
- Biodiversity offsets/compensation beyond legal requirements, for example compensation pools for on-site and off-site compensation projects.
- Pro-biodiversity and adaptation businesses.

From 2022, the facility does not accept new project proposals as it will be replaced by InvestEU, a program that brings together 13 other EU financial instruments including the NCFE.

Going back to the Italian situation, a clearer picture of the whole spectrum of financing tools is given by the annex B of the National Plan for the Mitigation of hydrogeological risk, the recovery and conservation of natural resources. The document highlights that for the three-year period 2019-2021, the total amount of funding for the aforementioned activities is equivalent to more than €10 billion (Servizio Studi Camera dei Deputati 2022). The largest beneficiary was the Ministry of Ecological Transition with an overall endowment of €3.5

billion. Of this sum, 850 billion euros are allocated directly to the Ministry through budget laws, while the largest portion comes from the *Fondo di Sviluppo e Coesione*, which includes funding for various plans: Operational Plan for the Environment, Land and Water Protection (€600M), Plan for Metropolitan Areas at Risk of Flooding (€650M), Project design Fund (€100M), Development Pacts for the Environment and Disaster Sector (€1.700 M).

Budget Law 2018 and 2019 assigned €1.1 billion to the Ministry of the Interior, including the fund to be allocated to municipalities for investments in securing schools, roads, public buildings and municipal assets. Article 46 of Decree 104/2020 then intervened, providing for an increase of 2.6 billion euros for the years 2021- 2022. With the Ministerial Decree of 8 January 2022, an additional 450 million are allocated for the same purposes. To the Ministry of Agriculture, Food and Forestry are assigned 2.4 Billion euros of which 1.3 in the form of regional Programmi di Sviluppo Rurale related to the forestry sector aimed at fostering sustainable forest management, environmental protection, prevention and restoration of natural damage. Other funds come from the Fund for infrastructural investment and development, PSRN co-financed by the (FEASR) for irrigation infrastructure (290M), the FSC (Piano Operativo Agricoltura) intervention in the field of irrigation, drainage, flood mitigation, reservoirs, technical assistance (260M) and finally the extraordinary plan for reservoirs (250M). 150 million euros are assigned to the Ministry of Infrastructure every year for the maintenance of Dams and mitigation of hydrogeological instability. For Civil Protection, 850 million are allocated annually plus an additional 500 million euros earmarked with article 24 of the Law-Decree 119/2018. Other fewer substantial funds are provided for the Presidency of the Council (250 million) and the Ministry of Defence (40). The detailed representation of the funds is provided in the table below.

Table 3 DRR fund allocation 2019-2021 from “Allegato B al “Piano nazionale per la mitigazione del rischio idrogeologico, il ripristino e la tutela della risorsa ambientale”, 2019

| Dipartimento Protezione Civile | | | | | |
|--------------------------------|---------------------|------|------|------|-----------|
| Fondo | Stanziamiento | 2019 | 2020 | 2021 | 2019-2021 |
| Fondo Piccoli Comuni | Legge Bilancio 2019 | 400 | | | |
| | Legge Bilancio 2018 | 300 | 400 | | |
| | DL 50/1017 | 30 | | | |
| Ministero Ambiente | | | | | |
| Fondo | Stanziamiento | 2019 | 2020 | 2021 | 2019-2021 |

| | | | | | |
|---------------------------------|--|-----|-----|-----|------|
| Fondi Ministero | Legge stabilità 2016 | 246 | 150 | 150 | |
| Fondo investimenti | Legge bilancio 2017 | 50 | 37 | 35 | |
| | Legge bilancio 2018 | 14 | 45 | 42 | |
| | Legge Bilancio 2018 | 10 | 10 | 59 | |
| Fondo Sviluppo e Coesione (FSC) | Piano Operativo Ambiente tutela territorio e acque | | | | 608 |
| | Piano Aree Metropolitane rischio alluvione | | | | 654 |
| | Fondo Progettazione | | | | 100 |
| | Patti per lo sviluppo settore ambiente dissesto | | | | 1748 |

| Ministero Interno | | | | | | |
|----------------------|---------------------|------|------|------|-----------|------|
| Fondo | Stanziamiento | 2019 | 2020 | 2021 | 2019-2021 | 2022 |
| Fondo Piccoli Comuni | Legge Bilancio 2019 | 400 | | | | |
| | Legge Bilancio 2018 | 300 | 400 | | | |
| | DL 50/2017 | 30 | | | | |
| | DL 104/2020 | | | 900 | | 1700 |
| | D.M. 8 gennaio 2022 | | | | | 450 |

| Ministero della Difesa | | | | | |
|------------------------|----------------------|------|------|------|-----------|
| Fondo investimento | Stanziamiento | 2019 | 2020 | 2021 | 2019-2021 |
| | Bilancio 2017 e 2018 | 10 | 15 | 14 | |

| Presidenza del Consiglio dei ministri | | | | | |
|---------------------------------------|---------------------|------|------|------|-----------|
| Fondo | Stanziamiento | 2019 | 2020 | 2021 | 2019-2021 |
| Fondi Presidenza | Legge Bilancio 2019 | 110 | 120 | | |

| Ministero delle Politiche Agricole | | | | | |
|------------------------------------|--|------|------|------|-----------|
| Fondo | Stanziamiento | 2019 | 2020 | 2021 | 2019-2021 |
| PSR regionali 2014-2020 | Misure Forestali prevenzione e ripristino danni | | | | 1300 |
| Fondo Investimenti | Legge bilancio 2018 | | | | 107 |
| | Legge Bilancio 2017 | | | | 107 |
| PSRN 2014-2020 | Operazione 4.3.1 infrastrutture irrigue | | | | 291 |
| FSC-Piano Operativo agricoltura | infrastrutture irrigue, bonifica idraulica, difesa dalle esondazioni, bacini di accumulo, assistenza tecnica | | | | 257 |

| | | | | | |
|----------------------------|---------------------|-----|--|--|--|
| Piano straordinario invasi | Legge Bilancio 2018 | 249 | | | |
|----------------------------|---------------------|-----|--|--|--|

| Ministero Infrastrutture | | | | | |
|--------------------------|--|------|------|------|-----------|
| Fondo | Stanziamiento | 2019 | 2020 | 2021 | 2019-2021 |
| Fondi Ministero | Legge Bilancio 2019 rischio dighe e dissesto idrogeologico | 155 | 155 | 153 | |

In addition to the short and medium-term allocations, the law establishes expenditure plans of more than 10 years. For instance, the 2019 Budget Law, paragraph 134, provided funding for public works related to the safety of buildings and the territory for a time span of 13 years. It allocated 135 million euros annually for the years 2021 to 2025, 270 million for the year 2026, 315 million annually for 2027-2032 period and 360 million for the year 2033. The 2021 budget law, in paragraph 809, which intervened on the same discipline, increased the allocation by 1 billion euros for the period 2021-2034. Budget Law 2020, paragraph 44-46, established and regulated a fund for investments aimed to municipalities, with a total endowment of 4 billion euros (400 million for each of the years between 2025-2034), in the sectors of public buildings, roads, hydrogeological instability, seismic risk prevention. This fund is managed by the Ministry of Interior. Budget law 2020 regulated the assignment to local authorities of 2.78 billion for the period 2020-2031 for definitive and executive project planning costs (*Fondo Progettazione*). These resources were increased by a further 300 million by paragraph 415 of the 2022 budget law. Another interesting element of the 2019 budget law was placed in paragraphs 156-161, which regulates a tax credit equal to 65% of disbursements for a set of interventions, including those related to the prevention and restoration of hydrogeological instability. The rationale here is to mobilise private funds as investments are incentivized and partially offset through tax reduction spread over several years. Budget Law 2021, in paragraphs 701 to 704, allocated 35 million euros for the recruitment of technical personnel in order to accelerate and implement investments. However, it was just a temporary measure as it foresaw the use of fixed-term employment contracts with a duration not exceeding 31 December 2021.

In addition to standard programming and additional allocation, we are witnessing a further increase in public funding because of post-pandemic recovery plans. In 2021, it was agreed at

the EU level, the establishment of the National Recovery and Resilience Plan (NRRP), a financial aid programme that aims to foster the recovery of the countries most affected by the pandemic. Italy, due to its fragile financial situation, is among the largest beneficiaries of the fund, which include both subsidised loans and grants. The NRPP is going to finance strategic projects to be completed by 2026 and it is a crucial occasion for Italy to partially fill the gap in public infrastructure due to the lack of investments after the 2011 crisis. The Italian plan is divided into 6 main missions, the second, “the green revolution and ecological transition”, is the largest expenditure section amounting 59 billion euros. The national supplementary fund increases the funds for this thematic area by 9.1 billion while the React-EU programme by 1.3 billion. Item C4 of Mission 2 is the one that most concerns this case study, it is entitled “Land and Water Resources”, and it is endowed with 15 billion euros. It provides for the allocation of 500 million for the implementation of an advanced and integrated monitoring and forecasting system to identify and predict risks in the territory (M2C4.1-I.1.1-8-9), 2.5 billion for the financing of flood risk management and hydrogeological risk reduction measures (M2C4.2-I.2.1-10-13), for the resilience and the valorisation of the territory, and energy efficiency of municipalities (M2C4.2-I.2.2-14-17). The attention toward integrated intervention and NBS is testified, for instance, by the financing of a significant project, worth of more than 300 million, for the renaturation of the Po river basin, including intervention already foreseen in different plans such as the PAI, PGRA and PdGA.

Other funds and programmes that might include among their funded activities risk mitigation and biodiversity conservation are: European Maritime, Fisheries and Aquaculture Fund (EMFF), European Agricultural Guarantee Fund (EAGF), Just Transition Fund (JTF), European Regional Development Fund (ERDF), European Social Fund (ESF+) and the Recovery and Resilience Plan. These fund various initiatives more related to R&D activities, including the Horizon Europe and the Environment and Climate Programme (LIFE).

The figure below resumes all the yearly DRR allocation and interventions from 2004 to 2021.

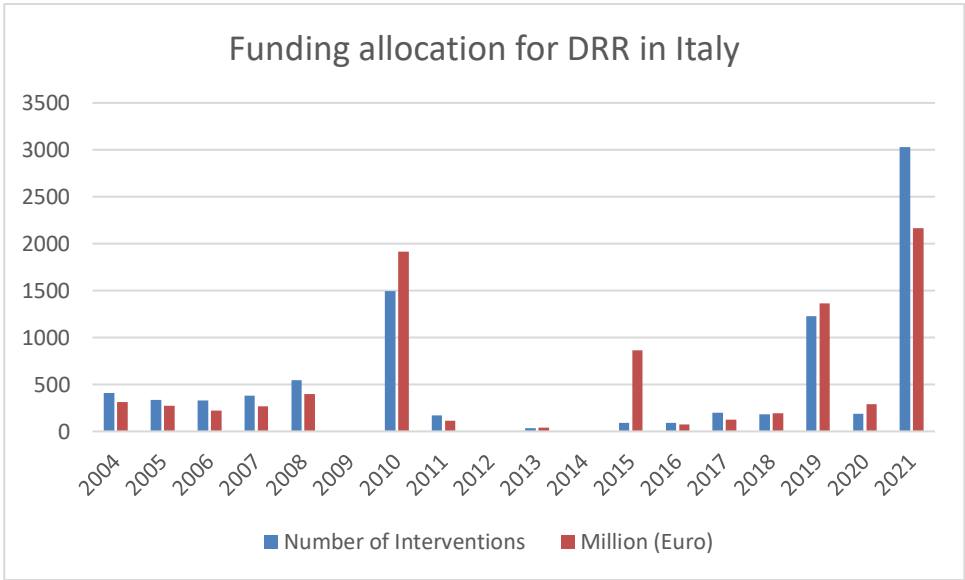


Figure 19 Million euro allocated for DRR and number of intervention financed per year in Italy data from the Rendis platform

It can be noted that funding has substantially increased, highlighting that DRR has become a top-priority in the national political agenda. However, there is still a consistent financial gap to be filled to reduce the vulnerability of the fragile national territory. Another interesting issue to note is that funding allocation is not regular but big and expensive plans are interspersed with periods of lower allocations. This is usually because big plans are made in response to cumulative delays and in response to increasing disasters that also have a strong practical and emotional impact on the population. This intermittent financing, however, is problematic in some cases as there is not always the technical and administrative capacity to implement so many works at the same time, as will be discussed below. One fact is that up to now these big plans have mostly financed traditional engineering structures and little place has been left for NBS (Respondent 6, 2022, Respondent 13, 2022, Respondent 3, 2022). Except for some European funds, the National Plan for Recovery and Resilience (PNRR), is the first direct monetary policy which more explicitly aims to implement NBS. The input also in this case came from the European level rather than the national one. Also this policy instrument will be further assessed in the discussion section.

5.4.2. Procedures and Criteria for funds allocation

After the review of the available funding programs, it is worth exploring how these funds are practically allocated, which criteria projects have to satisfy to be eligible for funding, which kind of project have the priority and if there exist criteria that favour Nature Based Solutions or not. A relevant piece of legislation that intervened on the matter is the Decree-Law n. 133 of 12 September 2014, the so-called “Sblocca Italia”, as amended by Conversion Law No. 164/2014. The law provides that the resources of Fund for the Financing of Infrastructural Investment and Development have to be allocated through the signing of programme agreements (*accordi di programma*) between the Ministry of the Environment (now Ecological Transition) and the Regions. The Programme Agreements are stipulated on the basis of the reports received from the local authorities and territorial offices, as well as the interventions included in the PAI. Art 7, paragraph 2, of the decree, states that resources must be prioritised for “integrated interventions”, aimed at both risk mitigation and the protection and restoration of ecosystems and biodiversity, that is why they are sometimes called win-win solutions/intervention. The law provides that a minimum share of 20% of the resources of the Programme Agreement must be allocated to this kind of projects. The decree “Sblocca Italia” also provides that, starting from the 2015 programming period, criteria for resource allocation should have been rationalized by a Decree.

The Decree of the President of the Council 28 May 2015 was finally adopted under the title of “Identification of criteria and modalities for prioritising resources for hydrogeological risk mitigation interventions”. According to the decree, the interventions proposed for funding have been divided into three categories depending on what is their object:

- a) Interventions with autonomous effectiveness.
- b) Complex interventions on vast area.
- c) Integrated interventions for the mitigation of hydrogeological risk and the protection and recovery of ecosystems and biodiversity.

Integrated intervention is here defined as “an intervention capable of simultaneously guarantee the reduction of hydrogeological risk and the improvement of the ecological status

of watercourses and the protection of ecosystems and biodiversity”. It must therefore be able to contribute to the achievement of the objectives set in the Water Management Plan implementing the WFD 2000/60CE and those set in the Flood Risk Management Plan implementing the flood Directive 2007/60CE. This typology is part of the broad set of so-called green infrastructures as defined in the 2013 EU Commission Communication No 249. The 2015 law does not explicitly refer to the term NBS but to “Integrated intervention” or “green infrastructure”. The decree established that the assessment of interventions belonging to the “Integrated Intervention” category will follow a partially differentiated procedure. The assessment is structured in 3 distinct phases:

- Stage 1 Eligibility for Funding
- Stage 2 Listing of eligible applications by order of priority
- Stage 3 Verification of feasibility and timetable of works

Stage 1 is common for every type of intervention. This is to be considered as the pre-assessment phase and it is conducted by the applicant region or its accredited bodies. Applications must be entered into the *Repertorio Nazionale degli interventi per la Difesa del Suolo* (Rendis-web platform) by the regions. Applicants have to fill in the preliminary assessment form specifying the stage of the project design (preliminary/definitive/executive), specific sections according to the type of hazard that it tackles, as well as administrative, geographical, financial and technical information. The applicants must upload a feasibility study just in the case of interventions exceeding 20 million euros. The region will then have to validate the data and upload each intervention proposal form on the ReNDiS system. The evaluation will be carried out through the verification of the following criteria and general principles 1) completeness of the data entered in the ReNDiS web system, 2) accuracy of the data and information provided, 3) adequacy and exhaustiveness of the contents of the attached project documents 4) compliance with the primary purpose of soil protection and, for the integrated interventions, compliance also with the objectives of protection and recovery of ecosystems and biodiversity. The criteria of consistency with the hydro-meteorological risk mitigation purpose is deemed to be satisfied when the object of the funding is congruent and functionally linked with the water management plans, flood hazard and risk maps, and flood management plans. More in details, the evaluation should assess whether the project:

- Consists of works and or activities that appear capable of affecting the causes or effects of the hazard.
- For the integrated interventions listed in Annex c, they must also contribute to the achievement of quality objectives set by Directive 2000/60 as declined by the water management plans in force, as well as improve the hydromorphological structure of the watercourse and increase its biodiversity.

The decree went more in the details regarding the type of projects that satisfy these criteria, indicating, for example, projects with the purpose of improving the hydraulic functionality related to the lamination capacity, slowing down the current velocity, reducing the channelling tendency dependent on hydraulic works and the anthropic occupation of part of the floodway. The works that fall into the category of integrated interventions have been mentioned in the section on "conservation and restoration of biodiversity" and are those related to: Morphological restoration, Naturalistic interventions, Reduction of artificiality, Sediment management and Sedimentary balance of watercourses discussed in previous paragraph. If the projects are found to fill in these categories and are coherent with both objectives of risk mitigation and biodiversity enhancement, the intervention, in addition to being eligible, will be considered "integrated" and thus acquire priority over the categories A and B interventions. Indeed, in compliance with the regulatory provisions, Category C projects will get access to at least 20% of the funding granted to each region. The law thus provides indirect monetary incentive , for the mainstreaming of NBS and demonstrate that already in 2015 it existed this sensitivity from the legislator about the need to go in this direction. This policy tool can be considered an indirect monetary because it does not create obligations as it does not command to adopt NBS but it gives priority fund allocation in the case of integrated intervention, alias NBS, are proposed. It therefore relies on the competition among public bodies for funds allocation.

Stage 2 has as its object the classification on a regional basis, in order of priority, of only those financing proposals considered eligible. This phase is carried out by the previously called Ministry of Environment in agreement with the Presidency of the Council, the Ministry of infrastructures and transport, with technical and operational support from Higher Institute for Environmental Research and Protection (*Istituto Superiore per la Protezione e Ricerca*

Ambientale, ISPRA), on the basis of the data entered in previous forms, by ascertaining the degree to which certain technical and administrative criteria are met. Common Criteria for every kind of project are the following:

- Regional priority: self-assessment given by the region that has to rank each intervention with an indicator of priority: AA, A, M, B; respectively very high, high, medium and low priority;
- Degree of approved project design (Preliminary, Definitive, Executive);
- Completion: relevance to an intervention that aim completing an unfinished work;
- People subject to direct exposure and risk;
- Assets and goods at high risk: the score differs according to the type of exposed assets or goods;
- Hazard frequency;
- Quantification of expected economic damage;
- Reduction in the number of exposed people *ante* and *post operam*.

Regarding category a) and b), extra points are assigned in the case the project includes compensatory measures which are works of environmental value that are not strictly related to the impacts of the main work and are carried out exclusively to compensate the damage caused. Compensatory are divided in two categories:

- Restorative: when a negative impact is expected, the depleted resource is replaced with an equivalent one.
- Environmental/naturalistic: it should restore a part of the natural ecosystem that has been lost as even in degraded neighbouring areas other than the area of intervention. The NBSs fall in this category.

Then, to each of the above criteria are associated:

- Weight: maximum numerical value
- Class: numerical, qualitative, physical range
- Score: numerical value attributed to each class in relation to the weight
- Weighted value: $\text{Weight}/\text{max score} \times \text{score}$

The sum of the weighted values gives the overall score on the basis of which the interventions will be ranked on a regional basis and will constitute the “Regional project ranking list”.

Table 4 Criteria for DRR fund allocation according to DPCM 28 May 2015

| Criteria | Weight | Class | Score | Weighted score | 2021 Decree |
|-----------------------------------|--------|---|---------|----------------|---------------------|
| Regional Priority | 20 | AA, A, M, B | 4/3/1/0 | 20/15/5/0 | 30/ 22,5/ 7,5/ 0 |
| Degree of approved project design | 10 | Preliminary Definitive Executive | 1/2/3 | 3,3, 6,6, 10 | = |
| Completion | 10 | Si/no | 1/0 | 10/0 | = |
| People at high risk | 60 | From <50 to > 50.000 | 8 to 0 | From 60 to 0 | from 30 (<1000) a 0 |
| Asset and goods at high risk | 30 | 1) Hospital, School, Residential area/ Industrial area 2) Main communication lines/ cultural Heritage 3) ? | 4 to 0 | 30/22,5/7,5 | From 30 to 0 |
| Hazard Return Period | 30 | Slow, Fast | 1/2 | 30/15 | 30/22/15/7,5 |
| Expected economic damage | 10 | Yes/no | 1/0 | 10/0 | |
| Reduction of people at high risk | 30 | Da 0 a >50.000 | 0 to 8 | 30 to 0 | |
| Compensation measure | 5 | Yes/no | 1/0 | 5/0 | |

Finally, Step 3 aims to ascertain and establish the degree of “implementability” (*cantierabilità*), namely the feasibility of the beginning of works, and the work schedule. It is assessed according to:

- the stage of intervention design
- the level of acquisition of all opinions and authorisations required by law.

These criteria are assessed throughout the process according to project development and the acquired documentation. It is finally assessed in the proximity of fund assignment, thus at the end of the process. Regions are responsible to draw a fact sheet to declare the stage of design and the existence or absence of authorising acts. The following are the voices required in the fact sheet: preliminary project approval, final project, executive project, publication of the invitation to tender, works awarded, works delivery, and completion of works. For each of these items, it should be indicated the expected and effective date of achievement. These requirements and all the paperwork needed for the assessment, authorization and implementation of projects require high project design capacity and thus adequate tools and skilled human resources. As the Court of Auditors (*Corte dei Conti*) pointed out the lack of project design capacity is one of the main barriers for spending the allocated funds (Corte dei Conti 2019).

Decree 28 May 2015 had finally standardised the procedures for submitting and financing preventive and risk mitigation interventions but, however, it was repealed shortly after its approval. The necessary procedure and documentation were deemed too complex and not compatible with the perceived urgent need for preventive measures in the country. In 2015 there has been an extraordinary “allocation of resources to an outline plan of priority interventions, by level of risk and promptly implementable” and it was decided to suspend the DPCM 28 May 2015. The same thing happened with the 2019 national plan. As said before, in order to speed up the implementation of works, the national plan was designed to act in derogation of the discussed decree. The same plan, however, as well as the PNRR, established that a new criteria decree should have been soon approved.

Decree of the President of the Council of Ministries (DPCM) 27 September 2021 thus amended the previous one and established new modalities and criteria for resource allocation for the financing of risk mitigation intervention. The Funds are first distributed to each region according to indicators established in DPCM 5 December 2016. Then the individual projects submitted by the regions are assessed. Differently to the decree 28 May 2015, the new decrees identify just two categories of intervention, merging the previous category A and B into one A, namely “ordinary intervention”, and the C “integrated intervention” now labelled with the letter B.

- a. Ordinary Interventions are understood as those interventions capable of autonomously achieving the objective pursued, i.e. a network of organic and/or multi-sectoral interventions coherently aimed at achieving a common objective and for which a unitary and coordinated implementation is justified, which go beyond the local dimension as they affect a vast area.
- b. Integrated interventions are defined as in the 2015 decree as an intervention aimed at the mitigation of hydrogeological risk and the protection and recovery of ecosystems and biodiversity.

However, in this case it is interesting to note that the terminology Nature-Based Solutions also appears in reference to interventions such as functional floodplains, riparian zones, protection forests in mountainous areas, littoral cordons and coastal wetlands. From the terminology used, it seems that NBS are considered as a subgroup of Green Infrastructure which according to the mentioned COM(2013) 249 are “a strategically planned network of natural and semi-natural areas with other environmental elements, designed and managed to provide a broad spectrum of ecosystem services” such as water purification, air quality, hydrogeological instability mitigation and climate change adaptation. It thus seems that NBS are considered “Green Infrastructure” when inserted into a wider framework of interventions and planning process and have a structural impact on the environment. Criteria for drawing up the list and prioritizing interventions are established in Annex B which established that the regions have to take into account the following aspects:

- a) Consistency with basin planning.
- b) Inclusion in territories for which measures have been taken due to natural disasters pursuant to the Civil Protection Code.
- c) The level of project design available with priority to intervention with a higher likelihood to be put out to tender soon.
- d) Restoration works of hydraulic and drainage works with high expected improvement in efficiency
- e) High level of exposure of the assets.

Interventions that score higher according to these these criteria will be given priority of funding. Annex II to the DPCM 27 September 2021 gives us a more detailed view of the

criteria and scores that are awarded to each intervention proposal and will be discussed later. The decree changes some aspects of the procedure for drawing up the list of prioritised projects. Step 1 is similar to the previous one. Implementing bodies such as irrigation and drainage consortia, AIPO, municipalities or regional implementing bodies submit the projects design to the regions which in turn apply for funding by entering the necessary documentation in the Rendis-web platform. However, a crucial change has been adopted, namely that in this case a preliminary study would be sufficient for the uploading on the platform reducing the amount of preventive work and paperstuff in the hand of implementing bodies and the region. Definitive and executive project can be drawn up once the project are financed. Even if in this case they are going to receive a lower score in the priority list. The preliminary study form must be filled in and the files relating to the approved projects must be uploaded, even at the technical level, according to the level available (preliminary, technical and economic feasibility, final, executive). The minimum level required is the preliminary study, which must include at least the following contents:

- Technical documents aimed at verifying consistency with the basin planning objectives.
- Basin planning compatibility report illustrating the effects induced by the work in the reference physical-environmental context.
- Identification of the type and location of the hazard.
- Identification of characteristics and location of the works.
- Functional relationship between the proposed and identified works and instability and, where necessary, with the phenomena of degradation of river ecosystems and riparian habitats.
- Indication of "accessory works", the percentage of which must not exceed 10% of the amount of the works.
- Technical/economic/administrative documentation (economic framework, economic quantification, technical/financial timetable, act of approval in technical line).

The region concludes the first phase with the uploading of the validation act. The second stage consists of the assessment of the documentation carried out by the District Basin

Authority (DBA) which expresses its opinion on the ReNDiS-Web platform based on the coherence of the intervention with planning documents in force and with data inserted by the region with those in the possession of the DBA. At first, the DBA may ask for integration or modification of the documentation provided by the region in the first phase during the 30 days after the uploading of the validation act.

Most importantly for our case study, the DBA assesses whether the intervention can be classified as “Integrated Intervention” or not on a case-by-case analysis. In the first case, the intervention gains priority access to funding in accordance to Article 7 of Decree-Law No. 133/2014 *Sblocca Italia*, establishing that at least 20% of the funds should be allocated to integrated intervention. The DPCM 27 September 2021 thus reinstates the same priority access for integrated intervention that was established also in decree 28 May 2015 which was derogated soon after. Finally, the District Basin Authorities can give a preliminary indication of prescription for the executive phase with the aim of impeding watercourse deterioration.

In the third phase the DBA emits its definitive opinion which is a prerequisite for proceeding with the further steps of the application. Once the procedure has been carried out by the District Basin Authority, it validates the form and the system automatically calculates the score of the intervention, which takes part in the formation of the relative Regional Ranking of funding requests. The score is calculated as shown below.

There exist two types of criteria for the classification of intervention, the first are common criteria for every kind of intervention and regard for instance: localisation, financing, classification of the area, exposition and vulnerability. The second criterion is based on the existence of compensation and mitigation measures: which are intended to reduce or eliminate the negative impact of the work (mitigation) or to carry out other works of environmental value that are not strictly related to the impacts of the main work (compensation). Compared to the criteria established with decree 18 May 2015 there are some modifications. The 2021 decree increases the weight given to the Regional Priority which has increased from 20 to 30 in the case high priority is assigned. It, therefore, increases the discretion given to the regional planning authority. The decree also gives to the planning authority the possibility of identifying interventions in need of urgent funding, regardless of the scores calculated on the basis of the indicators, up to a maximum of 20% of the total allocated resources. In this case, intervention should still be chosen from those included in the regional list from the ReNDiS

platform and already validated by the DBA. The decree also includes a new item that assigns 7,5 point, in the case the intervention is located in protected areas. The decree also reshape the criteria which was a general frequency of hazard (high/low) to more detailed parameter assigned to each specific hazard:

- Flood return time: 4 classes of years are identified from < 50 years to which are assigned 30 point, to > 200 years that gives 7,5 points
- Erosion: residual beach width facing the exposed assets in the stretches of progressive retreat over the last 50 years (coastal erosion - metres): from L<10 equal 30 points to L>40 equals 7,5.
- Avalanches: high and very high or medium and moderate to which are assigned respectively 30 or 15 points.
- Storm surge return period: from y<20 to which are assigned 30 points to y>200to which are assigned 7,5 points.
- Landslide movement speed: fast or slow to which are assigned respectively 30 or 15 points.

The criterion of reducing the number of people at risk in the new decree is given in percentages instead of absolute numbers creating 5 bands of 20% for a maximum score of 30 and a minimum of 6. 0 if the estimate is missing. Finally, the Prime Ministerial Decree of 27 September 2021 adds a criterion that assigns additional points in the event that the proposed intervention is an implementation of a plan measure (PAI, PGRA or similar) and distinguishes the classes: fully implements, partially implements, does not implement with the respective scores of (30, 15, 0).

Table 5 Funding allocation criteria accordig to Annex II to DPCM 27 September 2021

| Criteria | Weight | Class | Score | Weighted score |
|-----------------------------------|-----------------------|--|---------------------------------------|------------------|
| Regional Priority | 20 | AA, A, M, B | 4/3/1/0 | 20/15/5/0 |
| Degree of approved project design | 10 | Preliminary Technical and economic feasibility Definitive Executive | 0 to 4 | 0/3,3,/6,6, 10 |
| Completion | 10 | Si/no | 1/0 | 10/0 |
| People at high risk | 30 (metà rispetto) | From < 50 to > 1000 | 1 to 4 and 0 in case of absent esteem | 0/7,5/15/22,5/30 |

| | | | | |
|----------------------------------|-------------|--|--------|-----------|
| | a prima) | | | |
| Asset and goods at high risk | 30 | 1) Hospital, School, Residential area/ Industrial area | 4 | 30 |
| | | 2) Main communication lines/ cultural Heritage | 3 | 22,5 |
| | | 3) protected natural area and other structure of public interest | 1 | 7,5 |
| | | 4) no asset at risk | 0 | 0 |
| Hazard Return Period | 30 | 4 class of different indicators for each hazard ²⁴ | 1 to 4 | 7,5 to 30 |
| Expected economic damage | 10 | Yes/no | 1/0 | 10/0 |
| Reduction of people at high risk | 30 | 5 bands from < 20% to > 80% | 0 to 5 | 0 to 30 |
| Compensation measure | 5 | Yes/no | 1/0 | 5/0 |
| Implementation of plan measure | | Fully / partially / not implement | 2/1/0 | 30/15/0 |

In conclusion, the Decree 27 September 2021 seeks to standardize and simplify the procedures, it gives more discretion to the region in identifying priorities and to the district basin authority in establishing whether an intervention is integrated or not, it is more flexible in that it also allows preliminary projects to be submitted but with the scores it tends to reward those at a more advanced stage. And very importantly for this case study, it reinstates the 20% priority fund allocation for integrated intervention and thus NBS.

This type of policy can be considered an indirect monetary policy since it does not provide for direct allocations, but it establishes the criteria and thus generate monetary incentives that can affect the choice of the designers and decision-makers. It does not generate obligations to present one type of project rather than another but creates incentives as funds are often lacking and public administration compete for them. The same goes for the principle of 20% of funding for integrated works and therefore NBS. In order to assess its effectiveness, it will have to be assessed whether implementing bodies will actually submit NBS projects in the near future but now it is early to have such results.

²⁴ See the list above the table for further details

Chapter VI

The Emilia-Romagna case

6.1. Regionalization of environmental policy

As highlighted before, the role of the regional institutions has changed over time and it is now pivotal in the field of environmental governance, an even more in the case of Disaster Risk Reduction. I am going to briefly sum up the process that led to this outcome highlighting the most relevant feature of the system. The regions were effectively established just in 1970 with Law n. 281 starting a period of power decentralization and expansion of local autonomies. The process regained strength in the second half of the 1990s reaching the peak with the “Bassanini reform” of 1997-1998 and the Constitutional reform of 2001. Here, it was introduced the principle of subsidiarity²⁵ into the Italian administrative system: the set of competences have been reassigned, transferring to the periphery functions previously being exclusive to the central government. Civil Protection, land and spatial planning and valorisation of cultural and environmental heritage are matters of concurrent legislation between the State and Regions, that gradually obtained more governance functions even if they already had a relevant role assigned by law 183/1989.

After the adoption of the environmental code (d.lgs 152/2006) and the suppression of the interregional and regional basin authority, regional offices have absorbed part of their role and increased their number of functions in the field of water management and disaster risk reduction. The region becomes the direct link between territories and the District Basin authorities and participate actively in the drafting of the water plan and the risk management plan. The region also actively participates in the evaluation and uploading of project in the Rendis platform but it also has a role in the implementation phase especially through EIA evaluation, when required by law. To the regions have also been entrusted functions of civil protection whose operative branch (Agency for Territorial Safety and Civil Protection (ARSTePC) can also be involved in preventive structural works. Other relevant agencies

²⁵ Principle of Subsidiarity: the central state intervenes in matters involving environmental interests when objectives cannot be sufficiently achieved by the lower administrative levels of government

under the regional control are the Regional Agency for Prevention, Environment and Energy (ARPAE), and the Po River Interregional Agency (AIPo) whose role and functions will be discussed later. ArstPC, ARPAE and AIPo composed the so called “system of regional agencies”, mostly technical body, controlled by political and administrative ones, who are in charge of relevant functions in the field of environmental governance and in particular water and risk governance.

The process of regionalisation of the governance of risk prevention has been further accelerated in the 2010s. First, budget law 2010 (191/2009) established an extraordinary fund for hydro-geological risk reduction and a new allocation modalities. It established that interventions should have planned through “Programme agreement” (*accordi di programma*) negotiated directly between the state and each region. The State allocates resources and the Region suggests the interventions to be financed with that kind of resources. However, structural features as lack of clarity about implementation responsibility and institutional fragmentation made implementation challenging. In 2014, the Mission structure “*Italia Sicura*” was created at national level to speed up the processes. In the same year, with Decree-Law 12 September 2014, the implementation of the “Programme Agreement” and interventions was assigned to the Presidents of the Regions as Government Commissioners as for hydrogeological instability. It was also stipulated that resources not spent by a set deadline would revert to the ministry and no longer be at the disposal of the region (Gallozzi and al. 2020). The region becomes therefore the pillar of the system and the President of the regional council become directly responsible for the implementation of interventions. For this task the President then delegates to an appointed official, within the regional administration, all the technical-administrative activities necessary for the implementation of the Programme Agreement between the government and the region.

DPCM 28 may 2015 overcome the Programme agreement system that was mainly built for urgent measures, trying to set homogeneous funding criteria and standards for the whole national territory. First of all, it establishes that funding for soil protection measures can only be requested by the regions through the completion of an Investigation Form, made available online on ISPRA's ReNDiS-web platform. Interventions will be evaluated in a second step by the District Basin Authority, Ispra or the Ministry of Environment to verify the requirements for eligibility for funding. Then each eligible intervention obtains a score according to criteria

discussed in paragraph 5.4.2 and regional list of priorities are created. The criteria list and score points established a system in which an intervention could gather a maximum score of 200 points. Among the many criteria which awarded points, a relevant weight is given to the priority assigned to the intervention by the region itself. That means that if the region assigns high priority to an intervention it receive extra 20 point. These extra points have been increased to 30 point with the decree 27 September 2021 giving additional discretion to the region. After all the criteria have been assessed, a regional list of projects is drawn and intervention are ranked according to the priority score seen in chapter V. Then, according to the funding provided by budget law and EU funds, the projects are financed starting from the first onward until available fund. Lately, it was established a “project design fund” whose functioning was defined by the subsequent DPCM of 14 July 2016, which identifies the Presidents of the regions, in their capacity as Hydrogeological Disaster Commissioners, as the only beneficiaries.

The scope of actions and actors explicitly involved in soil protection policies was redefined and expanded with the approval of the National plan for hydrogeological risk mitigation, restoration and protection of environmental resources, the so-called “*ProteggItalia*” Plan endowed of 3 billion euro. The plan acknowledged the cumbersome nature of the system created by the Criteria Decree of 2015 and establishes a transitional regime with regard to the funds allocated under the plan, and proposes to establish a more streamlined and definitive system by giving guidelines for a subsequent bill called “*CantierAmbiente*”. Meanwhile, the plan set an urgent “*Piano stralcio 2019*” with a list of “immediately executable, urgent and undelayable projects”. As already discussed, this plan derogated again the Criteria Decree. The lists of projects included and financed in the “*Piano Stralcio*” are indeed drawn up by a list of project defined on the basis of proposals submitted by the Regions and approved by Service Conferences in which the competent river basin authorities also participate. In this way total discretion has been given to the region regarding which project has to be financed confirming the pivotal role of this institution identified as the right body to speed up processes.

The “*CantierAmbiente*” bill, was filed in the Senate on July 2019 and hinged in October but it never completed the approval process since Covid pandemic arrived and other tools such as the Resilience and Recovery funds (PNRR) were adopted. Amongst other provisions, the

CantierAmbiente draft bill established to further strengthen the role of the Presidents of the Regional Government assigning the task of preparing a three-year Action Programme, consistent with the district basin plans and articulated in annual plans. It is the President-Commissioner who, with the Programme, punctually identifies the actions to be implemented, the relative costs, the resources already available and the further requirements needed to implement them.

The revision of the criteria decree, as advocated by the “*ProteggItalia plan*”, instead, achieved a better outcome with the approval of DPCM 27 September 2021. The new criteria decree increases the weight given to the Regional Priority which has increased from 20 to 30 in the case high priority is assigned. An increase even more significant if we consider that with the new decree the max score is 170 instead of 200. The decree also gives to the planning authority the possibility of identifying interventions in need of urgent funding, regardless of the scores calculated on the basis of the indicators, up to a maximum of 20% of the total allocated resources. In this case, intervention should still be chosen from those included in the regional list from the ReNDiS platform and already validated by the DBA. The new decree, therefore, increases the discretion given to the regional authority and maintain the provisions that at least 20% of funds should be allocated for “integrated interventions”, if presented. An integrated intervention is an intervention that aims at both the mitigation of hydrogeological risk and the protection and recovery of ecosystems and biodiversity, a very similar concept to NBS. The new degree also reduces the administrative burden to the region as it establishes that in order to be included in the Rendis platform now it is sufficient a preliminary study containing items discussed in paragraph 5.4.2. It can be considered an indirect monetary policy since there is a monetary incentive to bodies and organizations, but it doesn’t provide any obligations to actors.

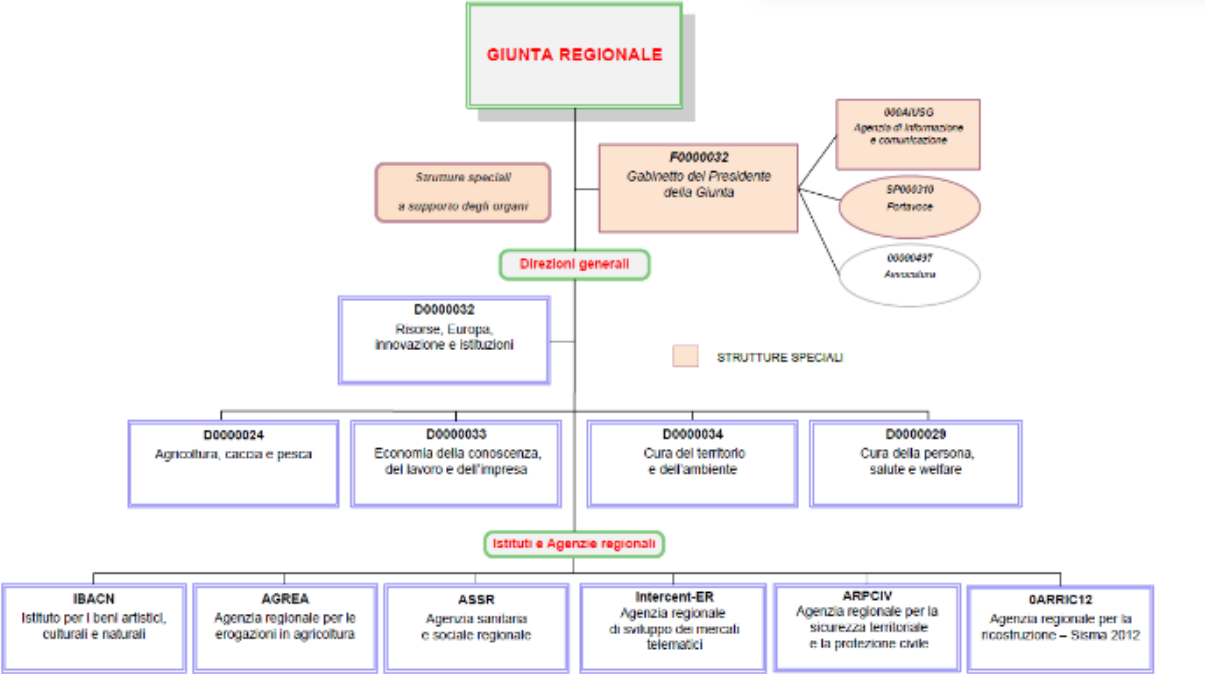
6.2 Regional organization

6.2.1. Regional Government

As established by art.121 of the Italian Constitution, the regional governing body is the Giunta Regionale, a collegial body composed of the president of the regional government and the councillors (*assessori*) to whom various governance departments and functions are

delegated. The regional institutions have a rather wide freedom in the organizations of its own functions assigned by the constitutions and its reform seen in chapter IV. The regional government is assisted by technical offices and 5 general directorates including “land and environment protection” (*Direzione Generale Cura del Territorio e Ambiente*).

Figure 17 Regional Government Organigram from Documento di Economia e Finanza 2020



The region has been active in asking for more autonomy and freedom in many fields, including the environmental management (DEFR 2020). The General Directorate for Land and Environment Protection is divided into several sectors, including: a) administration and in-house agency, b) protected areas, forests and mountain area development, c) territorial defence, d) territorial governance and quality, e) transport, infrastructure and sustainable mobility, f) environmental protection and circular economy. The land defence sector deals with geology, soils and seismic; administrative and financial activities in the field of soil protection, coastline and land reclamation, coordination of activities in the field of coastal defence for plans and programmes; c) coordination of geological themes and databases, hydrogeological hazard and risk assessments, management of basin planning, production and analysis of geological and hydrogeological data in the Emilia-Romagna plain, planning of interventions and management of complex procedures in the field of soil protection, hydraulic

reclamation and irrigation, development and analysis of soil data to support agricultural, environmental and urban policies, data gathering activities for coastal risk mitigation and maritime spatial planning (Regione Emilia-Romagna 2021).

The territorial governance and quality sector deals instead with spatial planning, urban planning and landscape protection area, urban regeneration and housing policies area, planning services and spatial observatory, evaluation of sub-regional plans and town planning. The protected areas sector is responsible for regional actions in favour of the protected areas system and biodiversity conservation, forestry and urban forestry, regional forestry nurseries, forestry plans and authorisation procedures, Natura 2000 network and implementation of the EU “habitat” directive. As it is evident at first sight, a lot of the aforementioned functions overlap, and it is therefore necessary a high degree of coordination between regional offices to avoid redundancy and homogeneous actions.

Directorate General and its subordinate offices represent the bureaucratic element of the regional administration while the regional government (the *Giunta*) and its department, alongside the Regional Legislative Assembly and its commissions, represent the political structures of the system. Regarding environmental and risk reduction issues, there has been a change in the name of the department and the allocation of functions within the regional government. The environment department was established in 1972 when the second regional government took office, and it was named “Hygiene and Environmental Protection” department. Disaster risk reduction and spatial planning was instead delegated to another department, the “spatial planning” department (*assetto territoriale*). Environment and risk reduction were thus separated at least in the initial phase of the regional government, but, since 1981, they were unified under the department of the “Environment and Soil Protection” (*Ambiente e Difesa del Suolo*). During the 1990s the department changed name becoming the “Territory, Planning and Environment” department but retained the same functions. At the beginning of the new century, the tasks related to the environmental governance were increasing considerably, due to the more recent international developments and agreements to be implemented (the COPs and the EU directives), and the national and local renewed attention to environmental issues. The regional government therefore decided to assign environmental functions to three different counsellors and three different Department: a) Soil, Coastal Protection and Civil Protection, 2) agriculture Environment and Sustainable

Development, and 3) Spatial Planning Department (more focus on urban settings). It is interesting to note the inclusion of the sustainable development terminology already at the beginning of the new century denoting a sensitivity of the regional institutions to the international development regarding environmental governance. In 2005, agriculture and the environment were further separated as it was created the department of Environmental and sustainable development that become the department of Environmental and urban regeneration in 2010-2014. Regarding risk reduction the department was renamed as “Territorial Security, Civil Protection, Soil and Coast Defence”, which become “soil and coastal protection, civil protection and environmental and mountain policies” in 2014. As for the Region ER? In 2020 we have assisted to a centralization and integration of environmental governance functions at the regional vice-presidency level. One vice president of the regional government, Elly Schlein obtained the competence on combating inequalities and ecological transition including the Climate Pact. These are more coordination functions as for instance the Climate Pact is a inter-departmental and comprehensive policy tool of climate change prevention and adaptation policies and for the ecological transition. The other vice president, Irene Priolo, is in charge of the “Environment, soil and coastal protection, civil protection” department. It deals with planning, programming and management of integrated environmental sustainability policies. This includes also water management, regulation of the implementation of environmental permits, environmental assessment procedures for plans, programmes and projects, information and education on sustainability, guidelines for integrated coastal zone management and the sea strategy. And finally, supervision and guidance of the regional environmental Agency system. The department of Mountain, internal areas, spatial planning, and equal opportunities is also involved in risk reductions and environmental management, land use, forest protection, parks and protected areas. Finally, also the department of “agriculture and agribusiness, hunting and fishing” deals with issues related to resilience and adaptation to climate change, biodiversity and protection and rebalancing of wildlife and fisheries.

This review of the region's main governing bodies gives us an idea of how much the region is at the centre of the system of governance and how intertwined and complex these issues are. Therefore, great synergy and integration is needed between the various political and bureaucratic bodies but also with the operative bodies that will be discussed in the following section.

6.2.2 The Agency System

The agencies are the operative branches of the regional institutions. As said before they are three and fulfil different tasks.

The Regional Agency for Environmental Prevention and Energy (Arpae) was established by Regional Law n. 13/2015 and has been operational since 2016. The agency integrates the functions of the former Arpa and the Environment Services of the Provinces abolished by law n. 56/2014. Arpae is structured in several offices per territorial unit, to guarantee a direct presence on the territory and performs activities of authorisation, concession, monitoring of the state of the environment, supervision and control, and analytical analyses. Arpae also plays a key role in observation, forecasting, research and development in the field of meteorology and climatology, addressing the knowledge issues underlying climate change adaptation and mitigation policies. Arpae is also responsible, alongside other stakeholder, of drafting relevant strategic document as the Regional Climate Change Mitigation for the Adaptation Strategy and the report of the state of the art of the regional environmental involving many fields ranging from pollution, ecological status, resource and land use, water scarcity, emission, and so on. Arpae can therefore be considered a knowledge base actor very relevant for strategic planning that provides policymakers the data to take decision.

The Agency for the Safety of the Territory and the Civil Protection “*Agenzia per la Sicurezza Territoriale e la Protezione Civile*” is another fundamental agency that supports the Disaster Risk Reduction governance system. The agency acts under the direction and supervision of the Regional Department (*Assessorato*) for “Ecological Transition, Combating Climate Change, Environment, Soil and Coastal Protection, Civil Protection”. The Agency is then divided in territorial services on a provincial basis and it is endowed by administrative and technical offices. It carries out management activities with respect to civil protection, soil and coastal defence, seismic, water and mining activities, inland navigation and management of the Ferrara waterway. It has technical-administrative competences in the field of land use authorisation procedures, design, contracting and execution of soil and coast defence works, flood services, hydraulic clearances, emergency and post-emergency resource management, relations with operational bodies and structures, voluntary work.

The Interregional Agency for the Po River (AIPo) was established in 2003 with four laws approved by the Councils of the Regions that falls within the Po basin: Piedmont, Lombardy, Emilia-Romagna and Veneto. AIPo takes up the legacy of the dissolved *Magistrato per il Po*, a state body created in 1956 and it is responsible for the management of the main water reticulum of the Italian largest river basin, mainly dealing with hydraulic safety, water management and river navigation. The agency is one of the operational branches and implements on the territory what are the directions of the superordinate bodies such as the District Basin Authority and the region, which plan also taking into account the indication of AIPo. The planning body can give draft guidelines during the planning phase like “put an embankment in this strip, an expansion tank in this area” (Respondent 13, 2022) but then the authority also takes on board the voice of the territory from the operating bodies, which can say “there is no point in putting an embankment there, better somewhere else”. There is an interaction in this sense (Respondent 13, 2022). Indeed, AIPo has a deep knowledge of the territory since, unlike the basin authority, which is centralised, it is an operational body with 15 operational offices distributed throughout the territory. It therefore has a good knowledge of local realities, risks and the main defence works. AIPo participates to basin planning activities mostly with the intermediation of the regions as far as the Flood Management Plan (PGRA) is concerned.

6.2.3 Regional protected areas

As discussed in paragraph 5.3.1. Law n.394/1991 establishes rules for the creation and management of National or regional parks while DPR n.357 of 1997 established rule for the creation of protected areas of the EU Natura 2000 sites. The region has roles in both.

Regional Law 6/2005 defines regional parks as “territorial systems that, due to their natural, scientific, historical-cultural and landscape values of particular interest in their overall characteristics, are organised in a unitary manner, taking into account the needs for conservation, restoration and improvement of the natural environment and its resources as well as the development of compatible human and economic activities”. Regional parks are established by regional law and are managed by the Management Entities for Parks and Biodiversity *Enti di gestione per i Parchi e la Biodiversità* provided for in Regional Law No. 24 of 23 December 2011. The region also plays an important role in the definition,

management and monitoring of Natura 2000 areas in compliance with the EU Habitats Directive.

The protected areas established in the Emilia-Romagna region today consist of: 2 national parks shared with the Region of Tuscany in the Appenine Mountains, 1 interregional park shared with the Marche region and 14 regional parks and 15 nature reserves. Regarding Natura 2000 Network, starting from the first census of habitats and species in 1995, the Region, in agreement with the Ministry of the Environment and the European Commission, has identified: 13 Sites of Community Importance (SCI) *Siti di Importanza Comunitaria* (SIC) and 87 Special Protection Area (SPA) *Zone di Protezione Speciale*, in some cases overlapping, which together form the sites of the regional Natura 2000 Network. Among the most important parks is the Emilia-Romagna Po Delta Regional Park, which was established in 1988 with a special Regional Law (L.R. 27/88). Until 2011 the Park was managed by a Consortium made up of the two Provinces of Ferrara and Ravenna and their respective nine Municipalities. Since January 2012, by virtue of Regional Law no. 24 of 2011, the Park has been managed by the Parks Management Body - Po Delta *Ente di Gestione del parco*. The importance of this body is testified by the fact that the region has recognised it as a management body for the Natura 2000 network, which allows it to intervene in the entire Po basin, has assigned it the management of the marine SCI set up in 2021 as well as the Unesco MAB planning of the Po Delta Park (interview Gottardi). As mentioned before, a sector of the regional government is in charge of actions relating to the promotion of the above-mentioned protected areas.

6.2.4 Drainage and Irrigation Consortia

The Drainage and Irrigation Consortia system of the Emilia-Romagna region is composed by 8 Drainage and irrigation consortia known as *Consorzi di Bonifica*, including: Piacenza, Parmense, Emilia Centrale, Burana, Renana, Romagna, Romagna Occidentale, and Pianura di Ferrara. The activities of the Consortia are governed by Royal Decree 215/1933 and Regional Laws 42/1982 and 16/1987. The consortia are set up among all the owners of property within the consortium's perimeter that benefit from the land reclamation activity. Some municipalities that fall within the area of competence are part of the consortium directors board. The consortia take care of the drainage and irrigation network that serves the territory

in the plains, while in the Apennines they deal with drainage with artefacts and works that regulate the flow of water, both to provide water to users and to consolidate slopes. They have to work in close collaboration with the municipalities and the region and also with the civil protection service. The functions and tasks of the Consortia are referred to in the above-mentioned regulations and are summarised in the following: a) ensure the stability and good hydraulic regime of the sloping terrain; b) ensure the drainage of water and the hydraulic health of the territory; c) adapt and complete the land reclamation and ensure the maintenance of related works; d) conserve and increase surface water resources for agricultural use. The Consortia provide for the implementation of ordinary measures through the sums, the land reclamation contribution, that they receive from all the owners, Consortium members, of real estate that benefit from the Consortium's activity. The land reclamation contribution is determined in proportion to the benefit that each property derives from the land reclamation activity. For extraordinary interventions, the consortium may submit projects once there is extra funding from the region or ministries.

The Emilia-Romagna Region, through the Soil, Coastal and Land Reclamation Defence Service, grants funding to the Consortia, subject to budget availability, for the construction or restructuring of land reclamation works. The Regional Service deals with the planning of interventions, approves the relative projects, and periodically monitors their implementation status. It also coordinates and directs the activities of the Land Reclamation Consortia. The consortia are organised by river basins, and the Burana consortium (intercepted for our case study) deals with the Panaro basin and also covers small territories in Lombardy and Tuscany. The consortium has a central office that includes general technical activities and then there are the three peripheral offices of the consortium that work operationally for the maintenance and ordinary annual management of the territory. The activities of the consortium are divided mainly between those carried out in the mountains and those in the plains. In the Apennines, there is no land reclamation, but the activity dates back to around the 1980s and is linked to an agreement whereby, since the consortium has the personnel, technical skills and means, it operates on the basis of reports from the municipalities or civil protection on any critical situations. They mainly intervene by repairing the slopes. Downstream, on the other hand, there are reclamation and irrigation activities that are important in managing the risk not only of drought but also of flooding (interview Respondent 9, 2022). The consortium participates in the PGRA drafting process and has a privileged relationship with the municipalities, 3 of

which are part of the consortium's board of directors even though they “tend to forget it” (Respondent 9, 2022). In addition, the municipalities are responsible for authorisations and processes that go to the services conference, as well as constraints preordained to expropriation, also as signalling of criticalities and needs. Interestingly, a member of the consortium pointed out that “the consortium acts on a network that has important naturalistic characteristics. For rivers it is more straightforward while for the drainage canals, it seems less so, but in reality the drainage canals have ecosystems that must be protected” (Respondent 9, 2022). This consideration highlights how cross cutting the issue is, and the needs of involving of all the stakeholder, including those whose main aim is not disaster risk reduction or conservation of biodiversity.

6.3. Regional Strategic and Operative planning tools

The region adopts several planning instruments. Some are “ordinary” and recur in every legislature while others are “extraordinary” as they respond to new, emerging and urgent need. The latter are used to recalibrate the regional focuses often in response to international developments, especially those related to environmental issues The most important strategic and operational planning tools are the following:

- Regional Government Mandate Programme (*Programma di Mandato*)
- The Regional Economic and Financial Document (DEFER)
- The Regional Strategic Document (DSR) for the Programming of European Structural Funds and European Investment Funds
- The Basin plan in which the region is deeply involved alongside the District Basin Authority
- Regional Spatial plan (*Piano Territoriale Regione*)
- The Labour Pact (2015) and the Labour and Climate Pact (*Patto per il lavoro e clima*) since 2020 onward

6.3.1. The Mandate program

The Mandate program is a political and strategic document, signed by all the members of the regional government that set objectives and actions for the legislature in each field of competences of the region. The mandate programme of January 2015 was signed in a period in which Italy was still struggling to recover from previous year of financial crisis. Emilia-Romagna was, however, one of the region that reacted better and swifter. Moreover, in 2012, the region was hit by a series of seismic tremors that reached 5.9 magnitude and caused 27 victims and considerable damages especially in the Modena provinces. The risk awareness was therefore high at the time. For instance, among the top-priority in the Mandate Programme there is the “hydrogeological, environmental and landscape rehabilitation of the Po river” reference? that should be done by “involving communities, universities and research bodies, businesses to secure the territory through soil, river and coastal defence, and to upgrade and enhance the complex and delicate natural, environmental, historical and cultural balance”. The issue is addressed in more depth in section 5.2 of the document “soil defence” (Giunta Regionale Emilia-Romagna 2020).

The document, regarding the hydraulic risks, highlights the necessity to ensure the implementation of multi-year maintenance programmes of both the hydrographic network and the coastal system. To this end, it aims to improve the coordination between all the managing bodies such as the Local Authorities, the regional agencies, the agricultural organisations and the Civil Protection. The document states that “this will allow the sharing of priorities, the correct allocation of resources, the simplification of authorisation procedures, optimising the relationship between interventions for hydraulic safety and the protection of habitats and biodiversity” (Presidenza Giunta Regionale 2015). The regional authorities already identified the linkages between risk reduction and biodiversity conservation as it is also testified by other two documents: “Guidelines for the environmental rehabilitation of drainage canals” (2012) and the “guidelines for the integrated rehabilitation of natural watercourses in Emilia-Romagna” (2015).

In the mandate programme 2015 reference is also made to the need to guarantee the amount and stability of allocation of financial resources to allow for a proper implementation of multiannual programmes for the routine maintenance of the hydrographic network, coastal system (including beach nourishment), and slopes stabilizations.

6.3.2. Financial programming tools

The Regional Economic and Financial Document (*Documento di Economia e Finanza Regionale* DEFR) is the regional main tools for assessing the status of the regional economy and programming the budget for the following years. The DEFR has to be approved by the Regional Government by 30 June each year and it defines the strategic and operative objectives that the Regional Government intends to achieve during the legislature. It contains data about the current European, Italian and economic context and more detailed data about the regional economic, institutional and social context. It indicates, for each objective, the results expected every year, over a three-year period, and at the end of the legislature.

The Strategic Regional Document (*Documento Strategico Regionale* DSR) is the regional programming tool for European development policies that ensures the “translation” of the strategic objectives that can be pursued through the European Funds into specific objectives of the regional operational programmes, helping to define their economic and financial programming within the framework of the DEFR. The documents follow the 7-year EU financing programming time span and it includes “Operative regional programme” regarding the following policy tool:

- European Social Fund (ESF) or “*Fondo Sociale Europeo*” (FSE)
- European Regional Development Fund (ERDF) or “*Fondo Europeo di Sviluppo Regionale*” (FESR)
- Rural Development Programme (RDP) or “*Programma di Sviluppo Rurale*” (PSR)
- Development and Cohesion Fund (EDCF) or “*Fondo per lo Sviluppo e la Coesione*”(FSC)
- Horizon and LIFE research programmes

The DSR 2014-2020 shows that for the reference period the region had 2.5 billion at its disposal divided between ESF, ERDF, and EAFRD programmes with EU providing 1.5 billion euro, the state 920 million euro and with a regional co-financing amounting to 393 million euro ((Regione Emilia-Romagna 2014).

Table 6 Fund allocations in million euro from Emilia-Romagna data from the DSR 2014-2020

| Fund | EU | Italian gov. | Regional gov. | Total |
|-------|------|--------------|---------------|-------|
| FSE | 393 | 275 | 117 | 786 |
| FESR | 240 | 168 | 72 | 481 |
| FEARS | 513 | 437 | 202 | 1189 |
| Total | 1447 | 917 | 393 | 2457 |

The DSR includes a needs analysis, priority selection, strength and weaknesses analysis, strategy formulations, definitions of tools, expected targets. They are analysed on the basis of eleven strategic priorities (Thematic Objectives, OT) set by the European Commission and include, among others: OT 5 climate and environmental risks; OT 6 environmental protection and enhancement of cultural and environmental resources.

OT 5 of the 2014-2020 DSR programming period includes: maintaining a high degree of quality of the environment and land infrastructure. Containment of soil consumption, Restoration of agricultural and forestry production potential and introduction of appropriate prevention measures, Improvement of knowledge of the state of the problems and risks, also by adopting cost-benefit analysis tools for the identification of structural risk mitigation measures, Actions for the mitigation of environmental risks (seismic risk, hydro-geological risk, coastal erosion), containment of hydrological and geological instability involving increasing portions of the regional territory.

OT 6 deals more with halting biodiversity loss through “protection of agro-biodiversity and biodiversity in general, renovation of part of the distribution networks and optimisation of aqueduct systems, improving water quality by reducing pollutant loads from agricultural and livestock activities, improving the conservation status of species and habitats, maintaining and restoring eco-systemic services.

However not much of the aforementioned fund was awarded to this objectives. The biggest share, the 37%, were spent on capacity building and people professional qualification. A similar share of funds was spent for the strengthening of the regional economic system for research and development, for the start-up of new enterprises, including agricultural enterprises, for the competitiveness of supply chains and SMEs. The 23% of the grants awarded related to the environmental sustainability dimension and, in particular, to investments in energy efficiency and renewable energy, forest management and carbon

sequestration, adaptation to climate change and natural hazards, the transition to more sustainable production processes and organic farming, the protection of ecosystems and biodiversity, particularly in agriculture, and sustainable urban transport (Regione Emilia-Romagna 2021). Disaggregated data are not readily available but because of the wording used in the document, more leaned to renewables and energy efficiency, and the results obtained from the interviews analysis, it is very likely that few funds have been granted to NBS and biodiversity. When one goes to read the primary objectives of the various funds are mainly related to economic development even in regard to sustainability (energy efficiency and emission reduction as a cost reduction strategy) which is still valuable but more effort are needed in order to improve the ecological status of the region.

The New DSR endorses the objectives of the Regional Government Mandate Programme, which represent the strategic lines of the project for the revitalisation and development of the regional territory shared by the territorial system (firms, trade union, associations) through the Labour and Climate Pact. Among the 4 pillar it includes the Ecological transition. The new document does not contain the precise allocation of resources, but from the declared strategic objectives, one can see a greater focus on the prevention of hydro-meteorological risks, which become a top priority in all areas of the region (mountainous, Po River shaft, via Emilia urban agglomerates and the coast), but also an increasing attention to aspects of an ecological nature.

The rural development fund will increasingly contribute to the sustainability of the agricultural sector, recognising the indispensable role of farmers as custodians of natural resources and managers of ecosystems, habitats and landscapes and the need to increase the effectiveness of interventions in these areas.

The document recognises that the last few years have been characterised by exceptional weather events that have caused severe and repeated damage to agricultural production, forcing the payment of substantial but insufficient compensation to affected activities. The document therefore considers it essential to provide funding to support the introduction of systems to prevent or mitigate the damaging effects on crops caused by these exceptional weather events. Later, the document also talks about the recognition and valorisation of ecosystem services.

Finally, the 2021-2027 RSP recognises the need for increased efforts to safeguard biodiversity with targeted investments and actions in ecosystem, species and habitat management. One of the threats identified is the increase in non-native species that may compete with natives and cause further damage to both crops and populations. It is therefore necessary to deepen the knowledge defining the fauna pressure in the different areas of the region, in order to adopt measures that favour the fauna balance and the conservation of biodiversity and the correct functionality of agricultural ecosystems.

However, no references are made of NBS except when mentioning the Po river renaturation project within the framework of the PNRR.

6.3.2. Programme Agreement

In 2014 with law n. 164, in order to speed up implementation of project related to Risk Reduction, more power was entrusted to regional government and a new planning tool was established: the *Programme agreement* (Accordo di programma). The law provides that the resources of Fund for the Financing of Infrastructural Investment and Development have to be allocated through the signing of Programme agreements between the Ministry of the Environment (now Ecological Transition) and the Regions. For instance, a Programme agreement has been signed for the use of resources earmarked for the financing of urgent and priority hydrogeological risk mitigation measures identified in the prime ministerial decree of 15 September 2015. Other supplementary programme agreements were subsequently signed until the National Plan introduced a new mechanism for fund allocations.

6.6.3. The Basin Plan

As said before, the District Basin Authority is in charge of drafting the basin plans and its subplan, (Water, Flood and Hydrogeological management plans) but the region has a central role also in this activity. The region provides indeed a report with data on various aspects contributing to the development of the district basin risk maps, including socio-economic data related to the exposure and vulnerability of people and assets. The region has to identify the Areas of Potential Significant Flood Risk *Aree a Rischio potenziale Significativo di Alluvioni* (APSFR) and the Unit of Management. In the Po River district, the APSFRs are divided into

district-level and regional-level areas. The regional level APSFRs are identified where: "situations of medium and high hazard are found, resulting from flood flows such as to generate torrential and fluvial criticality and involving floodable areas of medium/large extension, which, can be managed at the level of a single Region" (Regione Emilia-Romagna 2021). For the elaboration of the flood management plan (PGRA) of 2015 and 2021 the Emilia-Romagna Region territory was divided into 4 Units of Management (UoM): 1) UoM ITN008 coinciding with the Po river basin; 2) UoM ITI021 coinciding with the Reno river basin; 3) UoM ITR081 coinciding with the Romagna river basins; 4) UoM ITI01319 coinciding with the Conca, Uso and Marecchia river basins and minor basins afferent to the coast. This fragmentation of the regional territory, resulting from the subdivision into basins of national, regional and interregional rank under the now abolished Law 183/1989, is unique within the Po river basin district and makes the management of the Plan and its measures particularly complex (Emilia-Romagna 2021).

The region participates in the drafting of hazard maps of natural watercourses falling within the regional APSFRs were prepared in 2019 on the basis of the data available in the Hydrogeological Structure Plans (*Piano Assetto Idrogeologico PAI*). Damage maps are added to the hazard maps by analysing people, economic activities and buildings exposed to the hazard. The report that the region delivers to the basin authority also includes the exhaustive list of all regional prevention and protection measures. Now the region play a relevant role also in a another phase of interventions programming, namely in the validation of project proposed by implementing bodies (Irrigation and drainage consortia, municipalities, Civil Protection), their upload in the Rendis platform and the following interactions with the Authority in case integrations and modifications are needed.

6.3.4. The Labour and Climate Pact

Another high level and strategic document is the *Labour Pact* that had as the first aim to generate qualitative labour through the method of discussion and sharing with local authorities and all economic and social representatives. The Pact was further strengthened in 2020 when *the Labour and Climate Pact* was signed by all social partners, employer organisations, the agricultural world, trade unions, the third sector, municipalities, universities

and some environmental associations such as Legambiente who sign for the first time this kind of document with the region (Interview Respondent 5, 2022). The regional vice-president stated that “the Pact indicates the shared strategic objectives to aim at an inclusive recovery, fighting social, territorial, and gender gaps, with investments on skills and research, aiming at the creation of new jobs and new quality enterprises, also through the now imperative ecological transition and digital transformation” (Elly Schlein 2021). The pact again consolidated the role of direction and control of the regional government but also of the regional legislative assembly, confirming the will of the institutions and the entire territorial system to increase the effort for sustainable development. The pact relies on four main pillar, namely Emilia-Romagna as the region of: 1) of knowledges and skills, 2) Ecological transition, 3) Rights and duties and 4) job, entrepreneurship and opportunity. The Labour and Climate Pact outlines the strategic framework and guidelines of a positioning project that takes 2030 as its horizon, indicating a medium- and long-term vision, which is indispensable to set the territory's development on new foundations and align the Emilia-Romagna region's path in addition to the objectives set by international institutions.

6.3.5. Regional Territorial Plan

Finally, the region, with Regional Law No 24 of 2017, provides for a single general plan for territorial planning, called the Regional Territorial Plan *Piano territoriale regionale* (PTR), characterised by the integration of a strategic and a structural component. The PTR encompasses and coordinates, in a single planning tool, the regulations for the protection and enhancement of the landscape and the Regional Landscape Territorial Plan *Piano territoriale paesaggistico regionale* (PTPR), as a plan with specific consideration of landscape, historical, cultural, natural, morphological and aesthetic values, and the spatial component of the Integrated Regional Transport Plan (PRIT). The strategic component of the PTR relates to the definition of the objectives, directions and policies that the Region intends to pursue in order to guarantee the protection of the landscape, environmental, cultural and social value of its territory and to ensure sustainable and inclusive economic and social development, which at the same time increases the competitiveness and resilience of the regional territorial system and safeguards the reproducibility of resources. The structural component of the PTR identifies and depicts the landscape, physical-morphological, environmental, historical and cultural systems that characterise the regional territory, as well as the infrastructures, services

and settlements that are of strategic importance for the development of the entire regional community and establishes prescriptions and guidelines for defining the related spatial planning choices. Consistent with the objectives and operations of the Rural Development Programme (RDP), the RDP also dictates the general discipline for the qualification and development of the landscape and environment of the rural territory.

6.4. Extraordinary strategic and programming tools

As said before, the region also adopts extraordinary strategic planning tools according to the more recent and urgent societal needs and international inputs. The Emilia-Romagna region has shown a significant sensitivity to international developments. The 2013 European Climate Change Adaptation Strategy, the 2015 Paris Agreement and the adoption of the 2030 Agenda and the SDGs gave a new impetus of environmental topic in many national but also sub-national strategic planning tools. Agenda 2030 is also at the heart of the *Green Deal* flagship initiative, the European strategy to transform the EU into a “fair and prosperous society with a modern, resource-efficient and competitive economy” (EU Commission). Finally, the adoption by the Eu Commission of the Next Generation EU programme and funds for the pandemic recovery, the ecological and digital transformation represented another step toward the promotion of sustainable development. These developments, pushes the regional government to takes on all 17 goals of the UN Agenda, which are to be declined at the regional level with a cross-sectoral approach to the Sustainable Development Goals (SDGs).

6.4.1. Regional strategy for Climate Change Mitigation and Adaptation

Soon after the adoption of the Agenda 2030, in November 2015, the Region Emilia-Romagna joined the Under2 Coalition signing of the Subnational Global Climate Leadership Memorandum of Understanding (Under2MoU). The Under2 Coalition is a coalition of subnational governments that aims to achieve greenhouse gases emissions mitigation, committing to reduce greenhouse gas emissions by between 80% and 95% by 2050 compared to 1990 levels, or to a quota of 2 tonnes of Co₂ equivalent per capita. In the same year, Italy adopted its own National Strategy for Adaptation to Climate Change (SNACC) closing the gap with other European countries. Following international and national development, the

region followed suit by carrying out studies to develop its own climate change mitigation and adaptation strategy.

Finally, in 2018 it was adopted the *Regional strategy for Climate Change Mitigation and Adaptation*. The document, drafted with the decisive contribution of ARPAE and Ervet, contains contextual information such as the emission picture of the region, an analysis of possible impacts of climate change in the region, and an outline of the mitigation and adaptation actions in place, risk analyses by physical-biological and socio-economic sectors, and finally, proposals for future programming and planning. Chapter 5 of the Strategy includes proposed actions for future planning and programming therefore represents the heart of the document. It contains suggested actions to complement and adapt existing programming and to be introduced in the definition of future sectoral plan and planning documents. Each action is assigned to one or more regional directorates-general and may concern planning and programming, emergency preparedness or research and development. Chapter 5 opens with some cross-cutting and general considerations and suggestions that are useful for all sectors: increasing awareness, introducing CC in the Vas and EIA, integrating CC in all sectoral planning and programming, improving coordination and integration both horizontally between sectors and vertically top-down and bottom-up, introducing measures and evaluation on the effectiveness of actions undertaken.

The strategy identifies different types of measures relating to one or more physical-biological areas including inland waters, landslides and floods, coastal areas, and biodiversity. As far as operational planning is concerned, morphological restoration measures are dealt with in different sections. Within inland waters and water resources, the following are mentioned: morphological restoration and sediment management, morphological restoration of water bodies to restore interconnections with the water table, to improve the recharging capacity of surface aquifers. Actions related to research and development have much space, including: a) in-depth knowledge on flows and morphological aspects also in relation to changes b) climatic terrestrial ecosystems, linked to groundwater, ecological networks connected to water bodies, c) environmental aspects of reservoir management, and storage basins, d) vulnerability to floods and droughts, forecasting systems, and e) of relevance to this case study is the “development of natural interventions for the abatement of nutrients in water bodies, in order to limit eutrophication phenomena”.

Within the “Territory Landslides and Floods” section, the strategy mentions, among others, the following actions: a) Improve the geotechnical and structural knowledge of embankment defence systems b) make the maintenance plans of the hydrographic network systematic, c) strengthen the redevelopment, preservation and extension actions of river areas (win-win action), d) targeted information campaigns aimed at local administrators, e) studying alterations in regimes and the most significant hydrological phenomena (e.g. flash floods) due to CC and their effects on soil and land degradation, f) developing innovative tools and methods for monitoring phenomena and warning systems.

Within the “Coastal Areas” section, the strategy includes: a) to prepare an integrated Plan for the defence and adaptation of the coastal area to changes, b) to strengthen urban policies aimed at reducing vulnerability and coastal stiffening c) to strengthen policies for the environmental use of the coast by favouring naturalistic interventions for the regeneration of the physical coastal system, also by raising the beach elevations d) promoting multiannual planning and guaranteeing certain and continuous funding, e) promoting public-private agreements for the realisation of multifunctional interventions in the coastal area, f) integrating sector plans with sediment plans, g) allocating funding for the research and design of innovative solutions and green infrastructures for coastal defence and man-made works.

In the Biodiversity section, the strategies, amongst others, identifies the following actions: a) planning tools should have a greater awareness of the special biogeographical position, b) integrating the criterion of minimum vital runoff (MDV), or ecological flow, into management plans and practices, c) increasing the habitat available to endangered species, d) reducing vulnerability to flooding, promoting multifunctional basins, e) promoting natural regeneration and resilience of the coastal and marine physical system, f) ensuring continuous funding and promotion of public-private agreements for interventions to preserve and enhance ecosystem services of transitional and marine ecosystems, g) promoting informed participation, h) ensuring certain and continuous funding for research and design of innovative solutions and green infrastructure to safeguard transitional and marine ecosystems, i) development of new monitoring systems.

The strategy made another reference to interventions that can be considered as NBS stating that it is necessary to implement “works aimed at improving the water regime, reducing flood peaks, slowing down runoff or reducing water energy by restoring space to the river through

controlled flooding of areas, management of riverbed vegetation, elimination of at-risk elements, restoration of vegetation, naturalistic engineering works” (Regione Emilia-Romagna 2018).

6.4.2. Regional Strategy Agenda 2030

The Regional Strategy Agenda 2030 for Sustainable Development *Strategia regionale agenda 2030 per lo sviluppo sostenibile*. The region with the adoption of the Labour and Climate Pact and the 2020-2025 Mandate Programme paved the way for the adoption of the regional Strategy Agenda 2030 for Sustainable Development. The process, however started some years before. The Italian Alliance for Sustainable Development (ASviS), which was founded in 2016 with the aim of “raising awareness of the importance of the 2030 Agenda in Italian society, economic actors and institution” (Strategia Regionale Agenda 2030, E-R region) reference, plays a fundamental driving role in this regard. At the end of 2018, the Emilia-Romagna Region obtained economic resources from the Ministry of the Environment, through a public notice, aimed at launching integrated processes to support the definition of a regional strategy within Agenda 2030.

Elaborated with the aim of defining Emilia-Romagna's contribution to the Programme of Action for People, Prosperity, Peace, Partnership and the Planet, it declines and "localises" the goals, starting from the specificities of the regional context. In fact, it relates the 17 goals of the 2030 Agenda with strategic objectives and transversal processes defined by the Mandate Programme and the Jobs and Climate Pact. The Strategy also sets targets to be achieved by 2025 and 2030, introducing a measurement system. The elementary statistical indicators represented in the table compose a composite indicator of Emilia-Romagna's positioning that ASVIS has elaborated and uses to monitor over time the path taken by Europe, Italy and its territories towards the 17 Goals. For each goal and indicator, the document indicates the current positioning of the region and then the regional strategy to reach the targets. I am going to discuss SDGs 6, 9, 11, 13, 14 and 15, the one more related to this case study.

Regarding SDG 6 “Clean Water and Sanitation”, the region states that in order to protect and enhance water resources, it intends to improve the status of ecosystems by encouraging sustainable use, including by reducing consumption and waste in both the residential,

industrial and agricultural sectors (Water Footprint). The aim is to improve quality and availability, with the prospect of halving network losses, by increasing, innovating and improving storage capacity, reusing wastewater and rainwater, “through an integrated win-win approach, ensuring water quality and hydraulic safety”. Here, too, allusion is made to NBS, which is instead referred to as a win-win approach. Among the targets, the strategy indicates that by 2025: 1) the share of river water bodies with good chemical status must reach 93%, 2) the share of river water bodies with good ecological status must reach 30% by 2025, and that 3) the share of lake water bodies with good ecological status must maintain 60%. These targets seem at first sight rather modest considering that the European target for all three is 100% by 2027. As we will see after, the ecological status of the region is poor and the starting point to reach the European goals are far. Emilia-Romagna will therefore need in proportion much more effort to reach such goal compared to other European areas.

The strategy also identifies the main implementation tools which are: Water Protection Plan (PTA) in force and in adoption (PTA 2022-2027), Water State Property Management System and Cadastre DGR n. 1540/2017 and the “indication for the exercise of activities” related to the management of the water state property pursuant to Article 16 of LR n. 13/2015.

Regarding SDG “Innovation and Infrastructure” the region states that it has long been committed to the innovation of infrastructure networks and the support of businesses in the ecological transition and technological and social innovation processes. The region intends to continue to strengthen the regional research and innovation ecosystem, particularly through targeted investments in the areas of health, digital transition and ecology. In this case, the strategy uses very different indicators to compose the composite one. Among others, I would like to point out the following that could be useful for this case study: a) Enterprises with product and/or process innovative activities, b) Research intensity, and c) Researchers (in full-time equivalent). Unfortunately, data are not disaggregated to assess the of application of this research and activities.

SDG 11 “Sustainable Cities and Communities” it can also be correlated with this case study. The region is aware that no vision project and strategic positioning of Emilia-Romagna can be realised without the active participation of cities and city territories, peripheries, small mountain and rural municipalities, which must be supported in their path towards full sustainability. The region indicates the need to support the Covenant of Mayors for Energy

and Climate to foster Urban Transformational Agendas for Sustainable Development and Territorial Strategies for Inner and Mountainous Areas. In this way, it is proposed to reduce the distances between centres and peripheries at every level. The region intends to focus on zero land consumption strategies and urban regeneration for multiple purposes including increasing greeneries in cities. The process of greening the cities is also functional to increase air quality which is a huge problem in the whole Po valley area. Among the elementary indicators adopted are the following: a) Index of illegal building, b) Incidence of urban green areas on the urbanised surface of cities, c) Exceedances of the daily limit value for PM10 in provincial capitals. This SDG is so cross cutting that implementation tools vary across many types and sectors.²⁶

With regard to SDG 13 “Climate action”, the region proposes to work to accelerate mitigation and adaptation to the impacts of climate change with an organic approach to all future standardisation, planning and programming activities and with full transversality in all sectoral policies and with a pathway that does not put productive and natural capital at risk. It is therefore a transversal pathway that concerns all planning and programming instruments. Here again, the region shows sensitivity to the promotion of integrated planning instruments. Climate actions can be divided into two main categories which are emission reduction and carbon capture. The NBS can potentially affect both. Renaturation and vegetation interventions can increase the carbon capture capacity of the ecological system. But NBS can also contribute to reduce emission if the life cycle of alternative grey solutions is considered: “you have to consider that many of the materials we use come from abroad from

²⁶ LR 15/2013 “Semplificazione della disciplina edilizia” amended by da LR 14/2020 “Misure urgenti per promuovere la rigenerazione urbana dei centri storici”; DGR 1338/1993 “Piano territoriale paesaggistico regionale (PTPR)”; Piano Aria Integrato Regionale - PAIR2020”, (DAL 115/2020) “Nuovo Piano Integrato regionale (PAIR) 2021-2030”; art.36, LR 24/2017 “Atto di coordinamento tecnico, relativo al territorio rurale che definisce le linee guida in merito alla tutela e qualificazione paesaggistica ambientale del territorio rurale e al recupero e valorizzazione degli edifici di valore storico-architettonico, culturale e testimoniale”; DGR 2135/2019 “Atto di coordinamento della Strategia per la qualità urbana ed ecologica - ambientale e Valutazione di sostenibilità ambientale e territoriale del Piano Urbanistico Generale”; DAL n. 80/2016 “Regolamento Forestale Regionale” n. 3/2018, “Piano Forestale Regionale” 2014-2020; (DGR 349/2021 e D.D. n.4990/2021) “Programmi Triennali di Investimento delle Unioni delle Zone Montane Fondo per la Montagna e Disciplina sulla creazione di biodistretti; Piani di Gestione del Rischio Alluvioni (PGRA) vigenti (primo ciclo), Piani di Gestione del Rischio di alluvioni (PGRA) di seconda generazione, Piani di Assetto Idrogeologico (PAI), aggiornamenti e varianti specifiche, Strategia di Gestione Integrata per la Difesa e l’Adattamento della Costa ai cambiamenti climatici (GIDAC); DGR 1855/2020 “Piano Regionale della Prevenzione”; DGR n.274/2021 “Istituzione del Sito di Importanza Comunitaria della rete natura 2000: "Adriatico settentrionale - Emilia-Romagna”.

Belgium for example, and if you consider the emissions for extraction and processing and transport it becomes a significant impact” (Interview Respondent 13, 2022). Questo tipo di valutazioni però non vengono fatte al momento delle decisioni. As far as carbon capture is concerned, the region has focused heavily on planting trees, but this will become a problem when the “uncontested” areas in where to plant them run out (Interview Respondent 5, 2022). Moreover, in this case we can only speak of NBS in the case where tree planting aims to provide ecosystem services such as risk reduction, temperature reduction as well as improving ecological and biodiversity indicators.

SDG 14 “Life below water” aims to preserve the sea, marine waters and habitats for sustainable development. The region adopts the target of the European Biodiversity Strategy to protect at least 30 per cent of the total marine areas (currently at 1%), achieve good ecological status for 100 per cent of the marine coastal waters (currently at 50%). The strategy identifies the following instruments, currently in place: PO FEAMP 2014-2020 D.lgs 17 ottobre 2016 n. 201 “piano di gestione dello spazio marino - proposta della regione Emilia-Romagna alla pianificazione dell'area marittima mare adriatico”; DGR n.274/2021 “Istituzione del Sito di importanza Comunitaria della rete natura 2000: Adriatico settentrionale - Emilia-Romagna”; DGR n. 1572/2020 Revisione del regolamento e redazione del Piano ittico regionale pluriennale per la pesca nelle acque interne”.

SDG 15 “Life on land” aims instead to boost the sustainable use of terrestrial ecosystems by combating deforestation and degradation which at regional level translates into combating land consumption, protecting biodiversity, increasing forestry. The statistical indicators used by the region and ASVIV for this SDG are two: a) Land Cover Index, b) Fragmentation Index. Among its objectives, the region aims to achieve 30% coverage of protected areas (currently at 4.6%) by 2030 in line with the European strategy and to increase lowland forest areas (numerical target not specified).

The Emilia-Romagna Region safeguards and protects the natural ecosystems and the biodiversity they host through the issuing and management of the parks like the Natura 2000 areas and the hundreds of sites that refer to EU or global systems such as Siti di Importanza Comunitaria (SIC), Zone Speciali di Conservazione (ZSC), and UNESCO MaB areas. Significantly, the project *Mettiamo Radici al Futuro* which aim to plant 4.5 million trees in 5 years has been launched to upgrade the existing heritage and increase the greenness of cities

as well as riverine forests. The region also intends to strengthen the connectivity and protection of existing ecological corridors and, within the broader strategy of zero land consumption, recover polluting sites in the territory with the aim of returning them to a better ecological functioning. Finally, the region intends to promote and protect mountain and inland areas which are irreplaceable reservoirs of biodiversity and basins of opportunity for sustainable development of territories and local populations. The region intends to achieve this through multiple policy tools: with Regional Law LR 24/17 *Regional regulations on the protection and use of land* it is established that, in order to guarantee the zero soil consumption for 2050, land-use and urban planning tools must encourage the reuse and regeneration of urbanised land and limit the consumption of further land within a maximum of 3% of the surface of the urbanised territory. Other relevant piece of legislation concurs to regulate this field.²⁷

The pattern traced by these extraordinary planning tool such as the Mitigation and Adaptation strategy as well as the regional strategy Agenda 2030 then spill into ordinary planning tool. From 2015 onward it has been observed an increasing presence of environmental (both disaster risk reduction and biodiversity conservation) also in ordinary planning tools such as the DEFR, the Mandate Programme, DSR which become more and more correlated with international agreements and strategic tools. For instance, the *Cabina di regia per la governance e il controllo strategico della programmazione regionale* established by DGR 602/2021 will have the task of promoting and verifying full consistency between the regional programming of European Funds 2021-2027 and the objectives of the Agenda 2030 Regional Strategy for Sustainable Development. Sectoral planning, through which the strategic objectives defined in the various regional planning documents are implemented, will in turn also have to consider the thematic dimension of sustainable development by incorporating the objectives and targets of the regional strategy into plans and programmes. Furthermore, it is foreseen that for Plans and Programmes, and their variants, as well as for Projects, and their

²⁷ Other relevant regulatory tools are: LR 30/1981 “Incentives for the development and valorisation of forestry resources, with special reference to mountain areas”; LR 24/2011 “Reorganisation of the regional system of protected areas and Natura 2000 network sites and establishment of the Stirone and Piacenzano regional park”. “Regional Forestry Regulation, n. 3/2018”; Regional Development Program 2014-2020 extended until 2022; PSN (National Strategic Plan of the PAC) 2023-2027, PAF (Prioritized Action Framework) for the Natura 2000 network (DGR 1791/2014).

modifications, subject to environmental assessment procedures (SEA, EIA, EIA screening, VINCA), it shall be made explicit, in the documents provided by the proponent and in the assessments of the competent Authorities, how the Plan/Programme or Project contributes to the achievement of the objectives identified in the Agenda 2030 Regional Strategy for Sustainable Development. In the event that the implementation of a Plan/Programme or the realisation of a Project results in a worsening of environmental conditions, with respect to the objectives and targets of the Agenda 2030 Regional Strategy for Sustainable Development, evidence must be provided of the planned mitigation and compensation measures. Finally, the region in all its documents stresses how they have been drafted with a participative method and how every relevant decision-making process should adopt participatory processes, pursuant to Regional Law 15/2018 “Law on Participation in Public Policy Making”.

6.4.3. Integrated Strategy for Coastal Defence and Adaptation to Climate Change (GIDAC)

The Integrated Strategy for Coastal Defence and Adaptation to Climate Change (GIDAC) was adopted in 2022 responding to the need to strengthen the previous regional strategy, namely Integrated Coastal Zone Management (GIZC). In fact, there was a need to respond to the stresses of coastal phenomena in the most recent conditions in order to envisage adequate management methods in line with adaptation needs. Being an "integrated strategy", the reference policies refer to and intertwine different laws and acts in the European, national and regional spheres. In particular, the aforementioned GIZC (DCR no. 645/2005), the Strategy for Mitigation and Adaptation to Climate Change of the Emilia-Romagna Region (2018) and the Flood Risk Management Plan.

The ultimate aim of the strategy is therefore to ensure greater resilience of the coastal system, in relation to short, medium and long term (2030-2050-2100) climate phenomena and scenarios. In fact, stated goal are: 1) to reduce the vulnerability of the coastal territory and the exposure of natural and anthropic elements to risk and impacts caused by current and expected meteo-marine phenomena, in relation to climate change; 2) ensure the safety of coastal populations, both residents and tourists, and the conditions for maintaining the economic and ecosystem functions of the coastal territory; 3) define an integrated set of actions and measures to ensure more effective and optimised management, aimed at reducing or avoiding significant damage to the coastal system. For the first time, therefore, an attempt is being made to develop an organic adaptation strategy that takes into consideration the

problems related to climate change on the Romagna coast. Moreover, another novelty of this instrument is that it is inclusive in the sense that it envisages a participatory process aimed at involving all the actors operating on the coast. Interestingly, the GIDAC also mentions dunes as a promising tool to manage risk. However, if, how and to which extent they will be realized is still uncertain at the moment of writing.

6.5. The OPERANDUM project

Finally, the regional research system, with its well-known Universities and research organization is another relevant part of the governance system. Universities indeed play a pivotal role in carrying out studies and researches alongside the main actors of the governance system. Some of them work directly with the District Basin Authorities like in the case of Parma (where the headquarter of the authority is located) while other proved to be very active and successful in obtaining funds for research in this field like the University of Bologna. The main example is the EU Horizon 2020 OPERANDUM project designed and coordinated by the Department of Physics and Astronomy which involved dozens of international partners and 7 European countries involved. I took part in the project in February 2020 as the assistant to the OAL Italy stakeholder engagement manager, Teresa Carlone, from the Department of Sociology and Economic Law of the Bologna University.

The OPERANDUM project was designed to address the major hydro-meteorological risks (floods, drought, landslides, storm surge and coastal erosion (Debele et al. 2019) through the development and testing of NBS for the mitigation of Hydro-Meteorological Hazard. The project adopted a co-creation process to monitor and evaluate the performance of the NBS in mitigating hydrometeorological risks and to create applicable knowledge enabling their replication, upscaling and mainstreaming for each specific hazard (Sisay et al. 2020). The work has been carried out in seven so-called open-air Laboratories (OALs) which are based on the living lab concept defined by Westerlund and Leminen (2011) as “physical regions or virtual realities, or interaction spaces, in which stakeholders form public–private–people partnerships of companies, public agencies, universities, users, and other stakeholders, all collaborating for creation, prototyping, validating, and testing of new technologies, services, products, and systems in real-life contexts”. The OALs have an additional dimension, which is that they are mostly located in rural and natural territories. The OAL Italy was entirely located in the Emilia-Romagna region and I am going to go into further details of two case

studies, the Panaro River and the Bellocchio/Volano beaches. In the first site Operandum tested artificial dune realized with special sandbag to reduce coastal erosion, while in the second site it has been tested deep-rooted plant to strengthen river embankments.

6.5.1. Bellocchio and Volano Beaches

For this project site the main partner of UNIBO that followed the project since the beginning were, Arpae Emilia-Romagna, RINA Consulting (a big engineering firm based in Genova) and the Euro-Mediterranean Center on Climate Change (CMCC). As anticipated before, the aim in this site of the OAL was to test the behaviour of an artificial dune build with sandbags made of coconut fiber and a special zip patented by Rina Consulting. Other relevant partner



Figure 18 Artificial dune built in Volano beach, Comacchio (Ferrara)

were IRIS SAS Strategie per l'Ambiente, a natural engineering firm located in Tuscany that already worked with dunes and the Regional Agency of Land Security and Civil Protection Emilia-Romagna Region (ARSTePC), contacted in a second moment for the commissioning and implementation phase.

The sites are located on the Emilia-Romagna coast of Adriatic Sea. The Bellocchio beach, in the province of Ferrara, was selected as first site of project but, unfortunately, strong storm surges occurred in December 2020 which eroded the beach. Thanks to the ARSTePC it has soon been identified an alternative site in Volano, 20 km north of Bellocchio. Both sites are part of The Po Delta Biosphere Reserve and belong to the Comacchio municipality. The Bellocchio beach is limited between a very active touristic hub (Lido di Spina) and the mouth of the Reno river, and it borders the inland Bellocchio lagoon from the sea, while the Volano

beach is closer to the Po delta. The site is very interesting from a naturalistic point of view, the beach is located close to a vast pine forest and strongly affected by marine flooding due to Scirocco winds.

The hazard and risk: the beaches are strongly affected by marine erosion. In case of storm surge, sea water floods the lagoon, threatening the freshwater ecosystem and biodiversity. The sites preserve natural heritage, historical records and hosts, in the inland area, industrial activities like fish farms and is embedded in one of the main touristic systems of Europe (Operandum 2021). Sea level rise, subsidence and lack of sediment from the river are increasing the risk of erosion of the beach which needs protections structures. The aim of the dune is therefore to protect the beach and the surrounding ecosystem from storm surges and coastal erosion.

6.5.2. Panaro river

In this OAL project site the main partners alongside UNIBO have been: the Euro-Mediterranean Center on Climate Change (CMCC), the Inter-regional Agency of the Po River (AIPo), PratiArmati (a Lombardy based firm with 20 years of experience in deep-roots plantation), Municipality of Bomporto, the Bomporto civil protection volunteer (OPERANDUM 2021).



Figure 19 Deep-rooted plant planted on the Panaro river embankment close to Bomporto (Modena)

The river Panaro is a tributary of the Po river and flows for its greatest part in the province of Modena in the Emilia-Romagna region, with a basin covering 1775 km², 45% of which in mountain environment. The main hazard here is river flooding since the area is a natural floodplain. According to the authority of the Po river (AIPo), from 2000 to 2018 a total of 16 relevant flood events were reported plus another one in December 2020 due to an embankment failure not far from the Operandum testing site. The Panaro basin is populated area, with many industrial and agricultural activities, including livestock and therefore present a high level of exposure. Vulnerability is also high due to lack of wetland management capacity, flood proofing of properties and buildings and reduced water retention capacity. The area is thus subject to risk of potential loss of human life, damage to infrastructure, properties and buildings and agriculture crops or livestock (Operandum 2021). In this OAL site, the selected NBS aims at mitigating the risk of flooding occurrence related to soil erosion on the internal toe of the riverbank through the plantation of deep-rooted plants aimed at strengthening the embankment.

This university-sponsored project, involving major regional bodies of the Disaster Risk Governance system, demonstrates the openness of this system and some of its officials to testing innovative solutions such as the NBS. This project is part of a broader movement of European projects aimed at testing and disseminating NBS. The next chapter will discuss the enabling factors and barriers for this mainstreaming process in the Emilia-Romagna Disaster Risk Reduction governance system and its context.

Discussion

The region has been very active in incorporating input from the international context such as the mitigation and adaptation strategy and the agenda 2030 strategy, the Labour and climate pact. In regional planning action and in all the policy instruments adopted there has been a growing attempt and direction to increase the degree of integration and coordination of policy instruments in order to increase their effectiveness. The region's action through the Labour and Climate Pact, the European funds and the various integrated planning are geared to reducing territorial imbalances and thus also to promoting, safeguarding and protecting rural and peripheral areas. There is therefore potential for rural NBS in the near future although they are not always explicitly mentioned. What is certain is that in the most recent regional

strategic policy tool it is grown the relevance given to natural disaster risk reduction (DSR Emilia-Romagna 2021): “The issue of territorial safety and mitigation of natural risks, which are also strongly influenced by the effects of climate change, remains central to the sustainable management of this territory”.

However, it is noteworthy that despite intentions, most environmentalist interventions to date have mainly focused on climate change mitigation, while little has been done on adaptation except for recent developments such as the GIDAC on the coast. Interventions, also in agriculture and rural areas, have been mainly aimed at coupling economic growth with emission reductions costs and energy efficiency. Little has been done on biodiversity and ecosystems except for nature parks and the creation of MAB areas and newly established protected area. Biodiversity conservation seems still to be confined as a specific policy sector and it is not yet cross-cutting issue in regional planning. Especially in the operative and implementation phase of interventions given the data confirming the negative trend in regional ecological status (Strategia Regionale Agenda 2030). This awareness is present in the planning documents but must be put into practice with operative tools, and there perhaps exist the most obvious barriers. What is certain is that the fight against hydrogeological instability and weather hazards has become a top strategic objective and priority in regional planning following the recent extreme events. This attention, together with the focus on rural and peripheral areas, and a growing sensitivity to ecological transition issues could bode well for the spread of rural NBS in Emilia-Romagna in the near future, even if important barriers to overcome still exist.

Chapter VII

NBS Mainstreaming: discussion

In this chapter I am going to discuss the main feature of NBS, the socio-ecological context and the governance system to assess how they interact and what are the barriers and enabling factor for the NBS mainstreaming process to succeed or fail. The assessment has been done by the content analysis of materials gathered through interviews, focus groups organized within the context of the Operandum project and participant observation to project's activities. The respondents were anonymised by indicating only the type of organisation they belong to, the main focus and field of action, and the educational background as it is shown in the table below:

| Respondents | Organization | Sector | Functions | Background |
|-------------|-----------------------------------|---|---------------------------|---|
| 1 | High-level public technical body | Hydraulic Risk Management | Planning | Civil engineer-hydrologist |
| 2 | High-level public technical body | Water quality and ecological status | Planning | Environmental engineer |
| 3 | Private firm | Risk mitigation and biodiversity conservation | Design | Naturalistic engineer |
| 4 | Regional body | Water protection – coastal areas | Planning and design | Coastal geologist |
| 5 | Environmental NGO | Ecosystem and biodiversity conservation | Research and advocacy | Physician and data analysis |
| 6 | Regional body | Risk mitigation | Design and implementation | Civil Engineering |
| 7 | Private firm | Risk mitigation and NBS | Design | Architecture and construction engineer |
| 8 | Private firm | Risk mitigation and NBS | Design | Civil engineer constructions sustainability |
| 9 | Irrigation and drainage consortia | Water management and risk mitigation | Design and implementation | Environmental Engineer |
| 10 | Park authority | Biodiversity and ecosystem conservation | Planning and design | Environmental Engineer |
| 11 | Private consultant | Disaster Risk and biodiversity | Design and implementation | Biologist/Ecologist |

| | | | | |
|----|------------------------------|--------------------------------------|--|----------------------------------|
| | | conservation | | |
| 12 | Civil Protection | Risk mitigation | Planning, risk prevention and response | Geologist |
| 13 | Interregional operative body | Water management and risk mitigation | Design and implementation | Civil Engineer – hydrologist |
| 14 | Research Organization | Forecasting and risk mitigation | Research | Physicist |
| 15 | Research Organization | Modelling and risk mitigation | Research | Civil Engineer - hydrologist |
| 16 | Regional agency | Modelling and forecasting | Research | Physicist |
| 17 | Research Organization | Modelling and forecasting | Research | Physicist |
| 18 | Private firm | Risk mitigation and biodiversity | Implementation | Agronomist |
| 19 | Municipality | Spatial planning and urbanistic | Design and implementation | Construction engineer/ architect |

7.1. Nature-Based Solutions in Emilia-Romagna

NBS is an umbrella concepts which include different types of intervention for different type of hazard. In this section it will be discussed NBS type, their degree of innovation in the specific socio-technical context of Emilia-Romagna and the main characteristic of the NBS that might has an impact on the acceptance and mainstreaming.

7.1.1. Mainstreaming Stage

All respondents agreed that in the Italian context we are at an embryonic stage in the NBS mainstreaming process in which NBSs are an innovative niche used in the last years by few actors like small forestry cooperatives (Respondent 3, 2022) in experimental spaces like Operandum, or in natural parks (Respondent 10, 2022). Only since the 2020s has there been interest from large companies (Respondent 7, 2022) and some officials from public bodies (Respondent 13, 2022; Respondent 6, 2022). On the other hand, naturalistic engineering had been talked about for decades and had failed to be mainstreamed in the standard intervention programming activities. Consequently, few NBS projects have been developed in Italy:

Nobody heard us and these things (naturalistic engineering/NBS) have faded away. So this thing that was supposed to take off has been squashed. There are two things going on in parallel: one positive that these practices are increasing but in a modest way and not as striking as they should be, on the other hand there are more important and larger processes. It is as if the strength of a modest counterwave is increasing. A new countewave, then you swim against the current, the swimming force increases but the current increases more and eventually you go backwards. So there are more positive experiences but they are less than the negative process that is happening on a macroeconomic level in general on interest, consumption and climate as calamitous events increase and emergency actions are taken. It may be a tailspin and I don't know what will happen in the next period (Respondent 3, 2022)²⁸.

I can tell you that many of my colleagues, they don't know when it comes to NBS what to refer to. We are at a standstill. The new positive input could have been the National Plan for Recovery and Resilience (PNRR) that could have been an opportunity to push on the use of NBS. In reality, it was not pushed in such a clear and codified way even if NBS are the most appropriate tool to fulfil the objectives of the PNRR (Respondent 6, 2022)²⁹.

In the last 20-30 years something has changed but very little, I agree about the embryonic stage, still absolutely, embryonic (Respondent 11, 2022)³⁰.

To speak of mainstream is early, we are quite backward, but it is physiological that it should be so. It is still a fairly frontier topic (Respondent 7 2022)³¹.

Interestingly, most of the respondents who have known NBS the longest, came to know about NBS through experiences abroad:

I was familiar with NBS (coastal) because I often collaborate with European projects and especially with the Dutch and Belgians, these are techniques they created out of necessity, as

²⁸ Interview – Respondent 3: naturalistic engineer and founder of a naturalistic engineering company with more than 30 years of experience. Interview conducted in collaboration with Teresa Carlone on 13/07/ 2022, online. All interviews were conducted in Italian language, then translated in English language by the author.

²⁹ Interview – Respondent 6, a technical member of the Emilia-Romagna regional agency for Territorial Safety and Civil Protection), Coastal Defence sector. Interviewed in collaboration with Teresa Carlone on 11/07/2022, online

³⁰ Interview - Respondent 11, biologist and ecologist consultant, is responsible and/or team member of activities and projects commissioned by public and private organisations. Interview conducted by Matteo Mannocchi and Teresa Carlone on 17/02/2022, online.

³¹ Interview - Respondent 7, architect with a PhD in physics and environmental technology, employee of an engineering consulting company working group that aims to develop and promote NBS projects. Interviewed on 15/07/2022, online.

they had no mountains and no possibility of using rocks. Here we have mountains near the sea everywhere (Cipriani 2022).³²

In 2010 I went to England to study sustainability issues in construction. There I came into contact for the first time with NBS-type solutions but in an urban context. The inputs are mainly top-down, coming from international institutions such as the World Bank and the European Union, but also investment funds. Maybe at the political level there is some input, but it has not yet reached the technical side and the ministries themselves and so on (Respondent 7, 2022)³³.

I have been to England and Denmark and there are publications dated more than 20 years ago and they are perfect, there were already monitoring and we also translated into them in Italian, we made the river rehabilitation manual (Respondent 3,2022).

In the United States they were used quite a bit, especially in Louisiana where there is a similar situation as the Netherlands, the mountains are far away and there is the Mississippi delta situation, they always tried to use these techniques (Respondent 4, 2022).

I have experience abroad and let's say that in Italy, the problem of integrating ecological aspects is much stronger. In the US. The results of research are mainstreamed rapidly while in Italy it takes a generation (Respondent 11, 2022)

Despite lagging behind some area of northern European countries and some USA states where the NBS adoption seem to be more widespread, some changes in the Italian and Emilia-Romagna context have been noted, still marginal on the operative field but more pronounced regarding the attention and awareness related to the NBS approach:

The NBS topic is currently limited to a few niches. If I had to give my impression we are still three to four years away from a full conscious adoption of NBS in Italy, an optimistic estimate. The private sector is more receptive and quicker than the public sector and some large companies, including Italian ones, are realising the potential of NBS (Respondent 8, 2022)

I discover the NBS thanks to a professor from Parma. We know they are there, we also started over the years to propose, in fact, two win-win interventions by the Ministry of Agriculture and the Environment had entered the list and we had been asked for integrated environmental and

³² Interview - Respondent 4, is part of the Water, Territory and Coastal Protection Sector of the Tuscany Region as a planning officer. Interviewed as a coastal NBS expert and interested in the latest developments in Emilia-Romagna. Interviewed on 13/07/ 2022 in collaboration with Teresa Carlone, online

³³ Interview – Respondent 7 is a civil engineer employed in a engineering company. He is an expert in NBS design and is part of a working group developing and promoting NBS. Interviewed on 03/10/2022, online.

hydraulic interventions. We had found an intervention that tried to renaturalise one part of the course but the other had to be structurally consolidated (Respondent 9, 2022)³⁴.

At the Italian level, we are at an embryonic but punctual stage, there are quite consolidated experiences, let's say that here (Po Delta Park) then, to a greater or lesser extent, a project here or there is done, there is something, I don't see it all black. At a national level, however, we are at a very embryonic level (Respondent 10, 2022)³⁵.

“The vision is changing and there seems to be more sensitivity and direction towards decisions of this kind. Like all cultural changes it must have its time to be taken and digested” (Respondent 13, 2021).

“It happened to participate in events where we were invited by associations, public administrations to present the topic, explain to stakeholders what it is all about, why it is essential, and so on” (Respondent 7 2022).

In this regard, urban NBS seem better known and have a more established history in both research and application, such as urban forests and green roofs. On the other hand, there are less experience with rural NBS, as already mentioned by Respondent 8, but also by the proponents of the Operandum project, who decided to focus on rural NBS exactly for this reason. This perception was also shared by the regional President of an important environmental NGO:

In my own experience I started to hear about NBS in urban projects, we are talking about 2019. In the suburban or rural context just thanks to the Operandum summer school in 2022. In my experience the term NBS is related to some kind of intervention that you do make in an urbanised context and not so much in a rural context (Respondent 5, 2022)³⁶.

The first NBSs I tackled were mainly related to water management, such water disposal through solutions that replicated the behaviour of natural solutions. First, I tackled urban NBSs, two or three research projects while this is the first rural NBS project took part (Respondent 8, 2022).

³⁴ Interview – Respondent 9, environmental engineer, technician in a irrigation and drainage consortia. Interview conducted in collaboration with Teresa Carlone on 17/10/22, online.

³⁵ Interview 9 – is the Former Director and now Head of the Planning Office of the Po Delta Regional Park. Conducted by Matteo Mannocchi and Teresa Carlone on 17/02/2022, online.

³⁶ Interview 5 - physics graduate, President of Legambiente Emilia-Romagna and head of the environmental science sector for the company Future Education. Interviewed on 07/10/22, online.

Therefore, as it also pointed out by the literature (Debele et al. 2020) rural NBS are at an earlier stage of mainstreaming but not that far, at least in Italy, where urban NBS are not commonplace either. Anyway, this research is focus on rural NBS.

7.1.2. Defining NBS

One of the pressing issues that emerged from document analysis and the interviews is to establish what NBS means in order to make it a clear concept for all the actors involved in the Disaster Risk Governance system. We have seen that in Italian legislation alone there are multiple terms to refer to NBS. At the national legislative level NBS have been named only one by a decree dated September 2021, whereas previously the term that most resembles the NBS was “integrated interventions”. At the regional level, instead, they are referred to as “win-win interventions”. Both integrated intervention and win-win solutions means that they should be conceived to achieve the double purpose of risk mitigation and biodiversity and ecological net gain. The interviews also revealed the need to clarify what NBS are and when interventions can be defined as such.

On the subject, we are beginning to consolidate the concept, what is meant and what is not meant. Until now, there has been a lack of a taxonomy on the subject. Of definitions, of categories, of methodologies, and we are still working on it, even within Operandum (Respondent 7 2022).

If you had told me the term NBS a while ago I would have told you what the heck? the technicians even "capsize" if you don't give them a concrete example (Respondent 10, 2022).

One of the most relevant points seems to be to what extent an intervention must support ecological factors and natural processes to be considered an NBS. Indeed, almost all respondents admitted that the approach to naturalistic engineering adopted in Italy so far has been that of “greening” classical intervention (Respondent 3, 2022; Respondent 1, 2022³⁷; Respondent 6, 2022; Respondent 13, 2022). They also all agree that in this case they cannot be considered NBS, because a proper NBS has also the specific aim of restoring natural processes and provide ecosystem services. Respondents who have a more naturalistic background (Respondent 11, 2022; Respondent 10, 2022; Respondent 3, 2022), but also

³⁷ Interview – Respondent 1 is in charge of the Hydraulic Risks sector of a high-level public technical body. Interview conducted in collaboration with Teresa Carlone on 28/09/22, online.

Respondent 6, add that beyond providing ecosystem services, NBS must also improve the state of biodiversity as this is not automatic with all ecosystem services. This latter conception of NBS is also the one recently adopted by the European Commission (2020), in line with the IUCN (2016) definition discussed in Chapter I. Biodiversity gain, land and river connectivity and, in general, environmental gain should therefore be one of the priorities in the phase of project design and not just ancillary.

Indeed, the specific sector of disaster risk reduction, in which errors might lead to significant negative consequences, is characterized by low-risk acceptance, and therefore perception of effectiveness is paramount like already pointed out in the literature (Albert et al 2019; Anderson et al. 2021) and by respondents as well: “what the decision makers are looking for is data, whether it has been done this way and has been successful and why, or they point out these critical issues that can be solved in certain ways” (Respondent 4, 2022). This issue has also been confirmed by the two respondents of the engineering consulting company Rina consulting who set up a specific working group on NBS and conducted a market analysis acknowledging that scepticism exist regarding NBS efficacy:

They want the data to be demonstrable, rightly so, they want it to work so that there is no doubt about the solutions adopted, and they want it to be supplemented with other warning measures if the limits of the solutions are exceeded. The inclusion of NBS-type solutions and natural engineering is welcome when their effectiveness is demonstrated, in this hydrogeological field (Respondent 8, 2022).

From the experience we have had and discussions with business development and commercial colleagues, there is certainly little knowledge of the subject, and therefore it is not easy to convey the concept to a client, especially since there is scepticism about the effectiveness of the solutions (Respondent 7, 2022)

Among the respondents, there is a difference between those who believe that more experimental studies are needed to collect data before implementing NBS and those who believe the technology is already mature and only needs proper normative setting and the input to implement them. Those belonging to the first group tend to have a naturalistic background and are scientifically more up-to-date with studies carried out even in other countries.

It is important to be aware that certain interventions have already been successfully tried out in the Netherlands and have been successful (Respondent 3, 2022).

Many NBSs are already known to be effective and should only be applied (Respondent 11, 2022).

From a technological point of view, we are at a good point. The ideas are there, the solutions are there. From the point of view of their widespread application we are far behind (Respondent 12, 2022)³⁸.

The second group mainly includes those in the implementing and operating organisations who have never experienced them and have a more cautious approach fearing failures or complications such as ecological disservices (Respondent 9, 2022) and need to further test it (Respondent 13, 2022; Respondent 6, 2022). The need for further experimentation and application was the prevailing sentiment among respondents as they believe those in the governance system trained to work with NBS are a small minority, and there is the need to build trust. It is necessary for both technicians and local administrators to be reassured about efficacy of this solutions and have concrete successful experience to rely on, preferably close to its own socio-technical context. The fact that something has been successfully tested in northern Europe, for example, can help but it may not be sufficient to replicate it in other distant contexts. Therefore, the degree of development and maturity, which imply knowledge and previous experiences of NBS in a given socio-technical context is of considerable relevance. In this section, I am going to assess, for different typology of NBS their degree of maturity in the Emilia-Romagna region and the specific characteristic of NBS that might have an impact on mainstreaming. As discussed in chapter II, to determine where we are in the mainstreaming process it is important to understand what has already been done in specific socio-technical context.

7.1.3. NBS types

All respondents believe that NBS can be valuable tools to address the challenges of the coming decades including adaptation and mitigation of climate change and a more balanced

³⁸ Interview – Respondent 12, geologist, prominent figure in the National Civil Protection Department, Office III, Technical and Scientific Activities forecasting and preventing risks. Interview conducted on 11/03/22, online

relationship with the natural environment, conservation and improvement of ecosystems. However, they are aware that NBSs cannot always be decisive and are more effective in some contexts than in others where they can still complement more traditional grey solutions. A complete replacement of the previous regime with NBSs is unlikely, as also reiterated by one of the interviewees who seems to be pushing for NBSs the most and who has 30 years of experience in nature engineering:

Naturalistic engineering cannot completely replace traditional techniques as in the case of city embankments. There are many intermediate situations where engineering can replace or supplement it, and then there are opposite solutions where naturalistic engineering can take the lion's share and can be definitely preferable, i.e. where there are morphological dynamics and traditional engineering does not work well e they only transfer the problem from one place to another (Respondent 3, 2022).

By morphological dynamics in this case, the interviewee refers to river dynamics, which we can understand as the hydraulic and natural processes, including sediment transportation and accumulation, riverbank erosion, that lead to changes in the river course. In this sense, importance is also given to longitudinal connectivity, which means eliminating transverse structures (barrage “*traverse*” or “*briglia*”, or dams) along the watercourse to allow sediment and fauna to move along the river and vertical connectivity between the river and the soil increasing the drainage and groundwater recharge. A pillar of river renaturation is thus giving space to the river to allow it to change according to natural dynamics and create habitat but at the same time reducing the risk of disasters such as floods and droughts. In some cases, flooding can also be planned in certain areas both to reduce damage but also to obtain long-term environmental benefit as well as soil fertilization.

These are interventions that Eggermont (2015) would classify as type 3 since they “are action to manage ecosystem in in an intensive way or to create new ecosystem”. They are therefore complex since the variables to take into account are many; they have a very obvious visual impact and at first glance may frighten people as they require the lowering of embankments, the removal of cross-barriers, as well as the reclamation of space on the edges of the riverbed. It has been assessed that little or nothing has been done for the renaturation of rivers and canals in Italy but also in Emilia-Romagna. They can be therefore considered intervention with low degree of maturity in this specific sociotechnical context. This type of NBS morphological interventions are a novelty for local technician and administrators. In this case,

in line with the socio-technical change literature, more incentives are needed to support social learning and reach the breakthrough point to challenge the old regime on a significant scale (Sovacool and Hess 2017).

Other interventions can be related to vegetation. For instance, riverbank vegetation can serve to stabilise banks and reduce erosion, reduce nutrients in the water, and contribute to woody sediment supply as well as organic matter and new habitats as it becomes a place of food and shelter. Natural buffer zone can also be used as natural barriers against floods to reduce exposure. This intervention can be relevant in the Emilia-Romagna context since there is a lack of maintenance of river and canal banks despite the great effort of the regional agencies. Regarding this type of interventions there are the experience of a Lombard firm with the planting of deep-rooted herbaceous species to fortify slopes. They have been successfully tested in dry contexts for example with ANAS and RFI³⁹ (Respondent 18 2021)⁴⁰ but they are to be tested on hydraulic works instead of traditional intervention using stone, concrete and steel, cyclopean boulders, the larssen sheet piling “*palancole*” and iron cages “*gabbioni*”. Seeds cost many times more than normal seeds, but intervention with this technique would still cost less than traditional interventions (Respondent 13, 2022). The interview with the Interregional Agency for the Po River then reveals that this type of intervention is not entirely new and he already heard of it:

Now they seem to be working, I do not exclude the possibility of using it in other cases. It is a well-known but controversial technique and I had intended to test it myself and see (Respondent 13, 2022).

It reiterates the fact that first-hand testing is the most direct way to increase the perception of effectiveness and the decision of whether or not to adopt a new technique.

In the case vegetation is a central focus of the interventions, biological and botanic expertise and knowledge become fundamental. Elena Toth is a professor of hydraulic engineering and OAL leader of the Panaro site within the Operandum Project, and she claimed that one of the critical aspects of the experiment was that they need the support of the company that supplied the deep-rooted plants to plant them on the riverbanks:

³⁹ Anas and Rfi are public corporation in charge of the highway and railroad network infrastructures

⁴⁰ Focus groups – Respondent 18 is the owner of a company with a decades-long history in the field of NBS, particularly in the reinforcement of slopes with deep-rooted grasses. Focus group held on 02/12/21, online.

We could not do the inspection ourselves because I would never know which plants are ours, which are traditional and which are weeds (Respondent 15, 2021)⁴¹

So I have to decide which species, what kind of leaves, only one solution, maybe it also filters the dust, it is much more complex. What about roots? so the big difference is that it is more complicated but there are many more advantages (Respondent 11, 2022).

In central Italy above all, it is full of forests that were planted in the 20s, 30s and 40s up to the 50s of the last century with non-native species, because they grew fast, sea pines, Aleppo pines. However, this choice carries several consequences with it, biological ecological etc. It is easy to say planting this tree because they are fast (Respondent 12, 2022)

In addition to botanical expertise, there is also a need for wildlife expertise. For example, there is a risk that NBS attract undesirable species and alter the natural balance or species that put in danger the intervention itself. Fossorial animals, for instance, are a danger to natural embankments as they can create cracks with their excavation activities.

Depending on the slope of the bank the nutria tend not to burrow or are very sporadic cases then we modify the slope of the channel by making two more benches with a little floodplain in the centre (Respondent 9, 2022).

Regardless such necessary ecological knowledge, interventions that imply re-vegetation are less complex from a technical point of view and can be classified, with due exceptions, as type 1 NBS according to Eggermont classification: “minimal intervention on the ecosystem to maintain or improve single or few ecosystem services”. Considering also that there are similar examples even in dry contexts and that they are already being tested in experiments such as Operandum are already at a more advanced level of development and potentially closer to greater use and mainstreaming.

The type of plants to be tested was also the focus of another Operandum site, the Po di Goro, where the aim was to identify species that could resist high salinity levels, absorb it and reduce it to counteract the salt intrusion. This hazard is indeed one of the least discussed in literature (Respondent 14, 2021) but it is now becoming more relevant as extreme salt intrusion events are increasing in the Po Delta but also minor basins. In Operandum, halophyte plant such as glasswort (*salicornia*) was selected.

⁴¹ Interview – Respondent 15 is a professor of hydraulic engineering and member of the Operandum research project. Interview conducted in collaboration with Teresa Carlone on 25/11/21, online.

It is an important experiment because there are very few of them because other risks such as flooding are well studied while salt intrusion is rare. So it would be one of the few in Nbs. In Operandum the only one and so if we can do it it's very nice - they use the water both to irrigate fields inland (Respondent 14, 2021).

The interest in the topic was also underlined by the interest the drainage consortium showed in this other Operandum experiment by stating that episodes of excessive salinity are also occurring in their canal network. However, it is the first experiment of this kind and results have not been assessed at the time of writing.

Regarding coastal defence, in recent decades, rigid interventions involving cliffs, boulders, groynes built with heavy materials and reinforced concrete have prevailed to protect the Italian coastline.

“On the coast you come from decades of hard infrastructure and reefs. Those who were doing port engineering in the 1930s were lately doing coastal defence” (Respondent 4, 2022).

In low sandy beach like those of Emilia-Romagna the alternatives are what are called “soft” intervention, like beach nourishment, which again do favour morphological dynamics. The 70% of Emilia-Romagna coastal defence interventions have been rigid works including artificial cliffs, groynes built with concrete or stones in 70% whereas “soft” interventions such as beach nourishment in about 30% of cases (Arpae 2021). Therefore, the concept of coastal protection with naturalistic engineering is not an entirely new concept in the Romagna socio-technical context.

With a term like NBS it has been create something that seems new but we with our old beach nourishment and dune defence have always done in Tuscany. Then we ruined ourselves over the years with coastal engineers who filled the coasts with reefs (Respondent 4, 2022).

In the case of the dune, there is something technologically innovative. The dune itself is not innovative as an idea. What is particular is the technology with which it will be realised (Respondent 6, 2022).

The coastal nourishment plan is also close to the NBS approach. In this case, restoration and dune creation there are similar approaches in Tuscany inspired by northern European ones (Respondent 3, 2022).

The concept of the “dune”, however, compared to beach nourishment is obviously different in that the dune also presupposes a protective structure, which in the case of NBS must be made of natural and eco-sustainable materials⁴². Furthermore, for these interventions to be fully considered as NBS, they should also aim to improve the ecological status of the beach. On the dune, for example, vegetation can grow and consequently also attract animal species. The dune is therefore created to fit into a territory and interact with it. Indeed, Luigi Respondent 4, an expert on the subject, speaks of the concept of the “ecological beach”, which would be the natural one in the Italian and Mediterranean context and would include the dune, beach and *Posidonia beds*⁴³ system. A system that has been destroyed for tourism needs and that would instead represent a good coastal erosion system beyond its benefit for biodiversity:

We, on the other hand, are in the Mediterranean, the endemic and natural beach would have berms with coarse sediments also mixed with gravel and *Posidonia* banquettes. We can call it a dune/beach/banquette system. The beach is not only the emerged one, which is the 5% that everyone sees, but it is also the submerged one. This is the ecological beach approach. While we remove the *Posidonia* banquettes to sell the tourist a product that does not exist. We have to start selling the Mediterranean beach product that is made by this system. Because in winter it protects us from erosion” (Respondent 4, 2022).

Despite the difference between the dune and the beach nourishments, however, the sole fact that this concept does not sound new to technicians, and that there are similar experiences in neighbouring contexts such as Tuscany, other than in northern Europe, reveals that past examples and these spillovers of knowledge are crucial to give credibility and a perception of effectiveness to the proposed NBS. The higher degree of development and maturity of these solutions and past experience certainly facilitates the mainstreaming process. As a proof about its readiness to be replicated, for instance Respondent 19, a technician and planner for a municipality in the Romagna coast, stated that “we are interested in the dune because we plan to do similar work” (Respondent 19, 2021). As well as Luigi Respondent 4 that included “soft” intervention as a top priority in their planning tools, and the fact that this type of

⁴² In the case of the Operandum project dune, coconut fibre bags with a zip designed and patented by Rina consulting were used, with a net made of natural fibre net and reinforcing wood poles

⁴³ *Posidonia oceanica* is an aquatic plant, endemic to the Mediterranean Sea. It has roots, a stem and ribbon-like leaves up to a metre long and joined in clumps of 6-7. It flowers in autumn and produces floating fruits in spring. It forms underwater prairies that are of considerable ecological importance, and exert considerable action in protecting the coastline from erosion. It is home to many animal and plant organisms that find nourishment and protection in the prairie. The *posidonia* is considered a good bio-indicator of coastal marine water quality.

intervention has been included in the very recent Integrated Strategy for Coastal Defence and Adaptation to Climate Change “GIDAC” drawn up by the Emilia-Romagna region in collaboration with various stakeholders:

“Regarding acceptance we are improving and in a positive phase. Also thanks to these cooperation projects, I must say that I find them to be a channel, in the meantime, of opening up collaboration. With the Operandum team we got to know each other thanks to a European project and the very fact that these networks and exchanges are created is already very positive” (Respondent 4, 2022).

Another NBS that has been discussed as it can be useful in the Romagna case, especially in the Po Delta are the, multi-purpose natural reservoirs “*bacini polifunzionali*” that can be either in coastal area (buffer zone between the shoreline and inland) or alongside the river course. These basins consist of natural or artificial/natural lamination basins that can create habitats for flora and fauna, provide phyto-purification and water in times of drought, carbon dioxide sequestration and other ecosystem services.

“Multi-functional basins can serve at the time when there is water to act as containment and then return it when there is drought. In the delta, there are two fundamental aspects: one is to reduce the saline ingression of the water table of the embankments, you know that the delta is below sea level, 2-3 metres are closed basins; the other is to give fresh water back when needed and to create stretches of water that would also allow the presence of flora and fauna” (Respondent 11, 2022).

Nevertheless, this NBS has not been widely applied so far, due, according to Park Authority manager Respondent 10 and ecological consultant and expert Respondent 11, to the complexity of this multifunctional work and the difficulty in making it understood by technicians accustomed to classical engineering:

This NBS, however, has not been applied much, we were reintroducing it even now that there is the engineering aspect and other aspects of land management, including land reclamation consortia, it is not always easy to make people understand that this is a medium to long term investment and then it will yield results (Respondent 10, 2022).

An issue that Graziano argued a lot and not all biologists and technicians always understand, is the fact that a lagoon habitat can be excavated. The excavation that also serves for water retention, navigation and fishing goes to increase the degree of conservation because if I

recirculate the water it recirculates for everyone, for the clams for the lagoon and for the environment (Respondent 10, 2022).

In another example of NBS designed in 2011, when it was proposed there was people giggling, after 3 years they did three of those proposed including 2 off-plan works. If it goes on like this, 10 years to get a result there is no way out (Respondent 11, 2022).

This is therefore a complex type of NBS, difficult to communicate and with a low degree of maturity in this specific socio-technical context. It is therefore not yet close to be mainstreamed.

7.1.3. Technical feasibility

As just highlighted, the NBS, compared to traditional grey solutions, require a completely different approach in the design and operation of the intervention. These design aspects may influence the choice of adopting this solution or not. The feature that most characterises these two different approaches is the dynamism of NBS compared to the stability of the grey approach.

It is not easy to convey the principle that NBS very often aims at re-instilling a mechanism that already existed in nature and for some reason no longer works. Hence, customers and stakeholders are used to solutions that, as it were, put an end to a problem and do so over time and remain static, whereas the dynamism of NBS is something that tends to scare them away (Respondent 7, 2022)

This dynamism is especially frightening in the maintenance phase of the work as there are still few examples, and on those that do exist, long-term data is lacking. As Respondent 11 pointed out in the interview, to the simplicity and linearity of the grey approach, another additional source of complexity of the NBS is represented by the inclusion of more variables (flora and fauna) that have a dynamic nature:

One cannot talk about and realise or design NBS works without talking about living organisms that have the flaws I have listed, they are not fixed either over the course of a year or over the course of the work so I have to design thinking about how they develop (Respondent 11, 2022).

This complexity and dynamism thus reach its peak in the case of NBS that aim to establish or re-establish morphological and habitat dynamics. Many respondents pointed out that because

of what just discussed, and the attempt of the NBS approach to integrating the intervention into the surrounding environment, it is thus less standardisable than its grey counterpart:

Traditional engineering is more standardised. A concrete wall or an iron cage is always done in the same way whereas in the other case you need to account for vegetation, the climate of the specific site and the context must be studied. It takes more intellectual investment and less hard investment in energy, materials and artificial structures. In this case you have to take responsibility and more complex designs perhaps take more time (Respondent 3, 2022).

I dare say, it is simpler (grey approach), it is undeniable. I draw straight lines, the simplest thing ever. Already starting to work with curved lines is already more complex. Instead, I calculate the volume of a watercourse as if it were a smooth pipe, but it has nothing to do with reality. It is an extreme simplification. I worked for 15 years with drainage consortia and the engineering calculation is the water flow rate, everything else does not exist or it is annoying (Respondent 11, 2022).

It is difficult to bring together a whole series of elements that are taken into account in the creation of an NBS due to the fact that so many different technicians intervene, discuss, pool expertise, it would be the best thing to do (Respondent 5, 2022).

This is pointed out by the respondents as a significant barrier that needs to be addressed in order to foster the NBS mainstreaming process. This complexity, for instance, can lead to a preference for grey solutions, even in cases where an NBS would be more effective, because they grey solution are better known and easy to design:

In some cases (the grey solution) it is the one you cannot do without, but these cases are not so frequent and often you could opt for other, better solutions (Respondent 13, 2022).

With the civil protection department, following landslides, what was proposed to us was to make a wall with piles. This was because it was very easy to do, I go there, and any worker can do it. Instead, it would have been much more useful to remove water from the landslide and much more decisive. But it meant doing soil soundings, drilling holes, putting drains (Respondent 12, 2022).

If I were a small engineering firm, I would say: I do the wall like this, the action is like that, I dimension it like this, because with the municipality I know it more or less works like this, and off I go. The other one (NBS) I have to study it, I have to study the solutions (Respondent 8, 2022).

It is much easier to make dikes than to design multi-purpose basins, in which sedimentation and so on may increase. They benefit in the long run and one should design over periods of time that are not 2 or 3 years but 20 or 30 and then there is nothing to be done (Respondent 11, 2022).

If the design phase is often more complex than the traditional grey solution, the implementation phase is not always complex even if the techniques are not consolidated. For instance, it was also interesting to note that an initial concern about the construction of the dune within the Operandum project was unfounded. In the end, a company that had no experience with NBS and dunes won the tender issued by ARSTePC. Then, all it took was two workers, a small bulldozer and a week of work to complete the 100-meter intervention.

Once they understood the dune mechanism, they were off and running should be a quick and easy process (Respondent 8, 2022).

As for the excavation of a floodplain, multi-purpose basins, the renaturation and widening of the embankment, or planting per se are not excessively complex operations from a technical point of view once properly planned. In conclusion if the phases of studying the territory of risks, and the dynamism of NBS are perhaps more complex, those of implementation are actually not and do not require great skills. This implies that there would be a need to increase design and construction management skills for NBS or to develop design tools that would allow even technicians trained with the previous approach to be able to design NBSs. For the labour needed, however, there seems to be no need for much specialised training. Another need is for bio-based materials, which are still scarce and more expensive and need to be further tested and improved (Respondent 7 2022).

7.1.4. Cost-effectiveness

As discussed in chapter II, the breakthrough point in a sociotechnical regime change can be achieved just when the new solutions reach a development stage in which they are competitive in terms of cost-effectiveness with their counterpart. The economic feasibility of these solutions is also relevant for their deployment. The interviewees point out that on NBS, as they are still not very widespread, there is uncertainty about the costs both of implementation but also and above all of maintenance and the whole life cycle of the intervention. In some cases, the initial investment may be very small compared to a grey work, but the maintenance costs may be higher.

NBS are very beautiful but if you don't do the maintenance, nature takes them back (Respondent 4, 2022).

Which, according to Maurizio Bacci, could also lead to social benefits such as increased employment instead of the big initial investment required by grey solutions and lower maintenance. In this case, the trade-off would be a lower initial investment but higher operating costs. This could be the case for river renaturation, multi-purpose reservoirs and banks vegetation.

In other cases, however, the flexibility of these works makes them easier to modify over time than traditional grey works which can be an advantage in uncertain and evolving climate scenario:

They can be more easily integrated solutions, for an adaptation they require, small or large additions but not a remake like traditional works so looking at them over a long life cycle, they may in the future be more competitive than what they are now (Respondent 8, 2022).

I just use grey solutions and then no one looks that they have had big problems and they have not always solved the issue, or they have solved just temporarily, and then you have to do it again with huge costs. It's not the cost of the work done and that's it, but over time, this is never taken into account (Respondent 11, 2022).

According to Respondent 3 and 11, it is already proven that some NBSs are more cost-effective than their grey counterpart. In the case of the Panaro river, for example, Respondent 13 confirms that if the experiment goes well, the intervention with deep-rooting herbaceous plants would be much cheaper than a traditional intervention where you have to buy, transport and dispose heavy materials on the riverbanks:

Certain types of interventions are very invasive and have a major economic impact, these other technologies we are talking about are more economical and would allow us to apply it on more sections of the embankment defence (Respondent 13, 2022).

Then there are also economic and environmental considerations. We used tons of iron from Belgium and just transporting it imagine what that could mean. In addition to the impact of the quarry itself. Life cycle assessments are not carried out (Respondent 13, 2022)

In the case of the Lido di Volano, on the other hand, the approximately 100-metre dune was not cheap compared to a rigid intervention of the same proportions. However, as the designer,

Respondent 8 reminds us, this dune is a prototype and the innovative parts such as the coconut fibre bag and the zip were made in an artisanal rather than industrial way and therefore without economy of scale:

“I think at the moment, with what we have in hand, it is not yet economical. So much so that many solutions, like the big sandbags were done in a semi-crafted way, certain things were entrusted to other companies. But there is room for cost reduction, halving the construction processes, increasing the scale of the works, this is a path by which costs can be reduced” (Respondent 8, 2022).

“At the moment some NBSs are not cost-effective but can become so. Spending even a little bit more today because it is new and has higher costs. The problem is that until something becomes standardised, it's a production cycle even of that kind of materials whose costs are slightly higher” (Respondent 9, 2022).

In addition to the issue of materials and development of the work itself, when there are no technological complications, it can be the process, which, being untested, leads to higher costs, as in the case of a floodplain that the park authority's consultant had proposed:

“We wanted to recreate a floodplain in a bend of the Po at Cormola that is already intended to be a floodplain. Only AIPo keeps that sand there as a reserve to raise the banks when needed. I told him: dig it up and put it in another place in a deposit, but this entails costs and it's better to leave it there and tell us that we can't do the renaturation. This is the brutal practice of today's offices” (Respondent 10, 2022).

If instead, for example, there had been a system whereby the material excavated to build the floodplain had been used for other purposes in a circular economy, that, instead of being a cost, could have been a resource for the authority.

“Some application is still needed to make NBS cost-effective compared to traditional solutions” (Respondent 8, 2022).

In conclusion, all respondents agree that, even for the NBS that at the moment are not cost-effective compared to the traditional grey one, they can become so through a progressive reduction of cost given by a widespread application. The cost reduction result can be achieved through some standardisation in design, implementation and processes. After this review on the state of NBS in Emilia-Romagna and the characteristics of this approach, we will

investigate which factors related to the socio-ecological and governance context represent a barrier or an enabling factor for the NBS dissemination and mainstreaming.

7.2. The Social-Ecological context

As mentioned in previous chapters, the socio-ecological context is made up of multiple elements that concern both the social and environmental context and are often closely interrelated. In recent years, Emilia-Romagna has equipped itself with multiple tools aimed at monitoring progress in achieving the various objectives. Arpae and Ispra (e.g. with the Rendis and Idrogeo platforms) carry on a huge and appreciated job in collecting environmental data, while the National Institute of Statistics (ISTAT), alongside regional statistics offices together with other local administrations, work more with data concerning social and economic aspects. The Italian Alliance for Sustainable Development (*alleanza Italiana per lo Sviluppo Sostenibile* ASviS)⁴⁴ is another body that supports administrations in monitoring the achievement of both social and environmental goals, which are those of the UN 2030 Agenda. ASviS supported the Emilia-Romagna region in the drafting of the Agenda 2030 Regional Strategy in which composite indicators are constructed to assess the region's positioning with regard to the UN's 17 Sustainable Development Goals.

All the tools and databases listed above represent a great source of data accessible to all that allow policymakers and researcher to accurately acknowledge the social-ecological system in which they operates. I will analyse these data following the analytical framework identified in Chapter 3.

⁴⁴ ASviS was founded in 2016 with the aim of raising awareness in Italian society, economic actors and institutions of the importance of the 2030 Agenda for Sustainable Development and to mobilise them to achieve the Sustainable Development Goals.

7.2.1. Environmental-social (Hazard and Exposure).

As it has been discussed in chapter one, the nature of risk is multifold, and it is composed by environmental and social feature. In this section, it will be discussed the variables that composed risk, in particular hazard and exposure. In this section vulnerability is partially set aside since much of this variable can be associated with governance features that will be discussed later. Risk perception has been found to be a significant variable for NBS acceptance and thus mainstreaming in particular for technicians who are skeptical about NBS efficacy or are not trained to work with NBS:

“The perception of risk matters because for me because the traditional solutions, I put up a dam, I use ballast, I have been experimenting with them for the last 50 years and I feel safer” (Caramori 2022).

“The perception of risk certainly counts and is also understandable. I often make comparisons with the medical world. If one has a headache perhaps an herbal tea and therefore not a pill, one is willing to take it. If the doctor says to him, look, that headache comes from a brain tumour, he won't take the herbal tea. It's complicated, nobody knows the side effects, I would tend to think yes there is also an effect partly related to the acceptance and severity of the problem” (Guzzetti 2022).

Before starting, it is necessary a clarification because risk perception often does not coincide with the actual level of esteemed risk that it will be discussed now. I am aware about the notion that risk perception is socially constructed, depends on previous experience and many other variables. However, for what regard the people within the Disaster Risk Governance system, the target of my interviews, it can be assumed that the perception of risk is much more well informed and based on data compared to average. And this information might lead to different behavior, including on acceptance or rejection of NBS.

The Emilia-Romagna region presents a high level of hydraulic Risk compared to the national average: 10% of its territory and populations are subject to high-level risk (floods with 20-50 years of return period) while 45% of the population is subject to medium level of risk (return period of 100-200 years) compared to a national average of 9%.

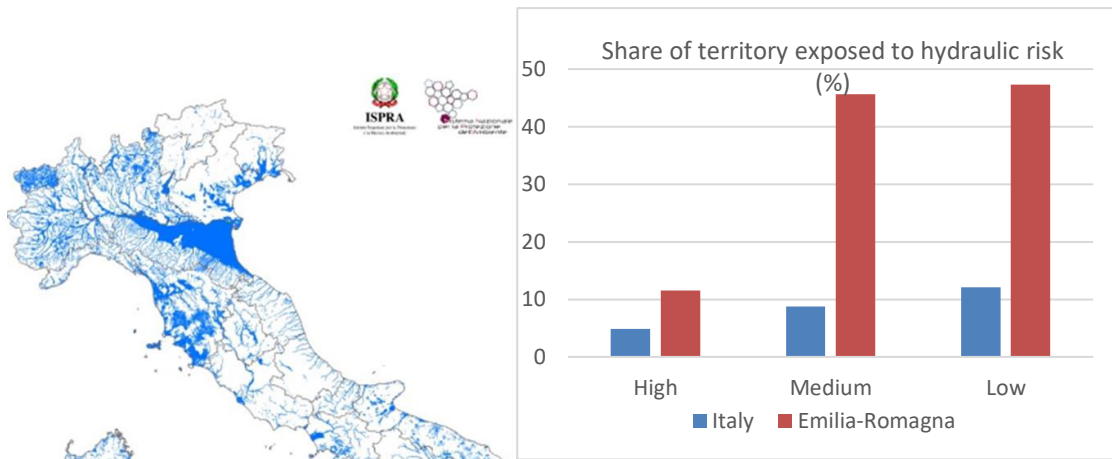


Figure 20 Medium hydraulic risk area P2 (Return period between 100 and 200 y) and figure 2 share of territory subject to high, medium or low risk at national and regional levels

As mentioned earlier, in addition to the hazard, it is also important to assess the impact risk of the hazard itself. Therefore, the most recent hazard maps also include data such as population, buildings, strategic assets and cultural assets at risk. The population of Emilia-Romagna is particularly exposed to hydraulic risk to a significantly greater extent than the national average, as shown in the figure above. The same applies to buildings, economic activities and cultural assets that are exposed. This is due to the fact that the region is strongly anthropized, which combined with the fact that Emilia is the geographical area into which the waters of the Po basin are channelled makes it at high risk. The same applies to the risk of landslides, mainly on the Apennines, with Emilia presenting higher risk values than the national averages (Rendis report 2020).

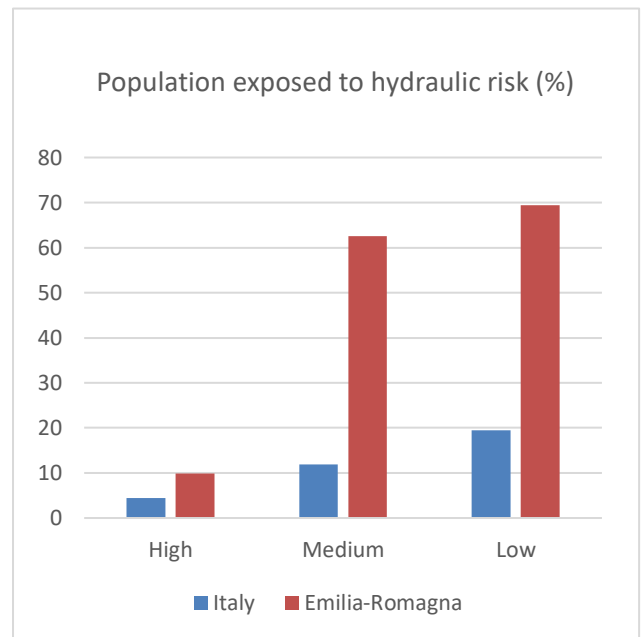


Figure 21 Population Exposed to hydraulic risk

Regarding coastal erosion, Emilia-Romagna has a low and sandy configuration, stretching for 130 km very subject to erosion. Coastal erosion has several causes: it is due to marine water dynamics but also the sediment dynamics from the river basins and subsidence dynamics. In Emilia-Romagna with the confinement and anthropisation of rivers and the excavation of

riverbeds, the sedimentary supply of beaches has been reduced (Aguzzi, et al. 2012). Furthermore, there is an increasing rate of subsidence due to the extraction of fluids from underground (water and hydrocarbons) in addition to the rising seas due to climate change results in a loss of volume to the beach (Arpae 2020).

The shoreline “*linea di riva*” is the indicator traditionally used to define the evolutionary tendency of shallow, sandy shores in natural beaches. A shift of the shoreline towards the sea, or towards land, represents the tendency of the beach to accumulation or erosion. However, in beaches subject to anthropogenic modifications, this interpretation loses its validity, as advances in the shoreline can be attributed to beach nourishment or the construction of defence work at beaches that actually tend towards erosion. From 1983 to 2006, for instance, more than 5.5 million m³ of sand was replaced along the regional coastline (Arpae 2020). For this purpose, other indices have been developed. the first indicator, called ASPE, aims to capture the real state of criticality of the coast as it would appear if no defence work were carried out. Based on a comparison between the coastal survey carried out in 2006 and the previous one in 2000, the ASPE analysis shows that already in 2006 48 % of the regional coastline was in a critical condition with 33 km in erosion and 23 km in precarious

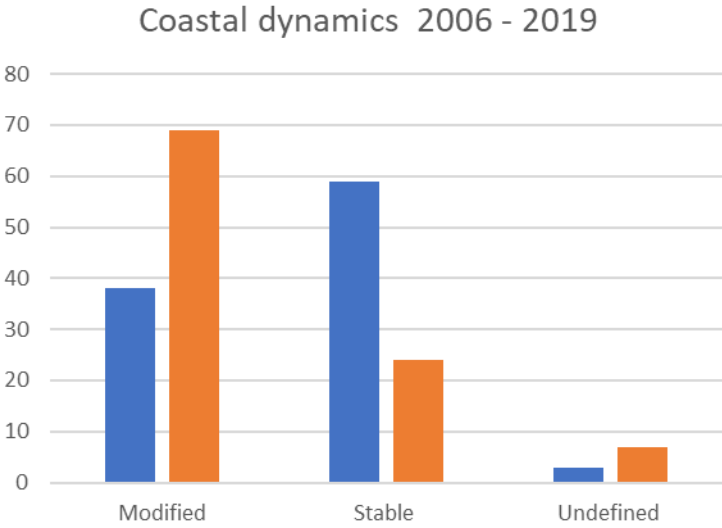


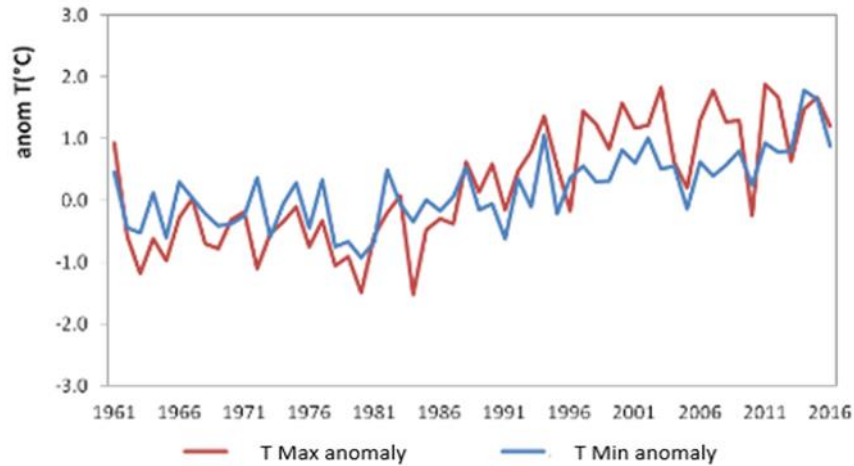
Figure 22 Coastal dynamics 2006-2019 Italy and Emilia-Romagna. Data elaborated from Ispra Idrogeo platform

equilibrium only thanks to defence measures. Ispra instead uses the littoral dynamics indicator to assess the conservation status of the Italian coastline. A study that considers the period 2007-2019 assesses significant instability for the Italian context but a slight trend towards greater stability compared to previous periods (Barbano 2020). In the Romagna context, on the other hand, a much higher level of instability was found than in the national context, as can be seen in figure below and takes in consideration the share of modified coastlines (+/-) of 5mt.

If not properly managed these dynamics can cause several problems as the level of exposure even on the coast is high. The coast is highly anthropized and hosts various types of tourist and recreational structures and activities, several important habitats, economic activities and residential areas (DSR Emilia-Romagna 2021). Moreover, the Po Delta area is few meters below the sea level protected by delta branches, beaches and barrier that if eroded might increase the flood risk. Finally salt intrusion from marine water is another increasing hazard to be managed because of two dynamics, i.e. increasing periods of drought and rising sea levels. Droughts reduce the supply and pressure of fresh water to sea water, which is then more likely to infiltrate into dried-up water basins. During the heavy drought in the summer of 2022, the salt wedge reached 40 km within the Po basin (Ansa 2022).

Climate pattern was coded as context variable C1.3. and it is relevant as it will change the risk scenarios which is a relevant information for planners. This risk values are of course not static but changes over times according to various drivers and one of the most significant, not just for the future but also for the present is climate change. Scientists are using past observations and models trying to predict what we should expect. This exercise is fundamental in various aspects not least for a long-term planning of preventive measures including NBS. For the 1961-2016 period, a significant trend of increasing minimum and maximum temperatures has been observed in Emilia-Romagna, both on a seasonal and annual level. The figure shows the temporal trend in the period 1961-2016 of the annual anomalies of the minimum and maximum temperature in Emilia-Romagna, calculated with respect to the reference period 1971-2000. As can be seen, there is a positive annual trend for both temperatures, although more marked for maximum temperatures (0.44 °C/10 years versus 0.25 °C/10 years). The warming trend is more pronounced since 1990 as it is shown in the figure below.

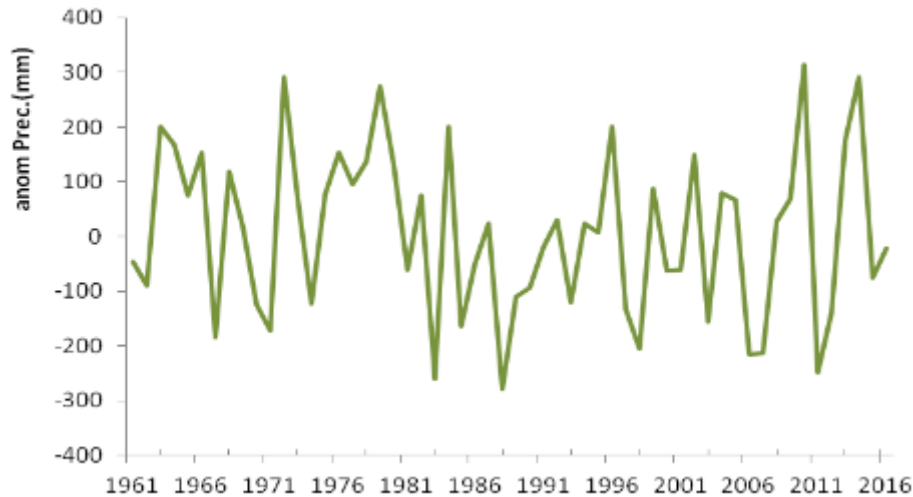
Figure 23 Climate variability of the annual minimum and maximum temperature anomaly over Emilia Romagna, period 1961-2016 (Data set Heraclitus5x5km-Antolini et. al., 2015)



Significant variations are also found on a regional scale for temperature extremes. A decrease in the number of days with frost (days with minimum temperatures below 0 °C) and an increase during the summer season in the duration of heat waves, where a heat wave is defined as a continuous, uninterrupted succession of a few days in which the maximum temperature is above the 90th percentile of the statistical distribution, emerged over almost the entire region (Emilia-Romagna 2018).

For what regard precipitation, the analysis of the temporal variability of annual rainfall over the region shows a weak negative trend for the period 1961-2016.

Figure 24 Climatic variability of the annual precipitation anomaly over Emilia Romagna, period 1961-2016 (Data set Heraclitus 5x5km-Antolini et. al., 2015)



On a seasonal level, a decrease in summer, winter and spring precipitation and an increase in autumn precipitation, especially on the Apennine ridge, has been noted. However, it should be emphasised that the trends are not statistically significant. With regard to precipitation extremes in Emilia-Romagna, a positive trend has been observed, especially during the summer, in the maximum number of consecutive days without precipitation. Locally in the plains and in some stations in the central Apennines, however, an increase in the frequency of heavy rainfall events was observed during the summer season (Pavan et al., 2008).

The assessment of future climate changes is entrusted to models, but they do not have sufficient spatial resolution to represent phenomena occurring on a local scale. Some research programme tries to solve the problem allow the formulation of climate change scenarios at different spatial scales, but they still have a significant degree of uncertainty (Emilia-Romagna 2018). One of the main sources of uncertainty are the future emission global patterns. In the Intergovernmental Panel on Climate Change (IPCC) assessment reports there is a set of scenarios, called Representative Concentration Pathways (RCP) which represent the future concentration of GHG according to different emission scenario e mitigation action taken at global level. For the Italian peninsula, climate change projections of temperature and precipitation have been made for the entire peninsula as well as for different areas, e.g. northern Italy including Emilia-Romagna (Ensembles project). The results of the mentioned

projects showed for Italy and for the period 2021-2050, a possible temperature increase in all seasons around 1-1.5 °C, and most intense during the summer around 2 °C (Gualdi et al., 2009, Tomozeiu et al. 2013). Moving down the scale, a signal similar to the national one was found for the Emilia-Romagna region. It showed for the period 2021-2050 a regional average increase in both minimum and maximum temperature of about 1.5 °C during winter, spring and autumn and about 2 °C during summer (scenario A1B). The precipitation scenarios constructed for the period 2021-2050, in the A1B emission scenario, show a slight increase during the winter in the northern part of the country (about 5%). The other seasons may experience a decrease in the amount of precipitation, highest during summer (about -20%). Moving towards the end of the century, 2071-2100, the same A1B emission scenario shows a similar pattern to that of the 2021-2050 period. In the framework of the Prismes project, projections for Emilia-Romagna show a possible decrease in spring and summer precipitation (regional average of about 10%) for the period 2021-2050 compared to 1971-1990 and, a probable increase of about 20% for autumn (regional average). For the winter season the pattern is more complex, although not significant, with an increase in the lowlands and a decrease in the Apennines (5%). Figure 26 represents the regional changes in seasonal precipitation. In the framework of the Prismes project, projections for Emilia-Romagna show a possible decrease in spring and summer precipitation (regional average of about 10%) for the period 2021-2050 compared to 1971-1990 and, a probable increase of about 20% for autumn (regional average). For the winter season the pattern is more complex, although not significant, with an increase in the lowlands and a decrease in the Apennines (5%). Figure 27 represents the regional changes in seasonal precipitation.

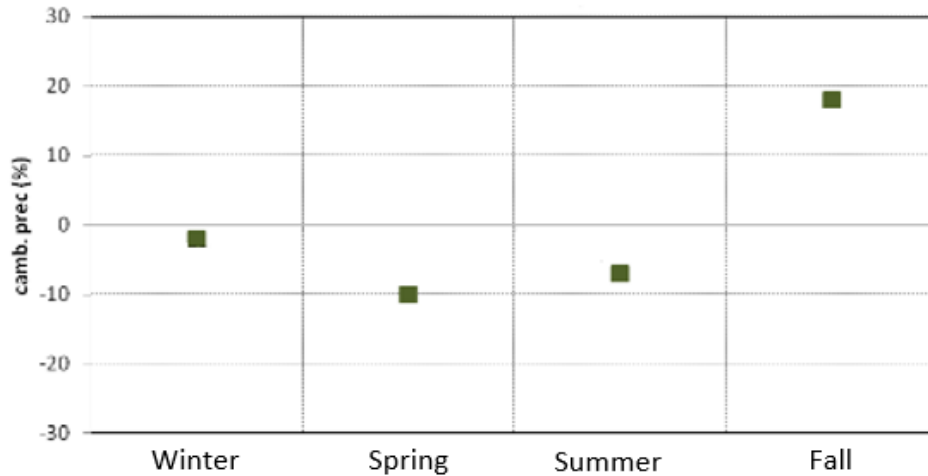


Figure 25 Climate change projections of precipitation amount over the Emilia-Romagna region, statistical techniques applied to the CMCC-CM global model, RCP4.5 scenario, 2021-2050 vs. 1971-2000 (5x5 km data-set)

A significant impact is given not only by the total amount of precipitation, but also by extreme precipitation events. scenarios constructed at the regional level through statistical regionalisation techniques have shown a possible increase in intense rainfall in the period 2021-2050, most significantly during autumn, about 20%, while summer is characterised by a possible increase in precipitation-free days (about 20%). The trend towards an increase in average seasonal precipitation intensity may lead to an increase in the contribution to total precipitation by the most intense events.

Given what has been discussed above we can assign the values to the variables identified in the analytical framework of chapter 3. Emilia-Romagna is a region in which the probability of occurrence of hazard (variable C1.1) is “High”, the Exposure (C1.2) is “High” while the vulnerability will be assessed after the analysis of the governance system. Climate Change (C1.3) it is likely to “Worsening condition”. Where and what which intensity an hazard can occur and thus the “Predictability of system dynamics” (C1.4) is Sufficient for the short term, Low for medium and long term.

It is possible to conclude that the territory, population and asset of Emilia-Romagna face a high level of risk. Increasing the resolution, it is still difficult to determine how and with what intensity hazard will occur and uncertainty about future scenario are still high. As pointed out before, a high-risk context can be a barrier for the mainstreaming of NBS since they are still a niche in this socio-technical system and there is uncertainty about their efficacy.

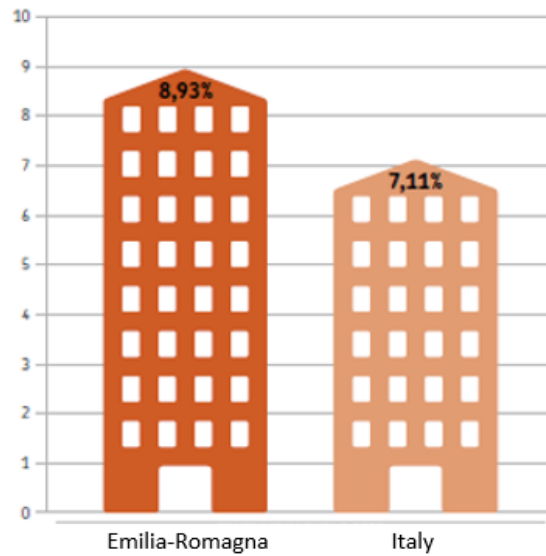
“I see that there is more focus on going for an approach that guarantees maximum results without risks, because a certain type of solution (NBS) is innovative and not deeply known” (Respondent 13, 2022).

Technicians and administrations therefore tend to protect themselves and are unlikely to adopt a solution that has never been tested before given the medium/high risk environment. Where the risk is lower, it is easier to think of adopting an innovative approach such as NBS.

7.2.2. Ecological Status

In Ostrom’s framework ecological variables were rather general as “in and outflow of ecological resources” from the social-ecological system. The UN system, and the EU directives have tried to harmonize indicators related to ecological status and biodiversity even if the process is still ongoing. The data compiled by ASviS give us an indication about the state of the regional land ecosystems using the land cover index and the fragmentation index as elementary statistical indicators. The composite index is characterised by a negative trend throughout the decade, caused by the marked worsening of the elementary indicators relating to land fragmentation and land cover. Both reach their worst values in the last assessment of 2019 (8.9% and 42.9% respectively) testifying that the process of ecosystems fragmentation and habitats reduction has not halted. Soil consumption has constantly increase as a result of phenomena such as urban expansion and the development of the infrastructure network. Emilia-Romagna is one of the Italian regions with the highest percentage of land consumption. This is a trend that, although at lower pace, has not stopped in recent years and artificial land cover has increased from 8.75% in 2012 to 8.90% in 2019. This increase of 0.21% is however lower the 0,24% increase recorded at national level (Arpae report 2020).

Figure 26 Soil consumption from Arpae report 2020



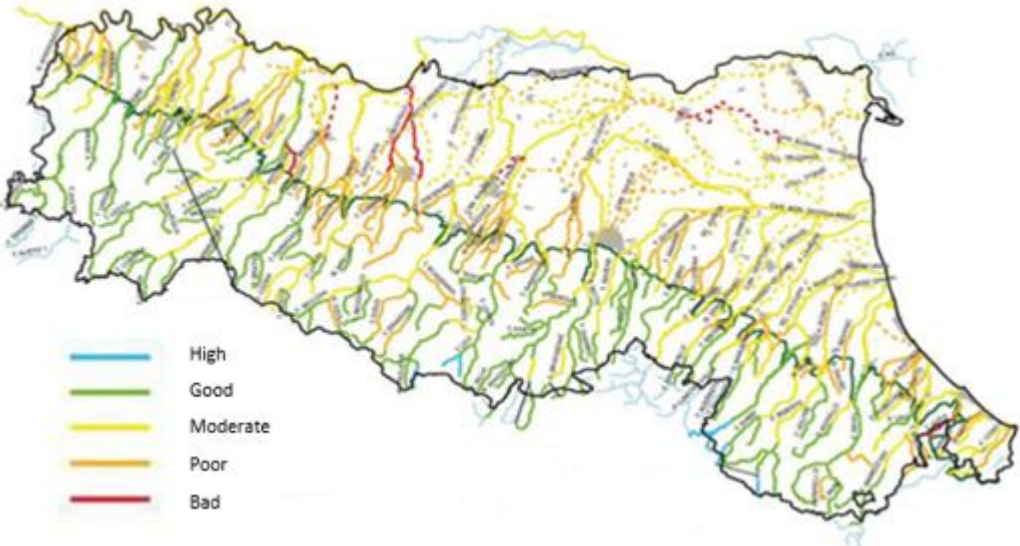
Regarding other land uses, agriculture constitutes 55% of the regional territory while forests and semi-natural areas account for another 30%. Regional ecosystem fragmentation increased from 41.1% in 2012 to 42.9% in 2019, against a national average of 36.1%. The composite index compiled by ASviS is characterised by a negative trend throughout the decade 2010-2019, caused by the sharp deterioration of the elementary indicators related to land fragmentation and land cover. The region shows a similar trend to that observed at national level, however, with higher levels of land consumption and fragmentation than the Italian average.

Regarding protected areas, there is a dispute over the data from Ispra and the region as the former states that protected areas are only 4.9% of the regional territory compared to the Italian 10.5%. The region, however, claims that this figure is based on the concept of protected area defined by Law 394/1991, which is limited to only certain types. Instead, taking into consideration protected areas in the all-encompassing concept that includes parks, nature reserves, ecological rebalancing areas, protected natural and semi-natural landscapes and areas included in the Natura 2000 Network, the protected area figure in Emilia-Romagna corresponds to 16.31%.

Another soil related issue relates to the erosion of inland areas which is mainly of hydraulic nature. It consists of the loss of the top layer of soil due to the action of precipitation. 25% of the regional territory has values above 2 t/ha per year (tolerable limit value) while exceeding 50 t/ha per year in hilly and mountainous areas. Agricultural areas lose 19 Mt of soil annually equivalent to 83% of the regional amount, while forest and semi-natural areas, which occupy 30% of the territory, lose 4 Mt of soil each year, 17% of the regional loss (Arpae report 2020).

Other indicators are used to assess the state of aquatic ecosystems. Arpae, in line with European water directive, uses a composite index that include the quality of the structure and functioning of aquatic ecosystems associated with watercourses and reservoirs. The “Water Ecological Status” index is therefore composed by biological, hydro-morphological, physico-chemical and chemical elements and can vary from “bad” to “high”. The vast majority of lowlands watercourses show a “moderate” ecological status but also “poor” and few cases of “bad” status where artificial and heavily altered water bodies prevail. “Good” status is recorded just in the Appenine mountain area and in foothill areas.

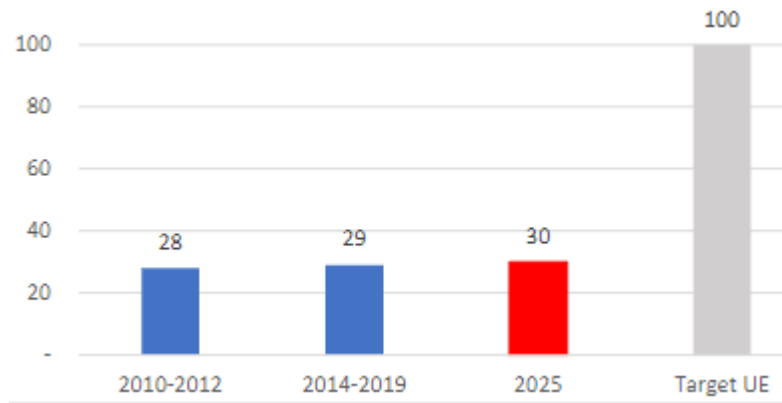
Figure 27 Watercourses Ecological Status from Arpae annual report 2021



According to Arpae analysis, river water bodies with good chemical status increased by 1 percentage point from 2010-2012 to 2014-2019. The target to 2025 is to maintain the 93%

share. The analysis also introduced the European Biodiversity Strategy's target of achieving good chemical status for all water bodies by 2027. From the Arpa report it is interesting to note that many watercourses are monitored just for chemical elements only “due to the inapplicability of biological monitoring” and probably the lack of data regarding flora and fauna.

Figure 28 Share of river water bodies with good ecological status from strategia regionale agenda 2030



According to data elaborated by ASviS, the ecological status between the three-year period 2010-2012 and that of 2014-2019 show a very little improvement quantified in 1%. According to the Regional Strategy 2030 the index should increase by another 1% in 2025, rather modest if one considers the European target, expressed in the European Biodiversity Strategy, of achieving good ecological status for all water bodies by 2027. In fact, this target seems largely out of reach for the Emilia-Romagna context. Lake water bodies instead presents a “good” ecological status in 60% of cases and “moderate” ecological status in 20% of the cases. Regarding marine waters, the ecological status is strongly influenced by the quality and quantity of river basin water that flow into it. The share of marine waters presenting good ecological status is 50% against a target of 100% to be reached by 2030. The ecological status is "moderate" for the marine waters of Water Body 1, which extends from Goro (Po Delta) to Ravenna with a surface area of approximately 96 km² and is influenced by the contributions from the Po River basin and the Reno River basin; and a "good" ecological status for the marine waters of Water Body 2, in the south which extends from Ravenna to Cattolica with a surface area of 202 km² and receives contributions from the catchment areas of the Rivers Uniti, Savio and Conca and Marecchia. The first regional marine protected area was recently established, consisting of a Site of Community Importance (SIC) of 11 km² for

the protection of species of high naturalistic value (*Caretta caretta* and *Tursiops truncatus*). The share of regional marine protected areas is now 1% while the European target is 30% and the Italian target is now 4.5% (Arpae Report 2020).

More than half of the regional beaches (about 74 km) are protected by rigid structures of various types. The most widespread are parallel emerged reefs that defend about 40 km of coastline (see figure). The remaining 30 km are protected by grazing reefs (intervention parallel and adherent to the shore), low crest reefs, submerged bagged reefs and groynes. In addition to these structures, harbour works and docks occupy approximately 2.5 km of waterfront (Arpae 2020). the coastline therefore also has a high level of anthropisation as it is almost all used for residential, tourist or fishing facilities and the extensive hard protective structures have altered the natural dynamic. As said before the Po Delta park host protected species while the first maritime reserve was established just in 2022.

In conclusion, most of Emilia-Romagna's lowland and coastal territory has an unsatisfactory ecological status, below the national average. This should be an additional incentive for the use of NBS approach in different field including disaster risk reduction. However, this has not be the case up to now, as we have seen NBS have been adopted on very few occasions. For the time being this has not been an enabling factor because the ecological and ecosystem status has not been at the centre of political action and public debate in recent years. However, as we saw earlier, it seems that slowly the sensitivity and awareness of this issue is becoming more widespread (Respondent 13, 2022). The establishment of a first marine protected area, the Po Unesco MAB area and the region's desire to increase protected areas are a confirmation of this tren. However, it will have to be assessed in the coming years whether these inputs will be operationalized. Certainly, protected areas, parks and MAB areas are more sensitive to the issue of NBS (Respondent 10, 2022; Respondent 11, 2022) and they could become a vehicle for mainstreaming in the near future.

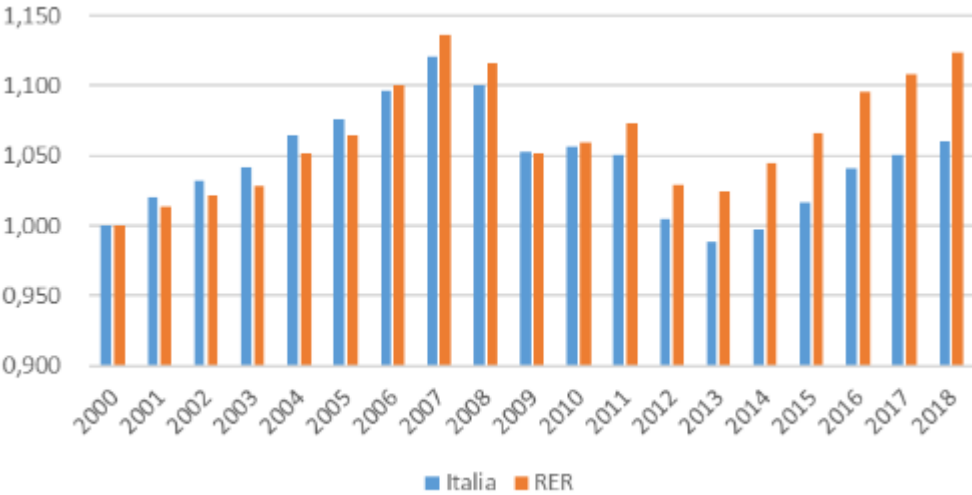
7.2.3. Socio-economic and Political

In this section, it will be discussed the contextual socio-economic and political features of the system which are not dependent on the Disaster Risk Reduction governance system but can still affect its activities or can be useful for future comparison of similar or dissimilar case. Starting from demographic data, Emilia-Romagna has 4.45 million resident people. The

indices measuring the balance in the age structure worsen as the elderly over 64 years of age account for 24.3% of the total population, which is about double compared to the age bracket 0-14 years which is the 12.5% of the total population. The overall ageing is accompanied by the ageing of the active population which is the one in between 15 and 64 years old (Statistical Office of the Emilia-Romagna Region). Even if this is not the focus of this research demographic structure might have an impact on preferences (disaster risk versus biodiversity conservation) the level of participation in decision-making processes related to water and land management and other relevant issue.

Regarding economic data, Emilia-Romagna is in a very good position compared to the Italian average for all the last 20 years and for all the indicators taken into consideration for the drafting of the regional strategy Agenda 2030 (ASviS 2019). People at risk of poverty and social exclusion are 15%, less than the Italian average (25.6%) but also less than the EU average (20.9%). The employment rate is 73.8% against 62.6% in Italy and 72% in the EU as a whole. This might have an impact on regional budget allocation on the efficiency of regional offices and investment capacity of its economic fabric.

Figure 29 Emilia-Romagna and Italy GDP growth compared, data from Istat



Moreover, the region invests 2.03% of GDP in research and innovation compared to 1.42% in Italy and 2.2% in the EU (2018). Even if it slightly lower the EU average, it is way higher than the national average confirming the regional propensity to develop innovative solutions.

Land property right and interests was coded as context variable (C3.4) and it can be very relevant in Disaster Risk Reduciton system. In Emilia-Romagna lowland rural land are mostly private while in forests area the share of public land is larger but still low compared to the national average. Overall, 63.5% of the forest area in Italy is privately owned. At a regional level, Emilia-Romagna has the second highest diffusion of private property (82%) for forest areas, preceded only by Liguria (82.3%), and succeeded by Tuscany (CREA 2005). Trentino is instead the region with the highest incidence of public ownership of forest areas (72.2%). Coastal area are instead of public ownership but managed by privates through the instrument of concession. Historically, due to the strength of interest groups linked to beach management, the concessions have not been re-allocated by public tender but have been extended over the years, creating almost a regime of “private ownership” of the beaches. Irrigation and drainage canals are instead managed by the eight consortia mentioned earlier, while the management of river branches is in the hands of AIPo and the coastline defence in the hands of the provincial branches of the regional Civil Protection.

This mainly private regime of land ownership or management necessarily leads to constant and necessary interaction with various stakeholders and has an impact on decision-making that in turn may also affect the NBS mainstreaming process as we are going to discuss. Drainage and Irrigation Consortia, AIPo and the other operative body have therefore to deal with landowners (mainly farmers but also residents) if interventions require going beyond the riverbed and canals area.

“If we have to do both banks (widen and renaturalise) no, because I would have to widen the canal, I need an amicable settlement (with landowners) or an expropriation, this make you enter into a procedure that complicates the process and therefore you can’t move in that way” (Respondent 9, 2022).

“There is a problem here because expropriation can only be done with public financing that declares public utility. We have to go to the municipality, set the pre-expropriation constraint with a conference of services and it is never easy because they start late, you have the financing, and you have to respect time targets” (Respondent 9, 2022).

“Then there is the whole issue of expropriation problems for example, having to use land that is not and still is not part of the state property, interest groups, for instance the farmers which is another big problem and a big obstacle (for NBS), the figures of the owners of the fields” (Respondent 1, 2022).

Land property right and management framework of specific territorial context are therefore relevant in many ways. Not only because of the issue of ownership but also because of the legal constraints:

“Working in protected areas was not easy and slowed us down, we should have involved the park authority from the beginning of the process” (Respondent 16, 2022)

“Making the intervention in this protected area has prevented us from working in some months of the year, postponing the works as there are certain species to be preserved” (Respondent 6, 2022).

“In the protected area there is hatching of one species and nesting of another and it is more complicated to work” (Respondent 9, 2022)

Within a social-ecological system it is also very relevant to be aware of who are the forces on the ground, which can include interest groups, associations, parties and other organizations. During the interviews, the issue of interest groups as leading forces within the system have come up several times and in most cases as a barrier to NBS mainstreaming. Respondent 5, a representative of an environmental NGO, told an anecdote with the aim of showing the prejudice and the opposition of this kind of organisation towards innovative ecological practices:

“Whenever I have heard talk of interventions to reduce the risk in the river area, I have always and consistently observed the opposition of professional associations in the agricultural sector. A participatory process was underway regarding the establishment of a form of protection on the river Secchia, there was no talk of expropriations and it was not a protection measure that would block the possibility of operating. But it was something that wanted to integrate, so trying to put together hydraulic safety with the protection of the river ecosystem. There was a very strong form of opposition, which was not explicit, but which led to some municipalities still not having decided in favour of this protection. There is still a certain dependence of the decision-makers on this part of the business world, which evidently has a disproportionate weight. (Respondent 5, 2022).

In fact, when operating in this area, one has to consider that certain interest groups are very powerful and one has to deal with them, as reiterated several times by respondents belonging to operational entities active in the area: “In Emilia-Romagna there is a fruit and vegetable sector that is an economic powerhouse worldwide and there are interests worth several billion (Respondent 9, 2022) or “Emilia-Romagna produces 65% of Italian pears,

but is a sector which is suffering and you have to deal with them” (Respondent 13, 2022). Among the actor of the governance system, there is therefore the idea that it is difficult to go against this status quo and convince these actors that, for, instance, giving room to the river can be beneficial for the whole social-ecological system but also for them in the long run.

“It is seems to be that there is a need of keeping the situation unchanged because it seems the safest and quietest way rather than going to tell people about this practices that may be more effective, but that entail sacrifices for someone. For instance, losing the possibility of using a floodplain and instead planting an orchard there. To take it down and make it an expansion area becomes complicated from this point of view. It is easier to be seen for a raised embankment than to make a setback and give land to the river so I am safer. From a social point of view they can say the land is mine and why do I have to make this effort?” (Respondent 13, 2022).

“Theoretically we can intervene, but we cannot, because in many cases state-owned areas have either been cleared or given in concession for agricultural, tourist or hunting uses. From the moment I want to intervene, I have to deal with the farmer who has the area under concession” (Respondent 2, 2022).

Another trade off can arise between navigational interests and renaturation objectives, as the former implies maintaining high embankments to allow boats to navigate the waterways, while the latter implies to remove artificial embankments to give more space to the river and reduce the risk by improving the ecological status. This contrast was also evident in the National Recovery and Resilience Plan of 2021:

“On the one hand, the project envisages the reforestation and renaturalisation of the Po and, on the other hand, the project envisages increasing navigability (going towards Ferrara and Ravenna and Cremona as a port), so we raise the barriers and thus raise the level and more ships can navigate” (Respondent 10, 2022).

In the coast, although with different kind of actor, there has been observed similar dynamics as, as said before, there is a semi-private management regime with a lot of interest intertwined.

"For us (in Italy), the concept of public good, having privatised the beach, is somewhat less and this is reflected in decision-making. Owners of bathing facilities, hoteliers and all those who have an interest are important lobbies” (Respondent 4 2022). “In this case, the main actors are

the bathers organisations and hoteliers which are the most relevant. There are also actors linked to the fishing sector and therefore also fishermen organisations” (Respondent 6, 2022).

In some case, the tourist use of the coastline and related interests may be at odds with an ecological management of the coast but also risk reduction:

“Even for the managers of the protected areas, however, everything is tied and unbalanced towards the tourist and recreational aspect of the beach. In any case, those who participate (in the decision-making process) and devote time to it are those who want to be sure that from these operations the concession remains, the kiosk remains. In order to maintain this influx of tourists, for example, we remove the posidonia beds to sell tourists a product that does not exist. We have to start selling the product of the Mediterranean beach, which is made up of this little beach, dune and posidonia system because in winter it protects us from erosion. This is the ecological beach approach (Respondent 4 2022).

Regarding structural defence work for watercourse embankments but also for the coastline, there are also the companies that manage quarries and materials that in turn can push against the adoption of the NBS approach:

“Here in Italy we have mountains by the sea everywhere and then there has been a business of quarries, transporters, etc. Building works over the years has been very profitable for a whole range of categories and so we pay the price” (Respondent 4 2022).

“I bring cyclopean boulders from the dolomites but I can't think about long-term pulling down the dolomites and planting them in riverbanks or on the coast, so absolutely agree to study and move forward but it can't be an on/off switch type transition” (Respondent 9, 2022).

“There is one aspect that we have seen from the business world in the sense that the companies that operate in our lagoons. They have their business plan on the rock and if you go and tell them to put stakes, and issues where the immediate gain is less, in the longer term and whatever else you have great resistance and then they act at various levels on the prohibitions and project activities” (Respondent 10, 2022).

The need to deal with this type of interest in most of the contexts in which one operates, including biosphere reserves, is therefore self-evident and balances between their need and interest and the public good interest should be find:

“About the biosphere reserve: when I used to say to the ministry or to Brussels: look at the fact that in those core areas every morning there are 1,500 fishermen catching clams that are worth

100 million. It's not possible (to shut down their business like this) so the interpretation of how habitats should be managed cannot be standardized like the northern European style of conservation because there is no uniformity of vision of how to do conservation (Respondent 10, 2022).

Respondent 3, a naturalistic engineer with over 30 years of experience in this field, says that the lobbies behind traditional engineering are much stronger than those behind naturalistic engineering, which therefore struggles to emerge.

“Traditional engineering is more business related, it is concentrated investment, more material related so there is more business behind it in all the various stages of the supply chain especially the market for standardisable materials. The concrete lobby is very strong. Traditional public works we know, when it goes well are in the hands of contractually heavy companies, Confindustria, the construction and civil engineering companies that make roads highways, dams, hydraulic works have considerable political and social economic weight. Natural engineering are forestry cooperatives and as well equipped as they may be they are ants compared to others (Respondent 3, 2022).

I conclude the critical aspects with the reflection of the regional representative of the NGO Legambiente that sums up what discussed before:

“As far as adaptation is concerned, the impression is that these are measures that, because they affect areas that are already in use, for any measure, rural or urban measure, it actually becomes one of the conflicting interests in the use of space, so it is not such an appealing topic. It is always something to be negotiated where total agreement it is hard to be reached” (Respondent 5, 2022).

Nevertheless, the picture is not totally black and some breaches have been observed also from the type of actors that seems to be more restrained to innovative ecological approaches. For instance, in Emilia-Romagna, the theme of bio-districts is expanding which, although not directly linked to NBS for risk reduction, may become so in the future or at least demonstrate a renewed sensitivity of some farmers to environmental issues:

“Bio-districts are these groupings of farmers that often expand to include other economic and civil society actors, institutions. The fact that they are progressively expanding is a sign of the farmers increasing sensitivity to environmental issues. Moreover, rather than with farmers associations, which often, and I say this from many experiences, tend to protect the more

archaic ways of managing the land, it is better engaging with the farmers themselves who are perhaps more attentive, more shrewd or perhaps just curious” (Respondent 5, 2022).

Going back to the earlier discussion on the biosphere reserve, the park authority respondent, Marco Gottardi, points out that conservation and business objective are not always conflicting:

“In the end I had to move areas used for fishing to transition or buffer areas to keep fishermen doing things, they have been recognised as a biosphere reserve and I do conservation anyway. you have to go for conservation through a concerted approach with the private sector” (Respondent 10, 2022).

According to all the respondents, communication must be improved to make the benefits of this approach understood by the general public, stakeholder, and private actors which might overlook the short-term loss and downplay the long-term gain:

“It is true that you give up part of your field, but in return you have not only greater security but also a more liveable environment, I use this term not too correctly, but in the meantime you can increase a value, the value of the remaining part of your fields and properties because there can be an increase in a value linked to a tourist use also, for example” (Respondent 2, 2022).

For instance, Respondent 5, believed that the revitalized public discourse on climate change can help to put NBS at the center of the political agenda and increase their acceptance of local stakeholder:

“Climate change is leading to a modification of the phenomena that are taking place, it has a novelty characteristic and therefore can almost be presented as something to start talking about. Let's say climate change is perhaps even fashionable enough to be perceived as something additional and not the continuation of an old debate” (Respondent 5, 2022).

It is possible to conclude that when deal with space demanding NBS, dealing with private or contested area is more complicated as more interest are involved and it is an issue that NBS implementer and designers have to take into account since the beginning of planning process.

Participative culture of planning was identified as context variable C3.4. In the literature, it is often pointed out that new relationships between authorities and citizen need to be established, and this is even more true with regard to NBSs which, as we have seen above, can have a direct impact on the local socio-economic system and can also find barriers that need to be overcome. There is a consensus on this point between the literature and the

respondents: it is considered of great relevance to foster dialogue and cooperation between authorities and private actors for the management of the territory and in particular for the NBS mainstreaming process.

“For the success of NBS you need integration of technical knowledge, so engineering, hydraulic, morphological, ecological, naturalistic, but then afterwards you also need to create some social awareness and involvement” (Respondent 2, 2022).

Climate Change Adaptation and NBS intervention might also imply unpopular decision that has to be properly communicated and mediated with local stakeholder:

“With Climate Change and sea level rise there is no big alternative between thinking about retreat and applying NBS, educating people and thinking about strategic retreat to create space and sediment. The alternative is to make people realise that there is no alternative. You cannot make a wall for the whole of Italy and the MOSE⁴⁵ at the Strait of Gibraltar” (Respondent 4, 2022).

“It is not easy for us to tell the municipality of Porto Tolle that at a certain point you will have to retreat because maybe it is better to leave it than to defend it with embankments and so on” (Respondent 10, 2022).

Furthermore, NBSs, as we have seen, can bring so-called co-benefits that are not at first sight evaluated by the actors and that also have to be communicated, and participative practices might serve this purpose:

“One struggles to convey complexity. The need from the point of view of those involved to understand, why the hell do I have to do NBS? There is a whole set of needs that the NBS discourse tries to hold together that people do not take for granted including the citizen, the association volunteer, and the local representative. Yes there is a theme of co-benefit, but also upstream I would say there is a theme of being able to evaluate, of being able to convey to those who are not technically involved, the urgency of this type, the need, the fact that they can produce benefits that other solutions do not give you” (Respondent 5, 2022).

As we have seen before, in the most recent regulatory instruments, there are provisions about participation. In practice, however, one must then assess whether this happens and how. Each specific context and field can be characterized by a participative culture of planning which is

⁴⁵ The engineering structure build in the Venice lagoon to save the city from sea level rise

hard to measure but it implies the general sense of ownership that citizen living in the area perceive, the attitude of authorities about undertaking these processes, which kind of actors usually participate, in which phase of the processes, with which degree of power and with which approach. According to respondents, in Italy there is a low level of participatory culture:

“In my opinion it happens very partially and very little for various reasons of legal and procedural complexity, timing, weaknesses of some subjects, willingness of others to make autonomous decisions without confusion, lack of culture on consultation. Concentration of power and culture of not sharing in order to have fewer problems. This approach (participative) is very low except for a few sectors and a few virtuous projects” (Respondent 3, 2022)

“Adaptation issues have so far had little appeal to be promoted through participatory methods. When you have to propose, for example, the retreat of the beach or the widening of the river, they are likely to be conflicts that then you then have to manage” (Respondent 5, 2022).

“In Italy we are not capable of doing that compared to other countries, or less capable. We are not capable of discussing and making decisions. Neither by the citizens nor by the institutions that typically have an attitude that imposes a solution. If you impose it, it is useless to ask me to come to the table, or if I come to the table, I put up the sign “I do not agree”. On the other hand, lack of ability to accept a collective decision that is made (Respondent 12, 2022).

Fausto Guzzetti, deputy head of the national civil protection department, however, added that despite difficulties these practices can be beneficial but some preconditions are necessary:

“If there is a sincere will to change, with a predefined time, we lock ourselves in a room, whoever has things to say says them, and then a decision will be reached. That can be useful. I repeat, it is not trivial and you have to start in primary school. People must be taught to discuss, to express their opinion, to mediate, to hear what the other person says, to arrive at a meeting point that is in everyone's interest. Culturally we are not capable, other countries are. In particular, public administration has a hard time doing this” (Respondent 12, 2022).

Some respondents pointed out that it is partially a generational cultural issue. They affirmed that the new generations of public officials and technicians are more inclined to inclusion and participation than their predecessors. Indeed, the old model envisaged land and water management as a technocratic issue to be dealt exclusively by state and local

bureaucratic/technical offices. In this case, “the intrusion” of other actors is perceived as a disturbance rather than an added value or a necessary practice:

“As far as co-designing is concerned, in some cases yes, but it is a very personal and individual thing, if I have to tell you, those who have old experience tend to bypass this type of possibility and exclude it. Those, on the other hand, who are younger or have a greater openness are more prone, but really it is an individual choices and there is no unique direction” (Respondent 6, 2022).

“My generation was not born and is not capable of doing these things because they were not taught. If I go to one of those meetings, I go there preconceived. I waste hours there but I have already decided what I am going to do” (Respondent 12, 2022).

About the citizens side, there seems to be low level of ownership regarding issues related to risk reduction and biodiversity, or at least a lack of direct activation. It is often stressed by interviewees that usually, the actors that participate in inclusive processes are almost exclusively the most powerful lobbies such as farmers, hoteliers, bathing associations. The main trigger for participation seems to be economic interests.

“In participatory processes, for example, there were only those with direct interests such as beach associations participate. Whereas when I have seen and participated in things like this in other countries, private individuals, people with gardens and small houses nearby, pensioners, everyone is there because everyone is interested and everyone is aware that this is a public good” (Respondent 4, 2022).

“These tables are often dominated by powerful interest groups” (Respondent 3, 2022).

There are exceptions in the case of recent disasters such as the Secchia river floods of 2014, and the 2020 floods which involved both the Secchia and Panaro rivers.

“The Modenese people and citizens are very attentive to the floods issue. There have been petition, debate in the municipality council, they have gone to Rome for the issue of the expansion tank. The citizens know their business” (Respondent 15, 2021).

Regarding environmental associations, little participation and activism was noted in the field of adaptation, risk reduction and biodiversity conservation, at least regional tables and in the planning activities. Nevertheless, the representative of the environmental NGO affirms that they are finally planning to move in that direction in the near future:

“One of the topics we wanted to deal with was NBS, then now we stopped for a moment because there are urgencies that colonise the agenda but in the future, I hope to get closer to something like that. Within we are now approaching adaptation issues and there is a debate on the meaning of defining oneself as an environmentalist or ecologist I have some territorial circles that ask me we have to do a lot of actions on river management in general and so we are trying to engage both the basin authorities and AIPo” (Respondent 5, 2022).

Despite this negative picture and the evidence that the culture of participation and consultation is not very widespread in Italy, there is however a widespread perception that Emilia-Romagna is a virtuous example for the capacity of regional institutions to build participatory processes.

“In ER there was a dispute because during the digging of a tunnels there was a problem and houses were damaged. The region and the vice president who was also councillor for civil protection called a meeting in an open session broadcast via streaming. The questions were relevant, difficult, complex, and it was a complicated exercise from my point of view as a respondent, but I think it was a real exercise of democracy. I think opportunities like that are potentially very useful. Things like that are not easy to do, but there are some” (Respondent 12, 2022).

Another positive experience is that of the establishment of the UNESCO MaB area on the Po River shaft, generated a virtuous participatory process demonstrating that in some cases institutions are proactive and effective in generating involvement. Respondent 2, who deals with water quality management, states that:

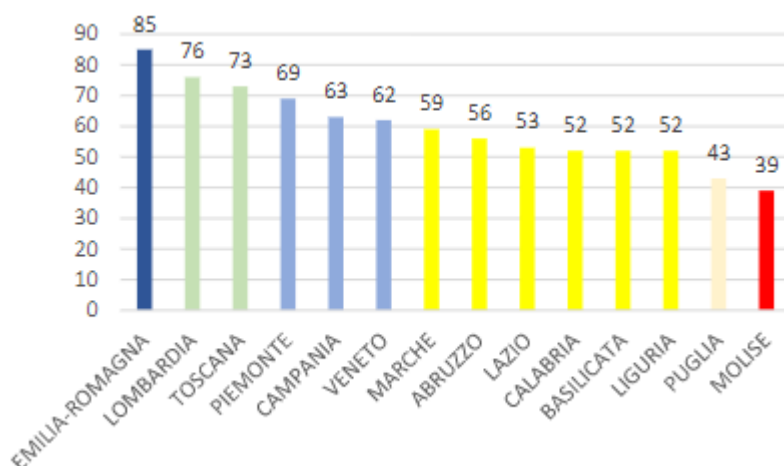
"With the mayors of the entire MAB area, which is made up of 82 municipalities along the middle stretch of the Po River, we started this process of sharing and participating in the territory and listening, and it is a sort of “cultural based solution”. It is a means of increasing awareness, knowledge of the territory and trying to work together with the territory. Not to be the superordinate body that is up there and does not know its own territory, but it is also a moment that listens to you because those who live along the Po, let's say, have some cognitive and social elements that can help them to plan and programme better. Local administrators, even from small municipalities, believe a lot in this institution and in this MAB reserve and invest resources, they see that there is a feedback in the area, local farmers and producers, and young people are also involved. If there is sensitivity and awareness then these paths work well (Respondent 2, 2022).

Other examples will be discussed in more detail in the section on participation within the governance section where the standard participative practices will be further assessed. It is possible to conclude that the participation of citizenship in land management in Italy is very low and problematic. Slightly better is the situation in Emilia-Romagna where institutions are more active in involving different types of stakeholders and in general there is higher civic participation. These impressions are also confirmed by some data according to which Emilia-Romagna maintains levels of political and electoral participation above the national average. The percentage of people aged 14 or over who carry out civic and political participation activities is 67.6%, compared to 59.4% of the Italian average. In 2019 Emilia-Romagna has a social participation of 27.1% significantly higher than the national average at 22.7% even if it is 4.5% lower compared to 2010 values (DEFRR 2020). However, this activism has yet not appeared in the field of risk mitigation yet, since even an important environmental organisation such as the one of Respondent 5 has dealt with it marginally, and it is just recently considering how to approach it deeply. Context variable (C3.4), participative culture of planning is thus evaluated as medium/low.

7.2.4. Institutional Capacity

For institutional capacity in this case we refer to administrative which is the capacity of to perform the functions assigned to them which span from tax collection capacity, spending capacity, self-financing capacity. One of the most used index in Italy is the “public rating” is an index for the qualitative assessment of public administrations that makes it possible to measure their efficiency and transparency, pursuant to Legislative Decrees 33/2013 and 190/2012. The index has been developed by *Fondazione Etica* and produced by the Public Rating Agency, both independent bodies. This index takes into account multiple sectors and can give us an idea of the state of health of the regional administration. Regarding the macro-sector budget and administrative capacity, Emilia-Romagna rank first in Italy.

Figure 30 Administrative capacity Index from Documento Economia e Finanza 2020



Emilia-Romagna is indeed the only region with an “Excellent” rating with a score of 85 out of 100 for its administrative capacity, while the Italian average value is 59.1 (Regione Emilia-Romagna 2019). From the data collected and the interviews there is a consensus that the Emilia-Romagna region is considered an excellency in many fields related to its administrative capacities. The specific capacity of the Disaster Risk Reduction system, including other governance level will be discussed in next paragraphs.

7.3. The Governance system

In this section I am going to sum up and describe the main feature of the governance system according to the materials discussed in chapter 5,6, and 7 and the information gathered through interviews. Before starting, in order to put thing into scale (Governance scale was coded as variable G2), the Emilia-Romagna region includes 4,45 million people (G2.2) distributed in an area of 22.509,67 km² (G.2.1), highly anthropized since almost 8% of the land is constituted by urban settlement, and more than 60% of agricultural land (G2.3).

7.3.1. Governance organization (functions)

Disaster risk and biodiversity conservation governance system are a multi-level governance system that involve a considerable amount of actors at different administrative level and with multiple interrelated functions. I am going to start by analysis of functions assignment

summing up what has been discussed in chapter 6 through the lens of the analytical framework discussed in chapter 3. Governance functions regarding preventive measure related to the Disaster Risk Reduction system are: strategic goal setting, rule-making, operational planning, project design and authorization, project implementation, monitoring and sanctioning.

Starting from the international level, the UN system is deeply involved in environmental issue, including disaster risk reduction and biodiversity conservation. The Convention on Biological Diversity, Agenda 2030 and the Sustainable Development Goals, the Paris Agreement, and the Sendai Framework for Disaster Risk Reduction are setting standard that has been quite influential in the EU, which at the international level is one of the most supportive sponsor of the aforementioned documents. The EU is also very responsive in steadily including such input within its own legal and strategic framework. The EU is very relevant in setting environmental strategic objectives that apply to member states mainly through directives. However, the EU leaves a certain degree of freedom to member state in the way they are supposed to achieve the objective set at the EU level.

At the national level, authorities are mainly responsible of strategic goal setting, rule-making and financing. It has been shown how strategic goal setting and rule-making in environmental field has been heavily influenced by the international level, especially the EU. National authorities are indeed responsible for the transposition and implementation of European Union Directives: Habitats Directive (1992), Water (2000), Floods (2007) and Environmental Impacts Assessment (2011 and 2017). The central state also has the task of transposing and putting into practice the strategic plans that are drawn up at the European level. In this case, national authorities have been deficient given the considerable delay in adopting the National Climate Change Adaptation Plan and the 2030 Biodiversity Strategy. The plans that are drawn up, such as the plans against hydro-geological instability of 2019 respond to emergency needs rather than to a long-term programmatic vision. The national level also has the task of allocating funding for risk reduction and biodiversity conservation through its own funds or European funds. The state determines the sums to be allocated to the regions for risk reduction, which are made up of national funds or European funds. The state also establishes the funding priority criteria for individual works and through ISPRA manages the Rendis

platform on which projects awaiting funding are uploaded. The regions then have the option of adding their own resources.

The central government also takes on the task of coordinating the system by means of “task forces” whose aim is to speed up the often cumbersome implementation phase of interventions. It was established in 2014 at the Presidency of the Council of Ministers the “Mission structure Italia Sicura” suppressed in 2018 and replaced by “Investitalia” and the “Cabina di Regia Strategia Italia” which had a wider scope and included all public infrastructure in its mission rather than just disaster risk prevention.

Finally, the state is responsible for issuing and adopting technical standard including standard for buildings and infrastructures in addition to the public procurement regulations, which are also very important in this governance sectors. The state, following EU guidelines issued through directives, also establishes thresholds for projects and plan authorizations and permitting procedures.

District Basin Authorities (DBA) instead have two main functions: planning on the grand scale and preliminary project evaluation. Moreover, the authority carries out research activity per increasing knowledge about pressures and pollutants in order to have a clear picture and try to concretely implement what Europe is asking of us from the water directive, floods, biodiversity strategy, farm to fork (Respondent 2, 2022).

As far as planning is concerned, there is an initial phase of sharing with the regions to draw up risk maps which, following the transposition of the flood directive, contain data on hazard and exposure of people, assets, buildings, and cultural heritage. This planning process leads to dialogue with the regions mainly the soil protection service instead for the water plan plus the water service and the natural and environmental heritage. The region in turn consults with its territorial offices on a provincial basis, which therefore have detailed knowledge of the territory. In Emilia-Romagna, proposals are discussed with territorial offices on a provincial basis, and with so-called implementing bodies including municipalities, drainage and irrigation consortia, AIPo and Civil Protection.

The region thus gather local instances bringing them to the relevant table of policy and strategy definition (Respondent 6, 2022) and acts as an intermediary between the basin authority and the territory in the definition of risks maps but also in the definition of

interventions. A plan proposal is made, which is shared with the various players, including the reclamation authorities and AIPO, and is open to all citizens and everyone can submit comments via an online platform. The final plan is then drafted and once the planning is finished, we start again with the updating in view of future planning, which takes place every six years.

The authority also has the task of evaluating projects to assess their compatibility with the basin plans and assign them a score, which then goes on to define the priority level for funding in the Rendis platform. The implementing bodies (AIPO, Consortia or Municipalities) submit preliminary or definitive projects to the regions, which upload them in Rendis. The authority then carries out an assessment of the project, which may be positive or negative, and may request integrations to the region. Subsequently, based on funding from ministries or European funds, projects are financed on the basis of the regional priority list come up according to the score mentioned before. Once a project is financed, it start another phase in which the authority has little say (Respondent 1, 2022) and there are other competent authorities responsible of the project. Then the definitive and executive project must be drawn up, and the permitting phase begun. There are the various authorisations to apply for according to the type of project on which the regions (through their own offices or regional agencies), municipalities and ministries (Environment, Cultural Heritage) may have jurisdiction discussed in chapter 5.

The regions are therefore the main interlocutors of the DBA in most of its activities. The basin plan development pertain to the DBA but it is built with the regions giving the input for implementing what is then defined within the plans (Respondent 6, 2022): “Let's say that in any case our main interlocutors are the regions” (Respondent 1, 2022). When funding arrives, the region interfaces with the implementing bodies asking for project proposal.

It has been already shown in chapter 6 the increasing role given to regions in this specific governance sector. In addition to the functions discussed above, after the setting up of programme agreements and the appointment of regional Presidents as government commissioners to tackle hydrogeological instability in 2014, the region has also a relevant role in facilitating the implementation of the interventions. The region is also responsible of the authorisation of projects if they are of regional significance or it delegate this task to lower

level. The region responds to queries on whether a project should be subject to an EIA, if screening or an EIA itself is required.

The municipalities are also key actor within this governance system. They can submit projects to the regions then to be uploaded on Rendis, they are responsible for placing expropriation restrictions if necessary, they are responsible for authorising small-and medium-scale projects, they can participate in the board of directors of land reclamation consortia, they can be on the board of directors of the park management body, they are beneficiaries of some funding lines for territorial security such as the Ministry of the Interior's one for small municipalities.

Having drawn a picture of the layered competences and functions of this complex system, we can break it down into the different components identified in the chapter to assess possible barriers and enabling factors in more detail. The starting point is the degree of decentralisation, what was coded as variable G4.1. In order to assign a degree of decentralisation that is comparable with other possible studies, I used the Local Autonomy Index (LAI) developed by Ladner et al. (2016) making some modifications to make it fit for the case study. The LAI is a composite index composed by 11 subitem that I am going to discuss. For each sub item a score are assigned on a scale from 0 to 3 where 0 is the lowest level of decentralization while 3 is the highest.

Institutional depth: the extent to which local government is formally autonomous and has a choice regarding which tasks to perform. Score of 2 according to the principle of subsidiarity the region can take on any new tasks (residual competences) not assigned to other levels of government.

Policy scope: range of functions (tasks) where local government is effectively involved in the delivery of the services, through its own financial resources and/or through its own staff. Considering the governance functions related to disaster risk prevention seen before the region and lower level administrative bodies, including the system of agencies and municipalities, have a role in each of the functions except for financing and technical standard setting where the national authorities has an almost exclusive competences. Project design and implementation is instead the functions in which operative lower level prevail. It is therefore assigned a score of 2.

Effective political discretion: is the extent to which local government has real influence over the assigned functions, which is high and therefore a score of 3 it is assigned.

Fiscal autonomy and self-reliance: it is the extent to which local government can independently tax its population and in Italy it is limited since the state mandate that 90% of the major regional tax (Irap) has to be destined to the health system while the other major regional tax is an addition on national income tax (*Addizionale Irpef*) and cannot overcome a certain threshold. The consortia have higher degree of autonomy since they collect money from consortia member but most of the budget is used for ordinary management while for bigger project they are still dependent on higher level funding. The region can potentially use its own resources to increase spending in disaster risk reduction but its source of income are mainly related to state transfer in this field (Chapter 5) and therefore a score of 1 is assigned.

Financial transfer system: the proportion of unconditional financial transfers to total financial transfers received by the local government. Since the majority of financial transfer are conditional a score of 1 is assigned.

Borrowing autonomy: local authorities can borrow with many limitations. Loans have to be strictly related to investment activities and with financial limitation and it is not a habit to use it in the disaster risk reduction field. A score of 0 is assigned.

Organizational autonomy: the extent to which local government is free to decide about its own organization. It is high but it has to deal with supraordinate authority with given procedures. A score of 2 is assigned.

Legal protection: Existence of constitutional or legal means to assert local autonomy. In case of conflict with the state the Constitutional Court expresses itself, for minor disputes, e.g. between the region and other subordinate bodies, the administrative courts are competent. A score of 3 is assigned.

Administrative supervision: unobtrusive administrative supervision of local government. A score of 3 is assigned for “there is very limited administrative supervision” (Respondent 1, 2022).

Central or regional access: the extent to which local authorities are consulted to influence higher-level governments’ policy-making: since there exist formal provisions for lower level

participation in decision making a score of 3 is assigned for “local authorities are either consulted or have access to higher-level decision-making through formal representation, and substantial influence” (Ladner 2016).

The average score recorded is 2 which, on a scale from 0 to 3, means a medium/high level of decentralization (Variable 3.1).

Then I am going to assess whether the governance structure is functional which implies the assessment regarding institutional settings and the level of eco-fit (variable G3), which is the degree of overlapping between bio-physical and management systems, and the level of redundancy and lacunae (G4.2) in the assigned governance functions.

The most experienced respondents, 3, 4, and 6 had the occasion to experiment two systems: the one established by law 183/1989 and set up from the mid-1990s and the one established by the adoption of the Environmental Code of 2006 and successive reform like the one that in 2015 merged all the regional basins. All the three of them expressed preferences for the older one in which basin level entity like the “Regional basin authority” had technical capability. According to Respondent 6, the new authority lack of technical capacity which are delegated to lower-level administrations that not always have enough skills.

“From my point of view, we need to go back to concentrating technical competences on a single institutional level, which should be the regional level, then actually the best scale is the sub-regional one, the hydrological basin. At the regional level, things are kept together and looked at in a fairly coherent manner, but it is the level below that is best able to analyse the problems, and find solutions (Respondent 6, 2022).

The respondent in this case regrets the previous system in which there was an authority with technical capacity for each regional basin (Po, Reno, Conca-Marecchia, Bacini Romagnoli). Respondent 3 and Respondent 4 agrees with this view:

“There has been a step backwards from a conceptual point of view. The connection between the geographical unit of reference of planning, as opposed to administrative” (Respondent 3 2022).

“Law 183 was a very important step. For us then after Law 183 it worked a lot. The Bassanini law passed the defence of the coast from the state to the regions at the end of the 1990s and at the beginning of 2000 there was a very important step, we took all the competences that had

become regional, we started planning at the regional level. At the beginning of 2000 there was serious planning” (Respondent 4, 2022).

“From my point of view, the risk mitigation system has undergone an involution. It had its best peak at the time when law 183 was enacted, which had brought all soil protection issues in the three macro-sectors of erosion, flooding and landslide risk back to planning at river basin level” (Respondent 6, 2022).

Regardless this negative opinion on the reform, however, Respondent 4 and Respondent 6 added that somehow the system still works, for the former because of the inheritance of the suppressed system and for the latter because people adjust to the system:

“Then the system, all things considered, works. With the region playing a leading role and we are still strong from the previous experience of Law 183 because the people are the same. But the moment these people are not there for various reasons, this type of experience is lost and it is a risk” (Respondent 6, 2022).

“At the beginning my business suffered a lot but then we rolled up our sleeves and started again and now things are working better” (Respondent 4, 2022)

For both the respondents of the basin authority, this institutional set-up has only positive aspects:

“I would say that in this change and evolution, as far as we are concerned, it did not have negative aspects. On the contrary it has been positive because it has officially and institutionally defined what the district authority's structure was and its role. It has been given a very important and definitive role. Above all, to think about the whole in the territory and it certainly brings more advantages than having a bias as before on various authorities” (Respondent 1, 2022).

According to the respondents 1 and 2, however, this is a temporary problem that will be resolved when the system becomes fully operational and will bring benefits in the long run:

“It is clear that we then found ourselves having unified planning instruments and it is probably a path that is still in progress, but it is clear that a single interlocutor for several regions will bring enormous advantages. Having the whole basin, the control of the district and the whole basin is an advantage” (Respondent 2, 2022).

An additional complexity arise from the merging of the suppressed regional and interregional authority of “Conca-Marecchia” and “Bacini Regionali Romagnoli “with the Po DBA even if the two basins are hydrologically unrelated. This additional difficulty was also recognised in

the report that the region delivered to the watershed authority for the revision of the 2021 Flood Risk Management Plan: “In Emilia-Romagna, more basins have been merged under the same authority, adding an element of complexity to planning” (Regione Emilia-Romagna 2021).

Drainage and irrigation consortia are organised according to the catchment areas of the Po's tributaries and in this case the eco-fit criterion is more evident. The representative of the Consortia *Burana* gives a positive assessment of the current organisation from his own positive experiences with both the region and the District Basin Authority. In conclusion, the large-scale eco-fit criterion adopted with the New District Basin Authority has led to partially loose small and medium-scale eco-fit, guaranteed by the old system the smaller basins. Due to the suppression the region has again assumed greater powers as it is responsible for unifying the planning of these different basins and be the most important interlocutor of the wider Po DBA. Then it is the task of the District Authority, to homogenise and make organic all the various inputs coming from the regions and the territories. It is possible to define this system, a system of “partial eco-fit” since bodies organized alongside administrative and bio-physical are both relevant.

Regarding the coherence, functionality and clarity of the attribution of governance functions, the system has suffered from various phases of reorganisation, including the 2006 with the Environment Code, the adoption of the PGRA with the transposition of the Floods Directive in 2010, the abolition of the provinces in 2015 and the reorganization of regional basin of 2016. This instability temporarily compromised some of its functions.

“Unfortunately, this is a sector that is affected by so many reorganisation events that waste a lot of time, then we have to review all the operational programmes and also from the point of view of references, it makes the territory and those who live there lose what are the references” (Respondent 4, 2022).

With time and thanks to the people who were there before and after the reorganisation, an arrangement was found and somehow the planning activity reached again a satisfactory level (Respondent 4, 2022, Respondent 6, 2022, Respondent 13, 2022)

According to the majority of respondents who are part of the governance system or those who have been dealing with it for the longest time, they state that functions and roles are clearly assigned (Respondents 3, 6, 12, 13). While for those who see the system from the outside like

local administrators or academic people it seems less clear and coherent because of the multitude of bodies and norms involved.

“From the outside figuring out who is the subject to refer to, and it is never that trivial, in the sense that sometimes it is the basin authority that prevails then there is always the opinion of the region (Respondent 1, 2022).

“There are always more opinions and more subjects involved, so if I have to tell the truth it often complicates things. Having several subjects expressing their opinion on the same subject becomes complicated” (Respondent 8, 2022).

“As an academic I don't interface with it much but planning is very complex some activities are not clear who has to do them, this is in general, then organisms have changed and there are constant evolutions” (Respondent 15, 2022).

This has been an issue for the Operandum project who was a experimental one leaded by academics with few experience with the governance system as one of the most recurring leasson learnt cited there was that an earlier engagement with all the involved parties would have significantly smooth the processes. However it does not seems a structural problem has the presence of multiple and sometimes overlapping authorities is inevitable in a cross-cutting sector like disaster risk reduction and water and land management.

Instead, a more relevant gap identified was that the project design function, in some cases, is entrusted to low level bodies like municipalities that do not have the appropriate technical capacities to perform these functions.

“New environmental code and subsequent reforms have shifted the programming of interventions from a basin-scale level to a local and municipal level, shifting the vision from physical to administrative which had quite a few negative repercussions (Respondent 6, 2022).

The respondent points out that some technical competences formerly held by the suppressed basin and regional authorities have not been absorbed by the new district authorities but delegated to the regions and in some cases to municipalities that do not have a basin vision and the appropriate competences to carry them out successfully.

In addition, little seems to be done on the monitoring of interventions during and after the work as the representative of the authority affirmed “indeed, we have little control over the

process after project approval on the Rendis platform” (Respondent 1, 2022). Monitoring is indeed entrusted to implementing bodies like also municipalities, which, again, do not have enough human and financial resource to carry out this task.

Regarding function overlapping, it emerged that between the ordinary planning system and some civil protection interventions as redundancy in the system: “then there is the strand of interventions managed by the civil protection that do not end up on the rendis platform and we cannot get a total 360% view of the interventions” (Respondent 1, 2022). This issue was also noted in the course of the Operandum project, as delays were due to an overlapping of tasks by the Civil Protection:

“Because the civil protection is an agency that is engaged in emergency interventions above all, they saw our dune as a marginal thing that had no priority. We should have to involve them in an earlier stage” (Respondent 16, 2022).

7.3.2. The strategic objective

The strategic objective of a governance system is the ultimate goal that the latter intends to achieve, and it was coded as variable G2. If by definition a Disaster Risk Reduction system aims to mitigate risk, it is interesting to note whether and to what extent this sector has also adopted the goal of ecological and biodiversity conservation alongside risk reduction. Strategic objectives are set through policy input that can be of various nature and with various level of enforceability.

As pointed out by members of the river basin authority, interventions in these areas “were only evaluated from the point of view of the Floods Directive” (Respondent 2, 2022) within which there were no indications of an ecological and biodiversity target. This can lead to “conflicts between the objectives set by different regulatory instruments such as the Water Framework Directive (WFD) and the Floods Directive, and if “these interventions, which originate as hydraulic risk mitigation interventions, can then result in a failure to achieve the objectives of the WFD or a potential degradation of the ecological or morphological aspects of the water body” (Respondent 1, 2022). In recent years, from this point of view, the strategic directions seem to have been to act quickly to reduce risk while little attention has

been paid to the ecological component (Respondent 13, 2022; Respondent 11, 2022). Some input has been there but ineffective for various reasons that will be discussed while other where totally absent. The 2020 National Biodiversity Strategy has not been taken into account by this area of governance, the 2030 strategy has not been adopted by the government, nor has the climate change adaptation strategy, which is many years overdue.

“If there had been a National Climate Change Adaptation Plan that clearly expressed the priorities for intervention, including in the area of NbS, this would have favoured dissemination. Currently, in Italy there is an Adaptation Strategy that identifies the sectors of intervention, but no approved and operational Plan that indicates timeframes and modalities and that has adequate economic coverage to prepare these actions as well” (Respondent 16, 2022).

An attempt had been made to give an input with DPCM 28 May 2015 by allocating a 20% share of funding to integrated interventions. This measure was immediately repealed by the National Disaster Plan, which acted with an emergency logic.

“In fact, there has been a change of direction and whereas before it was an element that could give a score at the level of projects to be financed, so it went up as a score, in the last decrees this has disappeared. before on the Rendis funds there was this ranking and a certain type of intervention benefited from it, now this criterion has been removed” (Respondent 13, 2022).

Respondent 9 and 13 mention this fact of funding priority and do not explain why this address has disappeared for this type of intervention. The respondents of the basin authority were also unable to give an answer on this. The analysis of the regulatory evolution shows that it had been repealed by the National Plan of 2015 and also those of 2019 that responded to an emergency logic of risk reduction and therefore of speeding up procedures that were not compatible with the system of criteria elaborated by that decree. The priority criterion was reinserted with the most recent Prime Ministerial Decree of 27 September 2021.

“The big change is that previously they were only assessed from the point of view of the Floods Directive, but with this new decree they are also assessed from the point of view of the Water Directive and an attempt is made to assess both the synergies between the Floods Directive and the Water Directive but also aspects of possible conflicts. In this case, the DPCM makes explicit reference to Nature Based Solutions, which are mentioned and can be an important support” (Respondent 1, 2022)

Since it has only recently been reinstated, it is difficult to make a judgement on its effectiveness but at least it is a sign that NBS and renaturation goals are falling within the strategic objectives of this governance system. In conclusion, however, we can say that, if not in the very recent past, there has been a lack of strategic input for NBS to be mainstreamed.

Regarding strategic objective (variable G.2) we can conclude that the main strategic objective remain risk reduction and ecological concern has had low priority, but we have recently assisted to an increasing relevance of this matter in both normative frameworks and values of the actors involved in this sector.

7.3.3 Multilevel integration and participation

It has been discussed earlier when a certain degree of vertical and horizontal integration is crucial in a complex system and they have been coded as Governance variable 4 (G4). Vertical integration (G4.1) allows for the proper transmission of inputs from the top to the lower levels of the governance system and vice versa. Interviews and data showed that the inputs to change came mainly from the international context, particularly that of the EU.

“EU policy is strongly focus on renaturation now, as in the National Recovery and Resilience Plan which include NBS” (Respondent 13, 2021)

“Input for NBS are coming principally from the international level and the world of international finance is also moving in that direction, for instance with the discourse on ESG” (Respondent 8, 2022).

It has already been shown that at the national level, some of the inputs from the international and European level have struggled to be promptly transposed. The Water and Floods Directives have been transposed late while some strategic documents such as the new climate change adaptation plan and the new biodiversity strategy have not yet been adopted.

In the Italian context, there has always been a difficulty in transmitting input from the strategic and planning level to the operational level (Chamber of Deputies Study Centre 2021), and therefore, the main objective at the national level has been to increase coordination and vertical integration to speed up the implementation of works. We have seen in chapter 5, the task forces created for this purpose, as well as the increased powers assigned to regional

presidents precisely to overcome these implementation difficulties. From a certain point of view, the situation has improved with some important interventions that have been unblocked. But even in the transmission of these inputs, the NBS aspect or at least the adoption of an ecological approach was completely lacking. With the National Plans against Hydrological Instability of 2015 and 2019, the environmental discourse was completely side-lined. It can be affirmed that in recent years there has been a lack of national guidance on the promotion of NBS and the concept of integrated planning. Coordination and integration structures at the national level such as the steering committee “*Cabina di Regia Strategia Italia*” and “*Investitalia*” should instead become an instrument for transmitting these inputs, if there is the political will for NBS mainstreaming. For instance to be sure that the input given by the National Recovery and Resilience Plan (PNRR) of 2021 and the DPCM of 27 September 2021 will be effectively implemented in an ecological way.

At a lower level, where planning takes place and therefore where the relationship between the District Basin Authority and the region is now more consolidated as a good level of coordination and collaboration has been achieved. The authority is responsible for coordinating, at basin level, transposing and homogenising regional inputs, but also for transmitting European inputs to lower levels, including those on NBS.

“Our role is to steer even the most operational bodies such as the regions or AIPo in this direction. Our tool, are the programming and planning tools, The renaturation project we call a challenge because we tried to start an integrated process. We started from the sediment management programme, from what were critical hydraulic issues, but we integrated it with all the aspects of land protection, conservation of Natura 2000 sites and reconnection of the river with the floodplain areas” (Respondent 2, 2022).

However, this can happen more effectively now since the new criteria decree 27 September 2021, whose predecessor had previously been derogated from the National Plan, has come into force. In addition, the new decree makes explicit reference to NBS, which were previously only called integrated interventions: “The new criteria decree, by making explicit reference to NBS, can help to broaden this panorama and encourage the regions to promote this type of intervention to the implementing bodies as well” (Respondent 1, 2022). The region has indeed the responsibility of acting as an intermediary with the lower levels such as the provincial, municipal and operational levels (land reclamation consortia, municipalities themselves, civil protection, AIPo). The region has tried to make up for this lack of national

guidance with the publication of guidelines for the renaturation of river basins and canals for drainage and irrigation, however, with poor results. This regional input was not put into practice, making it clear that the problem is perhaps primarily at the lower, operational level.

In some specific cases such as in the planning sessions dedicated to participation, the authority also meets directly with the implementing bodies or in exceptional cases such as the PNRR where the authority is a direct beneficiary of the funds to be spent. Respondent 9, member of the drainage and irrigation consortium affirms that:

“We participated in the planning, then it depends on the degree of involvement that they consider most appropriate at that time. We worked closely with the river basin authority on the Flood Management Plan, which was an important breakthrough at the national level because it was done for all the macro river basins. Now, for example, as part of the PNRR, we have met with the Po basin authority to point out those interventions that are most strategic helping them to draw a scale of priorities for interventions” (Respondent 9, 2022)

In any case the first approach even in the case of the PNRR was with the region who ask them to present projects and the consortia official reiterates that “with the region there is a very good relationship, there is really a dialogue so you can work more quickly” (Respondent 9, 2022).

The impression is that this polycentric system work and the level of collaboration is at least sufficient. According to Respondent 6 “the network system between authorities, the regions, provincially organised, and municipalities works” (Respondent 6, 2022). The good level of cooperation also concerns other bodies such as AIPo and the consortia: “the project is done by us and the consortium who know the water distribution network and it is they who interact with the farmers associations, so it is a chain seems to work at least for now” (Respondent 13 2021). This good level of cooperation can also be explained by the long-term, direct and continuous relation among actors: “in the end we obtain result because there is experience, you know each other by name, it is not the engineer Tizio, or Caio⁴⁶, the geologist etc, you really call each other by name, hello Stefano and Francesca” (Respondent 9, 2022).

The Civil protection is another body set up to act as a coordinator and boundary spanner of the system given its ramification, which includes national, provincial and local levels. This is

⁴⁶ Tizio and caio are names of hypothetical persons, used in Italian to indicate any person taken as an example.

mainly set-up for emergency preparedness but not only, as Civil Protection is in charge of managing some traits of the river and they are also in charge of preventive structural measure. Civil Protection is when another important actor to be involved if NBS have to be mainstreamed:

“We are useful if we are able to coordinate well the pieces of the system that are out there, and this presupposes that we are able to get everyone around a table and have them to discuss. In the headquarters (Rome) there is a physical place that represents this. It is called the operations committee room (sala del comitato operativo). It's a long table with the head of the civil protection department, alongside members of the army, defence, the centres of competence, the regions, Anas, Tim, healthcare. Everyone is there and together decisions are taken. It's not easy. Many times we clash, we clash, but technical decisions are taken which then can become political decisions. At regional level the it is the same (Respondent 12, 2022).

“The civil protection of Emilia Romagna has been carrying out meetings and sharing at provincial and level for years” (Respondent 9, 2022).

As mentioned before, the role of the civil protection could therefore also be important for the mainstreaming of NBSs considering also that some funds go directly through them and they are an implementing body in charge of structural works with an organizational structure which branches out across the whole country. A coordination problem concerning civil protection is that its funding is a parallel channel that do not fit in Rendis system as pointed out by the officials of the basin authority:

“Civil Protection interventions, for example, are not included in Rendis and therefore are not evaluated by the authority, so sometimes the negative aspect is that we do not have an all-round view of all the interventions because we are not required to evaluate them in all cases. Those of the Civil Defence do not pass through here” (Respondent 1, 2022)

Coordination problems occurred in the implementation of the Operandum project mainly between Arpae and ARSTePC since the former was the owner of the funds but as it is not an “implementing body” it could not spend them. There was therefore a need to conclude an agreement between the two entities, but it took a long time to obtain it due to ARSTePC inertia:

“Coordination needs to be improved. During the project, there was difficulty in urging ARSTePC which was engaged in other urgent interventions and therefore tended not to give the necessary priority to the intervention” (Respondent 16, 2022).

Moreover, as this was a new research project, there were no pre-set collaboration procedures for this operation, and it had to be improvised on the spot. A high level of proactivity was therefore needed on their part, which at least initially was not there to overcome these bureaucratic and coordination problems. In the operational phase, one of the problems highlighted is the authorisation phase, and according to some, it is also a question of coordination. A tool designed to increase coordination and reduce “transaction costs” is the conference of services (*conferenza dei servizi*) through which authorisation procedures are unified by bringing all the authorities and actors involved at the same table. Nevertheless, this tool not always works as expected.

“Then we often have conferences of services, those are those situations where there are all the people who express their opinion on the project, which theoretically should facilitate the approval of the project but in reality are very long things, where so many people are involved. In addition to the more technical ones, then there are so many people expressing their opinion, this is a weakness on any type of project, not just NBS” (Respondent 8, 2022).

Further discussion about this coordination tool will be discussed in the policy section.

In conclusion it is possible to affirm that coordination and cooperation among governance body is not considered the main problem within this specific governance system even if there are spaces for improvement such as in the authorization phase and the conference of services. What it is missing is some vertical integration between input coming from international level and lower level as there are shortcoming at the national and operative level. The national plan should have incorporated European input earlier, as in the case of the national climate change adaptation plan or the biodiversity strategy. The region has tried to step in with a regional adaptation plan which laid the foundations for subsequent instruments whose effects are now being noticed.

The guidelines for renaturation instead have proven to be a weak and ineffective input. Finally, the constant upheavals and institutional reforms taking place at national level, included those aimed at coordinating (from the Mission Structure *Italia Sicura* to the *Cabina di regia*) risk destabilising the lower levels. Clearer and constant input from the

national level are thus required to push change at the operative for instance through technical standard, regulations, funding criteria and other tools that will be discussed later. While from the regional to lower level the level of integration and coordination can be considered good.

We can conclude that variable G4.1 Vertical Integration has the following value: “Insufficient” between national and lower level, “Good” between Basin authority, regional and lower level.

The Horizontal integration, coded as variable G4.2 is what allows the various planning bodies and tools to pursue similar objectives, not to hinder or generate conflict among different goals, and to achieve multiple objectives at the same time by including environmental, social and economic issues. The integration of planning and implementation is one of the pillars of Integrated Water Resource Management IWRM discussed in chapter II. The concept of integration goes hand in hand with the concept of participation, coded as variable G4.3 which is another pillar of the IWRM. The integration is even more important when it comes to solutions that are inherently multi-disciplinary and cross-sectoral as the NBS. This aspect was also considered fundamental by the respondents:

“In the period before the reorganisation of the provinces in 2015 and the closure of the provinces I was in the sector that was in the environment directorate and it was called water protection and coastal marine environment and it was a wonderful thing. There they were doing coastal defence plan but also bathing water quality and it was a bit more integrated” (Respondent 4, 2022).

“Within the basin authority there are various types of professionalism, both in sector one which deals more with hydraulic risk and sector two which deals with water protection. We work a lot together so there is synergy. Of course, we start from one sector, but there are aspects and projects that are dealt with by the two sectors, so we manage to cooperate fully. Internally, we always try to work synergistically. We also assess the ecological status of watercourses” (Respondent 1, 2022).

Risk Reductions and biodiversity have for many years been treated as separate activities within the institutions as also found by the basin authority.

“This is an issue we have found at the level of some regions that work by sectors, so they have separate soil protection sector and water quality sector” (Respondent 1, 2022)

This is partially true for what regard the Emilia-Romagna region since risk reduction and water quality fell within the same offices, but it is not the case for what regard biodiversity which is assigned to a specific office in charge of the protected area. In this case biodiversity conservation risk to result a task confined in protected areas. However, both fell within the same Directorate General for the Protection of the Environment and the territory and it is therefore a task assigned to the director to make the world of risk reduction and biodiversity/ecological conservation to be more integrated.

The legislation with the “environmental code” (d.lgs. 152/2006) and subsequent amendments assigns to the basin authority the role of homogenising the inputs from the territory to make planning integrated. The other plans, including agricultural, urban, landscape, are hierarchically subordinate to the basin plan, and there is a time span of 6 to 12 months given to the responsible authority to change them and comply with the basin plan. A mechanism that aims to guarantee coordination and integration among plans.

“At the planning level, let us say that this kind of vision of managing to hold together mitigation, various interests and biodiversity, these different issues is quite well framed at the planning level even if problems exist” (Respondent 6, 2022).

As mentioned above, this respondent, despite a not entirely negative opinion, considers it problematic to have shifted the planning and design of interventions from the basin level with the old regional basin authorities to assign it in part to municipalities and other smaller authorities in addition to the regional one. According to the respondent, this is not only a technical problem, but also affects the level of integration of planning since municipalities and other local authorities do not have an overall view of the river basin.

“The integration that was driven by the suppressed basin authorities has faded and this drive has been lacking. We have forgotten to do justice to this need to make the world of environmental rehabilitation and the support of biodiversity and the needs there are in the environment speak with the needs of risk mitigation” (Respondent 6, 2022).

These considerations are partly, but with reservations, shared by the authority when it states that:

“We have encountered a difficulty: when we finally get to design, because we do the planning, then the implementing body will do the design internally but will contract out the work to firms. The whole active part of the intervention, even the final design, construction site management

and aftercare part, remains somewhat outside our competence, and we are not able to intervene much because then the authorising bodies are not us. Consider that an executive project is not required for inclusion in Rendis. On the contrary, feasibility studies and preliminary projects are often included, so it is clear that the assessments we make are assessments at a different level when we are assessing an executive project” (Respondent 1, 2022).

According to the agency, therefore, the regions as well have to make stronger effort to push implementing bodies toward integrated planning and management:

“It is the regions, and the regions should also hold the line. If an integrated project has been presented by certain implementers, they should then supervise the implementation of this intervention” (Respondent 2, 2022).

Despite the problems we have seen in the previous chapter how the effort to make planning and programming more integrated has increased considerably in the last period. The labour and climate Pact is for instance an instrument that was able to make many social parties and actors of the governance system agree on the following years integrated strategic programming. The same can be said for the GIDAC and the comprehensive mandate programme.

We can conclude that variable G4.2 Horizontal Integration can be considered sufficient and increasing.

Regarding participation, (variable G), the basin planning, in compliance with the principles suggested by the international community and the European Union as seen in Chapter 4, also aims at greater integration through participatory stages involving face-to-face meetings with seminars, conferences and workshops, as well as the opportunity to submit online comments during the risk map and basin plan revision process that has to be discussed. In this case the stakeholder engagement is managed by the District Basin Authority (DBA) or the regions:

“The involvement during the planning process yes, it is a process that is quite codified such as the passage with the regions or the organisation instead in the final but also initial stages of listening to other stakeholders. So there are moments that are planned by the basin authorities and others by the regions, it is the standard itself that establishes. Either we manage it internally or we rely for support on a company that deals with communication of participatory processes, it depends on the situation. the participatory process already included the participation of the regions but also the involvement through seminars of citizens” (Respondent 1, 2022).

The DBA and the region have the leadership, while the other institutional bodies like implementing bodies or municipalities can intervene either through direct interaction with the region itself or in the moments dedicated to participation mentioned above where also non-institutional stakeholder are admitted. The Emilia-Romagna region, beyond the practices imposed by law, is undertaking a series of initiatives on a voluntary basis, with the aim of increasing the coordination and integration of policies also through the means of higher participation. Most of the regional strategic document, like the mandate programme, the regional strategy for mitigation and adaptation, the regional strategy agenda 2020 all make references to integrated planning and disaster risk reduction and biodiversity conservation. The more recent “Labour and climate act” that deals with both social and environmental objectives is another example of the regional focus on integrated planning. Also more operative tool like “river contracts” established by the environment code, the “*Che costa sarà*” programme included in the “Integrated Management Strategy for Coastal Protection and Adaptation” (GIDAC) goes in this direction. These instruments, although presenting some difficulties, are nevertheless at the forefront in the Italian context and represent the first steps towards integrated management. All these policy instruments envisage broad participation and stakeholder engagement, including interest groups, experts, lower level bodies but also of private citizens in the planning and programming phase.

“I participate in various river contracts and have been participating in the first ones for years. Certainly, it is a positive thing also from a cultural point of view that we exchange and talk about certain things, also citizens and stakeholders there is finally an exchange of information and thoughts and opinions which is positive in itself” (Respondent 32022).

“In river contracts and with park authorities, local clubs participate. Again, this is something we are building in recent weeks because in reality, as Legambiente, we have delegated the issue to local clubs” (Respondent 5, 2022).

“With the GIDAC there is an action for the creation of a “coastal pact”, which is something new that is all to be built and verified. In this case, the main players are the municipalities, the bathing association and hoteliers, the region as the body responsible for coastal defence, the universities as the entities that bring technical knowledge, and other institutional entities such as Arpae, but also fishermen. Previously, only regions and municipalities were consulted and the

beach associations were only convened for advisory or informative purposes. The river or coast contract, however, can encourage co-planning” (Respondent 6, 2022).

A representative of the municipality on the Romagna coast, Respondent 19, spoke at the Operandum forum to reiterate how crucial any moment of confrontation such as the Operandum and the initiatives undertaken within the GIDAC are, especially in the case of NBS mainstreaming and dissemination:

“May this forum be a good omen to move in a direction of sustainability and use of NBS and a simplification of procedures in the area of authorisation for coastal municipalities, not only for the dune, which is only one of the many interventions also foreseen in the GIDAC. So perhaps there is a greater awareness both at higher levels and not, thanks also to the paths that have been taken within the GIDAC for participation and at least information dissemination for the implementation of the strategy” (Respondent 19, 2022).

These participatory practices and this mode of interaction and coordination have also received positive feedback from actors outside the Emilia-Romagna governance system.

“This is an important aspect that we are touching on. It reminds me the process that is taking place in Emilia-Romagna: “*Che costa sarà*”, the participatory process that the region is doing with everyone. The one that concerns the coastal contract and within this they are doing this process where they have really put everyone in. It is a beautiful dream, but sooner or later it will be achieved. It is already a step forward today. I think they have done a great job. It will have its problems, but it has been a long journey. It was also open to other regions but then there were no places (Respondent 4, 2022).

Even if:

“Improvements can and must be made in this respect, although it must be said that studies and projects aimed at integrated management of marine-coastal zones have been promoted for 20 years, an approach that consists of the active participation of the various actors involved and the development of policies capable of integrating and harmonising national, regional or local sectoral legal instruments through the adoption of guidelines for effective management of marine-coastal zones” (Respondent 16, 2022).

“We are at the beginning of the process, and we will see what it is going to happen” (Respondent 6, 2022).

A recent rapprochement between an important environmental association such as Legambiente and the regional bodies seems promising. For the first time Legambiente is indeed a signatory member of a strategic planning act of the region, namely the pact for Labour and Climate, even if in a subordinate role:

“We are within the pact for Labour and Climate, this regional table where the main players are the business associations and the trade unions (Respondent 5, 2022).

Moreover, the region has granted to the association an access to every regional planning activity that deals with the environment:

“In recent times we have been granted privileged access to all the processes under discussion in regional planning. Privileged access means that we are informed with an ad hoc meeting, tententially, after which there is always the classic mode of comments. We are also signatories for the first time to a document with the region: the Labour and Climate act” (Respondent 5, 2022).

However, with regard to risk mitigation and biodiversity these interactions as yet to be started and the NGO representative said that they are working on it. Other cases in which issues are addressed in a participative way are the river contracts, again managed by regional offices. One of the main issues that have been found in these participatory tables is the preponderance of institutional or economic actors, as there is generally a low participatory culture of planning in subjects not directly involved in this governance sector. Instead, those with economic interests participate mostly through associations/interest groups:

“Although, in my experience, at these tables the ones who are the most powerful are, for example, the bathing associations” (Respondent 4, 2022)

“In river contracts there is certainly a codified structure that allows for the participation of stakeholders. However, some interests that tend to be overrepresented as they have a very strong voice, especially the agricultural sector. Also because of the way the management system is structured, for example, in land reclamation consortia, they tend to have a control that as far as I know from my experience is very strong” (Respondent 5, 2022).

There are also cases where participation is really broadened but it remains difficult for those nor represented by powerful associations to have a say when it comes to decision:

“Then from there (participative practice) to the decisions, the influence is little and not so relevant. Those who participate then have no power to decide. Then there are high-level scientific people who are frustrated because they are not taken into consideration. The agricultural sector rather than those who manage public affairs have the same mentality as well as the reclamation consortia. Those who decide do not listen enough” (Respondent 3, 2022)

According to the respondents with a “naturalistic background” and academia, there is a lack of input from stakeholders with a longer-term vision.

“From the point of view of the objectives that must be achieved in this new phase in which the challenges are different from before, it would probably benefit from the intervention of stakeholders who have a longer-term vision, not only the associative world but also the activities of those who do research, those who investigate, scientifically give them greater representativeness. try to bring a more objective point of view to these tables untethered from particular interests” (Respondent 5, 2022).

“When there is the engineering aspect and other aspects of land management, including land reclamation consortia, it is not always easy to make people understand that this is a medium to long-term investment and will then yield results. So we need very stringent forms of consultation and a check on the economic balances that these activities make in the area both in terms of natural capital and in economic terms for agriculture” (Respondent 11, 2022).

“Then there are high-level scientific people who are frustrated because they are not taken into consideration” (Respondent 3, 2022).

“It is hard to make local administrators understand certain issues” (Respondent 18, 2021).

The pro-activity of the public administration and the leadership of public structures therefore remain crucial. They have indeed the task of integrating all knowledges and input, an in theory, weighting the input coming from stakeholders who autonomously take action for economic interests and the common good. The general public has indeed fewer incentives of participating as the free rider problem and the collective choice theory discussed in chapter 2 taught us.

In some cases, indeed interest group, accustomed to “exploitative” way of managing land and natural resources might also impair participative attempt to develop ecological approaches as in the case of the Secchia river in the Modena provinces where there have been discussions

about which kind of conservation measure should be taken to regenerate an ecosystem in very poor status:

“It was a process that had been initiated with the approval of the region, led by the park management body and also some municipalities in the area. The institution of this protection had been accompanied by a whole series of cautions and objectives, including for the management of the river's hydraulic safety. So it was not a protection that was proposed and that was going to block the possibility of operating in terms of hydraulic safety, but it was something that wanted to integrate, therefore trying to put together hydraulic safety with the protection of the river ecosystem. Even let's say in the face of this kind of shrewdness, there has been a very strong form of opposition on the part of agricultural associations, which has not been explicit, but which has led some municipalities to still not have decided in favour of this protection. I say still because more than five years have passed since the process of approving the proposal that had already been made” (Respondent 5, 2022).

In other occasion, instead conservation action have been more positively received when the public authority where deeply involved and they manage to convey the message that conservation measure are not a constraint on development, but can be also seen as an opportunity:

“Then another important aspect of sharing and confrontation with the territory is the one that has arisen in recent years with the MAB biosphere reserve, which is a parallel process to our planning instruments. Local administrators, even from small municipalities, believe a lot in this institution and in this MAB reserve and invest resources, they see that there is a feedback from the territory, local farmers and producers, and young people are also involved” (Respondent 1, 2022).

“There must be the ability of the administration to have a much more widespread communication with respect to the territory. it is very important that the structure of the local authority is very credible and has a spendable face. Now (in the park) there is more collaboration, and this is also true for hunters, in the sense that they are the first to tell you let's work together to do sustainable hunting, let's fight poachers, etc. It is a process that has to be put in place with phases of dialogue, in our reality the small economic activities, the artisans and farmers have a greater sensitivity, they are less constrained and in part more prepared than the administrators” (Respondent 10, 2022).

Interestingly, Respondent 10 and 5, state that small businesses, e.g. farmers, craftsmen, and individual citizens are more sensitive to environmental issues than their relative interest associations, which are then the ones that participate in the decision-making. However, smaller actors are difficult to involve, and it takes a constant presence on the ground. In the near future, participative effort will be of utmost importance since the region is considering how to incorporate European inputs and achieve conservation targets, and will also seek to do so in a concerted manner:

“Now the region is, I’ll chronicle a bit, responding to the EU’s request to enlarge the Natura 2000 areas, so we are taking an interest in the issue and trying to rebuild the dialogue with the circles that have historically dealt with it” (Respondent 5, 2022).

Where, on the other hand, participation and cooperation is almost totally lacking is in the project design phase. Not only there is a lack of active participation by non-scientific people (an aspect not desired by all respondents), but it has also been observed a difficulty in finding synergies also between different scientific disciplines. In particular, there is a lack of cooperation between traditional engineering and ecological knowledges that hardly ever works together.

“On an operational level, one thing that is missing is co-design and co-design if you want to design from an integrated perspective But it is very rarely done including more naturalistic skills. Either this co-design thing is accepted and must become part of the norm otherwise NBS will never pass” (Respondent 11, 2022).

“For the NBS there could be the idea of involving the various trade associations more, but I see that for this aspect there is a lot of struggle, there is no path of political dialogue and sharing, for now at our planning level we are all pretty much going our own way. There is a fear of touching local socio-economic balances” (Respondent 13, 2021).

“I believe this (co-design) is related to the extraordinary. The ordinary does not pursue any kind of collaboration and co-planning. The ordinary is done by following what has always been done. So the ordinary does not ask too many questions, nor does he go in search of so many collaborations. When it is obliged because of funding sources requirements then it is done. However, in a very complicated way, and I must say that it is always experienced with some difficulty by the technicians” (Respondent 6, 2022).

Therefore, in the project design phase, due to a cultural issue of the technicians but also due to a lack of resources and time, it is difficult to talk about co-design, deemed to be fundamental in the NBS case. Within the Operandum Project, most of the member highlighted the importance and relevance of co-design, but a difficulty in interacting between different disciplines was noted in some instances:

“Engaging “just for the sake of it” is a chore, I wouldn't do it again. A lot of energy is required, including emotional energy, and there are some contrasts. The closest stakeholders are a resource, the others maybe just need to be informed. We lack the human resources to get involved. Some partners are useless, on the management and partnership side I try to avoid them and do as little as possible because the exchanges are not enriching. They just ask and are one-way. On the other hand, the company only participates when there is AIPo, i.e. potential customers, while they have been absent in laboratory tests and reticent for inspections” (Respondent 15, 2021).

Co-design is also essential to avoid possible eco-system disservices that an NBS might provide if designed and implemented without an integrated set of knowledge and a multidisciplinary approach.

“We need an open and sincere dialogue, it is right to respect nature, but the problem is that (the intervention) is still a hydraulic safeguard instrument and perhaps we should talk more between those who are competent in one area and those who are competent in another to see if there is a meeting point. Because here I come to an aspect of caution that we all have. We would not want that, if we do too much renaturation, then later we are paralysed in the management of that NBS infrastructure” (Respondent 9, 2022).

In fact, the respondent gives an example of an expansion tank that has since become home to some protected species, which has made maintenance more complicated. Problems were encountered also in the between the park authority and the other bodies of the governance system. Respondents from the Park Authority complain about a lack of involvement in decision-making processes:

“Often the ministry started with a procedure and forgot to consult the park authorities and also the managing bodies of the Natura 2000 networks that perhaps could put some patch. They call us at the end of the procedure and that's where the problems arise. As in the case of the PNRR where we tried to put a patch (more biodiversity and ecological concern) on it in a second phase but it was not possible due to the deadline of the funding” (Respondent 10, 2022).

As the park authority are the bodies in charge of biodiversity conservation, it suggest that ecological approach has not been a priority in recent years. Finally, efforts are also made to raise awareness outside the governance system itself, which at least testifies that there is the recognition by relevant actor of the need to extended governance processes:

“Since this year we have also been involved in training courses because we have given a few lectures both with the order of engineers and to university students” (Respondent 9, 2022).

“There are a number of ongoing projects involving young people. Work is being done with schools, through territorial assessment and valorisation projects. We are going in this direction of participatory planning even if it is difficult” (Respondent 1, 2022).

Nevertheless, these efforts do not seem sufficient, and much is still missing to build a collective consciousness and produce the shared social learning that can enable large-scale changes and faster NBS mainstreaming:

“In the end I can go and tell all the benefits for biodiversity for ourselves, but it takes something and someone to trigger an awareness mechanism, I don't know. This step is missing for the whole process to be successful. Otherwise, there will always be an administrator who will say no I want the embankment because psychologically people are used to that, with the embankment they are safe, if I lower the embankment “oh my god” and so this is a change of thinking” (Respondent 2, 2022).

“I am for the uphill road in the sense that I would like to find ways to convince and educate. Our solution is environmental education, stakeholders, local government colleagues, beach managers, hoteliers, and all those who have an interest and are then the important lobbies. When you are able to explain then we also saw the enthusiasm, the beach managers understood certain things and then you gave them the brochures then when the tourist arrived they would turn it over to them as well”

“Absolutely true but I also think we need a collective conscience I think we need a collective acceptance of responsibility here” (Respondent 12, 2022).

To conclude at the level of planning and strategic objective setting, participation is increasing due to regulatory provisions and a growing proactivity of public administrations, with the region and park authorities at the forefront trying to work in a concerted manner. This despite a poor culture of participation as has been pointed out in the appropriate section. On the specific issues of risk mitigation, the actors involved have

mostly been institutional actors with little or no participation from other organisations except for interest groups. It seems, however, that awareness in this direction is increasing and attempts are being made, with many difficulties, to increase these experiences of participation. There is a widespread perception that the power asymmetries can jeopardise the achievement of the optimal solution as citizen but also external experts with a long-term vision of sustainability are not adequately represented and listened to. Power dynamics and economic interests therefore often prevail over sustainability issues, contradicting the discourse that higher degree of involvement automatically lead to better result in term of resilience and sustainability. The ability and strength of public administrations to steer these paths and smooth out the special interests of the various production categories remains crucial. Especially in the case of NBS, which undermines established business models and management approaches. However, administrations, such as implementing bodies and municipalities, do not always have the capacity, resources and time to pursue these paths, and thus participation is particularly lacking in the design phase. Finally, all the respondents agree that there is a relevant cultural gap that has to be filled to increase awareness and dissemination of good practices related to NBS so to boost the mainstreaming process.

7.3.4. Implementation capacity

A disaster risk governance system can be described as a socio-technical system which is supported by a given number of technical and administrative personnel with shared set of knowledge and skills necessary to put in practice what has been planned. It has been discussed before how NBS require a special effort for its design and implementation. Implementation capacity is thus referred to as the combination of quantity and quality of human resources and tools in the system in order to assess if and how this variable (G4) can affect the mainstreaming process. Implementation capacity can be divided into administrative (variable G4.1) and technical capacity since the programming and implementation phase require both expertise. For this case study it is also useful to further subdivide the category of technical capacity into “traditional engineering” (Variable G4.2) capacity and “Environmental/Ecological technical capacity” (Variable 4.3).

Respondent 8 of the engineering consulting firm argued that a general problem of Italian administrations is that they are unbalanced toward the administrative side, lacking technical resources:

“In general, Italian administrations are unbalanced on the administrative side compared to the technical side. Maybe they have a thousand administrators who take care of all the details, record things, etc., and a much smaller fraction of technicians, and when it comes down to it, it is much more complex to approve and discuss certain issues. Yes, all right, there is the bureaucratic part to understand, but then you have to know the subject to be able to manage it, so there is a bit of a barrier” (Respondent 8, 2022).

It has been discussed before the overall capacity of the Emilia-Romagna region while going into the specifics of the Risk Reduction sector, the leadership of the Emilia-Romagna region is confirmed. Giving an overview of the Italian situation, a senior Civil Protection official states that:

“In some cases the regions are very skilled and very knowledgeable and know their territory well and are very well organised. In others they are less so there is a gradient between north and south so that typically those in the north are much more organised than those in the south on these issues” (Respondent 12, 2022).

Maurizio Respondent 3 is the founder of a nature engineering company with 30 years of experience who has worked all over Italy and confirm this perception in relation to the Emilia-Romagna region:

“Emilia-Romagna and Tuscany are regions, and also Lombardy, compared to the national overview there is a fair amount of capacity and organisation” (Respondent 3, 2022).

On the same vein are the insiders of the Emilia-Romagna system like Margherita Aguzzi from AIPo:

“And yet I must say that there is a lot of competence in terms of knowledge and preparation” (Respondent 16, 2022).

Respondent 9 of the drainage and irrigation consortia official who considers himself lucky to work in Emilia-Romagna, which despite the difficulties is “light-years ahead” in land management (Respondent 9, 2022). These perceptions are also confirmed by the data. Emilia-Romagna, according to the Rendis 2020 report, is among the regions that manage to realise

interventions in the shortest time considering the design and authorisation, allocation, and execution phases.

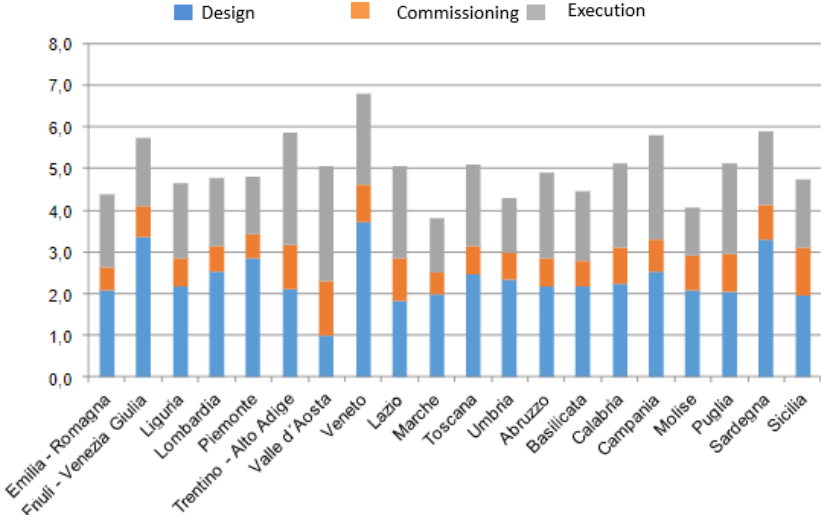


Figure 31 Average year of Implementation Time/Phases of Interventions

The ER is also a leader in the collection, analysis and sharing of environmental data including hydraulic and climatic data which are of particular relevance is the case of NBS (Respondent 11, 2022; Respondent 17, 2022):

“Fortunately, the data are shared quite well in Emilia-Romagna in other regions no, although Arpae cannot always explain how the data are taken and in some cases there are problems with instrument management” (Respondent 15, 2021).

“Europe, Italy and Emilia-Romagna even more, has adequate firepower in the world of computing for what needs to be done” (Respondent 17, 2021).

“It is more difficult to get the data to speak inter-regionally as these are collected regionally and in some cases with different methods "the data are not all communicated in the same way in the various regions and already studying them is complex” (Respondent 15, 2021).

“One of the most noticeable improvements in recent years is in the tools and collection of information needed for land management: the growth of data collection and experience thanks also to the growth of information technology, tools have improved” (Respondent 3, 2022).

Despite these excellences, some problems have emerged. There was a difficulty in replacing retiring staff in a timely manner due to bureaucratic delays caused by the system of recruitment by public tender.

“What we are struggling with is the retirement of a many people who represent the historical memory of the field. There are great difficulties in replacing them because on the one hand there are physically no people to replace them, and on the other hand those who replace them have not had the possibility of a handover. Now both the technical and administrative components are dying out and there is not enough turnover and staff coming in” (Respondent 6, 2022).

“Yes this talk of human resources I have reported and it is a bad period, apart from retirements, a lot of management figures have retired in recent years, even in Arpae it was like that, they were not replaced in certain cases and also several officials with historical memory who were not replaced” (Respondent 16, 2022).

Therefore, in some cases there was a shortage of staff to cope with the most stressful moments in the system, when, for example, emergencies or transitions were taking place within the agencies themselves.

“I did not perceive a skills problem, rather human resources are not always sufficient or clearly distributed” (Respondent 16, 2022)

According to respondent 6 public administrations are not too attractive to technicians because in the private sector, salaries are at least 1/3 higher at entry level and they can grow more. In spite of this, they have had less of a problem in replacing staff as a “private entity under public economic law”, in addition to the classic instrument of public calls “we still manage to have the margin to do some interviews with the curriculum vitae and a few questions or chats with the candidate. In recent years, if we go to take stock, we have a dozen new and young units. The problem, however, is that in other agencies the problem is real” (Respondent 9, 2022). Emilia-Romagna regional official also complains about lack of technical personnel in the Basin authority:

“Our region all falls within the district of the PO, where the whole of Piedmont, Lombardy, a good part of Veneto, Liguria and Val d'Aosta are located. From the point of view of officials, technicians in the district authority there are four cats for such a large territory. Whereas in the previous regional and interregional basin authorities these figures were present. Now they give very general guidelines but from an operational point of view they are not able to be effective (Respondent 6, 2022).

According to the respondents 1 and 2, however, there are enough human resources, but they are planning new hires in the near future to strengthen their activities and knowledges

(Respondent 2, 2022). Compared to the regional level, where institutional capacities are enough despite problems, more issues arise at a lower level, at the municipal level or among the implementing bodies:

“Capacity, as in reality there is now enough of it at a technical and scientific level but there is none at an operational level. Plans are made but they remain in the drawer and we move forward at a very slow pace” (Respondent 3, 2022).

“Municipalities are in charge of spending some resources on hydro-geological instability but in some cases they lack the technical skills to do so. They are recipients of resources from the state fund, with the various intervention programmes that can be ERDF, and other funding lines such as the PNRR, which can deal with instability, but they lack the expertise and also the skills to follow external projects. In my view, we need to return to concentrating technical competences on a single institutional level, which should be the regional level” (Respondent 6, 2022).

This shortcoming was partly noticed during the Operandum Project where the relevant administrations were not responsive enough as they were already overburdened with other tasks:

“We also had a lot of obstructionism from people who were, now I don't remember which people, but there were people within the administration who slowed us down” (Respondent 14, 2021).

“However, this interest in these subjects is not widespread because they (officials) are perhaps just lost in their daily work that perhaps fills their whole day” (Respondent 16, 2022).

In conclusion, in spite of some problems, it is still possible to give a positive judgement on the capacity of the Emilia-Romagna system for risk reduction, especially at the regional level with the system of agencies that are considered a flagship of the governance system and the consortia that also have adequate technical knowledge and personnel. Greater problems exist at the level of local administrations such as municipalities, which are relevant actors given their functions as implementing bodies, the issuing of authorisations and the drafting of urban plans.

A lack of ecological and naturalistic skills and training was highlighted by respondents as a significant barrier to the mainstreaming of NBS. To the question of whether there is a lack of this type of competence, we obtained the following answers, which will also be supplemented by the specific section on knowledge integration.

“Earlier you asked about skills, yes there are very few in relation to ecology. To give the level I was interviewed by Istat. They are doing the redefinition of professions, (he asked) apart from me: how many ecologist did you interview in Italy? Two or three. It is a figure that is a bit far from being recognised and present if you want to apply the NBS both in the municipalities but also at regional and national level. If there is not someone who deals with these issues within the institutions, how can it ever be applied? (Respondent 11, 2022).

From the basin authority, they affirm that there has been an expansion of staff over the years to include other professionals with more naturalistic backgrounds:

“The area is very large and there were only a few of us, but in recent years the authority has grown and will grow again, new hires and new skills are planned. In my sector there are agronomic engineers, chemists, graduates in environmental sciences, biology, natural sciences” (Respondent 1, 2022).

However, these input have not yet reached the operational level since we have seen that the authority does not have this function. The basin authority itself admits that in general there is a shortage of this other type of expertise, especially at the lower levels:

“Let's say that skills are not always so widespread. Both the people in charge of the procedures of the various interventions but also, above all, in the administrators because if the culture of local administrators is lacking, the mayor wants the thing done that way or the defensive system that has always been done and works well that way. it is obvious that until that is changed it is difficult. It is the region that should be the promoter of NBS with the implementing bodies” (Respondent 1, 2022).

“The difficulty is that, except for a handful of people, no one is used to working with living organisms and the training is very long” (Respondent 11, 2022).

The municipal technician who may even have done that university course there, however, is not in his or her depth to investigate in areas other than his or her own, and clearly there is already a first point of difficulty there. I believe that the everyone in the public administration and companies should do some (environmental) training before starting work. Otherwise they are not able to argue against those who have an economic interest, such as companies, who maybe sell you a product as fantastic the future etc. and you do not have the skills to discriminate what is good from what is not (Respondent 5, 2022).

In conclusion the actor's capacity within the Emilia-Romagna system is comparatively good in respect to the national average. Some problem arise in particular occasion like personnel

turnover, or emergencies especially at the lower level of the governance system. In these cases, it can be difficult for the current system to deal with innovative approach and thinking about experimenting new solutions that requires time and resources. Moreover, if the level of resources and skill for the traditional approach can be considered adequate, there is a serious shortage of ecological and naturalistic skills within the system which can be considered a relevant barrier for the NBS mainstreaming process. As it has been discussed in chapter 2, operational practices and competences are the result of a set of shared cultural preconditions that can be encompassed by the term “management paradigm” and which will be analysed in the following section.

7.3.5. Management paradigm

As discussed in Chapter 2, a management paradigm (variable G6) represents all those assumptions, heuristics and knowledges that are shared by the actors in the same action arena and are translated into operational approaches. Management paradigm therefore depend on cultural factors such as education, membership of certain social groups or professional categories in a given social context and are complex to unhinge. All respondents refer to cultural barriers that prevent a more rapid and massive adoption of NBS and ecological approaches. These cultural barriers are apparently present at all levels, from public administrations to citizens to policy makers. All interviewees describe a fairly inert system characterised by a “path dependency” that is difficult to overcome, as can be seen from the following quotes:

“This is something we are trying to insist on and change the orientation. We have always reasoned like this in the past: start with mitigation and then think about environmental mitigation. The objective was hydraulic risk mitigation, and that’s it” (Respondent 1, 2022).

“There is a certain inertia, which is our inertia, in the sense of habit and why we have to change what we have before?” (Respondent 5, 2022)

“Yes, in case we asked those a bit more of the old guard, they usually answer you with a no because I have the certainty after 40 years that one thing works and because I have to start doing something else?” (Respondent 9, 2022).

“There are always these slogans that the water must flow and that the natural environment must function like a domestic plumbing system, like a flush and everything must be evacuated immediately” (Respondent 3, 2022).

“On the subject of hydraulic safety, the Royal Decree of 1923 is still in force, the rule from a hydraulic point of view has remained that 'in the rivers there must pass water', that's it” (Respondent 6, 2022).

“Traditional engineering training always tends to solve the most immediate and most competent problem. I don't go looking to say it could be done another way by widening the riverbed because I have no experience and that can impact the speed of intervention” (Respondent 10, 2022).

“But it is also reflexively a cultural issue of citizens, since the authority is perhaps the first interface with the citizen. Whoever arrives there says they are planting a cane thicket on one side, they have made a floodplain on the canal, maybe the bank has been steepened. Then they say before the canal was nice and straight, the water was flowing, and they don't understand why they are doing this” (Respondent 9, 2022).

“Inertia is due to the culture that has developed on the design side: I go for the safe one and I am more comfortable, as is the perception of the population” (Respondent 13, 2021).

“It is a culture that has to be spread both among those in charge of the procedures of the various interventions but also, and above all, among administrators because if the culture of local administrators is lacking, and the mayor wants it done that way or the defensive system that has always been done and works well that way, it is obvious that until this culture isn't changed it is difficult” (Respondent 2, 2022).

“I was saying, in my opinion, there is a skill problem, if they say that, insults fly at me, but there is an understandable tendency to do what you are capable of doing and not what you need to do. The surveyor or geologist on duty comes up with a standard solution that he already knows how to do. Maybe because it costs less but it is not necessarily the best, and in instability this is particularly true” (Respondent 12, 2022).

Many of the respondents refer to the traditional engineering training of technicians which is geared towards “letting the water flow” without worrying about the rest. This training is therefore tied to grey solutions which are also considered safer because they have been tried and tested for so many years and there is no desire, interest or courage to innovate the sector.

7.3.6 Knowledge type

A feature of a management paradigm is the prevailing type of knowledge (G6.1) in a system, which significantly determines the outputs of the system. Indeed, as discussed in Chapter 2, many authors use the variable of knowledge and social learning to explain changes in a complex governance and management system such as that dealing with environmental risks and territory. All respondents emphasise that in NBS, the intellectual investment is very high and multidisciplinary skills are needed as “NBS are inherently multidisciplinary and integrated” (Respondent 12, 2022). Respondent 16 who participate in the Operandum project, emphasises how crucial was to have a big engineering consulting and its multidisciplinary team as partner:

“They were instrumental, they have all the specialists in all areas, economic planning, environmental when there was the preparation of the reports that were presented in the services conference, they did them all” (Respondent 16, 2022).

“For the success of NBS it is really needed to integrate technical knowledge, i.e. engineering, hydraulic, morphological, ecological, naturalistic, but then afterwards it also takes creating some social awareness and involvement” (Respondent 2, 2022).

The interviews revealed that there is little knowledge of NBS and the ecological method in the ordinary risk governance system. Respondents pointed out that until now, even those interventions that were intended to be integrated, mostly started out as traditional and “grey” hydraulic risk mitigation interventions, that just in a “later phase trying to make it greener; what you should do is an upstream design that has to be integrated” (Respondent 1, 2022).

“There is the unfortunate concept of greening classical works as naturalistic engineering, green works are made that are actually traditional works with a bit of aesthetic make-up, the prevailing trend is this” (Respondent 32022).

“The thinking was only focused on hydraulic risk and the natural aspect was considered marginal, we plant a few seedlings and for us it is an NBS intervention, no” (Respondent 2, 2022).

“Some naturalistic engineering techniques have been applied for many years, but they are seen more as ancillary interventions to an intervention done with another technology, while the

resolutive solution is always a traditional one with a greater structural weight” (Respondent 13, 2021).

The respondents 1 and 2 point out that in the design phase, “basic knowledge is still lacking, and the intervention is only approached from an engineering perspective” (Respondent 2, 2022). On the same line, Respondent 6 affirms that “many of my colleagues do not know when it comes to NBS what to refer to” (Respondent 6, 2022).

Referring to the Operandum project, Rina manager states that one of their objectives was to develop and “try to provide tools for NBS engineering because there is a lack of specific training. There is basic knowledge to be able to carry it out but the specific training and tools are lacking to enable even small, less structured companies or individual professionals to tackle the subject, which is currently limited to certain niches (Respondent 8, 2022). Among the most evident knowledge gaps there is the lack of naturalistic and ecological expertise as already discussed before:

“One cannot speak and realise or design NBS works without talking about living organisms that have the “flaws” that they are not fixed either over the course of a year or over the course of the work either, so I have to design and thinking about how they develop over time” (Respondent 11, 2022).

The respondent highlights in this case the dynamic nature of NBSs that become part of the surrounding territory and change accordingly. Furthermore, a difficulty in standardising language between actors with different background:

“Let's agree on terminology, between engineers, economists, biologists, there are different terminologies. you can't go around talking about NBS that hardly a few people know exactly what they are. But also talk about ecosystems and biodiversity or start talking about things we all know about otherwise it is impossible to talk about” (Respondent 11, 2022).

Within the Basin District Authority, the multi-disciplinarity issue is being developed and figures with different backgrounds constantly interact, like agronomist, engineer (hydraulic and environmental) and economists. However, this is less the case with regard to knowledge related to ecology since the authority does not include among its rank personnel with that type of knowledge and, if needed, relies on external collaborations, especially for experimental projects:

“Then for the implementation of specific interventions or to increase knowledge on certain things, we still do not have sufficient knowledge of what are for example the ecological or ecosystem aspects when doing an intervention. For in-depth knowledge, we rely on the support of the university, through conventions, research agreements, National Research Center (CNR) and ENEA, all aimed at increasing knowledge in order to try to concretely implement what Europe asks of us in the water directive, floods, biodiversity strategy, farm to fork” (Respondent 2, 2022).

Outside experimental spaces, in the standard way of operating, however, this type of interactions are rare, especially with regard to the integration of biological and ecological knowledge.

“Where it is obligatory because there is this kind of need for it in the funding sources then it is there. However, in a very complicated way and I must say that it is always experienced with a certain effort by the technicians. If it is really necessary and if there is time, which is of absolute importance and importance, we also look for other skills” (Respondent 6, 2022)

“Site management is always entrusted to technicians with a certain training and never supported by agronomists, forestry experts, botanical experts. Renaturation works is managed in a marginal way or is not carried out correctly, and this then leads to a failure of the intervention. We know that the weak point is that one” (Respondent 1, 2022).

“With regard to the integration of knowledge and objectives of mitigation and biodiversity, with organisations, these concepts continue to be passed on and even these are taken on culturally in small steps, the land reclamation consortia continue to do their work with canals and watercourses in the traditional way, cutting vegetation without taking ecological factors into account” (Respondent 3, 2022).

“I have to admit that I was surprised that in a meeting related to a project talking about NBS, in the end the only biologist was me, who was not even part of the project (Respondent 11, 2022).

Respondent 9 and 13 from an interregional technical body and irrigation and drainage consortia, affirm that they do not have internally this expertise and in case it is strictly necessary they seek external collaboration:

“We do not have ecologists or biologists internally. Collaboration in this respect is so sporadic that we go with external collaboration but it is very rare” (Respondent 9, 2022).

“We are a technical and engineering body and we have little naturalistic and biological expertise and we often have to rely on these collaborations. There is expertise, and you can also rely on external engineering companies that do this, public/private collaboration is done here. We, to do flora and fauna impact assessments, have turned to firms that are specialise in these things” (Respondent 13, 2021).

Discourses on the lack of proper formation and background is recurrent in the interviews. Some make a generational argument that the new generation of technicians are already more skilled and attentive in this respect, although more should be done on the training side:

“In general, there is more attention. More of a cultural issue than a technical one. I think that in the new generations there is more attention for this type of issue. But as far as the technical aspect is concerned, it is something that should come at the educational level, and as far as I know there is very little. And even at university coproduction does not come so easily. The old surveyors used to be trained in a certain way and it would take a push in that direction too there” (Respondent 13, 2022).

“I want to reassure you that this is not the standard in the sense that it is not the standard to oppose or be sceptical about some initiatives that are different from the routine. It is not true that the Civil Protection or the colleagues who deal with it, as well as AIPO, are blind designers who cannot see beyond the works they are used to. There are probably cases with people who have too rigid a mentality, but there is definitely, at the level of the organisation, a full openness. the difficulty stems more from people, and to their difficulty to innovate from a technical point of view (Respondent 6, 2022).

It is interesting to consider that in Italy, those with biological backgrounds hardly ever end up working in public administration related to environmental management but rather in laboratories and in the medical/pharmaceutical sector.

“In Italy biologists are not paramedics but something like that, and yes ours is built as a discipline related to the medical sciences, environmental skills . Just last year, the national order of biologists set up a group relating to the environmental part, environmental disciplines, last year, in 2020. Istat called me for a survey about new profession and I ask them how many ecologists did they found in Italy and the answer was 3” (Respondent 11, 2022).

“When I had to choose a three-year degree there was this very discourse, if you go to do biology you either go abroad or you end up in the lab. So I ran away” (Respondent 5, 2022).

The discourse on multi-disciplinarity is developing in large private engineering companies such as Rina that see NBS as a potential business area:

“It's not something I do alone, but it's a multidisciplinary group, other people from Rina working on it, and for the past year we have been setting up an internal working group on NBS from both a business and technical point of view. To get a more complete overview of the topic
“ (Respondent 8, 2022).

In this case, engineers, including those with an environmental background, interact with economists and other figures within the same company, while more strictly naturalistic and ecological knowledge is again dealt with by external collaborators.

“We also have more environmental engineering departments with which we collaborate that also include ecologists and social scientists, for some specific things, but mainly abroad”
(Respondent 8, 2022).

The attempt to build and develop multi-disciplinarity seems to be an exception even in the private context since the average dimension of practices is small, consisting of few professionals, or even individual professionals working on their own. This makes it difficult to create multi-disciplinary (Respondent 12, 2022; Respondent 8, 2022) team and figure that are necessary for the development and deployment of NBS. University as well are struggling to properly develop multi-disciplinary courses:

“In my opinion, there is a need and it would be nice to have people who start out already trained in a field that we would call multidisciplinary today, but which in practice would be a discipline of the future” (Respondent 17, 2022).

7.3.7. Risk acceptance and management

How the actors involved in the disaster risk reduction system approach the risk is another element on which a management paradigm rests and is a very complex issue involving ethical and moral considerations intertwined with regulatory and legal ones. This item was codified as a variable (G6.2). The literature associates a low-risk acceptance to the traditional dominant management paradigm which aimed of nullifying and controlling the risk. This regime is referred to as “command and control” as opposed to “integrated and adaptive” which is more flexible and able to adapt to changing and uncertain scenarios.

Moreover, risk can be approached in a deterministic way or a stochastic one associated respectively with the “command and control” and the “integrated and adaptive regime” and has several repercussions at the operative level:

“There is definitely a cultural problem, there is a bit of detachment on certain cultural aspects that is then a barrier. You can't always be convincing about how the problem is formulated from a scientific point of view. They (decision-makers) have a very old-fashioned mentality which is very deterministic, it is all black and white, and there is a certain resistance to accepting probabilistic approaches with a broad quantification of uncertainty. Large uncertainties in general are a bit of a new thing scientifically. Uncertain information is seen as being of little use (Respondent 17, 2022).

Decision makers but also public opinion would therefore like to eliminate risk and be sure about the hazard, if and with which magnitude it will occur. However, this is a probabilistic and stochastic problem and science has evolved in this sense while the rest of society is backward as a certain amount of risk has to be tolerated and it is unavoidable. According to respondents this other approach is necessary to obtain a regime change and the NBS mainstreaming. Many of the respondents argue that in a fragile territory such as Italy and Emilia-Romagna, the risk cannot be eliminated:

“Because around the issue of resilience, we have learnt this new term that is entering the minds of planners a little bit, as a new concept, to refer to when dealing with the issue of hydrogeological risk. Before, it was resistance, we had to resist and counteract, nullify the risk. Now we are learning that, partly because it is not possible to nullify the risk, partly because this is a concept that is maturing even at an institutional level and even at the level of the individual citizen, in the face of such striking changes our efforts are almost useless, complicated, and we must learn to act in different ways with different objectives, perhaps by accepting a degree of risk, by identifying different objectives too” (Respondent 6, 2022).

“From the point of view of water protection and irrigation needs because these are two things that will be increasingly in an emergency. One because the events have become extreme and the other because the extreme event starts to be all year round. always there a communicative aspect of the importance of water in general. Awareness has to be raised about the importance of water because in the end it is all connected and it is really a cycle. We can't keep pulling down the dolomites to defend all the embankments and the coastline” (Respondent 9, 2022)

“We would never be able as a country to hold all the mountain sides and banks of the country together, but we are able to do planning” (Respondent 12, 2022).

The respondents thus are aware that it is not possible to protect all the mountains and every inch of the coast with heavy structure, and in some case it would be necessary another approach, maybe with a lower level of efficacy for risk reduction in a single area of the territory but it can be used more easily in more areas and can also contribute to achieve other objectives related for instance to biodiversity. For, instance, the solution of deep-root plants to strengthen the embankment tested in Operandum might be less effective in risk reduction compared to cyclopean boulder but they can easily spread on a wider portion of the river at the same cost and with less environmental impact. The choice here made by decision-makers and technicians is thus also related to their risk acceptance level. However, it is a common perception that operating in an area characterized by a rather high level of risk therefore leads to conservative practices which might undermine innovative solutions like NBS, impeding the niche to grow.

The common feeling is that in Italy is challenging to break out of path dependency in many areas but that of risk reduction in particular because it implies a risk that few are willing to take, also due to high conflict and the extensive use of legal instruments.

“If something happens out of thousands of standard cases, then they do not go looking for a culprit. If, on the other hand, something happens with an alternative approach, then you risk being blamed precisely because you have made a different choice even if it is perhaps less risky. In the last 20 years, legal procedures have become more complex, sensitivities and responsibilities have increased a lot, there are many more trials, and so we have gone backwards” (Respondent 3, 2022).

“I don't want to say the wrong thing from an institutional point of view, but I do try, and the standard and the institution should take into consideration the fact that when a truly innovative intervention is carried out, there can be a risk of ineffectiveness or failure. On the other hand, if one makes a mistake, one cannot be hanged. Here, part of the PA's difficulty in being transparent is linked to the fact that if I make a mistake they put me in jail and throw away the key “ (Respondent 12, 2022).

“It is very brutal and pragmatic, but my responsibility is to save from the flood. If you tell me it can be saved in a different way but I have never done it and because there is a risk as an engineer and as an investment I go on the safe side” (Respondent 10, 2022)

“Innovation is a problem in all innovative sectors in Italy, there is fear. Whereas abroad it is very different and there is more courage. Probably also the more intricate legal apparatus but not only that, cultural attitude on conflict much more sensitive. Whoever thinks differently and suffers a micro-damage puts in place a legal procedure, we are often bombarded, so it is also understandable that an administration technician is not inclined to take choices out of the ordinary “ (Respondent 3, 2022).

“We will be very careful with NBS at first. Here is the other problem, always communicative and cultural. If one makes a mistake one is hanged” (Respondent 9, 2022).

“The acceptance of NBS also depends on the risk context: the perception is this and this is what was reported to us by our colleagues in business development, it is one thing if you have to reuse the NBS solution for one risk or another, where the risk is there but it is not so critical, it does not affect critical infrastructure it is easier to promote the use of NBS” (Respondent 7 2022).

“The official then said 'but why do I personally have to go and risk not having sufficient guarantee that in my river when there is a flood the water will pass without causing damage, which is the task given to me by the standard, and I do not have sufficient guarantee by doing something different” (Respondent 6, 2022).

“That is, they want the data to be demonstrable, rightly so, that it works that there are no doubts about the solutions adopted and that they are perhaps supplemented with other warning measures and so on if the limits of the solutions are exceeded the inclusion of NBS-type solutions and natural engineering is welcome as soon as their effectiveness is demonstrated, in the hydrogeological field” (Respondent 8, 2022).

“I'm struggling to express myself, I don't want to say something wrong from an institutional point of view, but I'm trying) the standard and the institution should take into consideration the fact that when a truly innovative intervention is carried out, there can be a risk of ineffectiveness or failure. we should learn to be a little more flexible even with regard to evaluating the effectiveness of interventions and understand that conditions are changeable and that therefore the result is not necessarily 100% certain” (Respondent 6, 2022).

In this case, it is evident that there are also ethical and moral consideration behind the risk acceptance which are intertwined with legal one. To which extent a technician that make a choice should be accounted responsible of something happen. In which case he will face trial, and be judged culpable is not an easy question to answer. In any case if something happen,

people want a scapegoat and then decision-makers are inhibited regarding taking what seems to be riskier choice. In other case NBS might be perceived as riskier just because of lack of knowledge rather than rational thinking. In any case, at the moment, NBSs are perceived as more risky and the literature as well as respondents tells us how relevant the perception of effectiveness of NBS and the social risk acceptance are for the mainstreaming of this approach.

7.3.8. Experimental spaces

The consideration made regarding risk acceptance opens up reflections about the presence or absence of experimental spaces (G7) that respondents invoke to test NBS, increase their perception of effectiveness and acceptance by every actors, including technician and decision-makers. How experimentation and innovation are managed is another relevant feature of a management regime as they can be more or less institutionalized, delegated to private or public actors, more or less widespread. As said before, respondent highlighted the need to increase knowledge, data and expertise regarding NBS before a proper mainstreaming might occur. That should be the first step to start the learning loops and social learning process:

“The inclusion of NBS-type solutions and naturalistic engineering is welcome when their effectiveness is demonstrated, in this area, hydrogeological” (Respondent 8, 2022).

“What the decision-makers are looking for is data, whether it has been done this way and has been successful and why, or if there have been critical issues how they can be solved” (Respondent 4, 2022)

“What is certainly missing is a dissemination of positive experiences that give courage and confidence to those who make plans, those who make interventions, that these things can really be done, that they work and that they are therefore worth the risk. There is a need for more examples of interventions that went well” (Respondent 6, 2022).

“I absolutely agree to study and move forward, but it cannot be an on/off switch type transition. In the immediate future, the consortium's technicians are not going to launch like that without pilot projects. I propose pilot areas, we do it together with the region and we do it together from the initial communication to the use of that infrastructure and see how it responds. We do it on small portions. We look at a couple of years how it responds to more or less serious flood events and decide how to proceed” (Respondent 9, 2022).

“This culture can only be changed by disseminating pilot interventions, by training both technicians and administrators and all the tools that guide us in the implementation of interventions” (Respondent 1, 2022).

“We have these pilot projects and the renaturation of the Po with the PNRR that will be an open-air laboratory of NBS implementation” (Respondent 2, 2022).

However, experimenting take years and thus it is important to find areas with as few problems as possible from a bureaucratic point of view, for instance areas where expropriations are not needed or areas without strict environmental/urbanistic and other kind of constraints:

“This could perhaps be the second obstacle to NBS, i.e. individual pilot areas to study them, areas where it is not problematic or at least not very problematic to start because otherwise if you already take months and billions to start doing the work it is all wasted time with expropriations and other paperwork” (Respondent 9, 2022)

“Having chosen a protected area complicated things for us because of the constraints of both authorisation and implementation. We should have involved the park authority from the beginning of the process” (Respondent 16, 2022)

“Acting in a protected area can slow down, for example because it is impossible to operate in certain periods of the year in order not to disturb certain species” (Respondent 6, 2022)

These spaces for experimentation have so far mostly been relegated to research projects outside the ordinary risk governance system, perhaps to park authorities, or to Universities through European projects such as Operandum. Innovation led by universities or private actor like Rina can be useful especially in the development of methodologies and tools to be applied for replication an upscaling:

“In my opinion the main effort should be one, but it is a big one as it is to generalise an approach where you can, we are trying to do this, get to write a methodology that has in it hazards, territory X, that has in it signal of climate change Y, and that does not need to be anchored to a certain type of local reality. Operandum has laid a solid foundation for the development of advanced modelling tools and monitoring protocols for assessing the effectiveness of NBS, useful both in the design and planning phase and in the post (Respondent 17, 2022).

“Operandum has to do or has the merit of being able to do is to at least codify the experiences made as approaches that are well defined and codified as innovative and nature-based approaches” (Respondent 6, 2022).

“We need to develop tools that can also be used by small firms and individual professionals” (Respondent 8, 2022).

However, delegating all the innovation to universities has also its shortcoming since, as the respondents affirm, what is experimented does not always translate into concrete results that make a difference on the grand scale:

“Regarding the research, I want to open a front, I have had a poisoned tooth for a few years, research and applied research must have the ability to pass on what has been tested and how it is applied. You can do as much research as you like but it remains a conference where it is discussed but when it has to be applied in the field it becomes a problem. We need a different way of approaching research and projects. This is also a limitation of European projects. We are always stressed by the pro forma, the expense reporting, the project objectives, and many times we lose sight of what is the effectiveness of the project itself. We should try to stimulate a moment of discussion between the various entities because it is now indispensable especially for climate change and a much more practical approach with stakeholders and also the economic aspect” (Respondent 10, 2022).

“I have experience abroad and let's say that in Italy, the problem is much stronger. Maybe because abroad there is more elasticity” (Respondent 11, 2022).

“Experience abroad in the United States there is an extreme elasticity in gathering the fruits of research and transposing them into the real world. Here, the times are a generation” (Respondent 4, 2022).

“In the university there is a lack of habit of dealing with the business world and also public entities. You struggle and even the university itself has to change your training, of the figures to have this link between the needs of the external bodies and with the various professionals” (Respondent 10, 2022).

The research projects like the latest stream of Horizons are aware of this shortcoming and Operandum has, for example, among its strategic objectives to have an effect on the main planning and regulatory instruments of the risk reduction system as well as on the authorities in this area.

“If we could influence planning this would be wonderful, that is the real purpose of Operandum, if our experience serves to expand, modify and integrate planning, we have won, we have succeeded in short” (Respondent 14, 2022).

Problems arise, however, when there is little connection between the university and the bodies that are primarily responsible for land management. As the members of the Operandum team confided, the Open-Air Laboratories approach in real and applied contexts was totally new to them. Moreover, most of them, being academics, confirm that prior to Operandum their knowledge of the governance system. The importance of this connection was evident from the analysis of the performance of two Operandum project sites in Emilia-Romagna. Site 1, that of the Panaro, in which the responsible body, AIPo, was included from the start, did not present any problems from the point of view of implementation and bureaucracy, as AIPo took charge of all the procedures. They are directly responsible of the embankment on which these deep-rooting herbaceous species were to be experimented and therefore it was easy for them. Any further authorization was needed:

“They did everything themselves and very quickly because they are directly responsible, I did not deal with any bureaucratic issues” (Respondent 15, 2022)

“AIPo governs and operates, they do things and I am also more relaxed, it is a pole mounted by them on their embankment and I am much more relaxed than if I had not sent my company” (Respondent 14, 2022).

Contrarily, at the Bellocchio/Volano site where it was planned to test an artificial dune, the problems have been more challenging. One of the major difficulties highlighted was the failure to involve at an early stage of the project some key players such as the ARSTePC and the Park Authority, who were contacted at a later stage. This led to bureaucratic complications:

“The dune it is really a mess, excuse the term. For the dune, it's a very complex procedure and I think it's the same for all work on beach areas, but I think it's also the same for public areas where there is interest like parks. I also confirm the difficulties in talking to the park authority, but again I felt that if the park had been directly involved in the project we would have had more cooperation. When they realised that the Project had already started and could not access the funds and that they would play a secondary role they become more reluctant (Respondent 16, 2022).

Instead, for example, once ARSTePC was fully involved they were also ready to react to difficulties and be cooperative despite many difficulties as in the case of an urgent change of test site due to a sea storm that destroyed the beach just before the implementation of the dune:

“The storm surge that rendered the project site unsuitable coincided with the 2020 Christmas break and a period of extreme events that overburdened ARSTePC with urgent tasks. Despite this, in March 2021 ARSTePC still identified an alternative site” (Respondent 16, 2022).

One of the main lessons learnt was therefore to involve all relevant authorities at an early stage of the project and not only before implementation:

“If you want to operate on the territory you have to involve as partners the bodies that are competent, i.e. those in charge of operating on the territory in this case the Civil Protection was the body in charge of building, but it took a complicated procedure to draw up a collaboration agreement that was also very complicated to compose (Respondent 16, 2022).

“There is a need for an initial phase of involvement and preparation of the various actors (which at the beginning one does not even know which and how many there are), to involve them and put them in front of a schedule. Start right away with some rules of the game. Evaluate a little better, make it more cogent and try to lighten the subsequent phases with a strong preparatory phase” (Respondent 32022). “Totally agree” (Respondent 8, 2022).

The involvement of research organisations without adequate interlocution with the relevant operational bodies also entails an extra step in the learning loop that must lead to the mainstreaming of NBS because then a further step is needed to transfer the knowledge to the technicians in charge of the territory when they have to go and do their routine planning and design:

“If the Agency had been involved as a partner, the intervention would have been more prominent in the planning of activities and fewer administrative steps would have been necessary. I would add that the whole thing was further complicated by the retirement of several managers and officials” (Respondent 16, 2022).

Several respondents argue that separate and more flexible procedures are needed for experimenting of pilot project as “it is absurd that an experimental project as small as one hundred metres has all these complications to be tested” (Respondent 3, 2022). For instance allowing designers to work, since day one, in close contact with the company who is going to

realise the intervention. A possibility that is not allowed by the procurement code “*Codice degli appalti*”, which for instance in the case of the dune, despite being experimental, it still provided for public tendering procedure following the elaboration of the project and its approval.

“The ideal would have been to be able to guide everything, right from the start with the planner, and to be able to choose calmly, everything including the implementing company. To be able to call in the particular company that may have operated in Tuscany, worked well, but the tender procedures do not allow it, but neither does the budget allocated, everything had to be set up differently because it is an experiment anyway” (Respondent 16, 2022)

An official, who remains anonymous, reveals that the only way to work with a specific company is to “include certain technical specifications in the tender specifications, so that only that company are able to work in this way, those who have to do it know that they are there, it is a bit tricky as an activity, it can be done, however...”. He left the phrase open suggesting that one could be accused of irregularities and favouring one company over market competition rules.

It would therefore be desirable for European projects managed by research institutes with little knowledge of the territory to be supported by institutionalised research and testing spaces involving the bodies that govern the territory since day one. Some pilot project taken over by authorities are taking place, such as the one mentioned above by the basin authority, although so far there have been very few of them. An important opportunity for experimentation presented itself with the project for the renaturation of the Po basin, which is part of the National Plan for Recovery and Resilience (PNRR).

“Another pilot intervention is that of the PNRR, renaturation of the PO with 56 interventions taken up in part by the sediment plan drawn up in 2006, which is a cognitive tool at the level of the Po river shaft that had already identified a sort of priority of interventions, and that can be a starting point” (Respondent 1, 2022).

The renaturation of the Po river will be further discussed in the next paragraphs. Finally, some respondent, especially those with a ecological background like Respondent 3, 4, 11, e 12 argue that in some cases, such as artificial dunes or some river morphological reshaping, the experiments proving effectiveness are already there and no more experimental projects would be needed, but only the courage to scale up and replicate on a large scale:

“Here there are experimental projects, but after 30 years we are still doing experimental projects when these things were already established in northern Europe 30 years ago, we are also lagging behind. It was already known. I have been to England and Denmark and there are publications dating back more than 20 years and they are perfect, there were already monitoring and we have also translated them in Italian, we have made the river handbook of river regeneration, we have done activities with drainage and irrigation consortia, including training, experimental activities, but all these years have passed and we are still thinking about small experiments, soliciting press releases, and so it means that the thing has not passed” (Respondent 3, 2022).

Everyone agrees that there would be a need for more dissemination of best practices and successful experiments, then also work on communication and dissemination. Operandum, for example, has developed a platform (GeoIKP) that collects hundreds of case studies, huge databases related to hazards, policy archives related to NBS. The activity of creating these online platforms for dissemination and best practices sharing is a precise input from the European Commission for the Horizon and Life projects. The GeoIKP platform was unanimously applauded by the people to whom it was shown, and all agreed that this kind of tool are important in the mainstreaming process (GeoIKP usability test). It is a way to disseminate and share the knowledge accumulated by the university and other institutions with whoever is interested in the matter.

7.3.9. Type of policy

We have previously discussed the classification of policies in chapter 2 by identifying two main criteria: 1) whether they are direct or indirect and thus generate obligations for actors or incentives and/or guidelines 2) whether they are monetary or non-monetary. In this section it will review the policies (variable G8) put in place for the implementation of NBS which will then allow an assessment of the legislative barriers to the diffusion of these solutions. I am going to start with non-monetary policy and thus all the regulations and policy tools that set compulsory procedures and obligations.

One of the most recurring considerations was the one already discussed in the strategic objective section, namely that the policy instrument with the highest degree of cogency and enforceability to date has only given relevance to the issue of hydraulic safety. Christian Morrolli affirms that:

“The regulation has not been sufficiently updated considering that 'the Royal Decree No. 3267 of 30 December 1923 on hydraulic safety is still in place. This is not always combined with the knowledge and needs that have emerged in recent decades in terms of redevelopment and support of biodiversity. The rule from a hydraulic point of view has remained the one whereby translated: the water must getting through, full stop” (Respondent 6, 2022).

For the other quotes related to this issue see the strategic objective section. Ecological and biodiversity issues have been delegated to minor regulations or documents without legal enforceability such as the regional guidelines on river and drainage canal rehabilitation handbook:

In this case, regional guidelines for supporting biodiversity or regulations on Sites of Community Importance or Special Protection Areas take second place when water safety is at stake and "therefore the technician, unless he is an enlightened technician, refers to that standard mentioned before without paying attention to other issues” (Respondent 6, 2022).

Other responded agree with this view:

“Since the birth of the Italian association of naturalistic engineering, the regions have moved in a positive direction, started to produce manuals, guidelines, little laws (*legiucole*), but then the interest faded” (Respondent 3, 2022).

“Guidelines are not compulsory and so one continues to put down ballast, reinforced concrete because it is easier” (Respondent 11, 2022).

“We are running out of time. we need a legal system that obliges you and evaluates you, first you are obliged and then you evaluate the impacts the economy and everything” (Respondent 10, 2022).

The Park authority respondents as well as Respondent 3, interestingly those with a more naturalistic background, are those arguing more assertively in favour of direct regulations that would obliges technicians to adopt ecological approach and the NBS rather than a gradual push. As already mentioned, we have recently seen an attempt to go in this direction with the Prime Ministerial Decree of 27 September 2021, although in a certainly softer manner than the one desired by the park authority respondents. On one hand it obliges the Region and Basin Authority to evaluate project also about the quality standard set by the water directive:

“The big change here is that previously, projects were only assessed from the point of view of the Floods Directive, but with this new dpcm of 2021 they are also assessed from the point of

view of the Water Directive and an attempt is made to assess both the synergies between the Floods Directive and the Water Directive but also the aspects, so to speak, of possible conflicts” (Respondent 1, 2022).

The decree also aims to increase the share of integrated interventions, those that meet both risk mitigation and ecological standards, out of the total share of interventions. In fact, the decree provides for priority funding for this type of intervention up to a share of 20% of the total funds. Respondents in this case highlight the problem of classifying and verifying when an intervention is actually integrated and when it is not.

“At a regulatory level, we have to settle the question of what integrated intervention means (Respondent 1, 2022). Then what does integrated intervention mean? there are no cogent technical and regulatory standards and it depends on how these integrated interventions are interpreted” (Respondent 3, 2022).

“What do I mean by regulations? I mean that there is a lack of technical regulations, the ones that allow you to apply certain ideas and directions. As far as NBS is concerned, there is a lack of all the support of technical regulations as they exist in the building construction sectors, for instance” (Respondent 8, 2022).

“If I have to decide between a concrete diaphragm wall or a sheet pile, I have every opportunity to do the checks required by actual infrastructure regulations. Instead, if I have to choose something else such as Prati Armati (NBS), fascines or other defence works I don't have them (the reference)” (Respondent 13, 2022).

“A link is missing. The Ministry should update these technical standards (AIPO, RINA2) Even guidelines such as the Eurocode could be tools because they are then transposed by the technical standards” (Respondent 13, 2022).

On the front of technical standards at the national level, considered fundamental by the respondents, almost nothing has been done, while from what the respondents from the basin authority say they are moving in this direction:

“We are also hoping for a somewhat clearer regulatory framework because even if one does a search on NBS, it turns out to be anything and everything. As an authority we are working to define our own guideline at district level, i.e. what NBS is for the district and how we intervene and what our intervention strategy is. So obviously we refer to what are the definitions that the

EU has given and that the IUCN has also given that are more biodiversity-oriented. Either the European references are important” (Respondent 2, 2022).

However, this attempt runs the risk of ending up like the regional guidelines if the same guidelines are not adopted at national level and that they are binding and generate more obligations.

“We made the guidelines for dune constructions in short. The coastal areas in short. We have to see the regulatory system if it transposes them and how it transposes them but the guidelines are there, we are also trying to introduce issues related to lagoons” (Respondent 11, 2022).

Another similar issue that came up during a focus group is that of “price lists” (*prezziari*), which are list managed by public administrations with cost references for each item that has to be purchased. In some cases of NBS, as the most innovative ones such as the Prati Armati deep-rooted plants, may not be listed in the price lists, which is a further obstacle to their mainstreaming:

“We as a company went through all these bureaucratic problems. For example, until the price lists of Anas and RFI⁴⁷ were published, which then referred to the technology of reinforced turf, for many designers, who understood the technology and knew that it was very clever and that they would save a lot of money as an administration, it still became very difficult to apply it. The rules and regulations did not allow it or rather allowed it but the person was faced with a stumbling block of paperwork and responsibility. Many planners gave up using a smarter technology to put in an older one, which, however, being catalogued in price lists was safer to use” (Respondent 18, 2021).

“Price lists are managed by various bodies such as municipalities, regions, ANAS RFI Aipo. They are formulated by doing price analyses on what work and materials are used for those work items and they are important to us and we are updating them” (Respondent 13, 2022).

Another delicate phase in the process of planning and then implementing works is that of the tendering and commissioning of works. Usually work design is made by public authorities like AIPo, ARSTePC or Municipalities that in some cases rely on external consultants. Then public tenders are published and after the tendering procedure the work are entrusted to a private firm.

⁴⁷ Anas and RFI are respectively the companies in charge of Italian highway and railroads

“The entire bureaucratic machine of this republic is complex, it is too complex, in the end everything is done with the rules by which tenders are made, projects are followed, and it is common knowledge by all that they are now too cumbersome. The technological part is less preponderant than the bureaucratic, administrative and economic part and is spent more on these preparatory phases than on the implementation of the work itself” (Respondent 12, 2022).

Some issues have been identified in this mechanism that could slow down NBS. For instance, according to Parodi and Bacci, the tender could not refer to a particular technology because it would be a violation of market competition rules:

“Unfortunately, we are in a free market society, so you can't say from one day to the next this solution is better and decide from above” (Respondent 3, 2022).

“However, we could not tell a company that it has to use that technology there because it would be a market restriction and it is a problem of entrustment that public bodies have” (Respondent 13, 2022).

Respondents mostly agree considering the system too rigid and argue for a system that is more adaptive and thus able to be flexible and adapt to various scenarios, including make it easier to make changes during the course of a project. An approach which is preferable for the NBS implementation due to their dynamic nature.

“The rigidity is also due to the difficulty and the tools of the regulations and the procurement code, they have not been able to innovate and push the public administration and its officials to make a change of pace, a leap in this direction” (Respondent 6, 2022).

“However, we need another approach to guide us in these new NBS interventions, which we call the adaptive approach: I act, they check what I do, and if necessary I modify it. This is logical, but at the level of managing a construction site it is not simple” (Respondent 2, 2022). To adopt this approach, however, would also require a change at the regulatory, cultural and training level, but according to procurement regulations, variants are not permitted (Respondent 1, 2022).

“The company, do everything on the cheap, you have delivery times, and if you deviate from schedule you have penalties, so how can I go and tell the company: “according to the adaptive approach you should modify in this way” but you are a month late, it is inconceivable” (Respondent 2, 2022).

“I understand the negative consequences of what I am about to say, there should be fewer rules and more ability to analyse problems and projects and to control them as they are implemented. This presupposes that there are skilled people in the administration side who can evaluate. It also means that the cost of the project is not defined beforehand whereas I now see it defined beforehand. This is not heresy. It passes the idea that there is continuous negotiation between the payer and the implementer. Either we return to a healthy relationship between public and private parties or we don't get out of it” (Respondent 12, 2022).

Respondents therefore believe that more flexibility in the procedures for assigning and carrying out work and the adoption of an adaptive approach would be beneficial for the NBS mainstreaming. However, they are aware that this is not likely to be the case in short-medium term as difficulties as for instance, a constant monitoring of works it is unlikely with the actual limited institutional capacity and human resources. Respondents also hope for a new public-private relationship that should be established even though many obstacles exist. The high level of perceived corruption and the high level of litigation for the works assignment have led to rigid procedures and codes to reduce the discretionarily without succeeding (Respondent 6, 2022). A more loose, unspecific and flexible regulation risk to lend themselves to suspicions and interpretation and thus a reform of the code should be very careful in finding a balance between these two principles of flexibility and transparency. From the tone and words of the respondents, it was clear that this was a sensitive topic and that it is not easy to balance these two requirements of flexibility and transparency.

During the focus group organised within the framework of the Operandum project, it emerged that the project authorisation phase is a critical phase within the governance system and that it wastes a lot of time during the implementation phase. This view is also shared by the respondents interviewed after the focus group: “Authorisation times are very long and exhausting” (Respondent 6, 2022, Respondent 16, 2022).

“In some cases, it happens that some projects or interventions to obtain authorisations become a path full of thorns. This is perhaps also due somewhat to a reticence of the past, given that in Italy for decades everything was done in defiance of the rules. So now the technician who has to issue an opinion is excessively, in a good way, scrupulous in his evaluations that involve time” (Respondent 9, 2022).

The Rina manager, who has witnessed many approval processes in Italy but also abroad including the UK and Switzerland, noted that procedures in Italy are too chaotic, baroque and unbalanced on administrative rather than technical aspects:

“There is a non-standardised approval procedure that depends on the expression of opinions of a thousand parties and who you meet, on the sum of opinions, on many things, and you cannot be 100 per cent sure that one thing works a priori. The conference of services that is supposed to simplify does not always do so. In Switzerland, for example, they don't ask you for a thousand things, 10 copies of the project as happens at services conferences where everyone has the whole project. But they ask for excerpts and the parts they have to comment on, and it is a more fluid process even if it seems more fragmented. There you have specific forms where you have to make an extract in a certain scale of a certain thing, when you present a project there are already a list of specific things to take out of the project that are the ones you focus on to meet certain criteria” (Respondent 8, 2022).

In spite of these problems, again we have seen that compared to the national average, Emilia-Romagna also performs better at this stage of the projects because of its superior administrative capacity (Rendis report 2020; DEFR 2020, Respondent 9, 2022).

To narrow the field to NBS, the main debate focused on whether and how it would be appropriate to provide privileged pathways for these solutions, thus giving an incentive for their use. In this case, that would be an indirect non-monetary policy. Now the procedures are the same for NBS or other kind of project as it is determined by the thresholds contained in the annexes to the Environment Code examined in section 5.2.2:

“In reality, the authorisation process that any work, whether traditional or NBS, must undergo is exactly the same and nothing changes at all” (Respondent 9, 2022).

“In the end, obtaining permitting for the dune is almost the same as obtaining it for a much larger work, and the steps and people to be involved are more or less the same. The waiting times are slightly shorter at the services conference, but the bulk of the process is independent of the size and impact of the work. In Italy there are actually no tools for a privileged channel for this type of work, whereas in other countries there are some” (Respondent 8, 2022).

Moreover, many possible NBS interventions are not mentioned at all in the lists of the annexes to the environment code and the regional laws that transpose the national ones. The

absence from the list therefore makes the procedure to be adopted uncertain, as in the case of the dune to be installed within the Operandum project:

“The dune was not codified among the projects covered by Regional Law no. 4 of 20 April 2018 that 'Discipline of the Environmental Impact Assessment of Projects'. Therefore, it was necessary to submit a Technical-Environmental Report to the Regional Service to question the applicability of an EIA procedure. Fortunately, this Service, in assessing the project, ruled out the need to subject the intervention to an EIA, and this favoured the route” (Respondent 16, 2022)

Some of the respondents suggest that specific NBSs, which by nature have less environmental impact than traditional solutions, should have a simplified and easier path but just with some preconditions:

“In terms of authorisation, the most pressing issue for us is environmental authorisations, screening or EIA. They are sacrosanct, absolutely, but when I have these net thresholds and if I do a work above that threshold, I am comparable to the private individual who has done a ceramic plant with its emission quantities or the biomass plant. Sometimes it gets a bit cumbersome for us in the procedures. If I decide to build a new link for our canals, a bypass to a canal, I upgrade everything, but by lengthening the route and making a sort of expansion tank, it becomes an intervention that exceeds a certain threshold, so that I don't have to go through a certain procedure that delays my time, which then may not coincide with the PNRR type funding, I end up doing something else (Respondent 9, 2022).

“Therefore, rewarding certain choices by giving an easier and faster path would favour the use of certain types of technologies. Perhaps it is worth considering it” (Respondent 6, 2022).

“If there was a more structured process and more clarity about what NBS are or clear guidelines, we could talk about it” (Respondent 2, 2022).

“The other aspect that I think is missing is a regulatory framework that regulates them and puts them within the context of the context in which they operate. We recently closed an EIA that considers things like dust on the construction site, the risk of groundwater contamination, endangering woodpecker nesting. In reality, all the other aspects that are secondary but have an impact, are not supposed to be considered in the EIA and there is a lack of regulatory basis” (Respondent 13, 2022).

The drainage consortium official suggests that one criterion for establishing simplified routes could be the location of the project:

“When I write the report, if I am in a countryside area only, I write it 10 pages long and I can have the opinion in 30 days, not 15. If, on the other hand, I do the intervention inside an urban centre, there is an open canal in a city park, it is right that everything should be completed the right word is flexibility” (Respondent 9, 2022).

These possible simplifications path would mean fewer steps, less documentation to be produced and shorter implementation times. This also translates into time and cost savings, which for small projects can be significant. Other respondents, on the other hand, point out that providing simplified routes for one type of technology or situation could present certain problems:

“The fact of saying give me a route, help me with an easier route because I adopt a naturalistic engineering solution is conceptually wrong. Then maybe it happens that where that intervention might not work, or where it would even be harmful, the designer is tempted to do it because it is easier to do it. And that is a shortcut. That's the problem with shortcuts. Why don't you revise the mother standard and make it easy to do that and the other things?” (Respondent 12, 2022).

Respondent 6, the same respondent who earlier said he was in favour of discussing simplified paths then pointed out that:

“Then it can be debated whether or not this type of intervention is worthy of subjection, it is not just because it is called NBS that it has no impact on the environment or landscape”
(Respondent 6, 2022)

“There is a risk of a simplification and that all aspects are not analysed and therefore perhaps not really carried forward as NBS, that may be the danger as well. Having two differentiated channels I don't know if it can be considered valid. For the EIA, there is either talk of a general simplification, but even going too far in simplifying risks skipping fundamental steps. Often things are presented as NBS that do not have that nature. It then becomes difficult to differentiate and give an ex-ante different path”(Respondent 1, 2022).

“I try not to have prejudices, I know I have to do those steps, if I am in a protected area the VINCA, and if I need the EIA as well. I start from the assumption that I have to do them so I try to anticipate and present it, explain it. By law, coastal erosion interventions go to EIA or EIA screening. I start that it has to be done, it has to be explained, the impact is that. Because we are in a sensitive environment up to a certain point, but an environment for all to see. The sea, the beach, how you intervene they jump on you. However, I am not so worried about this aspect

because if you do things well and present them well, I challenge anyone to find a flaw in it” (Respondent 4, 2022).

In conclusion, most respondents were against the establishment of simplified routes but rather an overall simplification of all kinds of projects permitting path, but everyone agreed on a better codification of NBS in order to know in advance which kind of procedures should be undertaken.

“Maybe rather than a magic wand, the aim is to lobby and publicly codify what NBS are. On the basis of this categorisation, it would then be easier to identify simplified paths. It would be important for NBS to be institutionally codified, clearly recognisable and clear. They must be assimilated by technicians but also by legislation” (Respondent 6, 2022).

It also emerged from the focus group that certain authorisations such as landscape authorization in most cases do not improve projects and are an obstacle:

“In the experiences I have had, there are very few cases in which these paths have added to and improved the projects. More than often, even the landscape authorisations, which are absolutely entitled to be considered and issued, however fail to contribute to anything. At least in the interventions that we do such as beach profiling and morphological rearrangement. Beyond saying “don't touch the vegetation or use the same colour” they don't go. It is imperative to find a way to ensure that these authorisations do not become an obstacle to the realisation of works also aimed at environmental gains” (Respondent 6, 2022).

“I have never seen a landscape authorisation that adds content or improves in any way the interventions” (Respondent 13, 2022)

According to Respondent 6, even the attempt to simplify landscape authorisation with the Presidential Decree 120/2017 did not work because:

“It has not simplified as the list of project is insufficient, not well defined, it is not clear where your intervention and design methodology fall. You are always in doubt and you do it anyway, but if there is no time, in front of the inertia of other authorities you take the responsibility and you do it anyway risking lawsuits (Respondent 6, 2022).

The landscape authorisation also adds an additional actor and further steps as the superintendencies, which are bodies controlled by the Ministry of Culture, are responsible for their issuing.

Regarding monetary policies we have seen in chapter 2 that it is possible to distinguish between: 1) direct monetary, such as public funding and direct spending on good and services, and 2) indirect monetary, such as taxes and monetary incentive schemes. It has been shown in Chapter V that public funds for Disaster Risk Reduction have increased in the last 20 years, but there are no disaggregated data to verify how much of these funds have been used for NBS rather than traditional interventions. However, Fabrizio Tavaroli from Rina consulting affirm that they have noticed an increase of fund for NBS:

“We have done a market research to see if there are any calls for tenders and there are some, and they will probably also increase with the next funding that will circulate, so we are monitoring them. The requirements are more general than we would expect but they are starting to be present in the public tenders as well, this in terms of market value” (Respondent 8, 2022).

We have already mentioned the DPCM 28 May 2015, which was immediately repealed, and its successor the DPCM 27 September 2021, which reserves a 20% share of the funds for interventions assessed as integrated and thus for NBS. However, this is an incentive and not a direct monetary policy because it does not oblige any actor to intervene with NBS and submit NBS projects. In fact, the rule prioritises funding to integrated projects up to 20 per cent of the total funds, but these interventions are not necessarily submitted. However, it is too early to verify the effectiveness of this rule even though the head of the basin authority states that:

“I have partially seen the interventions inserted after the 2021 decree, so I do not have a perfect view. But those that are being inserted now, but the bulk will be inserted by the end of the year, let's say they are all ordinary (non-integrated) interventions” (Respondent 1, 2022).

In a context in which the various administrations are competing fiercely for the allocation of funds, this instrument could work, although it should be verified that the interventions are actually integrated since, as stated earlier, there have been many cases of greening of traditional grey solutions that cannot be considered NBS. Here, again, the issue of defining what NBS and integrated interventions are, and thus also the technical standards discussed above, re-emerged:

“But the NBS must be clear and well codified otherwise the previous problem arises again, like the funding award, but it was never well codified what these types of interventions were, so they were just maquillaged by adding few plants” (Respondent 6, 2022).

“Maybe someone presents something that is not integrated, but sooner or later something in that direction will be developed” (Respondent 8, 2022).

There has been a recent shift to a type of “direct monetary” policy such as the National Recovery and Resilience Plan (PNRR) in which, with EU funds, there is a direct top-down input to operate with NBS in a structural way. The PNRR indeed finances a €360 million project for the renaturation of the Po basin. This can be seen as a great opportunity to develop and implement NBS in Italy and Emilia-Romagna, nevertheless, some problems have been highlighted. One of the most recurrent in the interviews was that with the PNRR and the previous National Plans (2015 and 2019) that allocated billions to this sector in “one shot”, there is the risk of overwhelming the administrative machine because these are large investments that are not structural. This could inhibit the innovative capacities of institutions and thus also the ability to develop and test the best up-to date NBS:

“With the PNRR there is a bit of a mess, but something good will come. When the resources arrive something good is there, but they are scattered and in various sectors. There is a risk that in the end these resources will be used in the usual way, infrastructures, always of defence that do not lead to a positive environmental and ecological condition” (Respondent 32022).

“It will end up with projects that already have a good level of authorisation, while those that we have in mind, which are innovative and a bit strange, will not be done” (Respondent 4 2022).

“It was a good opportunity to be able to tap into those funds there, even if the timeframe is tight because PNRR means between now and 2026. It is the usual problem when funding arrives like this headlong. Not only old projects are pulled out of the drawers, but projects that are already at a good stage of authorization and can be implemented. Knowing Italy and its problems with the timing of tenders and so on, five years is nothing” (Respondent 9, 2022).

“Inevitably, given the timeframe dictated by the PNRR agenda whereby you have to commission by next summer 2023, and I assure you that for public works these are tight deadlines. Most of the time we fall back on the argument that we do what we have always done, we end up using the tools that we know and master best, and we don't get into a new choice that we risk not knowing where it will take us” (Respondent 6, 2022).

“With the PNRR we were displaced so we should now move quickly” (Respondent 13, 2022).

The park authority points out that in the projects submitted in the context of the renaturation of the Po, the hydraulic component was at the core, but the ecological one was not, as old

projects had been drawn up. They are trying to intervene but the tight schedule of the PNRR does not allow substantial revisions:

“The difficulty of the PNRR is that, the implementation and timing of implementation gives the excuse not to act and plan. The projects pulled out by the basin authority are projects that date back to 2006” (Respondent 11, 2022).

“We are trying to patch it up by talking about recreation of floodplains and riverbed extensions and renaturation, but this is not particularly felt or matched with the timelines of the PNRR” (Respondent 10, 2022).

“Furthermore, the PNRR is not that strict regarding ecological requirements as it does not tell you to just use NBS. Its environmental constraints are quite loose in short. Clearly, if instead they were more concrete and strict and referred to well-codified and clear modes of intervention, it would be ideal and this would be the right instrument to promote NBS” (Respondent 6, 2022).

Another PNRR issue highlighted by Luigi Respondent 4 is that little weight is given to risk mitigation for coastal erosion:

“In the whole PNRR there is no mention of coastal erosion. In Italy we have 8000 km of coastline and we are the so-called “dock of Europe” and with climate change that will affect us, there is no space for erosion? we tried to put it in later but there are few chances” (Respondent 4 2022).

Many respondents such as Respondent 3, 4, 11 and 17 highlighted the issue of the short-term planning that they are used too. There is indeed a lack of long-term planning, which would be even more relevant in a context of climate change, especially alongside the coast. As mentioned earlier, “emergency” maxi-financing has been the main modality of fund allocations, but Respondent 4 also argued that another barrier for the long-term funding and planning has come with the restraint put on budget laws following the 2011 Italian financial crisis:

“Then the budget law also changed; before, big plans were made over the long term and big funds, and they were planned over many years. There is that new budget law whereby each year you only have to commit what you can spend. This means that small projects are carried out, while large projects such as the 12 million euro beach nourishment in Emilia-Romagna, which

takes a year and a half between planning and authorisation, are more complex to conceive” (Respondent 4, 2022).

In addition, continuous and long-term funding is mainly needed to make up for the lack of maintenance of the Italian defence infrastructure.

“There is a huge maintenance deficit in Italy but also in Emilia-Romagna. On embankments that are 50 or even 100 years old. I would have preferred a pulverisation. It is apparently less effective in the short term, but by having lots of small things done by lots of people in the area. It is the small interventions that could make the difference everything that has to do with green technology can be useful” (Respondent 12, 2022).

Another possible monetary policy would be payments for ecosystem services, in this case those related to risk mitigation and biodiversity conservation. none of the respondents referred to this type of policy autonomously, but the topic was always introduced by me with a follow-up question. Although many respondents identified as a barrier to NBS mainstreaming, the possible opposition of farmers and other categories due to potential economic losses, none mentioned this type of policy autonomously, but the topic was always introduced by me with a follow-up question. This is probably a signal that “the payment for ecosystem services” have not yet entered into the public discourse and political agendas. Park authority respondents believe that it is important to recognise in some way the co-benefits that NBSs produce and provide and that are not valued so far:

“I would add an element, the concrete, to my knowledge, enters the GDP basket, NBS does not. So resting on an NBS, any institution, parks do a little bit, but otherwise you continue with concrete and other elements. It doesn't even seem like money spent with all the benefits that they provide, microclimate regulation, ecosystem services. Trees of various species do not enter into the GDP, if I sell air conditioners they do. How do you want to go the ecological transition?” (Respondent 11 2030).

“How do you evaluate these other aspects that are accounted for in other ways. So when you go to choose then you should measure the benefits they give in the spatial planning tool” (Respondent 10, 2022).

However, the topic of payment for ecosystem services is not yet discussed and developed in the sector of Disaster Risk Reduction, as indeed confirmed by the interviews and the lack of reference in the national-level policy review. However, something is moving also in relation

to ecosystem services even if future directions are difficult to predict now as the debate is at the initial stage:

“We have a strand of activity related to payment for ecosystem services, we don't have big examples yet because it is still a rather new field for us” (Respondent 1, 2022)

“We do not yet have examples of practical application, we have seen a few examples that had been done along the Brenta, which were very interesting, we are working in other fields, but not with NBS but with farmers regarding water use, water use fees. But we are still in a very experimental phase” (Respondent 2, 2022).

Respondent 5, representative of the environmental NGO points out that some kind of ecosystem payment scheme are yet debated, like for carbon capture through forestation, but not in the case of disaster risk reduction or biodiversity conservation:

“There is definitely talk about it, and while you were asking the question, very distinct things came to mind; ranging from the funds of farmers, to the topic of large-scale forestation interventions, which are there already today, however there is this system with carbon that I am not directly familiar with, but in a fairly rough way, but which nevertheless goes in the direction of recognising the value of interventions of this type from the point of view of ecosystem services” (Respondent 5, 2022).

Furthermore, he identifies a relevant issue in this regard, namely the distinction between urban and rural contexts. In the former case, payment for ecosystem services would not be significant for the individual citizen, due to higher population density, and it would hardly influence their choices. In rural setting, instead, there are fewer stakeholder and incentives can be more significant:

“More applicable in rural contexts than in urban ones where there are too many actors and the payments would be too small. At the planning level I have not seen anything, but it is an issue that is beginning to be talked about. let's say they are interventions that on the farmer's side go to occupy an area that could potentially be the subject of agricultural activity, then there, it is an intervention that requires periodic compensation over time” (Respondent 5, 2022).

As far as the private market is concerned, something is moving due to two factors: first, the current expectation that public funds and NBS project demand will increase either through calls for tenders or through competitions “*concorsi*” (Respondent 8, 2022), and on the other hand, the increasing importance of the companies' sustainability indices:

“We have also done a bit of scouting and marketing to see if there are any calls for tenders, and there are some, and they will probably increase with the next funding rounds” (Respondent 8, 2022).

“With “competitions” it is easier to include NBS because compared to calls for tenders it is a more flexible way and we can propose NBS to clients, so that it increases the score of our project in the sustainability indices” (Respondent 7, 2022)

Furthermore, there is also the whole strand of international finance and sustainability standards promoted by the UN and the Global Compact that are starting to be relevant for gaining privileged access to credit as well as improving corporate brand reputation:

“From the private investor's point of view, there is a change taking place and certainly as a result of the whole Environmental Social Governance (ESG) phenomenon and therefore, partly out of duty and partly out of pleasure, several companies are beginning to work on the subject and consider these aspects” (Respondent 7, 2022).

“In the private sector there is a growing focus on ESG issues, and therefore to demonstrate sustainability and social commitment of big companies, I speak about ENI and ENEL from direct experience but I have spoken to others as well, there is interest in NBS. The private market is a bit more mature. The big companies have a sustainability report in which they include this data. I mentioned these but we are also trying to do things with Royal Caribbean, which does port area development, as well as other mobile operations. We try to include these kinds of solutions with these clients who in turn ask us for strong sustainability components in their projects because then they have to show it to the shareholders, the market, the financiers. On the bank side, let's say that in general, for international lenders this interest, extended on sustainability issues has been there for some time. The first ones that came to us was from a foreign financing funds. These are policies, partly greenwashing, you name it, but there is interest” (Respondent 8, 2022).

The respondents thus point out that these practices are becoming useful to companies for branding purposes but also financial returns. There is therefore a risk of NBS being used to fuel greenwashing practices. However, every step in that direction of NBS development is seen as positive. In conclusion, there is a feeling among Rina Consulting Tavaroli and Respondent 7 that without a policy framework that obliges or make convenient practices such as sustainability reports, environmental and ESG criteria disclosure, there would not be the same interest in NBS as there is now:

“At the research level, it is normal to talk about circular economy, Life Cycle Assessment (LCA). outside of research, however, it is still a bit early and perhaps the levers are a bit missing. In the sense that in the end, especially from the private world, you do something when it is required for some reason, authorisation, or other things that you need to keep your work going. You don't do it simply because it should be done. That's kind of the truth. In some countries these criteria also have legislative spin-offs, so there are countries where there are already carbon taxes, etc. Every time these mechanisms are triggered, one is then obliged to implement the changes. Until this happens you have to wait for the cultural change, which however takes a long time” (Respondent 7, 2022)

Interestingly, for this respondent, cultural change is slower and needs to be accompanied and driven by legislative changes that make these practices a standard. Regarding the European case, the European Directive 2014/95/EU makes the disclosure of non-financial information mandatory for large public interest companies, leaving it voluntary for SMEs. It is therefore a non-monetary direct policy instrument because it produces obligations but not a monetary one. In fact, it does not oblige companies to take green actions but simply publicly report some aspects of the company's environmental and social impact.

Finally, the last aspect I would like to mention emerged from the interviews and the implementation of the Operandum project and concerns the application of taxes to NBS, especially the Value-Added Tax. Respondent 1 states that:

“Another aspect I happened to read in an article is that grey infrastructure enjoys reduced VAT while many NBSs do not, and this too deserves a regulatory review. Despite the fact that the added value of natural capital expressed by NBSs is recognised, grey infrastructures, which constitute urbanisation works, benefit from reduced VAT, even though they consume resources, pollute, and degrade the environment and landscape. The same concessions are not available to NBS, except in special cases” (Respondent 1, 2022).

This issue wasted valuable time within the Operandum project due to the uncertainty as to whether or not the VAT should be applied to the construction of the Dune. It was not easy to come up with a definitive answer as the opinions of various experts diverged. In the end it was found that the VAT was not due in the case of the dune (Respondent 16, 2022). In any case, here again, a better and clearer regulatory framework would have helped in order to provide project managers with reliable and timely information about the costs.

In conclusion it is possible to affirm that:

Direct monetary policy (G7.1): funding for Disaster Risk Reduction are clearly increasing but they are not structural and long-term. Few has been done for the NBS as the first direct allocation has been with the PNRR on EU input and yet has loose ecological requirements. This variable can be considered “Insufficient” even if on an increasing trend.

Indirect Monetary (G7.2): criteria decree discussed above was abrogated and reinstated just in 2021 and no incentive scheme for ecosystem services related to DRR were present in the policy framework before this date. Therefore, this variable will be labelled as “missing until 2021 and yet to be assessed”.

Direct non-monetary (G7.3): lack of technical standard, regulation and codification of NBS which make us evaluate this type of policy as “missing”

Indirect non-monetary (G7.4): no awareness campaign and large scale NBS dissemination process but some steps are coming from universities and research organization. More effort needed from planning bodies to take charge. Basin authority is now undertaking one NBS pilot project. ESG criteria disclosure are starting to have an impact in the very small NBS private market.

The following tables sums up synthetically what has been discussed above in relation to the Emilia-Romagna Social-Ecological Context and Disaster Risk Reduction governance system.

Table 7 Emilia-Romagna Social-Ecological Context variables

| Social-Ecological Context variables | | | |
|-------------------------------------|-----------------------------------|-------|---|
| First tier | Second tier | Code | Value |
| Environmental - social (C1) | Hazard | C1.1 | High |
| | Exposure | C1.2 | High |
| | Climate Pattern | C1.3 | Likely worsening |
| | Predictability of system dynamics | C1.4 | Good for short term, low for medium and long term |
| | Ecological status | C.1.5 | Poor |

| | | | |
|------------------------------|---|-------|---|
| Socio-Economic (C2) | Economic Development | C2.1 | High |
| | Demography | C.2.2 | 4,4 million people mostly living in hazard prone area |
| | Land property and management right and local interest | C.2.3 | Farmers, hoteliers and bathing facility associations are powerful and included in the governance system |
| | Technological capacity | C.2.4 | High innovation capacity |
| Institutional political (C3) | DRR in the national political agenda | C.3.1 | High priority |
| | Biodiversity in the national political agenda | C3.2 | Low priority |
| | Institutional capacity | C3.3 | High |
| | Participative culture of planning | C3.4 | Sufficient in different sector but low for DRR |

Table 8 Emilia-Romagna Disaster Risk Reduction governance variable in relation to the NBS mainstreaming process

| Governance system (G) | | | |
|------------------------------|----------------------|-------|--|
| First Tier | Second tier | Code | Value |
| Strategic Objective (G2) | | G.2 | Low but increasing relevance to ecological aspects |
| Governance organization (G3) | Decentralization | G3.1 | Medium/high |
| | Eco-fit | G3.2 | Partial Fit |
| | Functional coherence | G 3.3 | Good |
| Multi-Level integration (G4) | Vertical integration | G4.1 | Low between international-national, sufficient between national and regional level Good between Basin authority, regional and lower level |
| | Horizontal | G4.2 | Sufficient and increasing |
| | Participation | G4.3 | There are plenty formal provision for participation In practice powerful interest |

| | | | |
|------------------------------|-------------------------------------|-------|---|
| | | | group enjoy more weight than other actors like experts and researchers. Environmental associations are recently starting to be more involved and active in DRR. |
| Implementation capacity (G5) | Administrative | G5.1 | High |
| | Technical (traditional engineering) | G5.2 | High |
| | Environmental/ecological | G.5.3 | Low |
| Management regime (G6) | Uncertainty and risk acceptance | G6.1 | Low |
| | Adaptivity and experimental spaces | G6.2 | Low/medium |
| | Inter-disciplinarity | G6.3 | Low |
| Type of NBS policy (G7) | Direct monetary | G7.1 | Missing until 2021. PNRR to be evaluated as it had loos ecological requirements |
| | Indirect monetary | G7.2 | Missing until 2021, Criteria Decree abrogated and reinstated in 2021 and yet to be evaluated |
| | Direct non-monetary | G7.3 | Missing: lack of technical standards, constructions regulation and codification of NBS. |
| | Indirect non-monetary | G7.4 | Awareness and dissemination campaign delegated to university. ESG disclosure are starting to have an impact. |

Conclusions

The concept of Nature-Based Solutions (NBS) was developed and adopted in 2016 by the International Union for the Conservation of Nature, followed by major international organisations such as the European Union, which place it at the heart of its biodiversity strategy. NBS was born as a concept that encompasses all those land and water management interventions that aim at increasing the well-being of local communities and, at the same time, providing benefits to the ecological system and biodiversity. In the field of Disaster Risk Reduction (DRR) this translates into the twofold objective of risk mitigation and conservation and enhancement of ecosystems and biodiversity.

The NBS is a concept in continuity with naturalistic engineering or eco-engineering but, compared to the latter, it aims to make a step further in adopting a more ecological approach. To be considered NBS, on the other hand, any interventions must be “integrated” with the aim of fitting into the Social-Ecological context improving the social but also ecological indicators such as the degree of connectivity of ecosystems, the reduction of fragmentation of the natural territory, the increase of habitats and the provision of ecosystem services. However, this understanding is not yet widespread in the governance system and the concept of NBS is still unclear to many. Indeed, the research revealed that naturalistic engineering has been applied in Italy and in the Emilia-Romagna context more as a “greening” strategy of traditional “grey” interventions rather than with a truly ecological approach.

The objective of this research was to identify barriers and enabling factors for the mainstreaming of NBS, where mainstreaming means the process of making a niche grow to be considered a standard. In recent decades, the standard in DRR has been traditional engineering and grey solutions, which, although partially effective in achieving certain goals such as risk reduction and resource exploitation, have a significant environmental impact and can compromise the ecological status of entire areas.

To identify the barriers, three macro-categories were identified: first, the characteristics of specific type of NBS; second, the Social-Ecological context of reference; third, the Disaster Risk Governance system in all its components, structural and formal (regulations and policy input) and informal (cultural, cognitive, and knowledge/skills). These three macro-categories

were then broken down into second-tier variables in order to build a comprehensive view of the case study and its components. Finally, through the Content Analysis of documents and expert interviews, it was assessed how this set of variables interacts with each other in the Emilia-Romagna context.

It has been found that the main barriers to NBS mainstreaming pertain to what Pahl-Wostl would call “Cultural-Cognitive institutions” which are those set of paradigm, mental models and knowledge that influence the system understanding and are at the base of a management regime and a socio-technical system. These kinds of variables are usually slow-changing variables, and double or triple learning loop are required for a socio-technical regime change. In the specific case of the NBS mainstreaming, this means that key actors in this system of governance, who for years or decades have used certain types of knowledge, assumptions and skills must reformulate them to adapt to the alternative approach.

This is even more challenging in a governance arena such as the Disaster Risk Reduction that tends towards path dependency due to a low acceptance of risk and uncertainty, variables that hinder innovations. In this case, according to the multi-level perspective on socio-technical changes of Geels and Schoot (2007), in order for the “innovative niche” to challenge a well-established regime (the traditional engineering grey solutions), it is necessary the emergence of a disruptive disturbance and a major challenge to the system that the old regime cannot deal with; this would help opening up spaces for the niche to grow. In this case study, disturbances do relate to eco-system degradation and biodiversity loss, to which the grey solutions have contributed to. These disturbances have obviously occurred, as data about the social-ecological context show. However, they have not yet be framed and recognized as a top-priority and strategic objective within the Disaster Risk Reduction system. The research assessed that sensitivity to the matter is slowly growing among technical actors of the system but not enough to challenge the regime and, more importantly, it is not supported by adequate policy framework and adequate set of skills. The policy framework, what Ostrom called “regulative institutions”, which have the potential to shape the behaviour and choices of actors, instead of fostering naturalistic engineering and NBS mainstreaming process, have proven to be a barrier: so far, it has induced actors to stuck with the old regime favouring the traditional engineering approach. The first signs of change have only recently been observed and it is too early to assess their impact and scope.

The table below provides a comprehensive list of barriers and potential enabling factors for the NBS mainstreaming process identified as a result of the documents, reports and interviews Content Analysis:

| | Barriers | Enabling factors |
|---------------------------|--|--|
| NBS features | Low effectiveness perception | Increasing experimental spaces |
| | Higher complexity and context-specific than grey solutions. Need of multidisciplinary competences for NBS with high level of eco-engineering intensity | Co- design Developing design tool and software |
| | Usually space demanding compared to alternative grey solutions and thus potentially opposed by local interest in case of required land-use change | Participative practices and awareness campaign related to co-benefit |
| | Higher maintenance need in case of NBS that reactivate morphological dynamics | Lower initial investment Co-monitoring and co-management with local stakeholder Green “competent” jobs |
| | Higher cost in case of pilot NBS | Promote the creation of a value-chain and economy of scale |
| Social-Ecological context | Medium/High Disaster Risk | Identify “protected” space for experimentation and lower risk area for pilot projects |
| | High level of anthropization and little uncontested space available in the case of space demanding NBS | Simplified routes for expropriations and compensation Ecosystem service payment scheme |
| Governance system | Lack of national strategic planning policy | Include NBS in the National Climate Change Adaptation Plan and National Biodiversity strategy |
| | Short-term extraordinary DRR financing plan | Long-term financial planning with higher environmental standard requirement |
| | Sectoral planning | Continuing effort for integrated planning |
| | Command and control management paradigm | Adaptive management approach Higher degree of risk acceptance due to increasing hazard uncertainties and extreme events |
| | Regulatory framework biased toward hydraulic need and no recognition of ecological objective | Increasing regulatory prominence of ecological objectives |
| | Lack of NBS codification | Develop technical standards |
| | Lack of eco-engineering and | Increasing capacity building |

| | | |
|--|--|---|
| | ecological capacity | opportunity of the actors within the DRR governance system Higher knowledge sharing and NBS best practice dissemination activities |
| | Lack of presence or power given to environmental experts and associations in participatory practices | Higher public administration proactivity in involving experts and association and greater predisposition in receiving input |

Here below I am going to discuss more in detail the variables and their interactions that compose the system discussed in Chapter VII and which pertain to the category of NBS features, Social-Ecological Context and Governance system.

It has been found that in the Italian and Emilia-Romagna Disaster Risk Reduction system, NBS are still a small “niche” confined to national or regional parks, forest cooperatives, or in few experimental spaces such as the Horizon 2020 “Operandum project”.

The content analysis of the expert interviews highlighted that one of the most recurrent themes related to NBS acceptance, in line with the literature, has been “perceived effectiveness”. As NBS do represent a major socio-technical change compared to the actual standard of grey solutions, their effectiveness is thus still uncertain to actors used to the traditional regime. The current state of knowledge and effectiveness perception of NBS, their adoption is dependent on the risk context. The higher the risk the lower the possibility of NBS being adopted compared to an alternative traditional/grey solution. This high-risk context and the uncertainties regarding the effectiveness of NBS are therefore an obstacle, as both the technical planners and decision-makers do prefer the solutions they know better and have relied on so far. Respondents often cite the fear of judicial processes, the liability involved in working in the Disaster Risk Reduction arena and the fact that the normative framework does not give incentives to change because the formal strategic objective remains “to let the water flow”. However, this fear of failure and lack of perceived effectiveness are also generated by the lack of knowledge and skills, the inability of the system to experiment with alternative solutions and an excessive reliance on the old regime. This is why it has been used the category of “perceived effectiveness” and “socio-technical maturity” rather than effectiveness and “technological maturity” in the case of NBS mainstreaming: many of the actors in the

Disaster Risk Reduction system have never experienced or witnessed the implementation of an NBS in their own socio-technical context.

There is general consensus that the NBS approach is more complex than the traditional grey approach, which is characterised by greater standardisation and linearity, and therefore easier to put into practice, particularly in the design phase. On the contrary, the NBS approach is multi-disciplinary by nature, less standardisable since it is context-specific and less predictable in the case it aims to restore morphological dynamics. High-level technical (e.g. hydraulic, geological) and ecological skills are required but the latter are scarce in the Italian and Emilia-Romagna context. There is indeed a lack of hybrid professional figures and medium/large engineering firm with multi-disciplinary teams. Naturalistic engineer, Biologist and ecologist are absent from public administrations and external collaboration are sporadic. The importance of this aspect obviously depends on the type of NBS and its degree of ecological intensity. Two operative respondents have in fact admitted to fear what are called “ecosystem disservices”, those unforeseen and unwanted impacts such as the attraction of undesired species, operational complications and the inability to manage new habitats. Respondents demand for higher integration of knowledge and a more adaptive and flexible management approach, necessary to deal with dynamic tools such as the NBS. In line with the prescription of an adaptive approach, there is a demand for more experimental spaces to test NBS, in order to better share knowledge, the risks as well as results and lessons learnt.

NBS is a very broad category as it includes very different types of interventions. In order to evaluate a mainstreaming process in a certain area it has been found relevant to assess the degrees of specific NBS technological maturity in specific socio-technical contexts. It was noted that the dunes, for instance, can be considered to be at a higher stage of mainstreaming since similar interventions such as beach nourishments are not new to local engineers and administrators. The dunes can be considered an upscaling of beach nourishment since they contain a structure that keep the sand and the vegetation. Furthermore, there are examples of the success of artificial dunes in a close socio-ecological context such as Tuscany and a spillover of knowledge for the replication has been found to be relevant.

Other types of NBS such as river or irrigation canal renaturation, for instance through the reactivation of morphological dynamics, re-connecting the riverbed with the floodplain or creating multi-purpose basins, are at an earlier stage of mainstreaming. There are very few

experiences of this type and traditional engineering structures are dominant for river flow regulations. However, a first sign of change lays with the National Recovery and Resilience Plan (PNRR) of 2021 which has financed a large project for the renaturation of the Po river basin. Yet, scepticism is prevalent among those who argue that, due to the tight funding deadline, they had to rely on old projects from 2006 (the sediment plan) and other projects which are biased towards hydraulic aspects and little on the morphological and ecological ones. The lack of structured long-term financing and rather the use of short-term extraordinary plan have been found to be a constraint on innovation.

Another research finding is that there is a general consensus that, things standing at present, the majority of NBS are not considered cost-effective compared to grey solutions. In fact, the latter, which are more standard and widespread, have reached maturity in technology and use that reduces their cost per unit. Whereas NBS still do not and, in many cases, further development is needed to standardize the engineering processes and thus achieve significant scalability and cost-effectiveness. There are also concerns about the uncertainties related to maintenance needs and costs. Another issue related to the assessment of cost-effectiveness is the low uptake of practices for the life cycle assessment of interventions (LCA) and the lack of systems to assign value to ecosystem services and co-benefits provided by NBS.

Another potential barrier identified is the case in which NBS are “space demanding” and need greater portions of territory to be effective than its grey alternative. This can happen, for instance, in riverbeds or canals widening actions, floodplain excavation (*golene*), or dune cordons. In highly anthropized Social-Ecological contexts such as Emilia-Romagna this potentially means creating conflict with local interest groups such as farmers, tourist operators or individual citizens who for various reasons prefer the status quo (e.g. feel safer with a high embankment; attachment to the place as it was).

Cultural factors here seem to be highly relevant to explain the system inertia, lack of innovation and preferences for grey solutions. One of the most cited cultural factors has been the background of technicians who are mostly trained to comply with the prevailing management paradigm whose main objective was to “let the water flow” to reduce the risk without worrying about other factors and further impacts. The prevailing management regime, therefore, promotes high specializations but few contaminations and integration between different types of knowledge, as well as a deterministic approach to risk which lead to low-

risk acceptance and low propensity to innovate. To reiterate that these cultural aspects are considered important, all data point to the high relevance attached to the need of new type of training and formation characterized by multi-disciplinary and adaptive skills and to increase the awareness of all actors, from technicians to decision-makers, to private stakeholders.

As previously mentioned, the policy framework has not contributed to change these cultural-cognitive institutions, the management regime or to encourage innovation. Relevant inputs were indeed missing or indirect policy instruments with little enforceability have been adopted. At the national level, the input of an operative climate change adaptation plan, now five years overdue, and an effective biodiversity strategy have been lacking. The Region, on the other hand, has been more sensitive to these issues. Emilia-Romagna adopted guidelines for the renaturation of river basins and drainage and irrigation networks since the early 2010s and a regional adaption and mitigation strategy since 2018. These inputs, however, did not translate into actual change in the DRR arena because they were neither operative nor compulsory, while at the national level, the legislation with a higher degree of cogency was still focused on risk reduction without ecological and adaptation considerations.

Another major problem identified regarding policy instruments is that major operational plans for risk mitigation, such as the 2015 and 2019 plans as well as part of the NRP, are allocated on an emergency and not structural basis. As a result, the administrative and technical offices are overwhelmed, and this reduces the possibility of experimenting new solutions. When funds come in, old projects are pulled out, whereas designing NBS takes time. Furthermore, the 2015 national funding programme, for instance, repealed the decree that provided for a funding priority for “integrated interventions” (now called NBS) precisely because there was a need to make up for delays, and the former decree implied complicated procedures to assess the funding priority. This principle has been reinstated in a simplified way with another decree in 2021, that explicitly mentions, for the first time, the term NBS, testifying the recent increasing sensitivity to the matter. It is too early to assess its results but again, it is an indirect policy tool that gives priority to integrated interventions up to the 20% of the total allocated fund: and yet, this does not guarantee that NBS projects would be presented.

One of most recurrent and significative legal barriers has been the lack of technical standards for NBS, set by competent ministries. If there were well-defined technical standards that had the force of law, technicians would feel more confident in adopting an innovative approach.

In addition, a better and more precise codification of NBS would also serve to provide more certainty when authorising projects. NBS are not explicitly mentioned in the annexes to the environment code that contain lists of projects with thresholds for establishing their authorisation paths.

In any case policy makers should be aware that future attempt to mainstream NBS only with regulatory policy may clash against the prevailing cognitive cultural structures of the governance system. The policy cycle must therefore consider the learning cycles necessary for the system to adapt and obtain results. In parallel with the regulations, work must therefore be done to sustain the social learning to reshape knowledge, skills and values in the system.

A policy that seems to be effective is the one of sustainability reporting requirements and compliance with criteria such as the Environmental Social Governance (ESG) promoted by the UN Global Compact. Indeed, the two respondents from an engineering firm reported a significant increase in interest by big companies in the NBS which would improve their sustainability indicators. It is difficult to determine to what extent it can be considered greenwashing, but the fact is that some private funds are converging toward NBS and might contribute to NBS mainstreaming. According to these two respondents, private companies are more prone to embrace innovations than public bodies.

Due to the need to fit harmoniously into the territory and to increase the level of acceptance of NBS, participatory approaches to their planning and implementation are necessary but improvement in participatory practices are equally needed. The poor culture of participation of both citizens and public administrations is often cited as a barrier even if, from this point of view, the Emilia-Romagna regional is considered more advanced than the national average, thanks to the proactivity of the regional offices. However, there is the widespread opinion that those participating in these tables are almost exclusively interests groups, while it is felt that more voice should be given to experts and citizens who have a long-term vision of sustainability, as opposed to economic actors that often act as short-term maximisers. It is also up to the ability and strength of the public bodies leading the process to balance these interests, but this is not always the case, especially at lower, local levels. The Region and the District Basin Authority have been recently proactive in promoting integrated and participatory planning initiatives such as in the case of basin planning (PGRA), the Integrated Strategy for Coastal Defence and Adaptation (GIDAC) and the Labour and Climate pact.

More problems occur when this has to be done at lower levels where human resources are few and time is tight. Co-design of interventions, instead, is almost non-existent except for sporadic cases. It is at the operational level where the greatest barriers were encountered in translating input into interventions that were truly integrated and that can be considered full NBS. Regarding this point, participative practices should be used as an enabling factor to gradually erode the cultural-cognitive barriers that are biased toward the old regime and foster the social learning that is necessary for the NBS mainstreaming to occur.

Throughout the research, it has been demonstrated how complex this system is and how many variables have to be considered in the case of socio-technical change such as the one related to the NBS mainstreaming. In conclusion, it can be argued that the system tends towards continuity and path dependency for reasons that are of cultural, legal, social, economic or technical nature. However, the most relevant reasons are those related to cultural cognitive institutions and lack of knowledge about ecological approaches. These barriers are unlikely to change in the short-term without decisive and direct political and regulatory input that allows for widespread experimentations and implementation of NBS. Some progress has been made especially in the very recent past but, for the attainment of the adaptation and biodiversity conservation targets set by the European Union, there is a need to speed up the process further again.

One of the main difficulties of this research was to structure an analysis that would hold together the many variables that make up such a complex system. Although it may be difficult to understand in some passages, I believe it was a necessary step to lay the foundations for future, more specific insights into certain variables and results. In future work one could for instance think of developing quantitative research to weigh the role of certain barriers in the mainstreaming process and compare it with others. Another difficulty was to adopt an interdisciplinary approach that held several disciplines together. Frameworks already exist for this purpose, but applicability to individual cases is complicated and often requires modifications that risk to preclude comparability. However, this was a necessary step as, at the beginning of this work in 2020, the academic debate on NBS was still in its infancy. It was focused on NBS effectiveness regarding natural science and engineering, and on local communities' acceptance regarding social sciences. Adding the governance and policy dimension was a very complicated operation, but it proved to be highly necessary to stimulate an academic

debate that might have an impact on public debate and policies. The framework developed may be complex and difficult to apply, but it can be modified, improved and reused in other contexts as well, hopefully with the help of a multi-disciplinary research team.

Annex I – Interviews

Intervista 1 e 2

Rispondente 1 Gestione dei Rischi Idraulici e Rispondente 2 - Qualità delle Acque. Ente pubblico di alto livello responsabile della pianificazione territoriale.

Intervista condotta da Matteo Mannocchi (Dipartimento di Scienze Politiche e Sociali, Unibo) e Teresa Carlone (Dipartimento di Sociologia e Diritto dell'Economia, Unibo) effettuata il 28/09/22 in modalità online.

Presentazioni e introduzione

Richiesta di autorizzazione al trattamento dati e alla registrazione

Intervista:

Domanda1: Iniziando dall'assetto istituzionale e amministrativo per quanto riguarda la mitigazione del rischio, abbiamo provato ad approfondire quella serie di riforme che ci hanno portato all'assetto attuale. Abbiamo visto come e quanto sia cambiato l'assetto, dalle varie autorità di bacino fino ad arrivare a quella distrettuale. Non so se voi avete assistito a tutto il processo e all'evoluzione del sistema, ma volevamo chiedere se secondo voi queste riforme hanno portato a un miglioramento, peggioramento e quali aspetti critici vi sentite di evidenziare?

Respondent 1: Noi siamo arrivate entrambe in autorità di distretto e c'era già stata la riorganizzazione. Però dall'esperienza dei nostri colleghi e dai riscontri, poi avendo partecipato all'inaugurazione e alla stesura dei nostri piani e agli strumenti di programmazione del territorio che curava già l'autorità di bacino, poi proseguiti con l'autorità di distretto, direi che in questo cambiamento e questa evoluzione, per quello che ci riguarda, non ha avuto aspetti negativi, anzi. È stata positiva perché ha definito in modo ufficiale e istituzionale quello che era l'assetto dell'autorità di distretto e il suo ruolo. Gli è stato affidato un ruolo molto importante e definitivo.

Respondent 2: soprattutto a ragionare sul complessivo nel territorio e sicuramente porta più vantaggi rispetto ad avere una parzializzazione come prima su varie autorità. È chiaro che poi si è trovati ad avere unificati gli strumenti di programmazione e probabilmente è un percorso che è ancora in itinere, però è chiaro che potrà portare a enormi vantaggi un unico interlocutore per varie regioni. Per qualche regione, noi abbiamo solo dei tratti piccoli di territorio, però avere tutto il bacino, il controllo del distretto e di tutto il bacino è un vantaggio. Poi altro aspetto fondamentale è che noi siamo in relazione con le autorità di distretto confinanti e nell'ottica di migliorare la governance si cercano dei momenti di confronto. Perché appunto alcune regioni ricadono in distretto e in parte in un altro per cui si cerca di elaborare il (?). Le nostre normative di riferimento in primis sono le direttive europee che bene o male che sia un distretto o l'altro si recepiscono nello stesso modo. Quella nazionale non fa altro che recepire le direttive europee e ci aiuta anche questo.

D 2: All'interno del distretto stesso, essendo aree abbastanza estese, come avviene il coordinamento tra i vari enti coinvolti e responsabili della mitigazione del rischio. Siete voi a gestire la pianificazione o raccogliete gli input dal territorio? Come avviene questo meccanismo?

Respondent 1: min 13 intanto c'è da distinguere tra pianificazione e strumenti programmatori e la programmazione degli interventi. Sono due aspetti diversi. Diciamo che in ogni caso i nostri interlocutori principali sono le regioni. Le regioni a loro volta, nella definizione degli interventi, devono avere a che fare con gli enti attuatori e qua si apre un mondo perché enti attuatori sono: consorzi di bonifica ma sono anche comuni, anche piccoli comuni o anche un ente attuatore nostro che è AIPO che ha interventi grossi sul bacino. Altri enti attuatori, un altro filone di interventi sono in mano alla protezione civile, è strutturata in questo modo: gli interventi di mitigazione del rischio vengono programmati a livello nazionale attraverso la piattaforma Rendis che è una piattaforma di ISPRA. Tra l'altro è uscito un nuovo DPCM del 2021 che stabilisce nuovi criteri per l'inserimento di tutti gli interventi programmatori fatti dalle regioni all'interno di questa piattaforma. Rispetto al vecchio DPCM, questo nuovo ha portato dei compiti maggiori in campo all'autorità di bacino perché le regioni coordinano e raccolgono i vari interventi dai comuni, consorzi e AIPO e inseriscono nella piattaforma. L'autorità deve valutare questi interventi sotto molteplici aspetti come la compatibilità con i nostri piani. In questo caso la grossa novità è che prima venivano valutati solo (min 15) dal punto di vista della direttiva alluvioni, invece con questo nuovo dpcm vengono valutati anche dal punto di vista della direttiva acque e si cerca di valutare sia la sinergia tra direttive alluvioni e direttiva acque ma anche gli aspetti, per così dire, di possibili conflitti. Quando un intervento viene inserito deve già essere specificato se è un intervento di tipo ordinario o integrato e in questo caso il DPCM fa esplicito riferimento alle Nature Based Solution che vengono citate e ne parla. Tra l'altro i finanziamenti dovrebbero riservare una quota parte del 20% a questa tipologia. Io ho visto in parte, una piccola parte di interventi inseriti dopo il dpcm 2021 e quindi non ho una panoramica complessiva. E anche quelli che si stanno inserendo adesso (ma il grosso verrà inserito entro fine anno) diciamo che sono tutti interventi di tipo ordinario. Diciamo che su questo c'è un po' da lavorare. Per l'altro aspetto invece della sinergia, che per ora un po' disatteso, comunque il dpcm lo prevede, e facendo esplicito riferimento alle NBS può contribuire ad ampliare questo panorama e favorire le regioni affinché si facciano promotori anche nei confronti degli enti attuatori di questa tipologia di interventi. L'altro aspetto è quello che riguarda i possibili conflitti tra direttiva acque e direttiva alluvioni perché c'è tutto l'aspetto dell'identificazione del corpo idrico, dello stato e degli obiettivi ambientali fissati, e soprattutto se questi interventi che nascono come interventi di mitigazione del rischio idraulico poi comportano un mancato raggiungimento degli obiettivi della direttiva acque o un potenziale degrado degli aspetti ecologici o morfologici del corpo idrico. Su questo noi dobbiamo valutare questi interventi e capire se gli enti attuatori hanno fatto tutte le procedure in maniera sostanziale, se hanno affrontato le tematiche e se si sono poste il problema di un possibile deterioramento. Qua si apre la partita, diciamo che quello che è stato fatto finora è che l'intervento nasce come intervento di mitigazione del rischio idraulico e poi si cerca poi di incanalarlo in una fase successiva cercando di renderlo green. Cioè di renderlo compatibile anche con la direttiva acque. Quello che si cerca di fare è una progettazione a monte che deve essere integrata.

Respondent 2: (min 19) questo è un aspetto sul quale cerchiamo di insistere e cambiare l'orientamento. Si è sempre in passato ragionato così. L'obiettivo era mitigazione rischio idraulico, punto. Adesso ci hanno aggiunto il discorso del cambiamento climatico ma il ragionamento era solo focalizzato su rischio idraulico e l'aspetto naturale era considerato marginale, cioè piantiamo qualche piantina e per noi è un intervento NBS, no. Le NBS non vuol dire piantare piante ma vuol dire riconnettere degli ambienti, ridare funzionalità ecologica al fiume, gli ambienti circostanti e gli ambienti peri-fluviali. Il nostro ruolo è quello di orientare anche gli organi più operativi come le regioni o AIPO verso questa direzione. Il nostro strumento, sono gli strumenti di programmazione e pianificazione, quindi lo strumento anticipatore che introduceva già il concetto di NBS è il programma di gestione sedimenti che è uno strumento il cui ruolo è stato riconosciuto a livello normativo, proprio con l'ultimo aggiornamento normativo che ha definito anche il ruolo delle autorità di distretto e ha riconosciuto

anche il ruolo del programma gestione sedimenti che è uno strumento conoscitivo fondamentale che fa lo sforzo di definire quelli che sono gli interventi integrati, interventi win win. Quindi sono interventi che garantiscono una riqualificazione dal punto di vista morfologico, che possono essere riapertura delle lanche, riconessioni fluviali, abbassamenti di pennelli, ma nello stesso tempo con un occhio di riguardo alla funzionalità degli ecosistemi e alla qualità delle acque. Diciamo che è un primo passo, diciamo una matrice di base si, rischio idraulico e geomorfologica, ma anche diciamo entrano dentro per la prima volta anche gli aspetti ecologici e questo è uno strumento di programmazione che si basa su conoscenze scientifiche. Un altro grosso ruolo che abbiamo è quello di aumentare le conoscenze sul territorio e sulla base di queste informazione poi definire gli interventi di programmazione e quelli che sono prioritari e quindi fornire alle regioni che poi sono quelle che dovranno fare gli interventi, dare delle indicazioni ecco.

Respondent 1: un altro aspetto da tenere in considerazione è quello dei progetti pilota che stiamo portando avanti con varie collaborazioni. Noi abbiamo collaborazioni con vari dipartimenti di varie università che ci permettano poi di diffondere una cultura ma di verificare che se l'attuazione di determinati interventi tramite monitoraggio, se viene confermato o meno la validità. Per esempio abbiamo un progetto pilota che prevende un abbassamento dei pennelli di navigazione ad Che è un progetto attuato da AIPO ma come autorità di bacino abbiamo fatto convenzione con l'Università di Padova per tutto quello che riguarda le analisi pre e post, il monitoraggio dell'intervento. Questo comporterà che si vuole verificare se questa tipologia di interventi potrà essere funzionale e valida, quindi il monitoraggio che abbia uno spazio a più ampio respiro temporale

Respondent 2: (min 23,3) per capire se effettivamente la programmazione, nell'ottica di interventi win-win e NBS se è coerente e se stiamo andando nella direzione giusta perché un conto è definire sulla carta e su base di conoscenze e studi e poi un altro aspetto è verificare fattivamente se quello che è stato programmato è efficace. Quindi essendo un intervento integrato parallelamente all'attività dell'Università di Padova che si occupa di aspetti geomorfologici abbiamo attivato un'altra convenzione con l'Università di Parma che si occupa del monitoraggio degli aspetti ecologici e di funzionalità degli ecosistemi in modo da avere appunto una sorta di integrazione del lavoro sinergico e ambire a risultati ad ampio spettro. Noi lo chiamiamo progetto pilota perché anche per noi è nuovo, anche come modalità di attività, perché comunque anche le università, per quanto su aspetti diversi, interagiscono si confrontano i dati e vediamo, è in corso e quindi vedremo i risultati in itinere.

Respondent 1: (min 25) un altro intervento pilota è quello del PNRR, rinaturazione del PO,

Respondent 2: non so se ne siete a conoscenza, questo è un grande progetto, molto ambizioso, perché sono davvero tante aree che sono state individuate lungo l'asta del Po, coinvolgono 4 regioni, sono in totale 56 interventi.

D 3: gli interventi sono di nuova progettazione oppure progettazione già in essere?

Respondent 1: (min 26) la nostra base di riferimento e punto di partenza è sempre stato il programma gestione sedimenti perché è uno strumento conoscitivo a livello di asta del Po che aveva già individuato una sorta di priorità di interventi e quello è stato il punto di partenza. Questo programma è in vigore dal 2006 ed erano già stati definiti una serie di interventi che poi non erano ancora stati realizzati per mancanza di fondi. Il programma individua gli interventi e poi ogni regione secondo il territorio di competenza e programmi operativi poi dovrebbe dare attuazione a questi interventi. Sostanzialmente forse non so, proprio perché mancavano i fondi e perché erano interventi di una certa rilevanza, e quindi il PNRR è un'occasione per dare attuazione a tutti gli strumenti di programmazione e pianificazione nell'autorità di diretto con il supporto delle regioni e gli enti gestori delle aree protette. Il progetto di rinaturazione lo chiamiamo una sfida perché abbiamo cercato di avviare un

processo integrato. Si siamo partiti dal programma gestione sedimenti, da quelli che erano criticità idrauliche, però abbiamo integrato con tutti gli aspetti di tutela del territorio, conservazione dei siti natura 2000 e riconnessione del fiume con le aree golenali. L'esito di questo confronto con regioni, i gestori delle aree protette, con i gestori dei siti natura 2000, un percorso che è durato vari mesi siamo arrivati all'elaborazione del programma d'azione. Questo è una sorta di programma di obiettivo dove specifichi gli interventi, cosa viene fatto in ogni area quali sono gli obiettivi ed il budget. Il progetto di rinaturazione del fiume è un progetto che nasce e segue il concetto di nature restoration e l'obiettivo principale è riconnettere il fiume, dare continuità all'assetto fluviale e l'obiettivo principale è rispondere agli obiettivi della biodiversità che per la prima volta venivano considerati prioritari gli obiettivi ambientali legati alla conservazione della biodiversità. Sono una sfida.

D 4: (min 29) a proposito di questo aspetto di integrazione tra gli obiettivi di mitigazione del rischio e conservazione di bio, volevamo chiedere se per quanto riguarda le competenze all'interno dell'autorità di bacino sono sufficienti in ambito biodiversità o vi avvalete anche di competenze esterne. E come funziona il meccanismo di valutazione degli interventi di cui parlavamo prima.

Respondent 1: per quanto riguarda quelli inseriti in piattaforma Rendis la valutazione viene fatta internamente. Ci sono vari tipi di professionalità, sia nel settore uno che si occupa più di rischio idraulico e quello due che si occupa di tutela delle acque, noi lavoriamo molto insieme quindi c'è sinergia. Chiaro, si parte da un settore di competenza però ci sono aspetti e progetti che vengono trattati dai due settori e quindi riusciamo a collaborare pienamente. Questo per gli interventi che vengono sottoposti a Rendis ce ne occupiamo internamente. Per interventi pilota come appunto il monitoraggio dell'abbassamento dei pennelli e quelli del PNRR ci sono anche delle convenzioni attive con le varie università che possono seguire meglio il monitoraggio e gli aspetti geomorfologici (min 31), che seguiranno nel corso degli anni questi aspetti.

Respondent 2: il monitoraggio necessita di strumentazione e tutto, noi non abbiamo le strutture tecniche quindi ci appoggiamo sempre all'università, quello che è importante è che, come autorità, c'è una visione globale e all'interno ci sono le competenze per tutti i vari aspetti, noi siamo di due settori diversi

Respondent 1: e siamo di due estrazioni diverse, io sono ingegnere, lei è laureata in scienze ambientali.

Respondent 2: (min 32) non so se avete dato un'occhiata al nostro sito, il settore uno sono principalmente ingegneri geologi ma poi abbiamo anche agronomi ecc, nel settore due per gestione delle acque si occupa di aspetti qualitativi e quantitativi di tutela delle acque e tutti gli aspetti legati alla biodiversità e agli interventi di rinaturazione. Nel 2008 l'autorità aveva emanato una direttiva che tuttora è in vigore, la direttiva rinaturazione che già definiva lì che cosa si intendeva per rinaturazione, che cosa e quali erano gli interventi di rinaturazione compatibili con l'assetto del PO. All'interno dell'autorità di bacino e di distretto c'era questa visione di insieme e anche al nostro interno si cerca sempre di lavorare in modo sinergico. In occasione del progetto pilota è un esempio di lavoro sinergico, non è semplice ma è la base, lo riteniamo fondamentale. (min 33).

D 5: domanda a bruciapelo, siete abbastanza per fare tutte queste cose?

Respondent 1: l'area è molto vasta ed eravamo pochi ma negli ultimi anni l'autorità si è ingrandita e si ingrandirà ancora, sono previste nuove assunzioni e nuove competenze. Nel mio settore ci sono ingegneri agronomi, chimici, laureati in scienze ambientali, biologia, scienze naturali. Chiaramente non possiamo fare tutto però quello che dobbiamo fare noi è avere una visione di insieme e le conoscenze e competenze per individuare una sorta di planning e di programmazione. Poi per l'attuazione di interventi specifici o per aumentare le conoscenze su certe cose, non abbiamo ancora

una sufficiente conoscenza di quelli che sono per esempio gli aspetti ecologici o relativi all'ecosistema quando si fa un intervento. Per l'approfondimento conoscitivo ci avvaliamo del supporto dell'università quindi tramite convenzioni, accordi di ricerca, università, CNR, ENEA, tutto finalizzato appunto all'aumento delle conoscenze per avere un quadro chiaro e cercare di attuare in modo concreto quello che ci chiede l'Europa dalla direttiva acque, alluvioni, strategia biodiversità, farm to fork.

D 6: (min 35) quindi voi agite tramite due canali principali, uno la pianificazione con PAI piano acque, e poi con la valutazione dei singoli progetti secondo i criteri del DPMC 2021?

Si esatto

D 7: una volta che i progetti sono presentati voi potete proporre modifiche e agire in un secondo momento per fare in modo che siano veramente interventi integrati?

Respondent 1: (36) su questo aspetto una volta che noi abbiamo fatto la nostra valutazione sul progetto, una volta che viene inserito in Rendis ha una nostra valutazione che può essere positiva o negativa, possiamo chiedere integrazioni e li interagiamo direttamente con le regioni per cercare di approfondire gli aspetti di cui il progetto è carente o su cui non approfondisce. Una volta che invece la progettazione va avanti dipende nel senso che tutti questi interventi rimangono in piattaforma fino a quando non escono i vari filoni di finanziamento che possono essere finanziati dal MITE, dal ministero delle infrastrutture e quindi varie forme di finanziamento. Quando arriva un possibile finanziamento ci dovrebbe già essere una graduatoria in Rendis e si finanziano i primi 10 della regione Lombardia ad esempio. In questo caso la palla passa ai ministeri, una volta che c'è la graduatoria, dopo si segue le procedure che sono proprie di un progetto, c'è un'autorità idraulica competente, ci sono valutazioni come la via e gli altri strumenti da rispettare e quindi la normativa va avanti a secondo della tecnologia di intervento e noi abbiamo più o meno controllo e li "puff",

Respondent 2: per quello che mi riguarda abbiamo riscontrato questa difficoltà. Nel momento in cui si arriva finalmente alla progettazione, perché noi facciamo la programmazione, poi l'ente attuatore per i grossi interventi e per il progetto rinaturazione del PO sarà AIPO che poi a sua volta ovviamente appalterà. Farà la progettazione internamente ma appalterà i lavori a delle ditte quindi tutta la parte attiva dell'intervento, anche la parte di progettazione definitiva, cantierizzazione, gestione del cantiere e gestione post, rimane un po' fuori dalla nostra, non riusciamo più di tanto ad intervenire perché poi gli enti autorizzatori non siamo noi.

Respondent 1: Sono le regioni, e anche le regioni dovrebbero mantenere la linea che si è data. Se è stato presentato un progetto integrato da determinati soggetti attuatori dovrebbero poi vigilare sull'attuazione di questo intervento. Considerate un altro aspetto, che per l'inserimento in Rendis non è necessario un progetto esecutivo. Anzi, spesso vengono inseriti studi di fattibilità e progetti preliminari e quindi è chiaro che le valutazioni che facciamo sono valutazioni a livello diverso quando stiamo valutando un progetto esecutivo. Si può avere già un panorama concreto se il progetto è nel dettaglio, se si valutano studi di fattibilità poi queste linee vanno mantenute anche per i successivi livelli di progettazione questo può essere un aspetto critico.

Respondent 2: (min 40) Manca ancora una conoscenza di base e si approccia l'intervento secondo una sola ottica finalizzata a realizzare un intervento di tipo ingegneristico. Guardano certi aspetti, ad esempio la direzione dei lavori dei cantieri è sempre affidata a tecnici con una certa formazione e mai affiancati da esperto agronomi, forestale esperto botanico, e anche gli interventi di rinaturazione vengono gestiti in modo marginale o non vengono realizzati correttamente e questo dopo determina anche una non riuscita dell'intervento ed è la questione che ci stiamo ponendo negli interventi del PNRR. Sappiamo che il tasto dolente è quello e per questo abbiamo riunito un gruppo di lavoro con

regioni, Aipo, fa sempre parte del lavoro di team, però abbiamo al nostro interno nominato un comitato scientifico con il supporto di esperti di tematiche di rinaturazione e riqualificazione fluviale del po che lo conoscono. Sono 24 esperti ricercatori di varie università che stanno già facendo degli studi proprio per aiutarci a dare linee guida alla progettazione in modo che già i capitolati per l'affidamento dei lavori abbiamo dentro delle prescrizioni. In modo che questi cantieri vengano svolti con certi criteri in un'ottica di Nature Based Solution per fare le cose fatte per bene.

D8: questo vale anche per i progetti in Rendis?

Respondent 2: No per il PNRR è un progetto che ancora seguirà il suo corso con procedure di VIA e tutto, extra rendis. Però siamo in una fase sperimentale e non è detto che quello che noi definiamo come linee guida alla progettazione di interventi di rinaturazione in generale, quello che produciamo adesso, potrebbe diventare una linea guida per tutti gli interventi di rinaturazione lungo il PO. Potrà essere uno strumento di diffusione e utilizzo anche in futuro per la piattaforma Rendis, per dire "guarda, i progetti devono avere queste caratteristiche": "se volete che i progetti siano considerati integrati devono seguire caratteristiche stabilite nelle linee guida"

D9: questa mi sembra di capire che è una questione fondamentale, uscita in molti dei nostri incontri, appunto criteri per poi definire un intervento integrato perché non è chiarissimo cosa voglia dire un intervento integrato/NBS e quindi avere linee guida più chiare e puntali può aiutare.

Respondent 2: si anche mettere paletti, a livello normativo e sistemare la questione.

D10: il discorso del finanziamento del 20% destinato agli interventi integrati è partito nel 2014 con lo Sblocca Italia?

Respondent 1: si però viene ripreso dal 2021 e tutti i filoni di finanziamenti che ci saranno e su cui pescheranno in piattaforma Rendis in teoria ci dovrebbe essere un 20% di posti per interventi integrati. Ora, rispetto a quelli inseriti per questo anno non ho ancora visto neanche un intervento integrato inserito. Chiaro che per percentuali molto piccole, perché dopo il DPCM 2021 vuol dire che gli interventi hanno iniziato a essere inseriti nel rendis da marzo. C'è stato un finanziamento del MITE che è scaduto a giugno e poi adesso ci sono solo per alcune regioni del distretto la possibilità di avere finanziamento sulla progettazione degli interventi. Ma ancora interventi integrati non sono stati inseriti ma tutto il grosso secondo me verrà inserito tra fine anno e inizio del prossimo. Spero che e ci aspettiamo di vedere l'inserimento di questa tipologia di interventi da parte delle regioni

D11: sbaglio o c'era stato già nel 2015 un DPCM?

Respondent 1: si era il precedente del 2021 e già lì era stato specificato, diciamo che la percentuale degli interventi anche prima del 2021 non era del 20% ma decisamente minore.

D 12: secondo te andrà ad aumentare nel prossimo futuro?

Respondent 1: mettendo questa riserva di finanziamenti (min 46) anche i ministeri dicevano che si andrà sempre più verso quella dimensione. Le regioni e gli enti attuatori si dovranno non dico adeguare, ma anche nelle regioni è una cultura che si sta diffondendo che a loro volta però si devono fare promotori di questi interventi da parte dei piccoli enti locali, quindi sono dei passaggi un po' difficili. Diciamo che le competenze non sono sempre così diffuse. Sia i responsabili dei procedimenti dei vari interventi ma anche soprattutto negli amministratori perché se manca la cultura degli amministratori locali, il sindaco vuole la cosa fatto in quel modo o il sistema difensivo che si è sempre fatto e funziona bene così è ovvio che finché non si cambia questa cultura, che si può cambiare solo con la diffusione, interventi pilota, con la formazione sia dei tecnici ma anche degli amministratori. È una tematica che abbiamo riscontrato a livello di alcune regioni che lavorano per settori, quindi hanno

settore di difesa del suolo e settore di qualità delle acque separata. Quando un intervento è presentato da un settore non sempre è stato condiviso con l'altro e diventa più problematico. Non in tutte le regioni è così ma in qualche caso abbiamo riscontrato questa problematica. Se non lavorano loro in maniera sinergica è difficile che l'intervento nasca come integrato. Poi si cerca di farlo diventare integrato che è altro e non è la direzione che deve essere presa per lo sviluppo progettuale di un intervento integrato.

D 13: capito, invece tornando al processo di pianificazione, sono cicli di 6 anni se non sbaglio, volevo capire meglio come avviene e quali enti sono coinvolti. Dalle direttive europee vengono previsti anche percorsi partecipativi, volevo capire se poi si riusciva a dare un effettivo e funzionale coinvolgimento dei vari attori e quali sono quelli che poi partecipano più attivamente.

Respondent 1: gli interlocutori principali sono le regioni, perché le regioni, noi abbiamo per esempio, per il Piano di Gestione Rischio Alluvioni, ci sono misure distrettuali ma la maggior parte delle misure sono regionali e qua si apre a loro volta un percorso partecipativo delle regioni poi si devono fare promotrici e raccolgono le istanze dei vari stakeholder che possono essere consorzi bonifica o enti più o meno piccoli. In ogni caso il percorso partecipativo prevedeva già la partecipazione delle regioni ma anche il coinvolgimento tramite seminari di cittadini, enti ecc, non c'è livello scalare ma si è cercato di raccogliere istanze direttamente.

Respondent 2: i nostri piani hanno ciclo sessennale e abbiamo appena approvato l'ultimo piano che durerà fino al 2027 e già nel 2023 inizia il processo di revisione e aggiornamento. Questo processo porta all'interlocuzione con le regioni, per il settore uno e il servizio dissesto o difesa del suolo invece per il piano acque più il servizio acque e il patrimonio naturalistico e ambientale. Il piano è dell'autorità di distretto ma costruito con le regioni che danno attuazione a quello che poi è definito all'interno dei piani e ci deve essere coordinamento. Prima si parlava di misure, perché nei nostri piani vengono definiti degli obiettivi che poi sono gli obiettivi che sono dettati dalle direttive Europee e poi recepite a livello nazionale. Quindi per raggiungere quegli obiettivi, viste le pressioni presenti sul territorio, vengono definite alcune misure. Alcune vengono attuate direttamente dall'autorità distretto con fondi nazionali, internazionali e fondi propri come misure conoscitive quindi: aumento delle conoscenze, sulle pressioni, sugli inquinamenti, abbiamo progetti in corso su micro plastiche e inquinanti emergenti e nuove forme di inquinamento che non sono ancora note e conosciute e sulle quali investiamo delle risorse per avere un quadro migliore e per capire quali possono essere le minacce future. Poi ci sono misure che vengono attuate direttamente dalle regioni all'interno delle proprie programmazioni quindi anche monitoraggi specifici o anche altri progetti. C'è questo primo coordinamento e viene fatto una sorta di proposta di piano, dopo questa proposta di piano viene condivisa con i vari stakeholder. Ci sono momenti di partecipazione e condivisione diffusa sul territorio e in quel caso partecipano le associazioni di categoria, consorzi di bonifica, associazioni ambientaliste. C'è prima un percorso di condivisione con le regioni e poi con il territorio e gli stakeholder che possono presentare osservazioni e tutti i nostri piani con i commenti vengo caricati sul sito internet e c'è questa fase di osservazioni e di condivisione. Si passa alla stesura poi alla stesura del piano definitivo. Finita la pianificazione poi si ricomincia a fare l'aggiornamento in vista della futura programmazione. Poi un altro aspetto importante di condivisione e di confronto con il territorio è quello che è nato negli ultimi anni con la riserva di biosfera MAB Po grande. Nel distretto sono presenti varie riserve MAB. Lungo l'asta del Po è stata istituita e riconosciuta completando l'iter burocratico la riserva MAB Po grande, che quindi proprio come scopo principale ha questo rapporto uomo-ambiente, la gestione sostenibile del territorio orientata a una valorizzazione delle realtà locali dal punto di vista sia ambientale, culturale e l'aspetto più turistico e ludico. Con i sindaci di tutta l'area MAB che sono 82 comuni lungo l'asta media del Po, è iniziato questo percorso di condivisione e di partecipazione sul territorio e di ascolto, per cui è un processo parallelo ai nostri strumenti di

pianificazione ma è una sorta di “cultural based solution”. È una sorta di aumentare la consapevolezza, la conoscenza del territorio e cercare di lavorare insieme al territorio. Non fare l’ente sovraordinato che è lassù e non conosce il proprio territorio ma è anche un momento che ti ascolto perché chi vive lungo il PO diciamo ha comunque degli elementi conoscitivi e sociali che possono aiutare a programmare e pianificare meglio.

D 14: questa partecipazione avviene tramite protocolli prestabili oppure in modo anche informale? E poi secondo voi funzionano e ottengono risultati soddisfacenti?

Respondent 1: il coinvolgimento durante il processo di pianificazione sì, è un processo che è abbastanza codificato come il passaggio con le regioni oppure l’organizzazione invece nelle fasi finali ma anche fasi iniziali di ascolto degli altri stakeholder. Quindi sono dei momenti che vengono pianificati dalle autorità di bacino e altri dalle regioni. È la norma stessa che stabilisce, come c’è la fase di partecipazione nella VAS, tutti questi strumenti sono soggetti a questa fase di partecipazione, è definito a livello normativo poi la gestione delle fasi viene definita dall’autorità e può essere strutturata. O la gestiamo noi internamento o ci appoggiamo per un supporto a una società che si occupa di comunicazione di processi partecipativi, dipende dalla situazione. Per quanto riguarda il MAB, si è una sorta di accordo, di protocollo di accordo tra comuni, quindi è partito dal territorio, una serie di comuni hanno manifestato questa volontà di creare, sulla scorta di altre riserve MAB, di creare una riserva MAB lungo l’asta media del PO, tutte le fasi non le ho seguite però è stato un processo nato dal basso e è stato chiesto all’autorità di fare da coordinatore, e di rappresentare la segreteria tecnica della riserva MAB. Alla base c’è un raccordo e un protocollo di intesa, e poi c’è tutta una strutturazione e di governance, l’assemblea dei sindaci, il comitato scientifico, c’è un programma d’azione e una sorta di definizione delle priorità e una dichiarazione di intenti ma anche effettive progettualità che si intendono realizzare lungo il Po. Ci sono vari progetti in corso che riguardano il coinvolgimento dei giovani. Si stanno facendo i lavori con le scuole, progetti di valutazione e valorizzazione del territorio. La manifestazione tra sponde è stata una manifestazione per la promozione della connessione dei territori, attraverso una mobilità lenta, come piste ciclabili lungo il Po e collegamenti fluviali, quindi, sì.

D 15: in generale vi sentite di dire che questa cultura della pianificazione partecipata si stia diffondendo o siamo ancora nella fase sperimentale dove questi esempi sono marginali oppure si sta andando in questa direzione con decisione?

Respondent 1: si sta andando in questa direzione anche se...

Respondent 2: nel momento in cui gli amministratori hanno questa consapevolezza, parte anche da loro la richiesta di coinvolgimento e di fare, allora si lavora bene, lì nel PO grande, gli amministratori locali anche di piccoli comuni credono molto in questa istituzione e in questa riserva MAB e investono risorse, vedono che c’è un riscontro nel territorio, si coinvolgono anche gli agricoltori e produttori locali, i giovani. Se c’è sensibilità e consapevolezza allora questi percorsi funzionano bene. Se invece c’è disinteresse, ritrosia, diffidenza questi processi di bloccano. Nei prossimi mesi esploreremo il processo di partecipazione nel progetto di rinaturazione del PO e di sicuro l’interesse è tanto da parte degli amministratori. Partendo un po’ in ritardo ma siamo vincolati dal ministero che è l’ente titolato per la parte comunicazione e partecipazione e dobbiamo seguire le sue direttive, però vedremo. Sicuramente, in merito a quello che ho potuto vedere, è importante che questi processi vengano gestiti da personale competente che riesca, visto che voi siete sociologi, davvero ci vuole per la buona riuscita della NBS integrazione delle conoscenze tecniche, quindi ingegneristiche, idrauliche, morfologica, ecologica, naturalistica, ma poi dopo ci vuole anche creare un po’ di consapevolezza sociale e di coinvolgimento. Alla fine io posso andare a raccontare tutti i benefici per la biodiversità per noi stessi ma ci vuole qualcosa e qualcuno che faccia innescare un meccanismo di consapevolezza,

non so. Manca questo passaggio per la buona riuscita di tutto il processo. Altrimenti ci sarà sempre un amministratore che dirà no io voglio l'argine perché psicologicamente le persone sono abituate così, con l'argine sono al sicuro, se abbasso l'argine "o mamma mia" e quindi proprio questo è un cambio di pensiero.

D 16: legandomi a questo discorso, intanto grazie al riconoscimento della nostra figura, volevo chiedere appunto quali sono le barriere principali, un po' ne abbiamo già parlato e ne sono uscite fuori, barriere alla diffusione delle NBS. In questo caso lei parlava di percezione di efficacia ad esempio. Su questo versante a che punto siamo?

Respondent 1: con enti attuatori il problema è quello, la mancanza di informazione e la mancanza di una cultura condivisa. Finché non ci saranno ma anche banalmente più articoli sul giornale che riportano la buona riuscita di interventi di questo tipo. La consapevolezza che determinati interventi sono già stati sperimentati in Olanda e hanno già avuto un successo. Piuttosto che la formazione dei tecnici ma anche e soprattutto i tecnici, intendo gli ordini professionali e anche gli ordini, non so, degli agricoltori che è un altro grosso problema e grosso ostacolo, le figure dei proprietari dei campi. Poi c'è tutta la partita dei problemi degli espropri per esempio, dover utilizzare terreni che non sono e che non fanno ancora parte del demanio. C'è tutto un aspetto legati agli espropri, e su questo è chiaro che se aumenta la consapevolezza che determinati interventi sono stati già fatti in altri posti, hanno avuto successo e quindi è vero che vedi rinunciare a una parte del tuo campo, però in cambio si ha non solo maggiore sicurezza ma anche un ambiente più vivibile, uso questo termine non troppo corretto, però intanto puoi aumentare un valore, il valore della restante parte dei propri campi e proprietà perché ci può essere aumento di un valore legato a un uso turistico anche, per esempio. Se si diffonde una consapevolezza che per andare avanti piano piano e riuscire a forzare i tempi si può con seminari, convegni, portando dati. Quello che cercano gli amministratori sono i dati, se è stato fatto in questo modo e ha avuto successo e perché, oppure si sottolineano queste criticità che possono essere risolti in alcuni modi.

D 17: Invece incentivi anche più diretti?

Respondent 1: un altro importante strumento potrebbe essere quello dei contratti di fiume per aumentare la consapevolezza perché è un luogo dove si mettono insieme conoscenze e stakeholder, che vede coinvolti vari attori, in primis gli amministratori locali che portano i loro problemi e si aspettano determinati tipi di risposte e può essere un incontro proficuo da questo punto di vista.

Respondent 2: bisogna lavorare molto ed è importante il vostro ruolo sull'accettazione degli interventi. Mi era capitato di partecipare a un incontro di gemellaggio, con un progetto europeo che si era svolto in Olanda dove vengono effettuati degli interventi di riconnessione fluviale, room for the rivers. Questo grande progetto nato 20 anni fa a seguito di una grossa alluvione che aveva interessato l'olanda. Però, nonostante ci fosse stata l'alluvione e grossi danni e c'era più consapevolezza che bisognava cambiare qualcosa, comunque è stato un processo molto lungo e ci hanno messo 10 anni sul mettersi d'accordo su cosa fare e altri 10 per realizzare gli interventi ed è stato fatto un grosso lavoro di condivisione, partecipazione e loro l'hanno definita ingegneria sociale. Questo aspetto che secondo me manca ancora e sul quale bisognava lavorare perché adesso iniziano anche le conoscenze e il nostro impegno deve essere quello di migliorare la diffusione delle conoscenze che stiamo acquisendo anche noi con i progetti pilota che ci forniranno i primi risultati concreti e avremo gli strumenti per andare a dimostratore sul territorio l'efficacia speriamo. O comunque un altro approccio che ci guida in questi nuovi interventi che definiamo approccio adattativo quindi: agisco, verifico tanto che faccio, e se necessario modifico. Anche questa cosa, è logica però a livello di gestione di un cantiere non è semplice. E qui entra il secondo limite quello giuridico amministrativo: secondo normativa degli appalti...

Respondent 1: le varianti non si fanno

Respondent 2: tu ditte che fai tutto al ribasso, hai dei tempi di consegna e se sgarri hai le penali per cui come faccio io ad andare a dire alla ditte: “secondo l’approccio adattativo tu dovresti modificare in questo modo” però sei lungo di un mese, no è inconcepibile, quindi va bene aumento della consapevolezza e diffondere conoscenze e ingegneria sociale ma ci vuole anche una rivisitazione della norma perché non aiuta e non favorisce le NBS. Un altro aspetto che mi è capitato di leggere in un articolo, è che le infrastrutture grigie godono dell’iva ridotta mentre molte NBS non godono delle agevolazioni e anche questo riterrebbe una rivisitazione normativa. Il PNRR ha come milestone la revisione del quadro normativo, quindi per quello che possiamo stiamo lavorando anche in questa direzione, noi il nostro rapporto lo abbiamo con il MITE, appunto per adottare questo aggiornamento normativo che vada nella direzione di agevolare le NBS e non di ostacolare con paletti burocratici e giuridici. Un’altra cosa importante è che stiamo sperimentando con il PNRR il discorso delle aree demaniali, lungo il fiume, che sono dello stesso. In teoria possiamo intervenire e invece no perché in molti casi le aree demaniali sono state sdemanializzate oppure date in concessione per usi agricoli, usi turistico o venatori. Dal momento in cui voglio intervenire a realizzare un intervento anche se è scritto sulla carta che quell’area, secondo il programma sedimenti che ha previsto l’abbassamento di un pennello e l’apertura di una lanca, mi devo confrontare con l’agricoltore che ha in concessione l’area. Magari con concessione decennale ventennale, e c’è una sorta di contrattazione, bonaria, o di esproprio, quindi un altro appesantimento burocratico che ostacola l’effettiva realizzazione degli interventi che deve assolutamente trovare un’agevolazione, un aggiornamento della norma.

D 18: tornando agli strumenti normativi per agevolare le NBS, a cosa ti riferivi in particolare? C’è qualcosa che avete già presentato o era un discorso in essere?

Respondent 1: nell’ambito del progetto rinaturazione del Po abbiamo gruppi di lavoro. Uno si sta occupando di definire una strategia di azione, sia per quanto riguarda l’aspetto relativo alla gestione delle aree demaniali, espropri, sia per quanto riguarda tutta la massa di proposte per la revisione del quadro giuridico-normativo. Quindi la milestone è per il 2023 o 2024, ci stiamo lavorando ed è un confronto che faremo con il ministero con il quale siamo in fase preliminare.

D 19: Per quanto riguarda le procedure autorizzative ci sembra di capire che non ci sia differenza tra soluzioni grigie e integrate/NBS. Secondo voi si dovrebbe semplificare per NBS oppure comunque è giusto fare tutta la procedura completa?

Respondent 1: c’è il rischio di una semplificazione e che non vengano analizzati tutti gli aspetti e quindi magari che non venga portata avanti veramente come NBS, il pericolo può essere anche quello. Avere due canali differenziati non so se può essere ritenuto valido

Respondent 2: servirebbe un processo più strutturato, ci vorrebbero delle linee guida. Se tu sai che il progetto è già incanalato rispetto a certi requisiti allora si però...

Respondent 1: per la VIA o piuttosto che le nostre valutazioni, o si parla di una semplificazione generale, però anche andare troppo a semplificare si rischia di saltare dei passaggi fondamentali. Spesso vengono presentate come NBS cose che non hanno quella natura. Diventa difficile poi a priori differenziare e dare un canale diverso.

D 20: servirebbe prima una definizione e una codificazione delle NBS? Oppure è difficile che si possano codificare per la loro natura molto locale?

Respondent 1: è chiaro che è una cultura che si sta diffondendo adesso e quindi come dire, ritorniamo sugli stessi temi. Finché non si diffondono e non c’è consapevolezza magari determinati tipi di

approcci non vengono presi in considerazione e si parte sempre da approcci tradizionali cercando poi di arricchire il progetto tenendo conto degli aspetti ambientali in un secondo tempo. Alla fine questi aspetti diventano interventi di mitigazione ambientale o poco più. La problematica centrale è quella.

D 21: in un'ottica storica in che fase siamo nella diffusione delle NBS in Italia: una fase embrionale, nella quale le NBS sono ancora prototipi, incremento stallo regressione? E cosa vi aspettate nel prossimo futuro?

Respondent 2: noi a livello di distretto crediamo che nei prossimi anni, saranno gli anni di sfida e di attuazione delle NBS e di aumento della consapevolezza. A livello dell'unione europea stanno emanando delle linee guida per valutare l'efficacia delle NBS. Quindi tutti strumenti che ci guidano nell'attuazione degli interventi. Noi abbiamo questi progetti pilota e la rinaturazione del PO che saranno un laboratorio a cielo aperto di attuazione delle NBS. Anche speriamo e mi auguro anche in un quadro normativo un po' più chiaro perché anche se uno fa una ricerca su NBS viene fuori di tutto e di più. Quindi anche come autorità stiamo lavorando per definire una nostra linea guida a livello di distretto, cioè cosa sono le NBS per il distretto e come interveniamo e qual è la nostra strategia di intervento. Quindi ovviamente noi ci riferiamo a quelle che sono le definizioni che ha dato l'UE e che ha dato anche la IUCN più orientate sulla biodiversità. Poi noi lavorando con la direttiva acque da noi si parla anche di Natural water retention measure. Tutti concetti che vengono sempre poi nel concetto generale di nature based solution, però secondo me sarebbe importante fare anche un po' di chiarezza su questi aspetti. Magari a livello locale sono già stati fatti interventi e azioni riconducibili a nbs manca forse una visione un po' più globale. Però io sono sempre ottimista. Però la direzione è quella dipendente anche dal fatto che l'Europa sta puntando molto su questi concetti. Poi con la strategia sulla biodiversità 2030 ha sottolineato l'importanza delle Nbs e delle natural water retention measures, ha emanato anche delle linee guida per la rimozione delle barriere, la riconnessione dei fiumi, sono riferimenti importanti.

D 22: voi partecipate anche a quei momenti di partecipazione e consultazione nelle quali vengono redatte linee guide o direttive a livello europeo oppure le regioni o altri enti partecipano?

Respondent 2: a livello europeo le regioni non partecipano a livello europeo alla definizione delle linee guida, noi con autorità di distretto non abbiamo partecipato direttamente, siamo coinvolti in progetti internazionali a volte, come ad esempio il progetto di gemellaggio e di esperienza sulle NBS.

Respondent 1: progetto che derivano dai ministeri però sostanzialmente il nostro ruolo dovrebbe essere anche per le regioni del nostro distretto quello di guida e di orientare gli interventi in una certa direzione.

D 23: Ci era pervenuta questa critica all'assetto istituzionale attuale rispetto a quello precedente nel quale le autorità di bacino regionali e interregionali, che appunto in qualche modo poi rappresentavano i vari singoli bacini idrografici, che nell'assetto attuale questo discorso manca, ovvero esiste l'autorità di distretto che copre un territorio molto vasto e poi la conoscenza vera e propria nel territorio nei vari singoli bacini idrografici è venuta a mancare con la soppressione delle vecchie autorità e questo compito viene assolto non sempre benissimo da regioni e dai comuni. Vi sentite di condividere questa critica oppure in qualche modo? Le vecchie autorità regionali e interregionali avevano una visione puntuale dei singoli e anche minori bacini idrografici...

Respondent 1: nel nostro caso era un territorio molto vasto anche prima, non lo vedo molto centrato sul nostro territorio. Se si parla dei bacini romagnoli, quelli piccoli come il Conca Marecchia, e sicuramente l'autorità conosceva il Conca Marecchia, almeno spero, però già c'erano quelli grossi.

Respondent 2: che coprivano un territorio molto vasto e non c'è stata molta differenza, abbiamo inglobato questo territorio e a livello anche normativo non aveva molto senso avere due strumenti diversi per le fasce... ad esempio.

Respondents 1: poi alcuni erano piccoli ma contenevano due regioni comunque

Respondent 2: io ho l'impressione che erano entità che si autogestivano e che prendevano decisioni in modo autonomo senza poi coordinarsi.

Respondent 1: sì questo invece l'autorità di distretto permette un coordinamento e di omogenizzare gli strumenti di pianificazione e diventa importante. Poi per la conoscenza del territorio è fondamentale e cerchiamo di averla, abbiamo sempre le regioni come interlocutore.

Respondent 2: sono le regioni la nostra voce sul territorio, sono loro che devono far emergere le criticità perché

D 24: poi dicevano che venivano demandate ai comuni delle funzioni che però non sono in grado di assolvere però non mi ricordo bene in questo caso.

Respondent 1: bisogna fare una distinzione perché se si parla del discorso idrogeologico e rischio idraulico ed entra in gioco la protezione civile e lì entrano di mezzo i comuni però sono due aspetti diversi perché noi non ci occupiamo di pc perché a livelli di bacino idro del po ci sono diverse entità, aut ditretto con funzione di programmazione, gestione del territorio, poi c'è AIPO che è un'agenzia interregionale, il vecchio magistrato per il PO che si occupava della parte idraulica e della pulizia idraulica. Di interventi sul territorio, di cura delle opere idrauliche, realizzazione delle arginature, tutta la parte legata alla navigazione fluviale. Prima quando c'era il magistrato per il PO e il genio civile era una gestione ministeriale poi con la riforma era stato dato alle regioni e le regioni che gravitano sul PO hanno deciso di istituire questa agenzia interregionale. Quindi è un'agenzia formata dalle regioni, quindi il presidente è a turno l'assessore regionale, ha una struttura ed è appunto un'agenzia di regioni, Piemonte, Lombardia, Emilia e Veneto. E si occupano proprio di attuazione di interventi e di opere idrauliche e hanno funzioni legate alla pulizia idraulica, poi c'è l'agenzia regionale e la parte di pc regionale e le ex aree tecniche hanno la competenza su tratti fluviali che non sono di competenza AIPO. Gli interventi di PC molti filoni di finanziamento non vengono inseriti in Rendis e quindi non vengono valutati dall'autorità quindi a volte quello che si può riscontrare come aspetto negativo è che non riusciamo ad avere una visione a 360 gradi di tutti gli interventi che ci sono perché non in tutti i casi noi siamo tenuti a valutarli. Quelli della PC non transitano di qua.

Respondent 2: Bisogna anche capire bene a cosa si riferiva l'osservazione

Respondent 1: quello che riguarda le funzioni delegate ai comuni secondo me si parla di Protezione Civile e sempre rischio idraulico però Protezione Civile, legata alle funzioni dell'Agenzia Interregionale.

Respondent 2: adesso mi è venuta in mente un'altra cosa alla luce di questa domanda, un'altra difficoltà e limite, colpa nostra ma su quello stiamo cercando di investire è che spesso sul territorio c'è un po' di confusione. Anche tra gli amministratori locali sul ruolo di aut bacino, ruolo di AIPO spesso vengono confusi, poi c'è l'agenzia interregionale per la protezione civile, ex servizi tecnici di bacino, non è così semplice per chi non lavora direttamente con noi capire come è strutturato il territorio. Ahh l'aut di bac del po "c'è da fare quell'argine" "no noi non c'entriamo" ma quello è anche un limite nostro di spiegare meglio.

D 25: poi questi cambiamenti istituzionali nei vari anni magari non hanno aiutato e speriamo che adesso l'assetto sia stabile per un po' di tempo. Ultima domanda: il discorso per quanto riguarda le NBS, è un

concetto legato molto anche ai servizi ecosistemici, si parla anche di pagamenti per servizi ecosistemici, compensazioni e cercate di spingere anche su queste questioni oppure no?

Respondent 1: abbiamo un filone di attività legata al pagamento dei servizi ecosistemici, non abbiamo ancora grossi esempi perché ancora è un campo piuttosto nuovo per noi.

Respondent 2: Non abbiamo ancora esempi di applicazione pratica, abbiamo visto qualche esempio che era stato fatto lungo il Brenta, molto interessanti, si sta lavorando per altri campi ma non con le Nbs ma con gli agricoltori a riguardo di usi idrici, canoni di utilizzo delle acque. Però siamo ancora in fase molto sperimentale. Non decidiamo noi i canoni e il nostro ruolo può essere quello di definire linee guida o dare prescrizioni perché poi ad esempio tutta la parte dei canoni legati all'utilizzo delle acque viene gestito dai consorzi di bonifica e noi lavoriamo con loro e con gli agricoltori magari per orientare un certo tipo di opzioni e di interventi però non possiamo mettere in campo noi direttamente dei pagamenti per servizi ecosistemici perché non siamo noi i diretti riscossori.

Ringraziamenti e saluti

Intervista 3

Intervista a Respondent 3, Ingegnere naturalista e fondatore di una società che si occupa di ingegneria naturalistica. Intervista effettuata in collaborazione con Teresa Carlone il 13/07/ 2022 in modalità online.

Luglio 2022

Presentazioni e premesse

Richiesta autorizzazione al trattamento dati per scopi di ricerca.

Intervista:

D 1: Innanzitutto volevamo sapere qualcosa sul suo background. Volevamo chiedere da quanto è nel settore e in, di cosa si è occupato all'interno della società e in quali aree geografiche ha operato.

R 1: Io sono 36 anni nel settore. Sono fondatore della che è nata nel 93 ma già prima svolgevo attività nel settore ambientale. In tutta Italia, in quasi tutte le regioni, ho lavorato per circa 300 enti, ministeri, regioni, soprattutto province, comuni, parchi nazionali, aree protette ecc.

D 1.1: quindi ha visto tutta l'evoluzione del settore anche dell'ingegneria naturalistica?

R 1.1: sono stato tra i fondatori dell'associazione nazionale, ho girato i paesi europei quando in Italia non era ancora entrata questa tecnica di ingegneria naturalistica e quindi sono andato a visionare le prime esperienze in Europa. E parlo di 30 anni fa. Poi sono fondatore del centro italiano per la riqualificazione fluviale che è nato circa 25 anni fa e che opera in ambito idraulico, dissesto, corsi d'acqua.

D 2: tornando alle questioni istituzionali volevo chiedere se il sistema che ruota attorno all' autorità di bacino e che ha il compito di mitigare i rischi idro meteorologici, negli anni è migliorato e se possiamo considerarlo efficace?

R 2: c'è stato un cambiamento giuridico e amministrativo. Con la 183 sono nate le autorità di bacino riferibili a entità geografiche del bacino idrografico, poi sono state accorpate in autorità di distretto. Si è fatto un passo indietro dal punto di vista concettuale. Si è persa la connessione tra unità geografica di riferimento di pianificazione, rispetto a quella amministrativa. Da un lato involuzione ma dall'altro accrescimento di dati raccolti e di esperienze grazie anche alla crescita dell'informatica, sono migliorati gli strumenti. Però dal punto di vista politico e amministrativo non c'è stata evoluzione positiva.

D 3: quali sono le problematiche principali? competenze distribuite male, coordinamento tra gli enti, dove risiede il problema principale?

R 3: quello neanche tanto, dipende dalle varie zone, perché non c'è una situazione omogenea in Italia e ci sta molta varietà come sempre sia a livello amministrativo che di conoscenza del territorio. Comunque, i ruoli sono individuabili tra autorità diretto, e regioni in particolare che sono gli enti preposti alla pianificazione e alle autorizzazioni degli interventi ma si sa bene tutti come forse quello che è mancato e continua a mancare è la priorità nella prevenzione. Si è fatto piccoli passi in avanti ma non sufficienti e si continua a intervenire su emergenza. Ormai sono 30 anni di pianificazione ma in realtà non si è fatto grandi passi in avanti. Alcuni sì ma si potevano fare di più perché il problema è rilevante e negli ultimi anni i problemi di dissesto sono aumentati. Non possiamo ritenerci soddisfatti.

D 4: tutto il sistema di pianificazione quindi piani rischio idro, tutela scque ecc non sta funzionando?

R 4: funziona così così e dipende da zone di Italia, da risorse disponibili, il nostro paese è culturalmente, e non si dà sufficiente priorità alla pianificazione e alla prevenzione e malgrado siamo stati tra i primi di Europa con la legge 183 sia stata la più evoluta in Europa allora. Abbiamo iniziato teoricamente prima. Emilia Romagna e toscana sono regioni, e anche la Lombardia, rispetto alla panoramica nazionale c'è una discreta capacità e organizzazione. C'è sempre il problema delle risorse e della cultura di cui parlavo prima e sebbene stiamo facendo dei passi in avanti sono troppo lenti rispetto alle esigenze.

D 5: per quanto riguarda le risorse umane e finanziarie?

R 5: problema di politica da un lato e di conseguenza di risorse finanziarie e forse prioritariamente risorse finanziarie perché se a livello governativo si finanzia non il contagocce anche se ci fosse capacità, come in realtà ormai ce ne è abbastanza a livello tecnico e scientifico ma non c'è a livello operativo. Si fanno dei piani ma rimangono nel cassetto e si va avanti con tempi molto lenti.

D 6: manca la messa a terra finale?

R 6: è carente, qualcosa si fa ma poco, pensiamo alle risorse idriche al di là del dissesto idrogeologico, siamo in una crisi tremenda. Da 30 anni il trend si conosceva ma un piano per le risorse idriche molto operativo bisognava avviarlo molto prima ma siamo ancora lì a pensarci e fare cose spot, parzialmente pianificate. Di fronte all'emergenze e alle situazioni drammatiche sembra assurdo che è più di 30 anni che abbiamo norma di pianificazione importante che evidentemente non ha dato grandi risultati applicativi.

D 7: quando si parla di pianificazione integrata che possa mettere insieme esigenze di mitigazione del rischio e conservazione della biodiversità, risorse idriche, agricole?

R 7: avviene poco, noi come associazione, CIRT, si continua a trasmettere questi concetti e pure questi vengono recepiti culturalmente a piccoli passi, i consorzi di bonifica continuano a fare la loro attività con i canali e corsi d'acqua in maniera tradizionale, tagliando la vegetazione senza tenere conto dei fattori di cui parlava prima. Qua ci sono progetti sperimentali ma dopo 30 anni si continua a fare

progetti sperimentali quando queste cose erano già assodate nel nord Europa 30 anni fa, siamo in ritardo anche nel settore rinnovabili ecc

D 8: non c'è bisogno di sperimentare ulteriormente?

R 8: si sapeva già. Io sono stato in Inghilterra e Danimarca e ci sono pubblicazioni datate più di 20 anni fa e sono perfette, lì c'erano già monitoraggi e noi abbiamo tradotto anche in italiano, abbiamo fatto il manuale di riqualificazione fluviale, abbiamo fatto attività con consorzi di bonifica anche formative, sperimentali però sono passati tutti questi anni e siamo ancora a ragionare su piccole sperimentazioni a fare a sollecitare a fare comunicati stampa e quindi vuol dire che la cosa non è passata. È un problema anche generazionale, la classe dirigente non è ancora cambiata come cultura e mentalità. C'è questa solita staticità che succede in molti cambi in questo paese mentre in altre parti di Europa c'è più dinamicità. Ci sono manager che hanno 30 anni con una specializzazione universitaria che prendono le redini. Qui sono ancora parecchio indietro e ci sono geometri che hanno 60 anni. Sto estremizzando però lo sappiamo come vanno le cose in Italia e molti giovani in gamba vanno all'estero. Questo è una conseguenza che vediamo. Finché non cambia la mentalità è difficile far capire certe cose.

D 9: mi viene in mente che a livello legislativo ci sono alcune provvedimenti che vanno in quella direzione come l'obbligo di investire il 20% delle risorse a interventi integrati. Poi questo avviene oppure anche lì non viene tradotta in realtà?

R 9: qualche volta sì e qualche volta no. Poi cosa vuol dire interventi integrati? non esistono riferimenti tecnici e normativi molto cogenti e dipende come vengono interpretati questi interventi integrati. C'è il concetto purtroppo di inverdimento di opere classiche come ingegneria naturalistica, si fanno opere verdi che in realtà sono opere tradizionali con un po' di maquillage estetico. È tutto il contrario di tutto. Anche lì c'è molta approssimazione. Quello che dicono non vogliono essere estremizzabili, ci sono anche casi positivi e via di mezzo ma la tendenza prevalente è questa. Ci sono sempre questi slogan che l'acqua deve scorrere e che l'ambiente naturale deve funzionare come se fosse un impianto idraulico domestico, come lo sciacquone e tutto deve essere evacuato immediatamente quando il sistema invece deve rispondere alle energie, ai tempi delle varie dinamiche delle varie forzanti di deflusso e deve riuscire a dissiparle perché altrimenti significa solo spostare il problema a valle e incrementarlo.

D 10: Per quanto riguarda questioni costi-benefici anche a livello economico, l'ingegneria naturalistica e NBS sono competitive rispetto a soluzioni tradizionali?

R 10: In molti casi le cose hanno un contesto applicativo differente. L'ingegneria naturalistica non può sostituire completamente le tecniche tradizionali. In alcuni casi non c'è alternativa qualora si debbano applicare. In una città come Firenze ci passa il fiume dentro e lì non si può utilizzare l'ingegneria naturalistica. Togliamo questa fetta esclusiva. Ci sono molte situazioni intermedie dove invece l'ingegneria può sostituire o integrarsi e poi ci sono soluzioni opposte nelle quali l'ingegneria naturalistica può fare la parte del leone e può essere decisamente preferibile ovvero dove c'è dinamica morfologica e l'ingegneria tradizionale non funziona bene. Tutti questi casi in cui si può occupare tendenzialmente costa meno. Magari richiede più manutenzione nel medio termine e più specificità. L'ingegneria tradizionale è più standardizzabile. Un muro in cemento o un gabbione si fa sempre nello stesso modo mentre nell'altro caso, la vegetazione va studiata il caso specifico, il clima il sito e il contesto applicativo. Ci vuole più investimento intellettuale e meno investimento hard in energia, materiali e strutture artificiali e questo vuol dire due cose importantissime: la prima, che si investe in mano d'opera e quindi conseguenza positiva perché si dà più lavoro e la seconda molto negativa per le opere tradizionali perché l'impatto ambientale è molto maggiore e si consumano le risorse. Aspetto

ancora più significativo dal quale dipende poi l'evoluzione culturale e applicativa di queste tecniche che è quello del business. L'ingegneria tradizionale è più legabile a un business perché occupazione non è un gran business controllabile da grosse strutture, società o soggetti portatori di interesse. L'ingegneria tradizionale è come impiantistica energetica, centrale termica, cioè sono investimenti concentrati, più legati a materiali perciò dietro c'è maggior business in tutte le varie fasi della filiera in particolare quella del mercato di materiali standardizzabili.

D 11: Quindi non si è ancora creata quella rete di aziende che agiscono in modo naturalistico e che possano anche agire da lobby?

R 11: in realtà ci sono ma è una lobby più debole perché la lobby degli operai e dell'occupazione non è così forte come quella del cemento. È molto più importante e controllabile la lobby sui materiali, le provvigioni dei materiali. È più facile da progettare e eseguire perché è standardizzabile. Per l'altro bisogna prendersi la responsabilità. E progettazioni più complesse che richiedono magari più tempo quindi non fa comodo cambiare la situazione come quella dell'edilizia che è un grande business e una cosa alternativa che riduca questo business è difficile che ce la faccia. Questo motivo è ancora più importante rispetto a quello culturale per cui non si cambia e non ci sta questa tendenza virtuosa a un cambiamento che ora è modesto perché schiacciato dal business delle opere tradizionali.

D 12: Se non ho capito male con le NBS non si può usare un'economia di scala e quindi magari ne risente anche la grandezza dell'azienda e quindi anche il peso politico?

R 12: le opere pubbliche tradizionale lo sappiamo, quando va bene sono in mano a società pesanti dal punto di vista contrattuale, Confindustria, le società dell'edilizia e dell'ingegneria civile che fanno strade autostrade, dighe, opere idrauliche hanno un peso economico politico, sociale notevole. L'Ingegneria naturalistica sono cooperative forestali e per quanto posso essere attrezzati sono delle formiche rispetto agli altri. Questo nel mercato legale poi purtroppo nell'edilizia, abbiamo visto quanti processi nelle grandi opere c'è anche molta illegalità. L'Ingegneria forestale non è mai successo se non qualche errore puntale ma non ci sono stati scandali per milioni di euro che vanno in mano a determinate strutture soggetti portatori di illegalità. Basta guardare come sono andate le cose in questi 20 anni di scandali vari. Con l'eco bonus si parla di truffe per 5 miliardi. L'opera idraulica è un sotto insieme però ha delle logiche simili sempre a livello di imprese e categorie commerciali, poi ci sono anche tante imprese serie, non voglio metterlo in dubbio però è un comparto che più di altri è caratterizzato da certe forme di illegalità

D 13: una soluzione quale potrebbe essere a questo problema di natura economica?

R 13: la soluzione dovrebbe essere politica, partendo da UE che potrebbe dare un aiuto per cambiare a livello politico e culturale dall'alto. Purtroppo siamo in una società di mercato libero e quindi non si può dire da un giorno all'altro questa soluzione è più bella e decidere dall'alto. Siccome dall'alto è molto lento rispetto alle dinamiche del problema che sono urgenti, saranno di più i fatti, come il ghiacciaio della Marmolada, quando avvengo i disastri qualcuno inizia e ripensarci, a capire che certe modalità di intervento provocano dei danni e quindi risvegliano le coscienze. Purtroppo mi pare di vedere che la società risponde dopo gli eventi mentre la prevenzione non è prevalente, la lungimiranza non è prevalente. Cambieranno i fatti gravi che non gli impegni intellettuali.

D 14: a proposito di fatti gravi, collegandoci al livello di rischio che può essere alto medio basso, lei vede che per quanto riguarda l'utilizzo di NBS ci sia una correlazione rispetto a livello di rischio. Per dire NBS si utilizza quando il rischio è ritenuto basso per esempio?

R 14: in alcuni casi sì, senz'altro, è un problema di responsabilità. Oggi l'apparato pubblico a qualsiasi livello che operano in vari strati della filiera che può essere il tecnico il progettista il docente il tecnico

dell'amministrazione pubblica, ci sono delle responsabilità quando si opera. Se si va sul tradizionale uno è più tranquillo. Se succede qualcosa se ne sono fatte a migliaia e quindi non vanno a cercare un colpevole se succede qualcosa su migliaia di casi standard. Lì si sentono con la coscienza apposta, ho operato come sempre è stato fatto. Se invece succedesse qualcosa con approccio alternativo allora si rischia di essere colpevolizzati proprio perché si è fatta una scelta diversa anche se magari è meno rischiosa. Può portare risultati positivi però la preoccupazione è quella, di fare una cosa diversa e quindi di essere tacciato di errore. Uno deve dimostrare perché l'ha fatto e perché era preferibile rispetto alla scelta tradizionale. È un problema in tutti i settori, come nella depurazione delle acque, è un problema di tutti i settori innovativi in Italia, c'è paura. Invece all'estero è molto diverso e c'è più coraggio. Probabilmente anche l'apparato giuridico più intricato ma non solo, atteggiamento culturale sul conflitto molto più sensibile. Chiunque la pensa diversamente e subisce un microdanno mette in campo una procedura legale, spesso e volentieri, siamo bombardati per cui è anche comprensibile che un tecnico dell'amministrazione non sia propenso a prendere scelte fuori dall'ordinario.

D 15: anche perché non sono codificate nei manuali tecnici?

R 15: c'è qualcosa ma non sono leggi, sono manuali linee guida e cose di questo tipo. Non sono così cogenti, non ti obbligano. Chi è che si prendere queste responsabilità? Chi fa questi manuali non si prende la responsabilità di dire si fa così e basta, è tutto un rimbalzarsi la palla per non prendersi la responsabilità quindi nessuno se le vuol prendere e alla fine sono tutte linee guida, consigli, si fanno bei convegni però poi nessuno si dà carico di fare scelte finalmente alternative.

D 16: quindi comunque c'è una percezione di efficacia ancora bassa?

R 16: assolutamente. È difficile, le cose a livello di conflitti e atteggiamenti stanno aumentando, le cose legali diciamo di rivalsa amministrativa, in questo momento è ancora più critica. 30 anni fa quando è nata l'associazione italiana di ingegneria naturalistica tutte le regioni si sono mosse favorevolmente, hanno iniziato a produrre manuali, linee guida, legiucole però poi parallelamente, chi ha vissuto a livello amministrativo negli ultimi 20 anni si sono complesse le procedure giuridiche, sono aumentate molto le sensibilità e le responsabilità, ci sono molti più processi e quindi si è tornati indietro. Nessuno ci sente e queste cose si sono affievolite praticamente e poi si è alzata anche la cresta di tipo imprenditoriale che si diceva prima. Quindi questa cosa che doveva decollare è stata schiacciata. Forse lo vediamo in senso macro è successa la stessa cosa a livello di macro-economica sul consumo. Da anni è peggiorata la situazione in generale malgrado ci fosse già consapevolezza dei cambiamenti climatici, dell'impatto ambientale, energetico, sull'acqua ecc ma in realtà la situazione è andata a peggiorare. È una tendenza negativa di questa fase. Almeno nel mondo occidentale.

D 17: nel processo di mainstreaming delle NBS, adesso siamo in un momento di regressione? Non vede che stanno aumentando l'utilizzo di queste tecniche?

R 17: no, ci sono due cose che vanno in parallelo: una positiva ovvero che queste cose aumentano ma in maniera modesta e non eclatante come sarebbe dovuto essere, dall'altra parte però ci sono dei processi più importanti e più grossi. È come se aumentasse la forza di una controcorrente modesta. Si nuota controcorrente, quindi si aumenta la forza del nuoto ma la corrente aumenta di più e alla fine si va indietro. Per cui aumentano le esperienze positive ma sono minori del processo negativo che sta avvenendo a livello macroeconomico in generale sugli interessi, sul consumo ecc. Può darsi che sia un colpo di coda e non so cosa succederà nel prossimo periodo per quanto riguarda il prossimo periodo dal punto di vista energetico e può essere che ci sia quello che ci darà una regolata che si sperava ci desse il covid. Questi eventi globali potrebbero comportare nell'economia una controtendenza però adesso processo inerziale e un po' voluto di tipo negativo che prevale. Aumentano anche gli eventi calamitosi e di conseguenza si continua a intervenire sull'emergenza.

D 18: per quanto riguarda il PNRR, sembra che sia una predilezione per questo tipo di interventi, poi si punta anche sulla rapidità, quindi nell'implementazione poi rischiano di venire meno o no?

R 18: si fa un po' di pasticcio, qualcosa di buono verrà. Quando arrivano le risorse qualcosa di buono c'è però a pioggia in vari settori però secondo me le azioni virtuose. Alla fine queste risorse vengono utilizzate nel solito modo di operare, infrastrutture, sempre di difesa che lasciano e non determinano un condizione positiva dal punto di vista ambientale.

D 19: in riferimento alla cultura di cui parlavamo prima, si parla tanto di co-progettazione e di co-pianificazione, volevo chiedere se lei vede una maggior propensione a farlo, per esempio nella stesura dei piani pluriennali, avviene questa concertazione allargata, non avviene, partecipano tutti quelli che dovrebbero partecipare, le varie competenze oppure anche li indietro?

R 19: secondo me avviene molto parzialmente e molto poco per vari motivi di complessità giuridica, procedurale, tempistiche, debolezze di alcuni soggetti volontà di altri soggetti a prendere decisioni autonome senza confondersi, mancanza di cultura sulla concertazione, penso ai contratti di fiume. Ci sono forme di concertazione però poi molto poco influenzano sulle decisioni che vengono sempre prese dagli stessi soggetti. Concentrazione di potere e cultura del non condividere per avere meno problemi di disturbo. È molto scarsa questa propensione tranne alcuni settori e alcuni progetti virtuosi.

D 20: contratti di fiume non stanno dando quella marcia in più per processo di mainstreaming delle NBS

R 20: io partecipo a vari contratti di fiume e da anni anche i primi. Senz'altro è una cosa positiva anche dal punto di vista culturale che si scambiano e si parla di certe cose, anche cittadinanza e portatori di interesse c'è finalmente uno scambio di info e di riflessioni e di opinioni che è già positivo di per sé. Poi di lì a passare alle decisioni, l'influenza un pochino c'è ma non è così rilevante e non è così a breve termine. Chi partecipa poi non ha nessuna facoltà di decidere. Poi c'è gente di alto livello a livello scientifico che è frustrata perché non viene presa in considerazione. Il comparto agricolo piuttosto che chi gestisce la cosa pubblica ha la solita mentalità come i consorzi di bonifica. Chi decide ascolta poco.

D 21: voi come IRIS avete partecipato, (min 36) avete partecipato a pianificazione?

R 21: siamo anche firmatari di contratti di fiume abbiamo partecipato a dei processi, la conclusione è quella che dicevo prima. C'è un gruppo e ci si confronta con persone interessanti, in gamba però molto spesso non vengono ascoltati e son tavoli che vanno avanti e che poi fanno molta fatica a farsi ascoltare dai soggetti che pianificano e gestiscono il territorio. Questo distacco. Anche con agenda 21 succedeva in passato, tutte forme di partecipazione belle, piacevoli a volte, raccolte tante opinioni però poi non sono entrate nelle decisioni, Forse hanno cambiato un minimo la cultura e la mentalità però troppo poco. C'è una partecipazione attiva bassa alle decisioni. Anche l'università è sfruttata poco in Italia.

Intervista Respondent 4

Respondent 4 fa parte del Settore Tutela Acque ente regionale. Intervistato in quanto esperto in materia NBS e interessato agli ultimi sviluppi in Emilia-Romagna. Intervistato il 13/07/ 2022 in collaborazione con Teresa Carlone.

Premesse: stiamo portando avanti queste interviste con diversi attori legati al network Operandum che si occupano di mitigazione del rischio e Nature-Based Solutions. L'obiettivo è tracciare una panoramica di questo settore di governance per identificare i meccanismi che lo governano e ricavarne una valutazione dagli attori stessi. E poi valutare come all'interno di questo contesto si inseriscono le NBS, identificare barriere alla loro diffusione e proporre soluzioni per il processo di mainstreaming. Richiesta di autorizzazione al trattamento dei dati a scopi di ricerca. Richiesta accettata.

Respondent 4: richiede materiale e propone successive cooperazioni. Io spesso vengo invitato a convegni a riguardo e mi piace parlare di situazioni reali e potrei includere anche Operandum quindi se voi mi girate qualche slide mi piacerebbe molto fare diffusione, queste cose devono girare. Questo progetto deve rimanere vivo e deve proseguire subito dopo. Devo andare a settembre a questo evento della commissione europea attraverso il taegs per la cooperazione con paesi terzi in Egitto perchè sono terrorizzati dal Sea Level Rise e voglio portare i vostri esempi che secondo me sono validi come impostazione e di ragionamento per l'utilizzo di queste tecniche in ottica di cambiamenti climatici.

Domanda 1: partiamo da informazione sul suo background, da quanto è in regione? Volevamo sapere il suo percorso di formazione e se conosceva le Nbs già da prima di Operandum?

Risposta 1: io sono un geologo costiero laureato all'università di Firenze, nel 1988 con tesi su geomorfologia dinamica dei sedimenti in Sardegna. Ho lavorato in Uni come ricercatore e poi ho vinto borsa di studio negli Usa, master of science per gestione dei litorali. Nel frattempo avevo fatto il concorso per la regione Toscana e mi ero dimenticato, stavo bene in Louisiana, poi mi hanno chiamato in regione nel 1994 e quindi ho sentito la necessità di cercare di sfruttare quello che avevo imparato nel Sistema delle ricerca che aveva investito su di me, per provare ad applicare in Toscana. Dal 1994 in regione e dal 1999 mi occupo della gestione dei litorali toscani. Le NBS le avevo conosciute perché collaboro spesso con progetti europei e soprattutto con Olandesi e Belgi, queste sono tecniche che hanno creato loro. Anche se poi noi nel nostro piccolo e nel nostro sistema di gestione integrata della costa le abbiamo sempre un po' applicata però non siamo bravi come loro a fare marketing. Con un termine come NBS si crea una cosa che sembra nuova ma noi con i nostri vecchi ripascimenti e difesa delle dune le abbiamo sempre fatte. Poi ci siamo rovinati negli anni con ingegneri costieri che hanno riempito le coste di scogliere. Però nel nostro animo, Nbs siamo stati anche noi. È grazie alla scuola nord europea. Io non mi stanco mai di dire che loro hanno applicato le Nbs per necessità. Loro non avendo montagne non avevano possibilità di usare gli scogli. Da noi purtroppo la difesa costiera è sempre stata legata all'ingegneria dei porti. Quelli che costruivano porti negli anni '30 e '40 poi si sono messi a fare difesa dei porti. Qui abbiamo montagne vicino al mare ovunque e poi ci è stato un business di cave, trasportatori ecc. Costruire opere negli anni è stato molto remunerativo per tutta una serie di categorie e quindi se ne paga lo scotto. Nel nostro piccolo in toscana siamo sempre stati abbastanza attenti e io personalmente sono sempre stato un fan di tecniche, per un mio background di geologo, per tecniche che si chiamavano di ingegneria naturalistica.

D 2: queste tecniche erano utilizzate negli Stati Uniti?

R 2: abbastanza, soprattutto in Louisiana dove lì ci sta una situazione simile dell'Olanda, le montagne sono lontane e avendo situazione di delta del Mississippi, loro hanno sempre cercato di utilizzare queste tecniche. Lì la battaglia è dura perché c'è una subsidenza maggiore della nostra e problemi da fiume e dal mare. L'esempio dell'alluvione del 200x di Katrina e New Orleans è l'esempio classico della situazione esasperata di aver costruito una città dove era impossibile costruirla. Forse anche più complicata di Venezia, alla foce del fiume in mezzo al golfo e con una subsidenza pazzesca. Le applicano ma con problematiche maggiori delle nostre.

D 3: dopo questa prima sezione dedicata al suo percorso volevamo passare al discorso a riguardo dell'assetto istituzionale, abbiamo visto come negli anni sia cambiato più volte per quanto riguarda la mitigazione del dissesto e la pianificazione territoriale, quindi dalla legge 183 al codice dell'ambiente, la riorganizzazione che ha visto nascere le autorità di bacino e poi quelle distrettuali, volevamo capire se secondo lei, se ha seguito l'evoluzione di questo processo, come lo valuta e se appunto un sistema un sistema funzionale ed efficace in questo momento.

R 3: le ho viste tutte in questo periodo con momenti più belli e meno belli. La legge 183 è stato un passo molto importante. Da noi poi dopo la legge 183 ha funzionato molto la Bassanini che ha passato la difesa della costa dallo stato alle regioni a fine anni '90 e a inizio 2000 c'è stato passaggio importantissimo, prese tutte le competenze diventate regionali, abbiamo iniziato a pianificare a livello regionale. A inizio 2000 si pianificava seriamente. Si fece un primo piano di gestione, chiamarlo integrato della costa è un po' troppo, quella in Italia è difficile riuscire a farla. Vorrebbe dire mettere insieme turismo attività produttive, infrastrutture ecc e quello abbiamo ancora difficoltà. Però quello era un bel piano di difesa costiera con un'ottica specifica al settore e all'attività turistica delle nostre spiagge. Negli anni 2000 grossi investimenti importanti, la regione toscana con più di 100 milioni di euro che allora bastavano per un bel piano pluriennale. In quel momento la regione toscana ha fatto un passaggio in più. Delegare le competenze alle province. Tutte le altre se lo sono tenuto mentre in toscana no. Regione si è tenuta il coordinamento, noi abbiamo fatto il programma, abbiamo trovato il finanziamento ma poi abbiamo delegato alle province l'esecuzione, ai comuni invece la gestione del demanio. Tutto quello che era legato a attività turistica ricreativa, concessioni e tutto che poi si legava anche agli interventi era diviso ai comuni. Quindi era un bel sistema, non mi viene il nome, il federalismo, si passa dal livello statale a regionale che coordina, le province che attuano, i comuni che gestiscono il demanio. Quando eravamo belli caldi e preparati, prima c'era stato un periodo di rodaggio perché all'inizio prima di questo passaggio si seguiva tutto a livello regionale con università per ricerca e monitoraggio. Quando le province sono diventate mature, hanno creato uffici, hanno investito per crearsi infrastrutture, attrezzature per monitoraggio e efficacia degli interventi, arriviamo al 2015 con legge del Rio che ha chiuso le province. Noi che avevamo fatto i fenomeni con la toscana che fa un passo più degli altri ci siamo ritrovati dalla mattina alla sera che è saltato tutto il sistema. Tutto rientrava in regione e con grosse movimentazioni, anche dovendo, tutti abbiamo vissuto come se tutto quel sistema di prima non funzionava. Io personalmente ho subito diverse difficoltà a livello di gestione della cosa. Questo ha creato ritardo però poi tutte le competenze delle province sono rientrati nella regione e al momento la regione ha rimesso in piedi i vecchi geni civili, che sono per provincia costiera. I geni civili della costa hanno preso le funzioni che facevano le province. Poi è cambiato anche la legge di bilancio, prima si facevano grosse pianificazioni sul lungo periodo e su grossi fondi e si programmava su tanti anni. Ci sta quella nuova legge di bilancio per cui ogni anno si deve impegnare solo quello che si riesce a spendere. Grosse pianificazioni sono andate a morire, si fa un master plan su lungo periodo però ogni anno si devono fare piani realistici. Questo fa sì che si fanno piccoli interventi e quelli che sono già cantierabili si cerca di farli e pagarli entro l'anno perché ci sta questa legge di bilancio. Diciamo che si cerca di fare interventi più piccoli, quindi in questi casi le NBS vanno bene perché grossi progetti tipo quelli che avete fatto voi, ultimo progettone dell'Emilia Romagna con i ripascimenti grossi (min 12) e sedimenti da mare, sarebbe più difficile in questo momento perché è un intervento che necessita più di un anno tra progettazione e autorizzazione e cose varie però interventi di manutenzione e recupero a basso impatto ambientale si riesce a farli.

D 4: adesso in questo momento dopo la riorganizzazione, le risorse umane e le competenze sono sufficienti, e le competenze sono suddivise in modo chiaro e funzionale? Si sta ritornando verso un sistema funzionale?

R 4: sì, c'è stato un periodo di collaudo però in questo momento è già funzionale con il nuovo assetto.

D 5: tornando alla pianificazione, perché non si riesce a seguire la pianificazione a sei anni che viene prevista dai vari provvedimenti normativi?

R 5: mi vuoi vedere licenziato. Potrebbe essere un bene per un cambio generazionale. Si fa questo masterplan che abbiamo creato che ha una scadenza a 5 anni e una a 10 anni. Secondo me bisognerebbe fare masterplan a 50 e 100 anni se potessi dire come la penso. Con il cambiamento climatico e con quello che sappiamo che succede bisogna fare come fanno gli anglosassoni degli scenari a 50 e 100 anni ma sapete meglio di me che con la tempistica della politica da noi bisogna guardare a subito. Però si fa, il nostro master plan ha un pacchetto di interventi e previsioni a 5 anni e 10 anni. Quello che è più difficile sarà superare quello scoglio del finanziamento anno per anno e riuscire a fare degli stralci funzionali per riuscire a realizzare gli interventi strutturali più importanti ma ci stiamo lavorando e ci riusciremo. Si riesce a rispettarlo ma ci vorrebbe cercare di avere il coraggio di fare un po' di più

D 6: mi sembra di avere notato che siano aumentati i finanziamenti nel settore negli ultimi anni, adesso anche con il PNRR.

R 6: è qui che ti volevo, ho trovato un modo per farti inciampare. Il bellissimo PNRR se te lo leggi con attenzione, in tutto il PNRR non esiste la parola erosione costiera. Noi che abbiamo 8000 km di costa e cosiddetto pontile d'europa e con i cambiamenti climatici che ci influenzeranno non c'è la voce erosione. Pensa che alla luce di questo il nostro presidente, aveva lanciato lì un progetto bandiera per poter chiedere il finanziamento a livello nazionale e europeo mettendo l'erosione. Chiamando consapevole di tutti gli stress, l'ha buttata lì, pensando di riuscire a farselo finanziare con PNRR e adesso sta trovando tutte difficoltà perché purtroppo non c'è. C'è la voce rischio idrogeologico ma non c'è la voce specifica erosione costiera. Quindi si cercherà di trovare il modo di. Però era un'ottima occasione per riuscire ad attingere a quei fondi lì anche se i tempi sono stretti perché PNRR vuol dire da oggi al 2026. Solito problema. Già se si riusciva a infilare lì qualcosa di quasi cantierabile però si torna al solito punto, per come la vediamo noi il PNRR non è quello che ci interessa, avere una visione che va oltre però si spera di poter raccattare qualcosa.

D 6.1: nel PNRR confluiscono progetti datati che non hanno questa spinta innovativa, al di là del fatto che ci sono delle grandi assenze nelle linee guida del PNRR, c'è anche un po' la questione che viene sempre utilizzato come strumento per cose innovative, ma in realtà per questioni di tempistiche vengono finanziati progetti datati che di innovativo non hanno niente. Il rischio è che queste occasioni non siano per aumentare e sostenere certi tipi di innovazioni.

R6.1: la penso assolutamente così. Succede sempre così quando arrivano finanziamenti così tra capo e collo. Vengono tirati fuori dai cassetti non solo progetti vecchi ma progetti che sono già a un buon punto e cantierabili. Conoscendo l'Italia con i problemi di tempistica di gare ecc, 5 anni non sono nulla. Si è visto anche in OPERANDUM per fare quei 50 metri di duna cosa si è dovuto soffrire con la protezione civile contro. E tutto per fare 50 metri di salsicciotto. Pensa te per fare un intervento grosso. Finirà così con progetti già a buon livello di autorizzazioni e quelli che abbiamo in mente noi, innovativi e un po' strani non sono quelli che anche con una VIA regionale, che dovrebbero passare liscio perché non hanno impatto, magari troveranno più...non ci sono vie preferenziali per le NBS. Si deve fare la procedura standard, siamo in un'area protetta e si deve fare analisi di incidenza uguale come se si dovesse fare la centrale nucleare.

D 7: anche di fronte a progetti legati alle NBS non si sono dei processi autorizzativi e delle procedure più agili più facile e diverse rispetto a quelle classiche. In che modo questo ha un impatto sull'utilizzo di queste infrastrutture nella pianificazione degli interventi contro il dissesto?

R 7: la domanda è giusta, io cerco di non avere pregiudizi, so di dover fare quegli step, se sto in area protetta la VINCA, e se serve anche la VIA. Io parto dal presupposto che le devo fare quindi cerco di anticiparmi e di presentarlo, spiegarlo. Bisogna lavorare sulla comunicazione sulla partecipazione. È inutile che io mandi progetto già fatto. Bisogna renderli partecipi spiegare perché si fa ecc tanto è un passaggio da fare. Però è sicuro che non ci sta una via preferenziale. Per legge gli interventi per erosione costiera vanno a via o screening di via. Io parto che va fatto, gli va spiegato, l'impatto è quello. Ripascimento con sabbia presa a mare o lungo costa ha soliti problemi con compatibilità dei sedimenti che devono stare nelle tabelle del CES 73 che devono essere di quel colore, comunque si deve passare da lì, perché siamo in un ambiente sensibile fino a un certo punto ma un ambiente sotto gli occhi di tutti. Il mare la spiaggia come interviene ti saltano addosso. Non è come intervenire in Appennino se devi fare una diga o interventi dove non ti vede nessuno. Anche se lavori sulla spiaggia in inverno tutti ti vedono, tutti son esperti, tutti sono tecnici della nazionale e tutti sanno tutto e dopo due giorni arrivare la denuncia perché hai cambiato il profilo della spiaggia, hai cambiato quello, il bambino fa la buca e si buca le mani. Comunque parto sempre dall'idea di fare cose per bene e cercare di spiegarle perché è un casino.

D 8: questo incluso anche all'autorizzazione paesaggistica?

R 8: ci sono linee guida del piano paesaggistico regionale che da tutti le linee e i paletti però un po' ti facilita perché quella è fatta apposta per evitare, utilizzare specie aliene, e noi si cerca di mettere le piante sulle duna autoctone. Chiaramente la fortuna che il piano paesaggistico ci hanno collaborato quelli di NEMO e IRIS che poi erano anche vostri consulenti di OPERNAUDM e che sono anche nostri partner di questo nuovo Horizon. Quindi siamo facilitati però i concetti dentro il piano paesaggistico sono quelli giusti

D 9: per quanto riguarda le procedure semplificate è previsto qualcosa per la costa? Per l'autorizzazione paesaggistica?

R 9: non sono esperto di procedure perché sono tecnico di vecchia maniera ma non credo ce ne siano. Procedure semplificate solo per cose di somma urgenza tipo mega mareggiata. Allora si tagliano tutte le procedure e li puoi fare di tutto e di più. Però per fare cose fatte bene come noi non mi sembrano ci siano procedure semplificate. Però non mi preoccupa tanto questo aspetto perché se si fanno cose fatte bene e presentate bene questo tipo di interventi, sfido chiunque a trovarci un difetto.

D 10: si potrebbe codificare meglio questi interventi innovativi NBS per ottenere comunque delle procedure semplificate oppure comunque bisogna sempre partire dal presupposto che bisogna farla.

R 10: bisogna lavorare non per trovare la scorciatoia. Io sono per la strada in salita nel senso che vorrei trovare il modo per convincere ed educare. La nostra soluzione è la educazione ambientale, i portatori di interesse, i colleghi delle amministrazioni locali, i gestori degli stabilimenti, albergatori e tutti quelli che hanno interesse e sono poi le lobby importanti. Noi si cerca di lavorare per loro e fare interventi a basso impatto che servono a loro e bisogna convincerli. Il progetto da noi a Serparglia, nostro progetto pilota con iris e nemo loro hanno fatto bel lavoro durante il primo intervento finanziato con piano 2003, proprio di educazione ambientale. Parallelamente alla realizzazione dell'intervento erano stati fatti sentieri e cartellonistica che spiegava, incontri sul posto con le aziende che hanno incarico dai comuni di fare pulizia spiaggia per educarli a non usare trattori e a farla a modino. Con i gestori dei servizi balneari e con chiunque per spiegare che questi interventi educare loro stessi al fatto che devono essere loro i portavoce, dell'importanza di questi aspetti. Si è visto l'entusiasmo, i gestori hanno capito certe cose e poi gli si dava le brochure poi quando arrivava il turista anche loro. Questo mi collega un'altra cosa, ci sta un altro progetto su utilizzo della posidonia su smettere di dire che la posidonia è il demonio che va buttata ecc, è un progetto MED europe si chiama posbemed 2, capifila è

la regione Sardegna ma ci ha lavorato alla parte tecnica anche Naturalea. Alla fine è venuto fuori che dobbiamo smettere, che dobbiamo vendere un prodotto che non abbiamo: la spiaggia bianca, liscia perfetta pari e quando arriva il turista vuole trovare questo perché lo vede su internet ecc. Noi invece siamo nel mediterraneo, la spiaggia endemica e naturale ha le berme con sedimenti grossolani e misti anche alla ghiaia e con le banquettes. Anche quelle voi non ce l'avete, le banquettes di posidonia anche alte un metro. La cosa bellissima venuta fuori da un professore francese che non parla più di habitat spiaggia/duna e sistema spiaggia/duna lui lo chiama sistema duna/spiaggia/banquette bisogna superare e fare un passo avanti. La spiaggia non è solo quella emersa che tutti vedono ma duna/spiaggia e spiaggia sommersa. Quella emersa è il 5%. Questo è l'approccio della spiaggia ecologica che è lo stesso di ISPRA ma la cosa avvincente è che non bisogna chiamare l'ecosistema duna/spiaggia perché da noi la banquette è un parte dell'ecosistema e se lo si toglie è un problema, si porta via la sabbia. L'approccio è quella di mantenerla più possibile. Il turista che arriva gli fa schifo. I francesi sono più abituati, da noi invece sentono l'odore, gli fa schifo ai piedi e sentono cose mollicce. La colpa è che noi si vende un prodotto che non è nostro. Bisogna cominciare a vendere il prodotto della spiaggia mediterranea che è fatta da questo sistemino. L'ecosistema non è più soltanto spiaggia duna ma anche spiagge emerse e sommerse, inclusa la posidonia e la banquette che è frutto della posidonia, e del fatto che l'acqua buona che è un habitat, sta lì e lì serve perché di inverno perché ci protegge da erosione, d'estate se proprio non la puoi tenere la sposti alla base della duna o dove la puoi tenere o poi ce la rimetti.

D 11: prima aveva fatto riferimento alle lobby che agiscono nel settore, collegandoci al settore privato, ci sono abbastanza aziende capaci di agire in maniera con ingegneria naturalistica, capaci di seguire un approccio ecologico, si sta creando questa rete di aziende o ancora no?

R 11: io direi di sì, noi siamo fortunati in questo perché abbiamo appunto queste due società toscane soprattutto Iris con Maurizio Bacci. Lui ogni volta che si presenta da 20 anni a questa parte si presenta come il primo ingegnere naturalistico di Italia. Lui è il primo laureato a Milano, trapiantato in toscana, ing naturalistico, noi siamo fortunati che abbiamo avuto lui. Lui ha tirato su questo filone. Almeno due piccole e medie imprese che lavorano specificamente in questo settore ce l'abbiamo. Secondo me poi a catena c'è il terreno fertile per e anche la sensibilità per. (min 9)

D 12: Collegandomi all'aspetto dell'educazione ambientale e della collaborazione tra diversi attori, quella della co-progettazione e della co-gestione sono pratiche che si stanno diffondendo e che sono auspicabili? e quali problematiche vede nell'applicazione

Respondent 4: in che senso? Nel discorso co-progettazione è una cosa super attuale, la commissione europea ci punta molto. Bisogna spiegare meglio cosa vogliono dire questi termini per co-progettazione. Noi per intervento in passato abbiamo utilizzato delle piccole e medie imprese toscane, tecnici esperti in ingegneria naturalistica che hanno fatto progettazione e monitoraggio, noi abbiamo fatto il finanziamento, direzione lavori ma poi anche il monitoraggio lo abbiamo fatto fare a loro. Questo è esempio di co-progettazione ai fini di quello che ci chiede la commissione? Se mi dici di sì allora sì. Per esempio anche il fatto che io in questo Horizon ho insistito perché loro fossero partner e avere la certezza di averli a bordo. In questo caso è stata Rina Consulting che ci ha chiamato e io ho cercato di mettere a bordo sia università toscane ma anche loro perché se poi fai gara pubblica per partner tecnico magari non avrei avuto la certezza. Siccome loro sono bravi e sono toscani mi sembrava giusto cercare di portare parte di questo investimento europeo in toscana e ho fatto sì che loro siano entrati come partner. Però se questo processo è quello che ci chiedono ovvero se co-progettazione vuol dire questo, sì.

D 12: invece per quanto riguarda stakeholder secondari e terziari ovvero quelli non direttamente coinvolti nel progetto?

R 12: questo no ma lo faremo nell'ambito del progetto. Questo è un aspetto importante che andiamo a toccare. Mi viene in mente il processo che sta avvenendo in ER, "che costa sarà", quel processo partecipativo che la regione sta facendo con tutti. Quello che riguarda il contratto di costa e all'interno di questo stanno facendo questo processo dove hanno veramente messo dentro tutti. Poi alla fine da noi purtroppo il processo partecipativo è dominato dai gestori degli stabilimenti balneari perché sono quelli più potenti però loro ci sono e hanno partecipato. Noi nel nostro piccolo abbiamo un tavolo coordinato da assessore all'ambiente anche per presentare interventi e master plan si è fatto una serie di incontri sui territori dove si presentano questi interventi e si prendono info da loro su quelle che sono le criticità e tutto. Devo dire che in tutti questi anni ho partecipato tante volte anche a tavoli di questo tipo però purtroppo da noi rispetto alla filosofia più anglosassone a questi tavoli quelli che la fanno da padrone sono le associazioni balneari mentre quando ho visto e partecipato a cose di questo genere di altri paesi ci arrivano i privati, chi ha giardino e casetta vicino, i pensionati, ci sono tutti perché tutti sono interessati e tutti sono consapevoli che quello è un bene pubblico. Da noi il concetto di bene pubblico, avendo privatizzato la spiaggia, essendo la spiaggia con le concessioni, viene un po' meno. L'approccio di un mondo ideale dove questo aspetto di partecipazione dovrebbe esserci, da noi c'è meno. Le associazioni di balneari ci sono, poi anche chiaramente i gestori delle aree protette, pulizia delle spiagge, però è tutto legato e sbilanciato verso l'aspetto turistico ricreativo della spiaggia. È nella natura nostra che il concetto pubblico e privato è separato, chi partecipa a queste cose, sono faticose, alla fine chi partecipa a queste cose sono quelli che hanno interessi dietro e quindi sono portatori di interesse economico. Comunque sia chi partecipa e ci dedica tempo è chi vuole essere sicuro che da queste operazioni la concessione rimane, il baretto e il chiosco rimane, però bisogna prendere quello che viene. Bisogna anche sfruttarli in questi versi, sono talmente bravi e potenti loro, lo vedi con la Bolkestain. Sono 10 anni che è tutto fermo perché riescono a bloccarlo. Sanno dove andare a battere. Si dovrebbe anche un po' imparare da loro.

D 12.1: volevo completare la riflessione sul fatto che la partecipazione rispetto alla tutela del bene comune è complicata anche in contesti maggiormente vissuti come gli spazi urbani e diventa difficilissima quando si parla di ambiente, e soprattutto ambiente naturale in spazi adibiti a turismo ecc. i gruppi di interesse sono amministrazione e chi ha interesse economico che può anche essere di pregiudizio ad alcuni tipi di progetti. Intanto non ho trovato riscontro per il processo partecipativo in EM sul contratto di costa

R 12.1: provo a girarti da montanari, news della piazza che costa sarà, esisti consultazione Gidac, secondo me hanno fatto un lavorone. Avrà i suoi problemi ma è un bel percorso durato tanto diviso per province. Era aperto anche alle altre regioni ma poi non c'erano più posti. Mi sembra un bel lavoro. Anche lì alla fine ci sta questo bias orientato verso i portatori di interesse economico piuttosto che generico.

D 13: tornando alla pianificazione, si riesce a fare in modo integrato? Tenendo insieme mitigazione e conservazione biodiversità, ha notato cambiamenti negli ultimi anni?

R 13: la realtà è che è la cosa più difficile, il mio settore tutela acqua del territorio e della costa e fa parte della direzione difesa del suolo e protezione civile, e facciamo un piano di difesa della costa legato alla protezione civile e quindi al rischio. Quando nel periodo precedente pre 2015 e della chiusura delle province ero in settore che era nella direzione ambiente e si chiamava tutela acque e dell'ambiente marino costiero ed era una cosa meravigliosa. Lì si facevano piano di difesa costiera ma anche qualità acque di balneazione ed era un po' più integrato. Oggi lo è un pochino meno perché il piano che noi si fa, ci saranno dei momenti in cui si incrociano, nasce un po' svincolato quello che è.

Nelle linee guida io la parola NBS e la parola EBM ecosystem based management and approach ce l'ho messa 200 volte, in Italiano Inglese ecc, cercando di far capire e di concentrarci, di fare e credo

che questo sia un passo avanti, ma all'atto pratico il nostro piano viene valutato da chi poi si occupa di habitat e aree marine protette. Ci sarà un momento in cui si dovrebbero passare in giunta e ci sarà un approccio più, ma diciamo che è uno scoglio difficile quello di fare gestione integrata della costiera. È un bel sogno ma prima o poi ci si riuscirà. È già un passo avanti oggi, io sono un fan di questo tipo di cose e nelle nostre linee guida per la progettazione ce le ho inserite più volte. Il concetto numero 1 è il concetto che di per sé la spiaggia è l'opera di difesa migliore e bisogna concentrarsi su questo.

D 14: la norma che prevede che il 20% dei finanziamento deve andare a questo tipo di opere integrate sta funzionando oppure no?

R 14: non sapevo neanche dell'esistenza di questa norma ma noi nel 20% ci stiamo. Soprattutto per il fatto che si devono facilitare interventi più piccoli e più facilmente gestibili si va in quella direzione. Noi si è messo priorità a interventi morbidi e quindi ripascimenti artificiali e ricostruzione della duna, al limite ripascimenti protetti con opere a basso impatto ambientale utilizzando geotubi e geotessuti invece che scogli, comunque nel 20% ci siamo. Diciamo che in quella direzione ci si sta andando.

D 15: per quanto riguarda l'accettazione e il mainstreaming delle NBS, secondo lei a che punto siamo? Regressione, incremento stallo? guardano al caso italiano e al nostro

R 16: come accettazione siamo in incremento e in fase positiva grazie a questi progetti di cooperazione territoriale, devo dire che trovo che siano un canale, intanto di apertura di collaborazione. Noi ci siamo conosciuti grazie a un progetto europeo altrimenti manco ci si vedeva. Io ho fatto di tutto per venire a vederlo altrimenti non ci si incontrava a Bologna. Lo sforzo della commissione va messa alla luce del sole che ha un effetto anche se questi progetti a volte rimangono nei progetti e non ci sta capitalizzazione però il fatto stesso che si creano queste reti e questi scambi è già molto positivo. La mia risposta è positiva. Poi bisogna spiegare meglio il concetto di mainstreaming perché ognuno da un'interpretazione diversa. Potete spiegarmela meglio.

D 17: intendiamo il momento in cui questo tipo di interventi diventano lo standard, quindi una pratica diffusa e processo di normalizzazione, di diffusione di utilizzo, non solo di conoscenza ma anche di pratiche di utilizzo e come queste infrastrutture vengono scelte in modo non per prototipare ma anche sulla base dei risultati prodotti dei progetti, forme un po' più strutturate di intervento.

R 17: finalmente ho capito, passare da qualcosa di nicchia, di prototipo a qualcosa di più diffuso? Quindi il fatto stesso che noi l'abbiamo usata un piano del 2003 già utilizzata e monitorata, purtroppo non ben mantenuta. Queste NBS sono fantastiche ma se non si fa manutenzione, poi la natura se le riprende. È anche vero che, come dice Bacc, anche senza manutenzione la natura se ne riappropria, nessuno se ne accorge e il risultato comunque lo hai ottenuto e questo è un principio fantastico. Poi la staccionata che delimita la duna e fa sì che tutti non ci vadano a camminare sopra, il cartello che avverte che se cammini la vegetazione muore o i sentieri delimitati che fanno sì che non tutti scavalchino la duna. Se non fai manutenzione il finanziamento in parte ha perso la sua funzione. Stanno entrando nella progettazione standard però non bisogna stancarsi di investire sul monitoraggio e sulla manutenzione. Anche sull'appropriarsi, in questi contesti particolari di aree protette dovrebbe essere poi ente gestore del parco a sentirsi poi il custode no. Il concetto di custode bisognerebbe diffondere, troviamo un nome inglese, quello che noi gli si da il nostro progetto che nasce da un progetto lontano e poi una volta realizzato si da in custodia agli utilizzatori, ai gestori, che poi dovrebbero cercare di mantenere sempre con fondi pubblici, però è importante trovare chi poi mantenga e lo senta suo, ti informa quando c'è qualcosa che non va. Arriva la mareggiata che la rovina. Però la risposta può essere solo positiva in questo caso.

D 18: tra colleghi tecnici e politici c'è una percezione che queste NBS siano efficaci? Sta aumentando questa percezione?

R 18: tra i tecnici si, politici io non li vedo più e non saprei rispondere. Poca stima e poca fiducia però penso di sì. Dovrebbero.

D 19: con autorità di bacino che rapporti avete? Nel senso in quali fasi vi interfacciate?

R 19: direi buoni, anche lì ci sono state diverse fasi, adesso l'autorità distretto appennino settentrionale, con Liguria e parte del Lazio. Abbiamo fatto recentemente accordo di programma per gestione dei sedimenti per noi fondamentale. Quindi direi ottimo. Io ho avuto bellissimo rapporto quando c'erano autorità di bacino regionali e interregionale. Io facevo parte dei comitati tecnici del bacino interregionale del Magra e collaboravo con quello interregionale del Fiora ed essendo la Toscana a cavallo tra Lazio e Liguria era fondamentale i rapporti che avevamo con questi bacini regionali e interregionali ma anche lì è saltato tutto e si è ricominciato tutto da capo e adesso con i distretti si sta riprendendo un po' di..., adesso sta migliorando. Purtroppo, gli uffici estremamente operativi del Fiora e del Magra erano anche una fonte di dati enorme ma sono stati smantellati. Però adesso con l'autorità di distretto si è iniziato un percorso interessante di collaborazione ai fini della gestione dei sedimenti. Quindi il coordinamento sta funzionando.

D 20: ultime domande, se appunto questo sistema è in grado di adattarsi in modo rapido e innovativo, di assorbire queste innovazioni e cosa che lo rende più statico e meno propenso al cambiamento? Le vengono in mente altre barriere? Tra aspetti culturali, economici, quadro normativo?

R 20: per prima la questione culturale e di educazione ambientale e di trasmettere questo concetto e poi quello del fatto che non abbiamo alternative, anche sul lungo periodo. Con CC e innalzamento non ci sono grosse alternative tra pensare ad arretrare e ad applicare, educare le persone e pensare alla questione dell'arretramento strategico, creare spazio e sedimenti, quello del concetto del progetto Erosion del 2002 e poi applicare il sistema, tecniche di adattamento, *NBS e eco based*, ti permettono di agire in tempi rapidi in caso di accelerazione di eventi estremi dovuti alla crisi idrica o riscaldamento perché sono elementi che hanno procedura autorizzativa più rapida e leggera. Anche nel futuro sono quelli che dovrebbero prendere il sopravvento. Se dobbiamo intervenire in tempi rapidi a trovare soluzioni. Perché è più resiliente e più elastico.

D 21: anche a livello operativo?

R 21: sì. Anche se non ci sono procedure semplificate però per loro natura sono più snelle. Dal momento in cui si fa il mainstreaming e diventa pratica ordinaria secondo me bisogna andare in quella direzione lì. L'alternativa è far capire che non c'è alternativa. Non si può fare un muro per tutta Italia e il MOSE allo stretto di Gibilterra. Proviamo a tenere in vita questo gruppo e questo network, partnership, voi come Operandum che seguite l'evoluzione del nostro progetto per vedere anche se. Poi cerchiamo di vedere nei giorni prossimi questa questione delle slide per far vedere questa cosa vostra. Devo pensare agli egiziani che stanno molto indietro. Devono pensare di fare i loro piani di adattamento ai cambiamenti climatici e delle pianificazioni volevo dargli qualche parola chiave.

D: invito alla Summer School e ultimo incontro del forum.

Respondent 4: entusiasta e molto volentieri se ci sono Arpa Emilia Romagna e gli altri stakeholder.

Ringraziamenti e saluti

Intervista 5

Il rispondente 5 è presidente di un'associazione ambientalista. Intervistato il 07/10/22 in modalità online.

Intervista:

Premessa: stiamo chiudendo questo ciclo di interviste con gli attori che si occupano in prima persona di mitigazione del rischio con lo scopo di chiarire come è composto questo sistema di governance, perchè da esterni non è semplice capirlo, e poi quali meccanismi lo governano, per poi darne una valutazione dagli stessi attori che ne fanno parte. Inoltre ci interessava capire in questo contesto come le NBS si inseriscono, e quali sono le barriere alla diffusione di queste soluzioni all'interno di questo sistema di governance. I risultati di queste interviste servono per il mio progetto di ricerca di dottorato e con D 2 stavamo valutando come ricavarne una pubblicazione e vedere come queste informazioni siano spendibili all'interno di Operandum e i documenti che stiamo preparando.

R: possono chiedere un gossip con chi avete parlato dell'autorità di bacino e AIPO?

D:

R: solo perché in realtà io sono abbastanza fresco qui e sono nella situazione in cui ho alcuni circoli territoriali che mi chiedono dobbiamo fare un sacco di azioni sulla gestione dei fiumi in generale e quindi stiamo cercando di agganciare sia autorità di bacino che Aipo. Però si è un'operazione abbastanza difficile e stavo cercando di capire anche nel momento in cui poi ci sono questi incontri di alto livello poi effettivamente con chi ci troveremo a interfacciarci. Ci piacerebbe che fosse sempre il direttore generale dell'AIPO e il segretario dell'autorità di bacino ma temo che sia una cosa abbastanza irrealizzabile.

D 2: questi sono risultati di anni di martellamento e D ha scritto mille mail, molto utile è stato l'incontro che abbiamo fatto per la summer school e il field trip che ci siamo incontrati. Noi insomma abbiamo agganciato in una prima fase degli stakeholder che erano fortemente interessati al progetto e quindi hanno seguito, altri per altre ragioni non sono stati coinvolti nel progetto fin dall'inizio sono stati più difficili da intercettare però una volta intercettati poi è andata bene e non ho visto ostilità.

D: ah e per AIPO

R: ah si lui lo conosco.

Richiesta autorizzazione trattamento dati e autorizzazione a registrare l'intervista.

Domanda 1: volevamo iniziare chiedendoti qualcosa in più sul tuo percorso e il tuo background, come sei arrivato in Legambiente e la tua expertise

R: il background a livello di formazione, io ho studiato Fisica prima a Modena e poi a Bologna, ho conseguito una magistrale in Fisica applicata con una tesi su dati di qualità dell'aria e dati per addestrare algoritmi di machine learning basati su dati meteorologici quindi cercare di ricostruire il link statistico e non tanto quello più causale tra i dati della meteorologia e della qualità dell'aria. Attualmente sono Presidente di....., responsabile del settore Scienze ambientali per future education Modena che è un'azienda che si occupa di formazione rivolta alle scuole. Mi occupo di formazioni insegnanti nell'80% del mio tempo e questo è il percorso. Sono arrivato in dopo un percorso di volontariato e attivismo dentro ai partiti e sono passato all'associazionismo e sono stato e sono tutt'ora presidente del circolo di Modena di e ho iniziato lì la mia attività dietro l'associazione. Poi di fatto sono stato coinvolto nella segreteria regionale di nel gruppo ristretto che si occupa della guida politica e da gennaio sono stato eletto presidente. Diciamo che il percorso è stato questo. L'ultima sull'expertise, mi trovo in entrambi i lavori a fare un po' di tutto nel senso che sul dentro il

future education modena mi occupo di progettazione di percorsi didattici e percorsi di formazione originali quindi non basati sui programmi didattici ma basati sulla ricerca più attuale. Dei temi che volevamo trattare era proprio quella delle NBS, poi adesso ci siamo un attimo fermati perché ci sono delle urgenze che colonizzano l'agenda ma in futuro spero di avvicinarci a qualcosa di quel tipo. Sfrutto ampiamente la mia laurea magistrale che mi ha dato molte basi di analisi dati e cerco di contribuire il più possibile anche se non direttamente ho responsabilità in quel senso nelle due attività. Per la presidenza implica attività di PR, di contatto con la stampa, tutto quello che è il contatto con soggetti esterni sia di livello istituzionale che non e poi in realtà anche lì c'è un po' un miscuglio di cose e per esempio oggi pomeriggio vado a dare una mano a pulire un parco a Parma.

D 2: quindi comunque hai interazioni con il mondo della mitigazione del rischio?

R: Questa è un'ottima domanda nel senso che chiaramente noi abbiamo la varietà di temi che trattiamo e io in particolare arrivando adesso alla presidenza regionale, mi sono trovato in mezzo a una temperie che è molto orientato sul tema dell'energia. Quindi energie rinnovabili, risparmio energetico, chiaramente per questioni molto di geopolitica e l'interesse dell'associazione a influenzare quel tipo di dinamiche quindi diciamo che per ora almeno il 50% delle attività è legato a quel tema. Dopodiché ci sono tutti gli altri temi che in teoria sono ugualmente importanti tra i quali il tema della mitigazione del rischio e adattamento ai cambiamenti climatici rispetto al quale, per così dire, non siamo direttamente coinvolti dentro a strutture organizzate; anche se riteniamo che esistono delle strutture come ad esempio l'osservatorio degli usi idrici che c'è dentro l'autorità di bacino che coinvolge sia istituzioni che soggetti di rappresentanza in cui oggettivamente, non ho ricostruito, però ci starebbe che l'associazione partecipasse a quel genere di tavoli. Ora non è così e infatti la prima interlocuzione che avremo con il nuovo segretario dell'autorità conterrà anche questa richiesta di consultazione rispetto alla nostra partecipazione a quel tavolo. Dopodiché io personalmente mi sono trovato sempre come attività in a partecipare all'interno di tavoli di stakeholder in un paio di progetti europei, nei quali il partner era il comune di Modena che sostanzialmente agivano sui temi della mitigazione e dell'adattamento al cambiamento climatico. Quindi in quel contesto ho avuto modo di interagire con le istituzioni. Non erano tavoli politici ma tavoli di progetti europei e quindi il tema era la ricerca e la sperimentazione. Quindi si diciamo che adesso anche tramite la summer school di Operandum lo scopo era quello di avvicinare altri soggetti che si occupano del tema ed è un discorso in fase di inserimento. come associazione chiaramente cerca di interessarsi e tutto quello che capita a livello nazionale sulle questioni dei piani di adattamento e scala nazionale a livello regionale, non abbiamo avuto richieste specifiche per piani di adattamento, però certamente è qualcosa che ogni tanto ritorna. Adesso c'è un piano che adesso parla di adattamento all'interno della regione, che è venuta prima che io diventassi presidente e che non ho seguito e ho trovato citato dentro l'ultimo documento del piano energetico che la regione sta discutendo in queste settimane. Diciamo che in quel senso cerchiamo sempre di sollecitare la regione a trovare sinergie tra i vari piani, spesso tra quelli di adattamento, avviene, non dico che passi in secondo piano, però nel discorso pubblico spesso viene relegato a episodi estremi per cui c'è un danno economico e una questione di persone ferite o decessi. Diciamo sulla mitigazione c'è un discorso pubblico che è costante, martellante e diciamo anche per il suo appeal rispetto al tema dell'adattamento.

D 3: su questo vedi anche un'inversione di tendenza? Sul discorso adattamento e l'impressione che piano piano si stia inserendo sempre più all'interno del dibattito pubblico e politico oppure ancora no?

R: L'impressione è che le politiche di mitigazione sono più carine nel senso che tu vai a piantare alberi e sei il salvatore della patria a livello di cronaca e di come compari anche mediaticamente. Perché è un'attività che fino a qualche tempo fa non aveva particolari ostacoli. Penso a quello ma ci sono altre forme di mitigazione che hanno un impatto economico notevole, però quando si parla di mitigazione

in tantissimi parlano di alberi e il dato che ho sempre osservato è quello. Dopodiché per quanto riguarda l'adattamento, l'opinione personale, anche se non ho mai avuto occasione di approfondirla, è che si tratta di misure che, interessando comunque tante volte delle aree che sono già utilizzate, per qualsiasi misura che sia una misura in ambito rurale, urbano, in realtà diventa uno degli interessi conflittuali nell'uso degli spazi per cui non è un argomento tanto appealing. È sempre e comunque qualcosa da negoziare e dove non si troverà un accordo totale dalla misura più scema del tetto verde, che ha dei problemi di gestione in ambito condominiale, e il conflitto è relativo, a delle misure nella quali si parla di gestione fluviale, quindi usare degli ampi spazi per la divagazione delle acque; e lì c'è un interesse economico più forte quindi sono, secondo me, a livello di dibattito pubblico questa preferenza per tutto ciò che sembra positivo e che non danneggia nessuno. Poi in realtà l'appendice della cronaca recente è che anche le misure e le operazioni di messa a dimora degli alberi adesso stanno rallentando perché stanno finendo gli spazi liberi, per cui ci si interroga su dove si può andare a parare per raggiungere gli obiettivi della regione.

D 2: in realtà per aggiungere complessità bisogna anche ragionare, queste misure sono molto d'accordo con la tua analisi. Queste misure molto spesso non sono neanche risolutive dei problemi, ma legate a una simbologia di azioni che vanno a mitigare e che hanno un impatto di storytelling di attenzione. Sembra che le istituzioni hanno una grande attenzione ma ci sono degli studi che dimostrano che tutti gli alberi non hanno la stessa capacità di tenere gli agenti inquinanti, la biodiversità ecc. In termini anche di consapevolezza e di awareness e fare un ragionamento nel quale questa complessità è restituita e sfondare il muro del disinteresse e dalla non conoscenza.

R: adesso non ho un'ottica così di dettaglio su Bologna ma è vero che in giro per la regione c'è questo genere di reazione, diciamo così. E poi in realtà io non conoscendo Bologna ho in mente tante situazioni, parlando con gli operatori che operano nel campo del verde, lo sto facendo in questi giorni, si parla di situazioni in cui l'albero viene rimosso per comodità. Perché deve essere mantenuto, che rottura di scatole, lo tiro via e faccio prima. Io vedo tante volte questo lato della medaglia soprattutto nelle città dove c'è un tema di spazi e chiaramente il conflitto poi è inevitabile perché non riesci a fare altrimenti e mi fermo.

D 4: volevo chiederti se come Legambiente partecipate al processo di pianificazione tramite quei momenti di consultazione previsti anche dalla norma? Parliamo di pianificazione territoriale quindi PAI, PGR, ecc

La risposta è non lo so nel senso che sicuramente si in passato e da quando sono presidente in realtà, essendo piani già approvati non se ne è ancora discusso. Piano tutela della acqua della regione forse, dovrebbe essere in fase di riscrittura però su quello non abbiamo ancora avuto un invito specifico. Noi siamo dentro il patto per il lavoro e il clima, questo tavolo regionale in cui i soggetti principalmente delle associazioni di categoria in ambito imprenditoriale e sindacati. Poi siamo stati aggiunti noi negli ultimi tempi hanno per dire un accesso privilegiato a tutti i processi di discussione, e della pianificazione regionale. Accesso privilegiato vuol dire che veniamo informati con un incontro ad hoc, tendenzialmente, dopodiché a livello di modalità di intervento c'è sempre la modalità classica delle osservazioni previste dalla normativa e talvolta abbiamo la fortuna di trovare degli uffici disponibili a interloquire al di fuori del momento formale delle osservazioni per cercare di intendersi meglio. Per le osservazioni, essendo un processo fatto per iscritto non è un processo così immediato, come comunicazione è anche dal punto di vista delle intenzioni che spesso hanno un peso molto grande all'interno del messaggio che viene trasmesso oltre ai contenuti. Da questo punto di vista ci aspettiamo che venga aperta una discussione che per ora non c'è stata opportunità di parlare di mitigazione del rischio, gestione delle acque ecc. Però si interveniamo, la risposta è sì.

D 5: nei contratti di fiume invece avete qualche esperienza?

Come regionale no perché si tratta tendenzialmente di, come vengono? Forme di tutela? Non so sotto che denominazione possono essere inserite però è qualcosa che viene deciso a livello locale e sono i circoli locali che talvolta promuovono e talvolta partecipano. C'era un caso specifico che però, sul Trebbia, di cui me ne aveva parlato il circolo di Piacenza ma sul quale non ho dei dati puntali. Perché noi non partecipiamo direttamente però se può essere interessante li recupero.

D 6: in generale ti senti di definire questo sistema a livello di inclusività e poi di ascolto del territorio, sentite poi in questa serie di processi di avere voce in capitolo, le istituzioni poi recepiscono quelli che sono gli input? Oppure notate una chiusura? Qual è la tua impressione?

R 6: Da persona che per ora li ha visti solo tangenzialmente, sul tema della gestione delle acque, se si parla soprattutto che stiamo andando a parare li dalle domande che mi fai. C'è sicuramente una struttura codificata che consente la partecipazione dei soggetti, ci sono in generale, in realtà nel settore dell'uso del territorio, alcuni interessi che tendenzialmente vengono, sono rappresentati, ma che hanno una voce in capitolo molto forte. Penso al settore agricolo in particolare, che anche per come è strutturato il sistema di gestione, ad esempio nei consorzi di bonifica tende ad avere un controllo che per quanto mi è dato sapere dalla mia esperienza è molto forte. Questo non vuol dire che la partecipazione non sia possibile. La cronaca degli ultimi mesi, mi riferisco in particolare alla siccità e alla gestione dell'emergenza idrica ha dimostrato che non c'è un polso, non c'è una leva, un timone che riesca a gestire veramente il tema dell'uso delle acque. Questo è più un tema se vuoi di gestione dell'uso che non di gestione del rischio però, anche qua vedendolo meno direttamente di quello dell'emergenza idrica, però tutte le volte che ho sentito parlare di interventi per ridurre il rischio in ambito fluviale, ho sempre e costantemente osservato l'opposizione di associazioni di categoria del settore agricolo. Nella mia esperienza in Legambiente a Modena, abbiamo avuto una campagna, una vertenza, a proposito dell'istituzione di una forma di tutela sul fiume Secchia. Un processo che era stato avviato con il benessere della regione inizialmente, guidato dall'ente di gestione dei parchi e anche da alcuni comuni del territorio. In un contesto di questo tipo in cui l'istituzione di questa tutela era stata accompagnata da tutta una serie di cautele e di obiettivi anche per la gestione della sicurezza idraulica del fiume. Quindi non era una tutela che veniva proposta e che andava a bloccare la possibilità di operare, in termini di sicurezza idraulica ma era qualcosa che voleva integrarsi quindi cercare di mettere insieme la sicurezza idraulica con la salvaguardia dell'ecosistema fluviale. Che in realtà per il Secchia vuol dire il ripristino della vitalità dell'ecosistema che è stato totalmente annientato dagli usi del territorio, in particolare delle escavazioni dei decenni scorsi. Anche diciamo a fronte di un'accortezza di questo tipo, cercare di includere soggetti come Aipo nella governance di questo parco regionale/paesaggio naturale e aree protette, c'erano queste due forme di tutela proposte, c'è stata una forma di opposizione fortissima, non esplicita che però ha portato alcuni comuni tuttora a non avere deliberato a favore di questa tutela. Dico tuttora perché sono passati più di 5 anni da quando è stato avviato non il processo di redazione della proposta ma il processo di approvazione della proposta che era già stata fatta.

D 7: in che modo questo intervento avrebbe minato i loro interessi?

R 7: Non c'era un rischio di espropri, la dico esplicita, tante volte si parla di espropri per allargare gli spazi per il fiume mentre qua era semplicemente un: gestiamo in maniera più omogenea la fascia del fiume quindi il territorio che correva tra le due sponde, cerchiamo di includere anche in aree dove c'è l'attività agricola altri usi che cercano di valorizzare il territorio da altri punti di vista, in particolare c'era il tema del turismo quindi possibilità di avere piste ciclabili dedicate, c'era il tema dell'agricoltura biologica, o della agricoltura a basso impatto. E questo diciamo confliggeva in ogni caso l'idea di attività agricola che alcuni soggetti avevano. Non esplicitamente l'associazione di categoria ma rappresentanti di associazioni di categoria sono stati attivati per far sì che questo

processo venisse rallentato. Dico questo perché è un esempio di quello che tanti altri mi hanno detto che succede così tipo ovunque quindi non preoccuparti, io ero rimasto un po' così.

D 8: anche autorità di bacino ci ha fatto presente questa problematica che hanno riscontrato in molte occasioni.

R 8: loro poi lo vedono su una grande scala, molto più grande

D 9: tutte le aree demaniali che sono state sdemanializzate e adesso sono in concessione decennale, ventennale e anche li hanno molta difficoltà ad agire.

R 9: Questo è un tema che non ho mai affrontato e credo che si sia una dinamica abbastanza diffusa. E diciamo che appunto per chiudere la risposta a livello di possibilità di influenzare questo genere di processi pianificatori e decisionali c'è ancora una certa dipendenza dei soggetti decisori da questa parte del mondo economico che evidentemente ha un peso e un effetto sproporzionato rispetto al peso che ricopre.

D 10: la domanda poi è come li convinci che è anche loro interesse fare azioni di mitigazione del rischio. Come porti queste categorie on board?

R 10: Diciamo che c'è sicuramente un'evoluzione positiva dal mio punto di vista nel settore agricolo che ogni tanto mi capita di intercettare. Ad esempio, un tema di bio-distretti, che sono questi raggruppamenti di agricoltori che spesso si allargano a includere altri soggetti economici e della società civile, delle istituzioni che probabilmente il fatto che si stiamo progressivamente allargando è segno di una maggiore sensibilità degli agricoltori rispetto al tema ambientale. Chiaramente il focus è più sugli impatti e sulla qualità che non sulla gestione del rischio però credo anche in un contesto in cui si rafforzano anche i luoghi di partecipazione, e si può interagire con le associazioni di categoria, che tante volte in realtà, e lo dico anche qua per esperienza tendono a tutelare le modalità più arcaiche della gestione del territorio, ma piuttosto con gli agricoltori in persona che magari sono più attenti, più accorti o magari sono solo curiosi. Diciamo che se ci siano questi luoghi che si aprono e allargano, probabilmente da l'opportunità di interloquire su questo tema. Che se vogliamo non è sicuramente un tema nuovo però per le modalità con cui effettivamente, anche lì il cambiamento climatico sta portando a una modificazione dei fenomeni che stanno avvenendo, ha una caratteristica di novità e per questo può essere quasi presentato come un qualcosa di cui iniziare a parlare. Questo forse è anche un'altra chiave, cercare di dire ok, iniziamo a parlare di questo tema cambiando un po' quello che è stato il punto di vista che abbiamo avuto fino ad oggi. Se altrimenti dal mio punto di vista, inserire il tema dell'adattamento al Cambiamento Climatico dentro al discorso che in realtà è pluridecennale e che riguarda l'uso dello spazio fluviale, insomma. Diciamo il cambiamento climatico è forse anche abbastanza di moda per essere percepito come qualcosa di aggiuntivo e non la prosecuzione di un dibattito vecchio.

D 11: mi venivano in mente che in Italia, se ne parla ancora poco, sistemi di pagamento per servizi ecosistemici, compensazioni, certificazioni come avviene nel mondo della mitigazione per la riduzione delle emissioni. Potrebbero essere anche questi dei meccanismi spendibili lato adattamento? Se ne sta parlando in qualche occasione? oppure è una cosa difficilmente realizzabile?

R: se ne parla sicuramente e mentre che formulavi la domanda mi sono venute in mente cose molto distinte tra loro; che vanno dai fondi del PSR degli agricoltori, al tema dei grandi interventi di forestazione che già oggi, comunque, c'è questo sistema con il carbonio che non conosco direttamente ma in maniera abbastanza grossolana, ma che comunque va in direzione di riconoscere il valore di interventi di questo tipo dal punto di vista dei servizi ecosistemici in se. Pensavo anche in realtà, non lo chiamo cruccio ma è un pensiero che ho da tempo, frutto delle discussioni che ho avuto a Modena

all'interno di questi progetti europei, come alcune azioni possono essere portate alla scala urbana dove in realtà ci sono così tanti attori e così tanto frammentati che hanno così poco spazio per ospitare qualunque tipo di strumento che probabilmente diventa molto difficile andare a pensare a un riconoscimento dei servizi ecosistemici a quei livelli. Sicuramente diciamo è qualcosa che, di cui si inizia a parlare se vogliamo. Almeno a livello di pianificazione non ho visto nulla di esplicito ma è sicuramente un tema al quale si sta cominciando a prestare attenzione. Secondo me c'è un aspetto che è quello del (io mi occupo molto di città che non è il vostro focus immediato) nelle città ci sono effetti molto forti dal punto di vista dell'adattamento e penso all'isola di calore, penso alle non bombe d'acqua. E lì non so se sia tanto un tema di riconoscimento economico del servizio ecosistemico quanto piuttosto di un, l'istituzione di un meccanismo di finanziamento per eseguire l'intervento, nel senso che diciamo credo che al cittadino non interessi tanto il fatto di essere destinatario periodicamente di una quota di riconoscimento dei servizi ecosistemici quanto al fatto che non riesce a sostenere l'investimento iniziale. Quindi in quel caso il fatto di poter intervenire direttamente con un finanziamento in fase di realizzazione dell'intervento potrebbe essere di per se la chiave per riuscire ad applicare delle misure di adattamento in ambito urbano. Senza che poi questo abbia degli strascichi dal punto di vista economico perché alla fine tutto quello che c'è a livello di città, in termini infrastrutturali, ma pensiamo anche ai parchi; al cittadino non interessa che il parco funzioni, ok quello è oggetto di manutenzione ma non è che, non si aspetta nient'altro che la cosa funzioni perché sia accettata. Mentre in un contesto rurale, i bandi PSR ad esempio per forestazioni in ambito rurale, che sono appunto il tema che tante volte mi sono trovato ad affrontare, a titolo di curiosità ma sono rilevanti, diciamo sono interventi che dalla parte dell'agricoltore vanno ad occupare un'area che potenzialmente poteva essere oggetto di attività agricola allora lì ecco, è un intervento che richiede una compensazione periodica nel tempo. Non so se nei bandi passati del PSR ci sono stati dei riconoscimenti basati sul servizio ecosistemico, come quello sulla superficie. Però quella dinamica la vedo più verosimile.

D 12: Per quanto riguarda il sistema parchi e rete natura 2000 invece che tipo di rapporti avete?

Anche qua è una cosa che stiamo costruendo in queste settimane perché in realtà come Legambiente si è delegato il tema parchi ai singoli circoli. Adesso la regione sta, faccio un po' di cronaca, sta rispondendo alla richiesta dell'UE di allargare le aree natura 200 per cui ci stiamo interessando del tema e stiamo provando a ricostruire il dialogo con i circoli che se ne sono occupati storicamente; quindi, in realtà a livello strutturale non abbiamo degli elementi per così dire di critica in senso ampio del sistema. Stiamo cercando di costruirceli, magari tra due settimane saprò risponderti meglio.

D 13: ti stavo chiedendo, dopo aver fatto un po' il quadro delle varie interazioni all'interno di questo sistema, quali sono le criticità maggiori che ti senti di evidenziare nel sistema di gestione del rischio?

R 13: Questa è un'ottima domanda, la premessa l'ho già fatta. Diciamo che come dire, per come l'ho vissuto a livello di associazione finora, non essendoci stato coinvolgimento diretto, probabilmente ci servirebbe un allineamento più organico nel senso che sicuramente gli attori coinvolti nella gestione del rischio e gestione del territorio in generale, hanno il loro strumento di governance nei loro organi di consultazione e di decisioni. Quindi da questo punto di vista è un sistema che deve funzionare, funziona, e quindi soprattutto nella gestione dell'emergenza c'è il luogo nel quale questi soggetti si possono ritrovare. È chiaro che è un sistema che è nato in determinato modo, con altre premesse dal punto di vista del contesto ambientale, climatico ecc. è nato con determinate premesse dal punto di vista della rappresentatività dei soggetti economici, e pur funzionando nell'emergenza, tra virgolette, perché appunto poi questa estate i prelievi sono continuati, quindi dal quel punto di vista funziona relativamente. Dal punto di vista degli obiettivi che devono essere raggiunti in questa nuova fase in cui le sfide sono diverse rispetto a prima, probabilmente beneficerebbe dall'intervento di soggetti che

hanno una visione più di lungo periodo. Non dico per forza il mondo associativo, noi spesso nella viviamo di riflesso delle attività di chi fa ricerca, di chi indaga, scientificamente con modelli, quello che sta accadendo e noi di fatto, ci preoccupiamo di portare questi risultati sul tavolo della politica. Però forse anche coinvolgere direttamente chi fa questo genere di analisi o comunque dargli una rappresentatività maggiore potrebbe essere una modalità. Perché giustamente tu dicevi prima che c'è Arpaè che svolge questo ruolo dal punto di vista del controllo, sulle attribuzioni che ha a livello normativo. È però un soggetto che è comunque legato alla regione strettamente, non ho chiari in realtà i meccanismi di finanziamento delle attività di Arpaè ma credo ci sia un legame con l'ente regione per cui in realtà hanno una relativa libertà di intervento in determinati contesti. Dove appunto la regione anche politicamente ha l'interesse ad intervenire e quindi non solo dal punto di vista della gestione ordinaria ma anche con interventi di politica, vera e propria, di politica appunto di cambiamento. Per cui è una riflessione un po' aperta dal mio punto di vista però c'è un tema di riuscire a fare sì che chi appunto cerca di rappresentare un interesse che non è semplicemente quello di chi gestisce il territorio ma anche di chi subisce le conseguenze degli eventi estremi, appunto riuscire a integrare queste voci all'interno degli strumenti di governance sicuramente sarebbe qualcosa di positivo. Diciamo che appunto anche dentro agli strumenti di governance ci sono l'influenza della politica nel senso della politica "politicienne", che è abbastanza, credo presente come influenza. Anche quello è un fattore di cui tenere conto e che dal mio punto di vista rafforza invece esigenze che ci sia chi cerca di portare un punto di vista più oggettivo all'interno di questi tavoli, è il vero punto, la politica decide e noi ci troviamo a vivere in questo contesto. Però riuscire a dare uno spazio maggiore a chi ha le competenze per aiutare i decisori sicuramente sarebbe positivo.

D 14: Poi mi è venuto in mente di chiederti prima, nel processo autorizzativo dei progetti, magari anche i circoli locali, partecipano al processo di Via per esempio o vinca che tu sappia?

R 14: si capita, c'è il tema delle forze nostre sulla quantità di progetti che vengono presentati, però si certamente su aspetti più rilevanti si. Dico gli aspetti più rilevanti perché in questo periodo, per esempio, la maggior parte di attenzione che abbiamo prestato rispetto a questi temi autorizzativi era legato al tema dell'energia. Magari tutto quello che magari è stato presentato legato all'adattamento non l'abbiamo monitorato. C'è sempre la necessità di concentrare le forze su quello che in quel momento è ritenuto importante. È vero che ci sono molti interventi di mitigazione del rischio, quindi di gestione del territorio, che hanno degli impatti abbastanza significativi anche ad esempio sul tema delle aree protette più tutelate e quindi meriterebbero in realtà una pari attenzione da parte dei soggetti come noi. Però le forze sono sempre molto limitate.

D 15: focalizzandoci più sul tema NBS, quando è la prima volta che lo hai sentito nominare? o se anche prima avevi avuto a che fare con questa tipologia di intervento? anche se non si chiamava NBS.

R 15: nella mia esperienza personale ho iniziato a sentire parlare di NBS nel contesto dei progetti di cui ti parlavo, si parlava soprattutto di ambito urbano e in quel contesto in realtà si trattava di misure e interventi di cui non avevo mai sentito parlare prima. Quantomeno non in maniera tecnica. Quindi sì, devo dire che rispetto a quello per me è stato qualcosa di nuovo in quel contesto.

D 16: di quanti anni fa parliamo?

R 16: parliamo di 2019, per quanto riguarda il contesto extraurbano e rurale, in realtà penso alla summer school di Operandum, e alcune di quelle misure ne avevo sentito parlare anche in passato, senza riuscire a inquadrare il momento, non ne avevo sentito parlare di NBS però sicuramente c'era qualcosa di quel genere. Nella mia esperienza il termine NBS è legato a qualche tipo di intervento che tu fai in un contesto urbanizzato e non tanto in un contesto rurale. Poi appunto si usa tranquillamente anche per il contesto rurale. Diciamo c'è una differenza da questo punto di vista, lo dico mentre parlo

perché ci penso, perché in realtà quando sento parlare di Nbs in contesto rurale c'è comunque un'attenzione al tema e all'aspetto ecosistemico che magari in interventi simili, che però non venivano codificati come NBS, in passato non c'era. La differenza c'è anche da quel punto di vista.

D 17: rispetto alle modalità di intervento precedente, ritieni che su questo versante, la pianificazione integrata, quindi tenere insieme mitigazione del rischio, conservazione della biodiversità e tutela ambientale, si stiano facendo dei progressi significativi? e a che punto siamo con il processo di mainstreaming delle NBS?

R 17: quindi una maggiore penetrazione di questo tipo di, a livello tecnico o pubblico?

D 18: in generale, in questo processo dove dibattito pubblico e operatività si intrecciano. Siamo in una fase ancora sperimentale e embrionale o di crescita?

R 18: la premessa è che faccio questa riflessione basandomi su un'esperienza limitata, ma vedo anche dentro come associazione. C'è un tema di prendere in considerazione la dimensione dell'ecosistema che non è scontato mai. E dico mai. Perché anche dentro all'associazione, appunto c'è questo bisticcio/discussione sui temi ambientalista e ecologista. Non è un semplice bisticcio nel senso che, all'inizio anche io dicevo ma di che cazzo stiamo a parlà? e invece il tema c'è perché tante volte appunto, quando si, in particolare parlo non dei tecnici nostri e dei vertici, parlo dei volontari e delle persone che insomma si fa fatica a trasmettere la complessità. Ogni intervento ha comunque un impatto anche se è un intervento, non dico se il fotovoltaico a terra, su quello ormai ci siamo arrivati, ci sono tanti interventi che portano un beneficio ambientale ma che non vuol dire che immediatamente l'ecosistema sta meglio. Anche sulla gestione del verde, tema di cui si parlava prima, c'è una dimensione complessa dietro alla valutazione dell'utilità degli interventi non solo per l'uomo ma anche per l'ecosistema che non è così immediato cogliere. Rifammi la domanda che mi sono perso.

D 19: si la domanda era a che punto siamo a livello regionale e italiano sul mainstreaming delle Nbs?

R: Ho fatto questa premessa per dire che in realtà manca quel bisogno, come dire? La necessità dal punto di vista di chi si occupa di capire, perché diavolo devo fare le NBS? Perché non posso semplicemente mettere l'albero, fare un buco e basta per tenere l'acqua quando piove troppo. C'è tutto un insieme di bisogni che il discorso NBS cerca di tenere insieme che non è scontato che le persone colgano. Dico le persone partendo da un cittadino comune. Diciamo così per arrivare anche al volontario dell'associazione per arrivare anche all'amministratore locale.

D 20: di quelli che vengono chiamati co-benefit?

Si c'è un tema di co-benefit, ma anche a monte direi c'è un tema di riuscire a valutare, e ne soffro anche io di questa mancanza di approfondimento, riuscire a mettere insieme tutta una serie di elementi che nella creazione di un NBS vengono presi in considerazione grazie al fatto che tanti tecnici diversi intervengono, discutono, mettono insieme le competenze e ti dico la cosa migliore da fare è questa. E secondo me c'è proprio un tema di conoscenza, di riuscire a trasmettere a chi non se ne occupa tecnicamente, l'urgenza di questo tipo, l'urgenza, la necessità, il fatto che possano produrre benefici che altre soluzioni non ti danno e delle NBS e quindi secondo me diciamo è lì che si fa fatica a. Mentre ne parli con l'università come fa l'università di Bologna a spiegare al comune X, parlati del progetto Europeo con noi e qui realizziamo la duna artificiale, il prato armato ecc e sono esempi forse neanche troppo complessi di NBS. Però già lì mi immagino che ci sia un insieme di mancanza di conoscenza del fenomeno che deve essere gestito tramite le NBS. A cui si somma il, tutta la questione degli interessi conflittuali di cui sopra e una certa inerzia, che è un'inerzia nostra, nel senso di abitudine e del perché dobbiamo cambiare quello abbiamo prima? Questi tre fattori son il motivo per cui insomma c'è non dico una difficoltà di penetrazione ma se tu dovessi vendere le NBS al cittadino

comune fai fatica. Questo anche professionalmente io ci penso costantemente, è anche difficile trovare la chiave per spiegare questo genere di cose.

D 21: quindi un problema di comunicazione principalmente? Essendo le NBS un concetto che complica e che mette in connessione diverse discipline e modalità di intervento dove tu metti una barriera e risolto il problema.

R 21: esatto o viceversa fai un intervento di forestazione positivo ecc però magari non risponde a quel tema di gestione del rischio. Quindi è riuscire a mettere insieme i piani. Fortunatamente chi fa ricerca è anche propenso, curioso e interessato a però magari già il tecnico comunale che magari ha anche fatto quel percorso universitario lì però non è nelle sue corde il fatto di mettersi lì a indagare in ambiti diversi dal suo, e chiaramente lì c'è già un primo punto di difficoltà.

D 22: questo tema delle competenze anche è uscito fuori in diverse occasioni, quindi un problema culturale ma che deriva anche da una mancanza di competenze all'interno delle amministrazioni per operare in quel modo lì. Abbiamo parlato con Respondent 11, un ecologo che collabora con l'ente parco che ci diceva che in Italia secondo lui non si sono più di dieci ecologi o qualcosa del genere e comunque in generale i biologi sono tutti poi indirizzato verso il lato medicina e farmaceutica mentre a livello ambientale non vengono presi in considerazione.

R 22: plausibilissimo, quando dovevo scegliere la triennale c'era proprio questo discorso, se vai a fare biologia o vai all'estero oppure finisci in laboratorio. Quindi sono scappato.

D 23: Ti vengono in mente altre barriere alla diffusione delle NBS?

R 23: Il tema delle competenze c'eravamo arrivati e quello c'è e c'è un tema enorme di finanziamenti, nel senso che, io non ho un'idea precisa di quanti soldi sono destinati alla mitigazione del rischio idrogeologico, perché per ora mi pare che l'unico tipo di rischio associato al cambiamento climatico che viene affrontato, ma perché cavolo l'Italia e il dissesto geologico ce lo avevamo anche prima. Quello viene affrontato e non ho idea se le risorse siano sufficienti o no. Non sono mai sufficienti perché finché a casa mia ho il fiume con il letto stretto, sopraelevato, l'argine così ma insomma ci sono una serie di interventi strutturali che richiederebbero un sacco di soldi e un sacco di spazi, e si torna al tema dei conflitti. Sugli altri tipi di rischio.

D 24: spesso il problema è che i soldi ci sono ma poi non si riesce a metterli a terra

R 24 Su questo non ho un'idea precisa da questo punto di vista. Questo te lo hanno detto altri soggetti?

D 25: Sì anche secondo poi studi, servizio studi della camera dei deputati identificavano il problema principale nella fase di progettazione degli interventi, e lì non si riusciva ad accedere ai fondi, poi è stato aumentato lo stanziamento per il fondo progettazione, ed è stato in alcuni casi centralizzato.

R 25: è il fondo assistenza tecnica? Comunque, supporto alla progettazione.

D 26: sì una dei principali colli di bottiglia poi mi sembra di avere capito negli ultimi anni magari 3 o 4 anni è migliorato perché già c'era questa consapevolezza nel 2018 o 2019, e i successivi finanziamenti, e immagino che questo aspetto sia migliorato ma le problematiche da questo punto di vista rimangono. Anche perché dopo tutti gli ultimi disastri, un aumento della consapevolezza della politica c'è stato e un aumento dei finanziamenti c'è stato, anche con lo stesso PNRR i fondi sono stati messi, non so se stai seguendo il progetto per la rinaturazione del Po.

R 26: mi fai una domanda scomoda, c'è una storia molto divertente dietro e non te la racconterò in un'intervista registrata. È una chiacchiera. La risposta è sì, diciamo che non l'ho studiato personalmente, ma c'è chi in Legambiente sta studiando il tema.

D 27: Li che idea vi siete fatti? Perché anche lì ci sono opinioni discordanti.

R 27: l'idea che ci siamo fatti è più sul tema della partecipazione dei soggetti appunto non decisioni alla definizione del programma di intervento. In realtà sugli aspetti specifici, chi se ne sta occupando ha chiaramente delle criticità puntali su alcuni progetti presenti nel programma ma diciamo che in generale non c'è una critica totale, e negativa. Ci sono alcune criticità che a seconda del luogo, l'intervento sarebbe potuto essere pensato in modo diverso. Criticità che non conosco direttamente che sono più in capo a chi dei nostri conosce i luoghi che vanno a monitorare i singoli tratti di fiume. Abbiamo alcuni circoli, uno in particolare nella bassa parmense che si è specializzato su questo tema, però appunto sono aspetti molto locali che noi come regionale seguiamo e cerchiamo di fare una sintesi ma non abbiamo un polso di dettaglio.

D 28: anche lì se non ho capito male sono progetti datati 2006 o 2009 dal Piano Sedimenti

R 28: si viene spesso citato, io lì non ero neanche mai pensato alla politica in quegli anni. Diciamo che chi è più vecchio di te insegna.

D 29 infatti anche quella è una problematica. La fretta che magari non consente a pensare a nuove progettazioni più moderne e adeguate e allo stesso tempo coinvolgere chi di dovere nella pianificazione. Quindi poi questo discorso della co-progettazione, co-design del quale tanto si parla poi mi sembra di vedere e di capire che nella pratica ce ne sia poco perché spesso si agisce sull'emergenza o comunque con la necessità di fare presto. Almeno questa è la mia impressione poi condivisa da alcuni attori del settore, concordi?

R: il tema di riuscire a ragionare con i decisori di questi interventi è una cosa che abbiamo sentito e abbiamo discusso internamente. È chiaro che lì, un po' tra la mancanza di abitudine e un po' per i tempi dettati dall'alto, quello purtroppo nei contesti dettati dall'emergenza, io personalmente me ne faccio una ragione sul fatto che le cose non vengano fatte bene. Io sono un fan della prevenzione e di tutto ciò che può essere pianificato per tempo e da questo punto di vista quando si parlava di PNRR alzi le mani e dici vabbè lasciamo che buttino via, speriamo che non buttino via i soldi. L'esempio del cazzo, sul quale mi ritrovo spesso a discutere sul tema dell'energia che mi occupa così tanto, si facciamo tutti i settori li passiamo a idrogeno. Si va bene, ma quali sono i costi dell'idrogeno? eh si sono un po' alti, il presidente di una società di trasporti, quindi finché ci sono i soldi del PNRR siamo tranquilli ma quando finiscono siamo in braghe di tela. "Eh ma poi ci pensiamo". Anche il tema della pianificazione, riuscire ad avere la visione di lungo periodo e questo per me dice tutte. Nell'ambito di gestione del territorio è più facile avere persone che riescono a inquadrare quello che può succedere. Sicuramente quando si parla di aziendine o aziende anche partecipate o comunque insomma, il governo e amministratori pubblici, per quanto mi riguarda dovrebbero fare tutti dei corsi di formazione prima di iniziare a lavorare. Non voglio essere antidemocratico ma il problema è che si va dalla sottovalutazione di progetti in tema NBS ma come tantissimi altri settori. Anche dal fatto di non riuscire ad argomentare contro chi ha un interesse economico, come le aziende, che magari ti vendono un prodotto come fantastico il futuro ecc e tu non hai le competenze per discriminare quello che è buono da quello che non lo è.

Saluti e ringraziamenti

Intervista ARSTePC

Il Rispondente 6 è un membro di un'agenzia tecnica regionale che si occupa di Sicurezza territoriale protezione civile, settore Difesa della costa. Intervistato in collaborazione con Teresa Carlone l'11/07/2022 in modalità online

Premesse: stiamo portando avanti questo giro di interviste con i diversi attori che si occupano di mitigazione del rischio e che hanno a che fare con NBS. L'obiettivo è quello di tracciare il quadro del sistema di governance di questo settore e offrirne una valutazione da chi appunto ne è parte integrante. Inoltre, ci interessa anche ottenere una valutazione sul processo di mainstreaming delle NBS: a che punto siamo, quali sono le barriere individuate in questi mesi e cosa si potrebbe fare per migliorarne la diffusione. In questa fase pensavamo di approfondire meglio alcuni di questi aspetti.

Richiesta di consenso al trattamento dati e alla registrazione, il solo fine è quello della ricerca e le info verranno utilizzate solo a tale scopo.

Domanda 1: volevamo partire dall'assetto istituzionale che si è venuto a creare in seguito alle varie riforme che hanno cambiato questo settore. L'assetto attuale è ritenuto funzionale ed efficace per la mitigazione del rischio? Le competenze sono distribuite in modo adeguato? e se c'è un adeguato livello di coordinamento verticale e orizzontale tra i vari livelli di governance?

Risposta 1: se avete fatto altre domande ad altre persone avrete già sentito parlare di queste tematiche, il tema della mitigazione, e in particolar modo rischio idrogeologico comprendendo il discorso esondazioni, erosione costiera e alluvioni da mare e rischio frane, dal mio punto di vista, ma condiviso da tanti colleghi, ha subito un'involuzione, ha avuto il suo picco migliore nel momento in cui è stata emanata la legge 183, che aveva ricondotto a una pianificazione a livello di bacino idrografico tutte le tematiche afferenti alla difesa del suolo nei tre macro settori di cui vi parlavo. In quel periodo, sia la 183 ma anche la 152 del 99 (Il Vecchio codice dell'ambiente). La 183 guardava il dissesto a livello di bacino che è la cosa che dal punto di vista fisico e funzionale è più efficace. Quella del 99 dialogava con il mondo del dissesto facendo in modo che il tema del dissesto idrogeologico venisse a interfacciarsi a quello della riqualificazione ambientale o comunque di tutti gli aspetti ambientali collegati. Un ruolo fondamentale lo avevano le autorità di bacino che poi sono state riorganizzate con la riforma del 2006 e molte sopresse perché avevano una dislocazione e a livello di bacino idrografico regionale o interregionale. L'organizzazione a livello regionale o interregionale era a mio modo di vedere molto efficace. Queste riforme, dal 2006 ma anche le successive hanno spostato la pianificazione e la programmazione degli interventi da un livello di scala di bacino a livello locale e comunale, spostando la visione da una visione fisica a una amministrativa ha avuto non poche ripercussioni negative. Poi c'è un problema di frammentazione e disomogeneità organizzativa a seconda della tipologia di dissesto o comunque sia di rischio. Nel senso che da una parte, ad esempio, mi occupo di erosione e alluvione da mare, alcuni territori affrontano la tematica a livello provinciale, delegando alle province. La riforma che c'è stata ha delegato alle regioni, alcune tipo la Toscana ha delegato alle province, noi come Emilia abbiamo mantenuto a livello regionale che poi si è organizzata su base provinciale. Con molte ondulazioni, si è partiti prima con assetto organizzativo di area vasta, poi si è tornati a un assetto di livello provinciale, poi anche a livello provinciale sono stati creati dei settori multi-provinciali. Quindi c'è stata molta variabilità.

D 1.2: A cosa era dovuta questa variabilità?

R 1.2: questo dipende da una serie di riorganizzazione che seguono necessità di riorganizzazione del personale perché la macchina regionale ha necessità di rivedere il suo funzionamento, ma che hanno anche seguito esigenze di livello nazionale. Tipo nel 2015 con la riforma del governo Renzi si è tentato di cancellare il ruolo delle province, e quindi giocoforza si è dovuto riorganizzare tutto il sistema. Le province comunque avevano un ruolo di pianificazione territoriale e di dissesto che adesso

è stato riassorbito dalla regione e redistribuito all'interno della propria amministrazione. Purtroppo questo è un settore che risente di tante vicende di riorganizzazione che fanno perdere molto tempo, poi bisogna rivedere tutti quelli che sono i programmi operativi e anche dal punto di vista dei riferimenti, fa perdere al territorio e a chi vive sul territorio quelli che sono i riferimenti. Una volta c'era il genio civile, ed era un riferimento chiaro, adesso anche l'utente finale, cittadino o impresa che si trova a dover affrontare problema dissesto non sa più a chi rivolgersi. Parte dal comune ma poi viene rimbalzato ad altri. Al netto di tutte queste problematiche, che vengono gestite, poi dopo ogni realtà territoriale le ha subite in modo diverso a seconda delle fortune che ha avuto o meno nel riorganizzazione del proprio servizio, e della propria unità operative regionale. Quello che noi adesso stiamo risentendo molto è che dal punto di vista delle persone che si occupano di queste tematiche c'è un pensionamento di tantissime unità che rappresentano la memoria storica della materia. Con difficoltà grandi nella sostituzione perché da una parte non ci sta fisicamente chi li sostituisce e dall'altra chi li sostituisce non ha avuto la possibilità di un passaggio di consegne. Quindi ci troviamo in una fase, in cui per effetto delle riforme che hanno passato competenze dallo stato alle regioni c'è stato un momento in cui ci sono state tante assunzioni di personale che adesso ha compiuto il suo ciclo. Nel frattempo, non ci sono stati grandi ricambi e adesso cominciano a mancare nei servizi e negli uffici che si stanno svuotando.

D 2: quali sono le figure che mancano?

R 2: le figure tecniche, ma anche quelle amministrative. Il nostro lavoro si può suddividere in una parte tecnica di progettazioni di interventi sulla base di valutazione dello stato di rischio e nell'affidamento dei lavori pubblici e quindi con tutto quello che è il mondo degli appalti pubblici. Adesso sia la componente tecnica che amministrativa si sta estinguendo e non c'è un sufficiente ricambio e affiancamento di personale che entra.

R 1: il ricambio da governi centrali e la competenza è stata spostate nella realizzazione degli interventi dalla regione ai comuni e questa confusione rimane. I comuni hanno capacità di spendere risorse sul dissesto pur in alcuni casi non avendo al loro interno gli strumenti tecnici per poterlo fare. Sono destinatari di risorse da parte dello stato, con i vari programmi di intervento che possono essere i POR, FESR, e altre linee di finanziamento come il PNRR che si può occupare di dissesto ma mancano le competenze sul dissesto e anche quelle per seguire progettazioni esterne. Questo passaggio ondivago di competenze e questo sparpagliamento ha fatto sì che non ci si concentrasse su un unico assetto istituzionale che poteva essere il comune, ma era logico che dovesse essere la regione per avere una visione a scale ampia e individuare correttamente problematiche soluzioni, progettarle e perseguire la realizzazione degli interventi. Dal mio punto di vista bisogna ritornare a concentrare le competenze tecniche su un livello istituzionale unico, che dovrebbe essere quello regionale. Deve essere quello regionale perché lo dice la legge poi in realtà la scala migliore è quella sub-regionale, del bacino idro, o quella provinciale quando si sovrappone a quella del bacino idrografico. A livello regionale, le cose si tengono unite e si guardano in maniera abbastanza coerente, ma è il livello sotto in grado di analizzare meglio le problematiche, e trovare le soluzioni.

D. 3: per quanto riguarda la pianificazione territoriale nel caso Emiliano Romagnolo quando si va a redigere il PAI, PGR, chi è che governa il processo e come si relaziona con i vari attori?

R. 3: È la regione che si consulta con i propri uffici territoriali su base provinciale e che hanno quindi una conoscenza del territorio dettagliata ma che comunque dal punto di vista istituzionale fanno capo alla regione. Quindi è la regione che si organizza da un punto di vista tecnico su base provinciale ma da un punto di vista istituzionale è la regionale che stabilisce indirizzi e obiettivi dei piani passando poi tutto quello che sono le scelte e indicazioni a livello di autorità di distretto che è chiamata ad adottare un piano e fare sintesi di quello che proviene dalle diverse regioni. L'organizzazione

istituzionale è quella del distretto idrografico, che assume a se tutti gli indirizzi che le varie regione in maniera autonoma, anche se poi un po' di coordinamento c'è, svolto proprio da autorità di distretto. le varie regioni assumono obiettivi, scelte strategiche e programmi e poi il piano viene autorizzato dall'autorità. A livello Emiliano le proposte vengono discusse con uffici territoriali su base provinciale, che sono quelli con conoscenza del territorio dettagliata e approfondita e che a loro volta dialogano con i comuni e il territorio a livello locale. Per cui portano le istanze dei comuni al tavolo della definizione degli indirizzi e della strategia che viene comunque fatto a livello regionale. Quindi l'istituzione competente è la regione in concerto con l'autorità di distretto ma all'interno della regione l'organizzazione tecnica e pratica segue questo percorso. Uffici territoriali provinciali portano istanze del territorio più le conoscenze che la regione poi fa proprie e propone all'autorità di distretto. Questo è quello che prevede la norma, che tutto sommato funziona, perchè a livello regionale è stato deciso di organizzarsi in uffici sub regionali in grado di portare istanze dei territori che sono molto diversi. Però grazie a una certa esperienza, Post 183, la regione ha svolto ruolo da protagonista e si è ancora forti di quella esperienza e quindi la visione che si ha è sempre quella di bacino idrografico anche se da un punto di vista istituzionale le autorità di bacino sono scomparse. Però l'esperienza passata della regione all'interno delle autorità di bacino è ancora il riferimento seguito per le attività che riguardano la mitigazione del rischio.

D. 3.2: questo è anche dovuto ai legami che si sono creati tra I vari attori?

R. 3.2: sì, è dovuto alle persone, come spesso accade. Se alcuni strumenti normative sono stati modificati o non esistono più, se le persone che sono coinvolte operativamente in alcune tematiche che riguardano quelle fasi che sono da un punto di vista normative ormai chiuse e che però avevano una loro logica, le persone continuano ad avere come riferimento quel modo di fare e di comportarsi. Dal momento in cui queste persone non dovessero esserci per vari motivi, questo tipo di esperienza viene a perdersi e c'è un vuoto che è piuttosto rischioso, perchè in questo momento l'assetto normativo non ha una logica di pianificazione e di definizione di obiettivi e indirizzi basati sul bacino idrografico ma su un territorio che invece non ha alcuna attinenza con quelli che fisicamente sono dei limiti che dovrebbero essere seguiti e che dovrebbero essere i riferimenti, il bacino idrografico perchè le dinamiche che interessano il rischio inevitabilmente si svolgono a livello di bacino. Il discorso generale è questo: le prassi si sono mantenute perchè ci sono delle persone, che hanno vissuto quel modo di intendere la pianificazione e la pianificazione in materia di dissesto che è figlia della 183 del 89 e dell'istituzione dell'autorità di bacino, che dava una visione a livello di bacino. Fintanto che ci sono queste persone, credo per quanto riguarda la regione ER, questo sarà ancora il riferimento, a prescindere da quello che in questo momento dice la norma che ha cancellato quel modo di vedere. Il problema sarà nel futuro nel momento in cui queste persone non ci saranno perchè sostituite o perchè in pensione. I nuovi, non avendo un riferimento normative che va in questa direzione, perderanno e non avranno a disposizione quegli strumenti e elementi di esperienza e si ritroveranno un po' spaesati. Stiamo ancora godendo di un approccio, efficace e funzionale che è figlio degli anni '90.

D. 4: da ciò che ho capito, le autorità di bacino regionali e interregionali poi vengono in qualche modo assorbite da quella distrettuale che coprono territori sconfinati.

R. 4: la nostra regione ricade tutta nel distretto del PO dove dentro c'è tutto il Piemonte, la Lombardia, buona parte del Veneto, la Liguria, la Val d'Aosta. Da un punto di vista di funzionari, tecnici nell'autorità di distretto sono 4 gatti per un territorio così grande. Danno indirizzi molto generali ma dal punto di vista operative non riescono ad essere efficaci. Possono contare sull'operatività dei funzionari regionali, proprio perchè figli di un'esperienza passata hanno un modo di intendere la pianificazione e la programmazione di interventi, calata sui bacini idrografici e quindi portano quel tipo di esperienza (min 3:20 Morolli 3). Nel momento del confronto e del coordinamento che c'è

nell'autorità distrettuale con le altre regioni. Fintanto che ci sono queste modo di agire e questa visione e capacità di intendere il nostro lavoro sulla base di un territorio delimitato fisicamente nei bacini idrografici ancora funziona bene. Quando questa cosa qua non ci sarà più e ci sarà un ricambio sarà un problema

D. 5: si prevede di potenziare il personale nelle autorità di bacino?

R. 5: assolutamente no. Il ruolo dell'autorità di distretto sta diventando un ruolo di collettore di quelle che sono le scelte fatte su base regionale dove si cerca di dare un minimo di coordinamento e omogeneità. Però non c'è più una parte tecnica nelle autorità di distretto che prima c'era in quelle di bacino che era in grado di formulare proposte, sviluppare idee di soluzioni e progetti. È un ruolo più di collettore formale e di un grande contenitore che chiama a confrontarsi le varie regione e dove si cerca di dare omogeneità e di coordinamento. Figure tecniche sono rimaste poche e quelle si occupano di svolgere questo ruolo di coordinamento e confronto delle istanze regionali.

D. 6: per quanto riguarda gli obiettivi che si pone la pianificazione, si riesce a pianificare in modo integrato quindi tenendo insieme esigenze diverse tra cui la mitigazione del rischio e la conservazione della biodiversità, esigenze agricole, economiche sociali oltre a quelle di mitigazione del rischio in sè?

R. 6: a livello di pianificazione diciamo che questo tipo di visione di riuscire a tenere insieme queste tematiche diverse è abbastanza ben inquadrata a livello di pianificazione. Anche qui, mi viene da richiamare sempre gli strumenti che sono figlie delle attività delle autorità di bacino. Mi ricollego a quello che dicevo prima. Le autorità di bacino avevano avuto le capacità e il ruolo di far coniugare questi due aspetti, almeno da un punto di vista della pianificazione, quello che in realtà adesso devo e mi viene da evidenziare è la difficoltà nel rendere in pratica queste scelte e questi indirizzi (min 8 Morolli 3) che la pianificazione, prima le autorità di bacino con i piani di assetto idro, che poi sono confluiti o comunque hanno indirizzato la pianificazione territoriale, sia i PTCP delle province ad esempio, ma a cascata anche i piani urbanistici comunali, diciamo che in realtà dalla pianificazione non si è troppo spesso riusciti a essere coerenti nella fase di realizzazione di interventi, quindi nella programmazione. I principi erano, sono stati ben individuate nei piano stralcio di assetto delle autorità di bacino e a caduta sugli strumenti di pianificazione territoriale delle varie realtà territoriali. In realtà al netto di qualche caso virtuoso, si è un po' spento questo spirito che forse a cavallo degli anni '90 e 2000 aveva raggiunto l'apice con alcuni interventi e alcune proposte di realizzazione di interventi. Ho in mente nella nostra regione alcuni casi che erano sempre, diciamo Venuti sulla spinta delle attività dell'autorità di bacino, piano piano questa spinta si è esaurita proprio perché con la loro soppressione si è esaurito il loro ruolo e ci si è un po' dimenticati di dare giustizia a questa necessità di fare parlare il mondo della riqualificazione ambientale e del supporto della biodiversità e delle esigenze che ci sono nell'ambiente con quelle che sono le esigenze di mitigazione del rischio. Vero è che anche la norma qua non è ben chiara, nel senso che, faccio un esempio, sul discorso della sicurezza idraulica è ancora in vigore il regio decreto del 1923, parliamo di norme antichissime approvate ai tempi del re, che parlano anche un linguaggio antico (Morolli 4 min 10:30) e che non sempre si coniugano con quelle che sono le conoscenze e le esigenze che sono venute fuori negli ultimi decenni in termini di riqualificazione e di supporto alla biodiversità. Da un punto di vista normativo non ci si è preoccupati di fare uno sforzo di innovazione della norma ma la norma da un punto di vista idraulico è rimasta quella per cui tradotto "nei fiumi ci deve passare l'acqua" punto. Quindi o trovi il funzionario tecnico e il suo dirigente in qualche modo illuminato che dice "si è vero la norma ci dice che nei fiumi ci deve passare l'acqua ma possiamo fare qualcosa di meglio", se invece trovi il funzionario che ha una sua visione pragmatica e si appoggia alla norma dice "io devo garantire che l'acqua passi senza fare nessun tipo di danno, quindi va bene che non ci sia un albero in alveo, mi devo preoccupare solo di quello checchè ne dica il manuale di riqualificazione fluviale, o che ne dicano gli indirizzi regionali su

supporto alla biodiversità, che ne dicano le norme sui SIC ZPS. Di lì ci deve passare l'acqua perché c'è il regio decreto e quella è una norma che devo rispettare, il mio ruolo è quello e il mio intervento ha quel tipo di obiettivo e modalità realizzative”.

D. 6.1. quindi questi indirizzi non sono vincolanti?

R. 6.1: non hanno coerenza che supera la norma, perché sono comunque indirizzi, rispetto a un momento in cui tra la fine anni '90 e primi 2000 c'era anche una certa predisposizione a voler dar seguito a questi indirizzi ma noto che c'è stato uno spegnersi di questo entusiasmo e di questa disponibilità a provare a fare qualcosa di diverso.

D. 6.2: dovuto a cosa questo spegnersi di entusiasmo:

R. 6.2: dovuto in parte alle persone, alla difficoltà di innovarsi da un punto di vista tecnico delle persone che si occupano di queste materie. Dovuto anche alla difficoltà e gli strumenti delle norme e del codice degli appalti, non sono stati in grado anche loro di innovarsi e di spingere l'amministrazione pubblica e i propri funzionari a fare un cambio di passo, un salto in questo senso. Per cui alla fine, per una serie di motivi il funzionario poi diceva “ma perché io devo andare a rischiare personalmente di non avere sufficiente garanzia che nel mio fiume quando c'è la piena l'acqua passi senza creare danni, che è il compito che mi dà la norma, e non ho sufficiente garanzia facendo interventi di diverso approccio, così come consigliati dai vari indirizzi regionali, linee guida ecc, se succede poi qualcosa sono io stesso il responsabile, e quindi una comprensibile paura di essere chiamato a rispondere di eventuali problematiche”. Il funzionario si mette in una posizione di maggiore garanzia e in tutto questo, la norma così come l'istituzione poteva fare un salto e dire ok, ragioniamo anche di situazioni un po' diverse, proviamo a modificare questo discorso sulle responsabilità e questo discorso sugli obiettivi, fintanto che la norma dice che di lì deve solo passarci l'acqua è chiaro che qualsiasi giudice se un domani ti chiede conto e ti dice “tu cosa hai fatto? Hai seguito le linee guida sulla riqualificazione fluviale, quindi favorito lo sviluppo di un bosco, ok, ma non ti sei preoccupato di far passare l'acqua che è uscita, ha allagato una zona industriale e adesso la responsabilità è tua”. Adesso sto estremizzando però un supporto tecnico e normativo sarebbe stato necessario per favorire questo cambio di passo e questo salto, verso una visione nuova e diversa di quello che è il discorso della mitigazione del rischio

D. 7: per quanto riguarda contesti normative, mi viene in mente che già a partire dal 2015, il discorso del 20% dei fondi devono essere destinati a opere integrate: poi questo avviene nella realtà?

R. 7: secondo me non avviene, alcune volte questa cosa avviene in maniera fittizia, vengono ricondotte a opere integrate, opere che integrate hanno poco. Questa è una mia valutazione. Quello che sicuramente manca è una diffusione di esperienze positive che diano coraggio e che diano fiducia a chi fa progetti, chi fa interventi, che si può fare, e che queste cose si possono realmente fare, che funzionano e che quindi vale la pena rischiare, perché effettivamente di rischio poi si tratta, anche rischio personale. Quindi, conoscere vedere, che in altre realtà queste cose hanno funzionato, vedere anche che se non funzionano, comunque non si è chiamati personalmente a rispondere a qualcosa di cui forse è bene che (faccio fatica a esprimermi, non voglio dire una cosa sbagliata dal punto di vista istituzionale ma ci provo) bisognerebbe che la norma e l'istituzione prendessero in considerazione il fatto che quando si realizza un intervento veramente innovativo ci possa essere un'alea di non efficacia o di insuccesso. Perché credo che questo debba rientrare all'interno di quelle che sono gli obiettivi di miglioramento, di cambio. Fintanto che ci diamo e ci nascondiamo dietro al fatto che si è sempre fatto così e così ha funzionato e appena esco, se non funziona mi danno contro, è inevitabile che il funzionario faccia sempre come è stato fatto.

D. 8: per quanto riguarda la pianificazione in contesto di adattamento ai cambiamenti?

R. 8: dovremmo imparare ad essere un pochino più flessibili anche per quanto riguarda la valutazione di efficacia degli interventi e capire che le condizioni sono mutevoli e che quindi anche il risultato non è detto che sia certo al 100% e quindi accettare un certo grado di indeterminazione anche nel risultato.

D. 9: per quanto riguarda la co-progettazione, co-gestione, e l'integrazione di competenze invece a che punto siamo? Per integrazione di competenze intendo anche quello di collaborazione con biologi, ecologi ecc

R. 9: io credo che questo sia legato allo straordinario. L'ordinario non persegue nessun tipo di collaborazione e di co-progettazione. L'ordinario viene svolto seguendo ciò che è sempre stato fatto. Quindi l'ordinario non si fa troppe domande, e nemmeno va alla ricerca di tante collaborazioni. Laddove magari da un punto di vista anche normative sei obbligato a cercare questo tipo di collaborazione o perchè, facciamo finta che il discorso del 20% sia reale, quindi hai la necessità compenetrare nel tuo intervento anche degli obiettivi che non siano solamente quelli della mitigazione del rischio ma anche miglioramento ambientale, allora questo riguarda normalmente finanziamenti di una certa entità allora lì si va alla ricerca anche di altre competenze e di altri soggetti che possono portare il loro apporto. Quindi laddove è obbligato perchè c'è questo tipo di necessità che lo prevede nelle fonti di finanziamento allora c'è. Comunque in maniera molto complicate e devo dire che è sempre vissuto con una certa fatica da parte dei tecnici. Laddove c'è una norma ambientale che ti chiede di prendere in considerazione anche gli aspetti non so (min 22 Morolli 4), faccio per dire: un tuo intervento ricade all'interno di un'area protetta, la norma sul nulla osta o sul discorso sic zps, e quindi le misure di conservazione prevedano anche un approccio che prenda in considerazione questi aspetti, ecco che allora se proprio necessario e se c'è il tempo, cosa di assoluto rilievo e importanza, si va alla ricerca anche di altre competenze. Ma in realtà il più delle volte questo tempo non c'è perchè le fasi di progettazione, di appalto sono comunque lunghe e vengono richieste tempi di progettazione e di esecuzione molto rapidi di un'opera. Spesso si fa il minimo indispensabile in maniera anche un po' così raffazzonata e discutibile per ottenere quell'autorizzazione perchè necessaria e prevista dalla norma e poi spesso anche dalla parte di chi deve rilasciare quella autorizzazione non si è troppo esigenti perchè si capisce che è un intervento di sicurezza idraulica piuttosto che idrogeologica e non stiamo qui a fare tante questioni. E quindi amen, sarà per un'altra volta. Quindi la domanda era: è maturata una certa tendenza alla coprogettazione?: no. C'è laddove questa cosa è possibile per i tempi perchè magari ci sta una progettazione CA? tempi di maturazione più lunghi ed è richiesta in qualche modo dallo strumento di finanziamento.

D. 10: dal punto di vista dei tecnici è auspicata?

R. 10: in alcuni casi sì ma è una cosa molto personale e individuale, se ti devo dire chi ha esperienza antica tende a bypassare questo tipo di possibilità e di escluderla. Chi invece è più giovane o ha un'apertura maggiore sono proprio scelte individuali e non c'è un indirizzo preciso. Poi bisogna vedere. Faccio fatica a parlare per altri. A livello generale se ti devo dire credo che siano pochi i casi in cui si va alla ricerca di competenze esterne che non siano quelle prettamente ingegneristiche o geologiche

D. 11: per quanto riguarda il settore privato, operative, le aziende che vanno ad agire sul territorio, Ci sono queste competenze per agire in modo integrato con NBS:

R. 11: ci sono perchè le abbiamo conosciute anche tramite Operandum però che queste siano molto presenti sul mercato o che siano molto presenti nell'ambito degli appalti pubblici, direi di no, nel senso che nell'esperienza che ho io nel mio servizio direi che sono pochissime se non nessuno i casi in cui aziende private si siano proposte per progettare in modalità mista tra miglioramento ambientale e

obiettivo di mitigazione. Sappiamo che esistono capacità progettuali e di realizzazione ma di esperienze ne abbiamo avute molto poche.

D. 12: per quanto riguarda questioni autorizzative ne avevamo già parlato, ci facevi presente la questione dell' autorizzazioni paesaggistiche:

R. 12: sono un problema. Ci sono diversi tipi di autorizzazione e anche altre che sono previste dalla norma che a esito della valutazione non aggiungono nulla e non migliorano assolutamente il progetto. Bisogna assolutamente trovare il sistema per non far sì che queste autorizzazione non diventino ostacolo alla realizzazione di opera anche finalizzate al miglioramento ambientale.

D. 13: il tentativo I semplificazione c'è stato DPR 120 con elenco di interventi da non assoggettare ad aut paes o semplificata

R. 13: non ha semplificato perchè l'elenco è insufficiente, non ben definito, non si capisce bene dove ricade la tua metodologia di intervento e progettuale e sei sempre nel dubbio. Se hai il tempo segue l'iter autorizzativo normale, nel dubbio e quindi i tempi necessari. Ente sovrintendenza spesso non risponde nei tempi e passa del tempo inutilmente e tu alla fine non sai se il tuo intervento doveva essere soggetto ad autorizzazione paesaggistica ma visto che questo tempo spesso non c'è, alla fine è una scelta personale e di assunzione di responsabilità. "Non riesco a capire dalla norma se deve essere assoggettato o meno, non ho il tempo, non faccio autorizzazione paesaggistica, sperando che poi nessuno abbia niente da dire, che qualcuno faccia un esposto". Che tu realizzi per esempio una duna, che non sai se è da assoggettare o no o semplificata. La cosa migliore è "faccio istanza di autorizzazione paesaggistica e aspetto il tempo necessario, possono essere 90 o 120 giorni" non hai il tempo, non fai l'istanza e fai finta che sia assimilabile a un intervento che non modifica il contesto perchè di fatto è una duna che e blabla, poi incroci le dita sperando che nessuno faccia esposto perchè davanti a un eventuale esposto di chicchesia, un bagnino che è scocciato dal fatto che hai realizzato duna dove prima era tutto piatto e non ci può mettere gli ombrelloni, fa esposto e parte un iter che tu non sai come va a finire perchè ti sei assunto responsabilità senza avere certezza normative perché questo tipo di modalità di intervento non sono codificate in maniera chiara. Quindi questo è un esempio ma ce ne sono tanti altri sui fiumi. Sui fiumi una qualcosina è stato fatto nel dpr 120: è stato detto che interventi di taglio finalizzati al deflusso non sono da assoggettare. Anche lì però so di alcuni casi in cui sono stati fatti esposti e i funzionari sono stati condannati da punto di vista paesaggistico perchè quelle piante tagliate non ostacolavano deflusso ordinario e quindi alla fine dei incrociare le dita.

D. 13.2: Ci sono queste procedure perchè queste interventi sono pochi conosciuti?

R. 13.2: è l'atteggiamento del legislatore italiano che fa norme poco chiare e poi lascia all'interpretazione di chi fa i progetti o di chi dovrà giudicare se quella cosa è davvero di interesse paesaggistico

D. 13.3: progetti come Operandum possono essere assunti come esempio in termini di dati, affidabilità ecc? in futuro questa potrebbe essere un potenziale anche in mano a chi fa questo tipo di pianificazione? oppure in assenza di una normativa chiara sarà sempre difficile?

R.13.3: Su tema paesaggistici sarà sempre difficile. Ideale è che ogni modalità di intervento sia ben codificata e inserita nelle categorie per essere assoggettate o meno a aut paes o impatto ambientale. Poi si può discutere se questo tipo di interventi siano meritevoli o meno di essere assoggettati, non è solo perchè si chiama NBS vuol dire che non ha impatto su ambiente o paesaggio. Problema vero è impossibilità di definire e categorizzare gli interventi e quindi si lascia ampia libertà di interpretazione. Operandum deve fare o ha il merito di poter fare è quello di codificare almeno le esperienze fatte come

degli approcci che siano ben definiti e codificati come approcci innovative e basati sulla natura. Il concetto di NBS è ancora troppo fumoso, non ben inquadrato e codificato. Tornando ai percorsi autorizzativi, vista l'esigenza di andare verso compatibilità tra la mitigazione e esigenze ambientali venga data una premialità o percorso accelerato sia per quanto riguarda aspetti paesaggistici o impatto ambientale un percorso semplificato. Però le NBS devono essere ben chiare e ben codificate altrimenti si ripresenta il problema precedente tipo il premio dei finanziamenti ma non era mai stato ben codificato quali erano questo tipo di interventi e quindi si faceva maquillage aggiungendo solo qualche pianta alle planimetrie. Codifichiamo bene cosa sono le NBS; diamo percorso agevolato dal punto di vista autorizzativo, se meritano di essere valutate positivamente per impatti ambientali, vengano fatti in maniera rapida. Quello che frena molto tutto il mondo della progettazione è il problema dei tempi. Non possiamo permettercelo. I tempi autorizzativi sono molto lunghi, estenuanti. Premiare quindi alcune scelte dando un percorso agevolato e più rapido. Questo favorirebbe utilizzo di alcuni tipi di tecnologie. Forse vale più la pena di prenderle in considerazione.

D. 14: per quanto riguarda i contratti di fiume, stanno aiutando? Leggevo che si stanno estendendo anche ai contratti di costa. (Morolli 5 min 7)

R. 14: Non ho tantissime esperienze ho solo un'esperienza su un contratto di fiume sul mio territorio ma non ha portato a niente in questo momento. Adesso si sta cercando di farlo per le coste e anche in emilia romagna e nell'ambito della strategia di gestione integrata e di adattamento ai cambiamenti climatici la cosiddetta GIDAC è prevista un'azione alla creazione di un patto di costa, vediamo come andrò a finire però è un qualcosa di nuovo che è tutto da costruire e da verificare. In questo caso gli attori principali sono i comuni, le organizzazioni dei balneari, quindi bagnini albergatori, la regione in quanto ente competente in materia di difesa della costa, le università in quanto soggetti che portano conoscenze tecniche e scientifiche su tutto il mondo legato al mare e alla costa, altri soggetti istituzionali tipo Arpa, un altro soggetto legato al mondo della conoscenza tecnica e scientifica settore costiero. Poi è previsto anche che ci siano soggetti legati al mondo della pesca e quindi anche le organizzazioni dei pescatori perché comunque sia in qualche modo sono interessati a tutto quello che è il discorso della gestione della costa. Ancora non c'è un'esperienza concreta, quello fatto in un recente passato è stato una specie di contratto di costa dove si chiamava in realtà tavolo di condivisione per la gestione integrata della costa a livello provinciale di rimini che vedeva coinvolti comuni, regione, e basta. Poi come attori, diciamo, chiamati di volta in volta anche gli operatori balneari dove venivano discusse alcune scelte di intervento ma era più che altro un tavolo consultivo, anzi di comunicazione di alcune scelte che poi è andato in estinzione nel momento in cui sono cambiate le amministrazioni con le elezioni e il cambio delle giunte poi dopo si è dissolto il tutto. È la regione in quanto ente competente in materia di difesa della costa

D. 15 e R.15: potrebbe essere uno strumento che incentivi la co-progettazione in teoria? Sì

D. 16: facendo una sintesi mi è sembrato di capire che secondo te siamo in una fase di regressione dal punto di vista della diffusione delle Nbs oppure come definiresti questo periodo?

R. 16: siamo in un momento di stallo. Il nuovo input positivo sarebbe potuto essere il PNRR in procinto di essere sviluppato e rispetto al quale ci sono tutta una serie di incognite almeno per quello che è la mia esperienza. In quanto il PNRR è legato, i suoi interventi sono legati a una serie di vincoli progettuali e realizzativi e vanno dalla tempistica ma anche agli effetti in senso più ampio sull'ambiente. Quindi quella poteva essere un'occasione nella quale spingere molto sull'utilizzo delle NBS. In realtà, non si è spinto in maniera così chiara e codificata, lasciando comunque un certo margine di operatività nelle scelte progettuali dove ecco, forse potrebbe essere questo il momento in cui promuovere le NBS come strumenti adatti a rispondere a quanto richiesto dai finanziamenti PNRR, cioè far capire che questi strumenti che abbiamo nella nostra cassetta degli attrezzi di

progettisti è più semplice raggiungere gli obiettivi del PNRR in tema di compatibilità con ambiente e con obiettivi che il PNRR si è dato in materia ambientale. Quindi siccome il PNRR è lì che sta per partire, adesso siamo tutti attendendo un pochino, in parte è già partito, noi stiamo aspettando adesso che ci vengano restituite l'approvazione dei programmi di intervento che comunque abbiamo già individuato, e anche tutte le modalità con cui dovremmo progettare e realizzare questi interventi. In questa prima fase c'era un indirizzo generico con una serie di vincoli temporali e di compatibilità adesso questi devono essere declinati in maniera più precisa e sulla base di questi dovremmo poi realizzare la progettazione e poi la realizzazione degli interventi. In questa fase potrebbe essere utile che si spingesse sulle NBS come strumenti che sono adatti a rispondere alle esigenze del PNRR. Perché altrimenti è un'occasione persa per far capire che le NBS sono uno strumento nuovo, tra virgolette, perché non è più neanche tanto nuovo, per progettare interventi con maggiore compatibilità ma anche maggior efficacia per quelli che sono gli obiettivi della mitigazione del rischio ma anche per gli obiettivi di compatibilità ambientale. Quindi sarebbe questo anche possibile, nonostante il PNRR è già partito come treno e alcune scelte progettuali sono già state fatte, però in alcuni casi credo ci sia ancora la possibilità di far capire che l' utilizzo di NBS sia lo strumento più calzante per adempiere agli obiettivi del PNRR

D: quelli già partiti non rispondono a criteri NBS

R: In alcuni casi no, non li conosco tutti quelli finanziati però purtroppo ancora una volta o avevi qualche cosa di già pronto a livelli di progettazione e idea progettuale che magari faceva riferimento anche a soluzioni NBS, e quindi immediatamente spendibile, oppure inevitabilmente visti i tempi che vengono dettati dall'agenda de PNRR per cui devi contrattualizzare entro estate prossima quindi 2023, e vi garantisco che per dei lavori pubblici questi sono tempi stretti, il più delle volte si ricade nel discorso per cui facciamo quello che abbiamo sempre fatto, utilizziamo gli strumenti che conosciamo e che padroneggiamo meglio e non ci andiamo ad infilare in una scelta nuova che rischiamo di non saper dove ci porterà.

D: Con i fondi PNRR si possono finanziare opere già previste nei vari piani o solo opere nuove

R: opere già previste che non siano già finanziate. Tipo messa in sicurezza di un tratto di corso d'acqua o costa con NBS, per quanto riguarda il mio settore, poi magari per altri settori come le scuole alle strade e tante altre cose che io non conosco, se tu avevi già pianificato l'esigenza di un intervento di messa in sicurezza del territorio, assolutamente si può essere finanziato con risorse PNRR purché non sia già finanziato con altre risorse, purtroppo i tempi di realizzazione sono talmente rapidi che o avevi già pronte un progetto ne quale era ben chiaro ciò che volevi fare, e allora chiuderesti il cerchio in maniera perfetta altrimenti il rischio è che con tempi così brevi, magari avevi già degli obiettivi di messa in sicurezza di un ambito territoriale critico e non hai in questo momento la possibilità e il tempo di andare a valutare le NBS come strumenti perché non le mastichi, non le governi e non le conosci sufficientemente bene per poter dire questa è la soluzione idonea per risolvere il problema e quindi ti rivolgi alla tua cassetta degli attrezzi a quello che meglio conosci e quindi alle solite cose per cui il PNRR magari non è molto contento, perché sono strumenti che non realizzano appieno gli obiettivi di compatibilità ambientale però comunque ammissibili perché comunque il PNRR non è così stringente. Non ti dice usi NBS e basta, i vincoli ambientali del PNRR sono abbastanza laschi insomma. Viene chiesto che i mezzi operativi abbiano e siano tutti euro 6, robe che da un punto di vista di scelta progettuale contano poco, più sulla parte esecutiva. Anche che il tuo intervento non abbia ripercussioni sull'ambiente in senso molto ampio. Chiaro che se invece fossero più concreti e stringenti e richiamassero modalità di intervento ben codificate e ben chiare sarebbe ideale e sarebbe questo lo strumento adatto.

D. 17: per quanto riguarda l'accettazione delle NBS e in particolare la percezione di efficacia a livello tecnico a che punto siamo, cosa vedi tra i colleghi?

R. 17: Sono così ancora non sufficientemente divulgate o non sufficientemente testate. Alcune cose se ne è a conoscenza ma come esperienze singole e puntali, per cui si aspetta una maggiore diffusione prima di poter trarre conclusioni. Io ho avuto questa opportunità nei limiti miei di capacità di capire e limiti temporali, e sono venuto a conoscenza di alcune esperienze. I colleghi che non hanno avuto questa possibilità di Operandum, al netto del fatto che ho cercato di coinvolgerli, non hanno nessuna esperienza. È il sistema più ampio che si dovrebbe occupare di divulgazione facendo conoscere questo tipo di esperienze come efficaci ma anche non efficaci. Si tratta di strumenti che non per forza devono avere efficacia al 100% perché si pongono obiettivi diversi, magari hanno efficacia del 100% per un obiettivo e un'efficacia inferiore per un altro, oppure hanno efficacia intermedia ma per tanti obiettivi diversi e questo fa sì che complessivamente siano strumenti particolarmente validi ma anche perché intorno al tema della resilienza, noi abbiamo imparato questo nuovo termine che sta un pochino entrando nella testa dei progettisti, come un concetto nuovo, a cui fare riferimento nella affrontare il tema del rischio idrogeologico. Prima era la resistenza, noi dobbiamo resistere e contrapporci, annullare il rischio. Adesso stiamo imparando che, un po' perché non è possibile annullare il rischio, un po' perché questo è un concetto che sta maturando anche a livello istituzionale e anche a livello del singolo cittadino, di fronte a cambiamenti così eclatanti i nostri sforzi sono quasi inutili, complicati e dobbiamo imparare ad agire in maniera diversi con obiettivi diversi magari accettando un grado di rischio, individuando obiettivi anche diversi, e in questo senso questi strumenti potrebbero essere molto più efficaci perché raggiungono una molteplicità di obiettivi rispetto agli strumenti che abbiamo usato finora. Su questo serve opera di diffusione forte. Problema di comunicazione. Vi posso dire che molti dei miei colleghi, (non) sanno quando si parla di NBS a cosa fare riferimento.

D 19: la tua esperienza deriva da cosa?

R 19: esperienza deriva da interesse mio, consultazione su internet, coinvolgimento in OPERANDUM, questo mi ha stimolato ad andarmi a vedere qualcosa che è stato fatto anche in altri paesi. E basta insomma. Non ho esperienze di realizzazioni, se non quelle che mi hanno coinvolto marginalmente in OPERANDUM come la duna. Dando una mano a Margherita.

Intervista 7

Intervista a Rispondente 7, dipendente di una grande società di consulenza ingegneristica e fa parte di un gruppo di lavoro che ha l'obiettivo di sviluppare e promuovere progetti NBS. Intervistato il 15/07/2022 in modalità online.

Premesse e introduzione

Richiesta autorizzazione al trattamento dei dati ai fini di ricerca.

Introduzione: partendo dal background, formazione e da quanto tempo sei in questo settore

R: sono architetto, laurea magistrale in architettura e ingegneria edile, dopo la laurea ho fatto un dottorato in fisica tecnica ambientale all'interno di una scuola di dottorato che si chiama cultural and landscape heritage, ho un doppio titolo nel senso che ho svolto il dottorato a metà tra POLITO e un Università Tedesca KIT : Karls institute of Technology all'interno del quale facevo parte della scuola di dottorato di architettura. Quindi scuola finisca tecnica ambientale ma collocazione trasversale su

quello che è il tema del patrimonio principalmente costruito quindi edifici. Per quanto riguarda il tema delle NBS, lo conoscevo già un po' perché durante i corsi di laurea di architettura ho avuto un paio di corsi di tecnologie e innovazione all'interno dei quali si è parlato dell'argomento. Quindi in ottica di architettura bioclimatica, anche urban design ecc. Quindi io ho visto sempre tutto molto più dal punto di vista diciamo dell'ambiente costruito, urbano, edificio e ho lavorato meno sul paesaggio, però molte delle soluzioni NBS, che ho potuto poi studiare negli ultimi mesi con OPERANDUM e in azienda lavorando sull'argomento, molte di queste soluzioni si ritrovano sia in piccolo nell'ambiente urbano e poi possono essere utilizzate anche in ambito paesaggistico. Questi corsi si svolgono a Torino. A livello aziendale io sono arrivata in azienda a settembre nel 2021 e sin da subito ho iniziato a lavorare su Operandum sostituendo una ragazza che ci lavorava già. Diciamo che la maggior parte delle attività tecniche dei deliverable di cui eravamo responsabili, per quanto riguarda l'ingegnerizzazione delle NBS erano già stati elaborati mentre era in fase di finalizzazione la parte dimostrativa italiana, in particolare la duna che è stata realizzata a Volano. Ho visto le ultime fasi della realizzazione del progetto esecutivo e tutta la fase di cantiere e monitoraggio per quello che competeva la nostra azienda. Ultima cosa che posso dire è che in azienda il tema NBS è una linea di sviluppo rilevante per la nostra business unit, ci puntiamo molto e da circa 6 mesi è attivo un gruppo di lavoro dedicato che si occupa di definire quelle che sono le nostre competenze, le linee di sviluppo e di seguire i vari progetti che possono afferire alla tematica. Nel frattempo mi sono fatta un po' di formazione perché sono io la responsabile del gruppo. Abbiamo fatto anche alcuni workshop nei quali abbiamo ragionato su aspetti più tecnici e progettuali che su aspetti più di sfruttamento commerciale.

Domanda: nel team quindi ci sono queste nuove figure già importanti all'ingegneria naturalistica oppure sono persone che si stanno convertendo?

R: hanno già lavorato in passato sul tema nel senso che a livello aziendale sono stati fatti alcuni interventi di ingegneria naturalistica che magari non si chiamavano ancora NBS ma che rivedendoli nell'ottica attuale possono essere assolutamente collocati all'interno della categoria. Nel team ci siamo io, che gestisco un po' la parte di project management e faccio da collettore di tutte le istanze, gestisco i workshop ecc, sono protagonisti dei progettisti, che fanno parte di un gruppo che si occupa di infrastrutture dighe e però si può dire sia grey che green infrastrutture a seconda dei vari progetti declinano le loro competenze su quello che è il tema NBS. Il workflow viene messo in atto per delle soluzioni più tradizionali è diverso da quello che viene messo in atto nelle NBS. Dove ancora essendo un tema relativamente nuovo si cerca di lavorare in maniera multidisciplinare tra varie expertise diverse per anche dal punto di vista degli strumenti utilizzati per trovare delle soluzioni adeguate. Anche per il dimensionamento, la verifica e tutto quello che è il lavoro ingegneristico da fare.

Domanda: questa svolta e questa maggiore attenzione verso le NBS da dove deriva? Vi siete accorti che anche istituzionalmente c'è più attenzione, ci sono più fondi?

R: sicuramente un insieme di cose. Diciamo che il tema NBS anche in azienda è configurato sotto il cappello della sostenibilità. Anche il gruppo che finora si è occupato di questa tematica a livello più trasversale facendo da collettore io stessa, mi occupo di progetti di sostenibilità relativi all'efficienza energetica degli edifici, la mitigazione del rischio del CC, le NBS vengono diciamo viste come uno degli elementi su cui lavorare per la transizione ecologica per usare un termine di facile comprensione. Poi sicuramente c'è anche un'attenzione a livello comunitario. OPER non è il primo progetto sul quale lavoriamo in tema NBS e non sarà l'ultimo perché comunque ci sono diverse linee di finanziamento per questa tipologia di opere. Per noi è di interesse avere un ruolo di leader sul mercato visto che è un tema nuovo cerchiamo di posizionarci come degli esperti e di prenderci tutte le occasioni possibili. Di finanziamento ma anche di presentazione quindi ci è capitato di partecipare a eventi nei quali siamo stati invitati da associazioni, amministrazioni pubbliche per presentare il tema, spiegare agli

stakeholder di cosa si tratta perché sono fondamentali ecc. In più anche a livello di quelli che noi chiamiamo progetti industriali, quindi quello che non è ricerca, abbiamo visto negli ultimi tempi un aumento delle opportunità di finanziamento, per ciò che riguarda i bandi per la progettazione e i bandi competitivi della pubblica amministrazione sul tema.

Domanda: tipo il fondo progettazione per il dissesto? Quello che era già stato rifinanziato nel 2019

R: parlo in generale di bandi per la progettazione, quindi non per l'esecuzione. Noi di solito non competiamo per l'esecuzione delle opere perché non siamo impresa di costruzione. E abbiamo visto che bandi per la progettazione ci sono diverse opportunità che possono afferire alla tematica. Un altro fenomeno, e qui si entra più nello specifico, l'aspetto negativo è che ad oggi difficilmente si trovano dei requisiti esplicitamente richieste per quanto riguarda le competenze progettuali, però ci sono diversi bandi all'interno dei quali sono previsti dei criteri di premialità per delle opere che siano sostenibili o comunque portino avanti criteri di eccellenza in termini di sostenibilità.

Domanda: i criteri per esempio quelli che riguardano il 20% sulle opere integrate che riguardano il dissesto oppure ti viene in mente un bando specifico?

R: io non seguo le gare però ti so dire di questo trend perché qualche mese fa alcuni colleghi hanno fatto un'analisi di mercato per vedere quale fosse il mercato delle NBS e hanno verificato che c'erano tutte queste opportunità. Nel giro di un paio di mesi c'erano 8/9 bandi aperti sul tema.

Domanda: interessante, questo potrebbe essere un buon viatico. Interessante la questione progettazione perché infatti spesso ci sono i soldi ma non si sa come spenderli perché mancavano le capacità progettuali in questo settore. Soprattutto nelle amministrazioni pubbliche infatti volevo chiedere: capita spesso che le amministrazioni si rivolgano a voi come consulenti esterni per questo tipo di progettazioni?

R: non che io sappia, nel senso che noi solitamente, partecipiamo a questi bandi competitivi, quindi non siamo consulenti ma partecipiamo ai bandi per la progettazione. Poi altra cosa fondamentale da tenere in considerazione è che anche laddove il bando non riguarda nello specifico l'opera di ingegneria naturalistica le nbs possono essere integrate: faccio un es: c'è un bando per riqualificazione dell'intero comparto urbano, le nbs possono far parte di quello che è l'offerta che viene fatta da parte nostra. Quindi noi possiamo andare ad integrare queste soluzioni che ci vanno a dare punteggio nei criteri di sostenibilità e quindi sfruttiamo la nostra posizione vantaggiosa in termini di innovazione in questo senso. La nostra azienda partecipa in progetti di ricerca anche per questo, per essere sempre sulla cresta dell'onda e poter proporre servizi che altri ancora non possono proporre per vari motivi o perché magari non li conoscono proprio. Li sfruttiamo in questo senso. Che io sappia, non si sono state delle occasioni o magari non ne sono a conoscenza. Magari in altri settori che non siano NBS. Altra cosa che vale la pena di dire è che effettivamente per il tipo di NBS che investighiamo in OPERNAUDM è più facile che il nostro interlocutore sia una stazione appaltante pubblica che un attore privato. Molto spesso i territori su cui si va ad agire sono di competenza pubblica e non privata.

Domanda: tu con quali autorità pubbliche hai avuto a che fare:

R: non sono coinvolta in progetti industriali perché mi occupo di ricerca e innovazione. In operando con Prot civ emilia romagna, arapa e contatti con regione ER, poi sempre a livello di proposte per progetti di ricerca più di recente collaboriamo anche con regione toscana, quelle che sono le loro linee di sviluppo e il tipo di opere che intendono progettare come NBS, però non sono coinvolta in progetti industriali.

Domanda: ti sentiresti di dare una valutazione sul sistema istituzionale oppure pensi di non averlo affrontato abbastanza?

R: dal punto di vista istituzionale sono cose sentite e risentite, trite e ritrite. Io devo dire per quanto mi riguarda almeno nei progetti e proposte di ricerca ho avuto a che fare con persone appassionate che ci tenevano al tema e che cercavano più possibile di promuoverlo. Quindi esperienza assolutamente positiva. C'è da dire che le persone con cui mi sono interfacciata non sono dei decisori pubblici. Normalmente c'è la necessità di avere un'approvazione e una volontà decisa da parte dei decisori, dirigenti e persone che sono nella posizione di decidere se una cosa viene fatta oppure no, questo è un passaggio sempre un po' farraginoso nel senso che comunque soprattutto su questi terreni di innovazione, laddove non c'è un precedente essere colui che crea un precedente è sempre un qualcosa, per un attore pubblico e un funzionario è complesso.

Domanda: comunque per la tua esperienza, il sistema di governance ci sono le competenze adeguate per assolvere a questo compito di mitigazione del rischio?

R: non è facile rispondere su questo perché non essendo stata io sul campo a dovermi interfacciare con uffici tecnici, non ho avuto a che fare con delle persone che operativamente si occupano di queste cose, ma ho avuto più a che fare con persone che si occupano appunto di innovazione che se erano interlocutori era perché erano effettivamente competenti. Non è per me facile dare un'opinione. Le persone con cui ho avuto a che fare io erano assolutamente interessate e competenti.

Domanda: per quanto riguarda il processo autorizzativo della duna tu hai avuto un ruolo nella seconda fase post-mareggiata oppure no?

R: no nel senso che io non c'ero quando è stato fatto l'iter autorizzativo. Sono arrivata quando è stata predisposta la gara e non ho visto ciò che è avvenuto prima ma ho sentito dire che è stato un processo complesso perché c'erano competenze stratificate. Sicuramente diciamo che anche in fase di gare e realizzazione non è, come dire, non essendoci un workflow prestabilito si è fatto affidamento sulla collaboratività delle singole persone coinvolte che a tratti c'è stata di più a tratti di meno, da alcune persone di più altre di meno. Sicuramente almeno un paio di realizzazioni, noi in generale di abbiamo avuto un'ottima esperienza perché la ditta che era stata individuata era competente e molto flessibile. Erano loro per primi disponibili nel chiedere come si dovesse fare la cosa per questo progetto di innovazione. Non è che volessero per forza rimanere al loro metodo tradizionale. Naturalmente, lì è un caso che non fa statistica. Probabilmente è stato anche molto bravo il direttore lavori che era della protezione civile a scegliere una ditta che effettivamente è stata collaborativa e la più adatta a svolgere il lavoro.

Domanda: in altre occasioni per quanto riguarda le ditte, hai notato che c'è un mercato e un'offerta che sta crescendo dal punto di vista di ditte in grado di lavorare con queste metodologie?

R: Non ho statistica. Ho avuto un'esperienza positiva con la ditta della duna, devo dire che in generale, almeno per il tipo di NBS che abbiamo installato noi, ci sono tutta una serie di accorgimenti che devono essere presi per far sì che le cose siano fatte in maniera adeguata e quindi è indispensabile che chi fa la direzione lavori segua bene le persone che lavorano ecc. Il tipo di lavorazione che devono essere svolte, gli strumenti da utilizzare ecc erano assolutamente tradizionali quindi almeno nel nostro caso non era richiesta una competenza diciamo inusuale da parte delle persone che dovevano lavorare. Hanno utilizzato badili, un escavatore di piccola media taglia, piantare dei pali, però erano delle lavorazioni che da parte di una ditta che comunque si occupa di opere simili non era niente di complesso.

Domanda: tornando al discorso innovazione, molti strumenti legislativi che mirano a promuovere le NBS, hanno provato a codificarle, sia per quanto riguarda procedimenti autorizzativi, priorità di finanziamento, tu essendo nel campo dell'innovazione pensi che questa modalità rigida, appunto della codificazione, piuttosto che lasciare il sistema più flessibile a autoregolato possa funzionare?

R: la mia opinione vale quello che vale? Penso che sia una cosa positiva per quello che dicevamo prima per quanto riguarda il contesto italiano. Nella mia esperienza laddove c'è una procedura stabilita, la persona che si occupa di gestire la pratica e dover prendere delle decisioni è assolutamente facilitato nel farlo. Ci sono delle rigidità aggiuntive che non beneficiano normalmente alla buona riuscita delle cose però c'è anche dove c'è una procedura prevista, se ben fatta, può facilitare di molto le cose perché toglie quella responsabilità che diversamente alcuni attori si devono prendere nel decidere di propria pelle, di fare una cosa in modo piuttosto che nell'altro. Laddove c'è una procedura scritta, dei template, è per loro credo più semplice agire. Hanno un qualcosa a cui aggrapparsi nella valutazione.

Domanda: da quello che ho capito, alcune NBS, partono quasi tutte da concetti già noti e poi l'innovazione risiede nei materiali, nei metodi. Una codificazione adeguata è possibile immagino.

R: esatto

Domanda: ultima parte dell'intervista sempre sul mainstreaming quali sono secondo te le barriere principali, che possono essere culturali, mancanza di formazione, il quando normativo, aspetti economici, quello che ti viene in mente.

R: per esperienza che abbiamo avuto, anche sentito dire da colleghi, e interlocuzioni con colleghi che si occupano di business development e di commerciale, sicuramente c'è una poca conoscenza dell'argomento, e quindi non è facile trasmettere a un cliente soprattutto un cliente privato, il concetto soprattutto perché c'è diffidenza sull'efficacia delle soluzioni e sulle performance a lungo termine. Quindi preoccupa la fase di manutenzione. Preoccupa maggiormente almeno secondo quanto detto dai colleghi del business development. Nel senso che la grey solution è ampiamente rodada e si sa dove si va a parare. In termine delle spese nel tempo per fare i vari lavori di manutenzione, ripristino ecc. Nel caso NBS non abbiamo ancora tanta letteratura e non c'è abbastanza conoscenza e c'è da dire che effettivamente non è facile trasmettere il principio che la NBS molto spesso mira a re innescare un meccanismo che in Natura esisteva già e per qualche motivo non funziona più. Quindi i clienti e gli interlocutori sono abituati a delle soluzioni che come dire mettono fine a un problema e lo fanno nel tempo e rimangono statiche mentre la dinamicità delle NBS è un qualcosa che tendenzialmente spaventa. Detto questo, per dare nota positiva, penso che si possa lavorare molto ed è fisiologico che ci sia questa diffidenza da parte del mercato visto che è un tema caldissimo sul fronte della ricerca. È normale che si debba creare conoscenza sull'argomento, dati e numeri a supporto di quelli che sono le evidenze che noi magari con persone che si occupano del argomento, e che vediamo già nei nostri progetti ma che difficilmente magari possono essere accettati come esempi singoli per dire da parte dei nostri interlocutori.

Domanda: interlocutori pubblici o privati?

R: soprattutto privati nel senso che il pubblico va un po' per conto suo. Sicuramente anche da parte del pubblico c'è questa diffidenza, c'è un problema di barriera economica, non è facile nel pubblico impostare delle procedure nelle quali si opti per soluzioni economicamente meno vantaggiose perché alcuni elementi che pur magari vengono presi in considerazione non hanno un peso così fondamentale magari, nella valutazione generale (min 31), e quindi si magari ci sono dei punteggi per la sostenibilità però poi quando viene presa una decisione si fa una matrice decisionale nella quale è un aspetto ma ce ne sono tanti altri, un po' per l'incertezza e un po' per anche dal punto di vista economico comunque materiali, bio-based ad oggi sono meno diffusi, più costosi e fon un punto interrogativo sulle

performance a lungo termine e questo non gioca a favore della soluzione NBS, questo però è un processo insomma.

Domanda: interessante questa questione degli aspetti economici, per quanto riguarda percezione di efficacia:

R: c'è un po' di diffidenza diciamo

Domanda: può anche essere correlato al livello di rischio?

R: assolutamente sì nel senso che la percezione è questa e questo è quello che ci è stato riportato dai nostri colleghi del business development, un conto è se devi riutilizzare la soluzione NBS per un rischio: o per cui non hai altra soluzione, tipo ambiente con vincoli e quindi non puoi agire in altro modo e quindi "the Grey solutions is not an option" e allora le NBS possono essere l'unica alternativa oltre che una buona alternativa, e poi generalmente, laddove il rischio c'è ma non è così critico, non interessa infrastrutture critiche è più facile promuovere l'utilizzo delle NBS.

Domanda: prima mi parlavi del processo decisionale degli aspetti che non vengono presi in considerazione: parliamo dei co-benefit:

R: diciamo che in ambito scientifico siamo sempre più abituati a creare una commissione, chiamiamola multidisciplinarietà tra social science e scienze dure e questo è una cosa che anche io approvo assolutamente. Però non è ancora così mainstream nei processi decisionali al di fuori del mondo della ricerca un po' perché non è facile settare criteri oggettivi o che possano essere riportati come oggettivi, per esempio in una gara dovresti avere dei criteri su questi effetti sufficientemente oggettivi da far sì che non si creino problemi di ricorsi ecc. Ciò che è calcolato ti dà una tranquillità anche al decisore. Dal punto di vista dell'investitore privato c'è un cambiamento in atto e sicuramente in seguito a tutto il fenomeno ESG e quindi un po' per dovere un po' per piacere diverse aziende stanno cominciando a lavorare sul tema e a considerare questi aspetti però anche lì c'è un processo lento che è in atto e che richiede il suo tempo. Direi che sono un po' questi gli aspetti insomma.

Domanda: il discorso che afferisce ai servizi ecosistemici tutto in divenire

R: dal punto di vista ambientale vale lo stesso discorso, a livello di ricerca è normale parlare di economica circolare, life cycle assessment, life cycle cost, LCA, al di fuori della ricerca invece è ancora un po' presto e forse mancano un po' le leve. Nel senso che alla fine soprattutto da parte del mondo privato una cosa la fai quando è richiesta per qualche modo, autorizzativa, altre cose che ti servono avanti il tuo lavoro. Non lo fai semplicemente perché andrebbe fatto. Questa è un po' la verità. Un ritorno di immagine, in alcuni paesi questi criteri hanno anche delle ricadute legislative, quindi ci sono dei paesi in cui ci sono già le carbon taxes ecc. Tutte le volte che si innescano questi meccanismi si è poi obbligati a implementare le novità. Finché ciò non avviene bisogna aspettare il cambiamento culturale che però richiede molto tempo.

Domanda: input deve essere dato dalle istituzioni e dal mercato?

R: almeno io la penso così, opinione assolutamente personale.

Domanda: ti volevo chiedere, ponendola in un'ottica temporale, secondo te a che punto siamo con il processo di mainstreaming? Ovvero siamo all'inizio, pronti a vederle esplodere, momento di stallo.

R: sul tema, si sta cominciando a consolidare il concetto, che cosa si intende e cosa non si intende. Finora c'è stata una mancanza di una tassonomia sulla materia. Di definizioni, di categorie, di metodologie e ancora ci stiamo lavorando, anche su Operandum. Parlare di mainstream è presto, stiamo abbastanza indietro però è fisiologico che sia così. È un argomento abbastanza di frontiera

ancora.

si comincia a parlarne, ho visto che in alcuni casi (min 7m39), se non ricordo male ho visto una posizione aperta di PHD al POLITO sull'argomento da parte di docenti che si occupano di estimo. Tutto ciò che riguarda l'economic and environmental assessment.

Domanda: Vedendo i nuovi finanziamenti PNRR, progetti di rinaturazione del PO, nei prossimi anni vediamo cosa succederà. Ultima domanda, ti volevo chiedere, Paolo faceva riferimento a un tool che state sviluppando, ci stai lavorando direttamente tu?

R: Ni nel senso che, parlare di tool è una parola un po'grossa e l'obiettivo sarebbe creare uno schema decisionale, diciamo, di supporto alla scelta della NBS, alla luce dell'esperienza fatta sulla metodologia ingegneristica applicata al tema e per capitalizzare il lavoro sul wp2. Io ci sto lavorando più dal punto di vista PM e non sono io la persona che si occupa di progettazione e dimensionamenti ecc e quindi sono e sarò affiancata da qualcun altro che si occupa più nel merito dell'argomento. È un tool per l'assessment e la fase pre progettuale.

Domanda: destinato a?

R: pensato come strumento di base per la valutazione del corretto workflow nell'implementazione delle NBS, quindi l'utilizzo non è stato pensato per i tecnici specializzati ma per uno Stakeholder che ha bisogno di fare una valutazione molto preliminare.

Domanda: quindi sarà aperto all'uso?

Si, assolutamente

Domanda: pensate di presentarlo al prossimo stakeholder forum di novembre? Per quando prevedete di ultimarlo?

R: ti direi di risentirci a settembre che siamo con la testa sott'acqua per progetti che stiamo finendo e altri con deadline a settembre.

Domanda: voi lavorate anche con la regione toscana e Respondent 4

R: lui è una di quelle persone che citavo e che è interessato e sa come bisogna o bisognerebbe fare, quali sono le opportunità. Vorresti sempre avere a che fare con PA ma lui si deve interfacciare a sua volta con decisori e li viene la complessità e non è detto che poi chi si occupa nella pratica si interessato e preparato quanto lui.

Ringraziamento e saluti

Intervista 8

Il Rispondente 8 è un dipendente di una grande società di Consulenza ingegneristica esperto in campo NBS e fa parte di un gruppo di lavoro che si occupa di sviluppare e promuovere le NBS. Intervistato il 3/10/2022 in modalità online

Introduzione e saluti

Richiesta autorizzazione al trattamento dei dati e alla registrazione

Confermo

D 1: Volevo chiederti qualcosa sul tuo background, da quanto ti occupi di mitigazione dei rischi idro-meteorologici? e quanto ti sei approcciato al mondo dell'ingegneria naturalistica e le NBS?

R 2: il mio background lo conosci ed è abbastanza lungo, ho iniziato a fare l'ingegnere civile nel 2001 e nel 2010 ho preso aspettativa e sono andato in Inghilterra a studiare i temi di sostenibilità nell'edilizia. Lì sono entrato in contatto per la prima volta con soluzioni di tipo NBS, che erano principalmente legate alla gestione delle acque, quindi smaltimento delle acque tramite soluzioni che andavano a replicare il comportamento delle soluzioni naturali ed era ante litteram già la definizione di NBS nel 2010. Dopodiché, via via le ho riaffrontate queste soluzioni prima in progetti, progettazioni anche pubbliche e poi in progetti di ricerca. Prima ho affrontato le Nbs di tipo urbano, due tre progetti di ricerca, per poi passare a Operandum che è il primo progetto di ricerca in ambito rurale. Però soluzioni di ingegneria naturalistiche sono diversi anni, almeno 6/7 anni che le applichiamo ad altri tipi di progetti. Non so se questo è sufficiente. Quindi prima spazi verdi in ambito urbano e sugli edifici e poi in ambito extra urbano e rurale che poi è il tema legato a Operandum. Non è una cosa che faccio da solo, ma è un gruppo multidisciplinare, altre persone di che ci lavorano e da un anetto abbiamo fondato un gruppo interno di lavoro sulle NBS da un punto di vista sia commerciale che tecnico. Per avere un'idea più completa panoramica del tema.

D 2: gli input per indirizzarsi verso questo approccio sono venuti direttamente da te?

R 2: da me e Giorgia che abbiamo organizzato questo gruppo ed è stato anche ben accolto. Adesso ovviamente come qualunque cosa, più specialistica, perché il discorso è proprio promuovere le NBS in ambito rurale. Di per sé è un servizio, non solamente un servizio aggiuntivo che fa parte di altre progettazioni quindi io e Giorgia abbiamo voluto formalizzare e creare questo gruppo di lavoro che include sia tecnici che commerciali in per aumentare l'exploitation delle conoscenze acquisite.

D 3: nel contesto italiano ritieni che si siano le capacità e le risorse umane adeguate per adottare questo approccio? Anche nel vostro team per esempio ci sono biologi, ecologici?

R 3: la prima questione è la stessa che ci ha chiesto la commissione europea quando abbiamo fatto l'ultima review di Operandum. È proprio quella di cercare di fornire degli strumenti per l'ingegnerizzazione delle NBS perché manca un po' di formazione specifica. Le conoscenze di base ci sarebbero per poterle portare avanti ma manca la formazione specifica e gli strumenti che consentono anche a società piccole e meno strutturate, o a singoli professionisti di poter affrontare il tema cosa che al momento è limitata ad alcune nicchie. Stesso discorso vale anche per le imprese che le realizzano, nel senso che c'è un numero limitato di imprese che si occupano di NBS in Italia. Anche gli strumenti di selezione da parte degli enti pubblici di tali imprese sono limitati perché sono inclusi in ambiti più vasti di opere di ingegneria civile quando vengono realizzati. Ci sono delle competenze di nicchia ben sviluppate, ma se si guarda ai grandi numeri, siamo ancora indietro. Abbiamo fatto anche un po' di scouting e di marketing per vedere se ci sono bandi e ce ne sono, e probabilmente saranno anche in aumento con i prossimi finanziamenti che circoleranno e quindi noi li monitoriamo. Sono più generici di quelli che ci aspetteremo ma iniziano a essere presenti anche nei bandi pubblici quindi questo per quanto riguarda il valore di mercato. Da noi, in, ha molte discipline diverse, quindi dal punto di vista ingegneristico c'è geotecniche idrauliche, civili, strutturali, e persone che si occupano di monitoraggio. Ci sono ma guardando su una scala più ampia di progetti abbiamo anche dei dipartimenti di ingegneria più ambientali con i quali collaboriamo che includono al loro interno anche degli ecologi e degli esperti di scienze sociali, per alcune cose specifiche, prevalentemente all'estero. Abbiamo attività finanziate da World Bank, o da banche o donors che richiedono anche componenti di social science e ecologi, in Italia il meccanismo è un po' diverso e queste cose sono distinte. È più facile che si sia un bando di progettazione per realizzare qualcosa, e certi studi vengono fatti più a

monte ed è più difficile. Noi siamo strutturati con tutte le competenze per fare studi di alto livello con competenze diverse.

D 4: mi sembra di capire che, come, vi aspettiate un incremento del mercato NBS nei prossimi anni, in generale ti voglio chiedere qual è la tua percezione, ovvero in che fase siamo nel processo di mainstreaming? Siamo ancora in fase embrionale e quindi sperimentale e di nicchia oppure se vedi che già siamo ad un passo successivo ed è un approccio pronto a crescere in modo significativo?

R 4: posso fare un'analogia. Io nel 2010 mi ero occupato di temi della sostenibilità nell'edilizia e ero andato in Inghilterra a fare diversi corsi e ho preso una certificazione. Se ne parlava ma ci è voluto parecchio prima di avere un'adozione massiccia che adesso ci siamo arrivati, ma negli ultimi 2/3 anni, non molto di più. Se dovessi dare una mia impressione siamo ancora a 3/4 anni da una piena adozione consapevole, in Italia di NBS. Prima che arrivi anche l'amministrazione pubblica, magari anche più piccola a fare qualcosa che non sia legato a fondi di ricerca o finanziamenti europei specifici ma che lo adotti come qualcosa di che ne so, almeno un 30% delle possibilità nelle quali possono essere utilizzate ci vogliono ancora 3 o 4 anni. Per quello che ti dicevo prima, di mancanza di una formazione specifica. E nel pubblico si tende ad arrivare dopo. Arriva prima il privato, soggetti privati come ENEL e ENI sulle NBS hanno chiari i concetti, riescono a gestirle e a capire il valore. Nel pubblico, tendenzialmente vedo sempre un gap di 3 o 4 o 5 anni di adozione di tematiche che alcuni clienti particolari nell'ambito privato adottano. Quindi mi sembra che più o meno ci sia la stessa curva della sostenibilità nell'edilizia. Questa è la mia previsione, magari ottimistica.

D 5: si infatti rispetto alle altre previsioni anche a me sembra una stima ottimistica.

R 5: dipende anche dalla politica, se i finanziamenti vanno verso quella direzione, magari all'inizio qualcuno farà qualcosa di finto ma prima o poi qualcuno inizia a provare ad adottarle sul serio e qualche soluzione reale, quelle più efficaci. Se non ci sono cambiamenti direi che qualche possibilità di iniziare a svilupparle in modo più massiccio c'è. Anche per i co-benefit che abbiamo visto anche all'interno di Operandum, perché dall'iter approvativo, ai finanziamenti, al ciclo di vita delle opere, ci sono tante cose che una volta dimostrate e consolidate, probabilmente, possono portare all'adozione via via maggiore delle NBS.

D 6: per capire meglio gli input da dove arrivano, voi a livello commerciale come le promuovete? Con le pubbliche amministrazioni sono loro che vengono a cercare voi?

R 5: distinguiamo tra privato e pubblico, il pubblico purtroppo il modo principale per accedere a certi lavori sono le gare pubbliche, che noi monitoriamo, abbiamo marketing e altre funzioni commerciali che vanno a monitorare i bandi pubblici e quando troviamo qualcosa di interessante andiamo a proporci. Altro strumento sono i concorsi che da un po' più di margine e nei concorsi mi è capitato di utilizzare di più il concetto di NBS. Possono essere sia pubblici che privati ma partiamo dai pubblici, mentre nei bandi si mettono offerte principalmente tecniche e economiche, mentre nei concorsi si fa una proposta progettuale piuttosto concreta e li diventa più facile inserirle, magari viene data un'area su cui lavorare e su quello abbiamo già introdotto proposte di NBS mescolate ovviamente ad altre attività. Nel privato c'è una crescente attenzione ai temi ESG, e quindi per dimostrare la sostenibilità e l'impegno sociale di grandi aziende, ti parlo di ENI e ENEL per esperienze dirette ma ho parlato anche con altre, e c'è dell'interesse nei confronti delle NBS. Siamo noi che inizialmente le andiamo a cercare però diciamo che poi quando si parla di certe cose inizia a esserci un interesse dall'altra parte e maggiore dibattito. Il mercato privato è un po' più maturo. Le grandi società hanno un report di sostenibilità nel quale inseriscono questi dati. Ho citato queste ma stiamo provando a fare cose anche con Royal Caribbean che si occupa di sviluppo di aree portuali, oltre ad altre operazioni mobiliari, noi proviamo a inserire questo tipo di soluzioni con questi clienti che a loro volto ci chiedono forti

componenti di sostenibilità nei progetti perché poi lo devono mostrare agli azionisti, al mercato, ai finanziatori. Quindi lato banche, lato ecc, diciamo che in generale, lato banche i finanziatori internazionali questo interesse, esteso sui temi della sostenibilità c'è già da tempo. Poi io parlo più a livello di fare un qualcosa di bello di edificio, di aree circostanti, gestione di alberghi, delle acque meteoriche sostenibili, di biodiversità. I primi che ci sono capitati sono derivati da finanziamenti stranieri da fondi, stiamo facendo anche adesso un centro commerciale con un parco all'esterno, che fortunatamente ha deciso di ripristinare la biodiversità e ricollegarsi all'ambiente circostante dovuto al fatto che è stato acquisito da un fondo internazionale che richiede questo tipo di qualifica nella loro proprietà. Quindi politiche, in parte greenwashing, metti quello che vuoi però dell'interesse c'è.

D 6: quindi mi sembra di capire che gli input vengono principalmente dall'alto in questo momento.

R 6: si tendenzialmente si

D: 7 Secondo la tua esperienza e percezione, le NBS, considerando l'analisi costi benefici per l'intero ciclo di vita sono competitive rispetto alle soluzioni tradizionali?

R 7: su questo abbiamo fatto una bella riflessione post summer school perché è un tema uscito diverse volte. Io parto dall'esempio della duna ma riguarda anche altre soluzioni che abbiamo studiato. Il fatto che ci occupiamo di soluzioni sperimentali, in questo caso, come in altri progetti di ricerca che mi è capitato di seguire, fanno sì che prima di arrivare sul mercato serve un'industrializzazione delle soluzioni. Quindi per rispondere, se penso che al momento, con quello che abbiamo in mano diventa difficile. Tanto che molte soluzioni, tipo il saccone sono stati fatti in modo semi artigianale, certe cose sono state per sicurezza affidate con certa cautela alle imprese. C'è un margine, per da un lato una riduzione dei costi, dimezzati i processi di realizzazione, aumentando le scale delle opere, Questo è un percorso con il quale si possono ridurre i costi. Dall'altro, sempre ... dei processi avere una maggiore standardizzazione nella progettazione e industrializzazione nella realizzazione. Faccio un esempio, se andiamo a realizzare 3 o 4 km di sacconi in diverse situazioni ci si augura che si arrivi già ad un processo, in un lab semi artigianale che ci realizza queste soluzioni ma una commessa per 3 o 4 km che prende in mano un soggetto più grosso e su un'economia di scala vai a ridurre i costi di produzione. Quindi la risposta non è proprio diretta quindi al momento no ma in prospettiva penso proprio di sì. Visto come è il discorso di stabilità, di soluzioni più facilmente integrabili, non richiedono per un adeguamento, piccole o grandi aggiunte ma non un rifacimento come le opere tradizionali quindi guardandole su un ciclo di vita lungo, potranno in futuro essere più competitive di quello che sono adesso. Adesso è o un mercato di nicchia o un mercato sperimentale, con particolari interessi. Serve ancora un po' di applicazione per riuscire ad arrivare ad un discorso economicamente vantaggioso rispetto al tradizionale.

D 8: quindi c'è bisogno che si crei una nicchia industriale capace di produrre questo tipo di soluzioni, e questa è una delle barriere principali?

R 8: come me sì, come tante soluzioni innovative è sempre lo stesso percorso.

D 9: per quanto riguarda il sistema di governance e di mitigazione del rischio, tu in prima persona in che modo ti relazioni con questo sistema? Hai a che fare direttamente con gli enti pubblici oppure no?

R 9: ne ho a che fare nelle progettazioni, discutiamo, ti faccio un esempio, in cui applichiamo qualcosa di simile alle NBS in ambito urbano, per la riqualificazione di un quartiere ex caserme zona flaminio in Guido Reni. Ci sono le caserme e stiamo facendo con CDP un progetto, lì c'è rischio idraulico per il Tevere e ci sono delle opere in corso di mitigazione del Tevere, e ho parlato con la regione Lazio, il dipartimento che si occupa di rischi idraulici e abbiamo concordato diverse misure di sicurezza tra cui anche...siamo tornati a poter riproporre dei bacini di infiltrazione dove andiamo a raccogliere l'acqua

e ad infiltrarla nel terreno, perché abbiamo visto che dalle indagini di carattere ambientale, sembra non fosse possibile e invece in alcune zone rimane possibile e quindi faremo dei bacini di infiltrazione che oltre a laminare l'acqua vanno a infiltrare riprendendo le leggi naturali di infiltrazione che adesso non c'è perché è una zona quasi tutta asfaltata tranne qualche albero qua e là. È un esempio in cui andiamo a parlare direttamente con le istituzioni in quel posto fuori dal mondo. Quindi sì, spesso quando gestiamo progetti andiamo poi a negoziare con gli enti pubblici le misure da applicare per mitigare il rischio .

D 10: quindi in generale ti sembrano ricettivi per questo tipo di soluzioni e propensi all'innovazione?

R: nel momento in cui parliamo di rischi idrogeologici sono abbastanza ricettivi, più che in altre situazioni ma vogliono che nel complesso ci sia una garanzia effettiva. Cioè vogliono che i dati siano dimostrabili, giustamente, che funzionino che non si siano dubbi sulle soluzioni adottate e che magari siano integrate con altre misure di allerta e via dicendo in caso di superamento dei limiti delle soluzioni. Si mantiene un certo livello di sicurezza e controllo indipendente però diciamo che spesso non sono da sole, magari oltre le barriere artificiali ci sono pompe e via dicendo e nelle zone specifiche vengono usate anche altre soluzioni. Però l'inclusione di soluzioni di tipo NBS e ingegneria naturalistica è ben vista nel momento in cui se ne dimostra l'efficacia, in questo ambito, idrogeologico.

D11: sempre in riferimento al sistema della pianificazione, questo assetto che si è venuto a creare dopo le varie riforme con autorità distrettuali e poi regioni, comuni, Protezione Civile, ritieni che sia un sistema funzionale?

R: premesso che per questa parte mi supportano altri colleghi direttamente sulla parte di chi è il soggetto a cui fare riferimento, e non è mai così banale, nel senso che a volte è l'autorità di bacino che prevale poi c'è sempre il parere della regione. Sono sempre più pareri e più soggetti coinvolti e quindi se devo dire la verità complica spesso le cose. Avere più soggetti che si esprimono sullo stesso tema diventa complicato. Come tante altre cose in Italia però sulla gestione dei bacini e sugli aspetti idrogeologici avere a che fare spesso con autorità di bacino, protezione civile, con municipalità e via dicendo di sicuro non è un aiuto. Allunga, poi a noi spesso capita di fare conferenze dei servizi, sono quelle situazioni in cui ci sono tutti i soggetti che si esprimono sul progetto che teoricamente dovrebbero facilitare l'approvazione del progetto ma in realtà sono cose lunghissime, in cui sono coinvolti tantissimi soggetti. Oltre a quelli più tecnici, poi ci sono tante persone che si esprimono, questo è un punto di debolezza su qualunque tipo di progetto, non solo NBS. Una procedura poco standardizzata di approvazione, l'espressione di pareri di mille soggetti dipende da chi incontri, dalla somma dei pareri, da tante cose e non puoi essere sicuro al 100% di una cosa che funzioni a priori.

D 12: La conferenza da chi è coordinata e gestita?

R 12: Dal committente che di solito sono soggetti pubblici. Se il comune vuole realizzare una cosa nella quale noi siamo progettisti il comune convoca la conferenza o la regione o la protezione civile o chi per lui, il responsabile dell'area di competenza dell'opera e noi li supportiamo da un punto di vista tecnico, presentiamo progetti, rispondiamo a osservazioni integriamo e via dicendo, diamo supporto tecnico.

D 13: non è meglio così invece di andare a chiedere singole autorizzazioni a singole autorità?

R 13: teoricamente sarebbe meglio così ma in pratica, dopo anni e anni di lavoro, e anche avere lavorato all'estero.... Adesso ho fatto una call ed era con la Farnesina a Zurigo, consolato italiano, siamo andati a parlare con il comune che aveva delle interfacce separate ma molto chiare e molto nette sulle varie tematiche. ci ha detto di produrre una serie di cose fin dall'inizio ben definite, abbiamo fatto un paio di riunioni nelle quali abbiamo spiegato il progetto, ci hanno dato delle indicazioni per

l'ottimizzazione, abbiamo fornito i documenti e si è risolto. Le competenze sono ben individuate, non ti chiedono mille cose, 10 copie del progetto come capita alle conferenze dei servizi nelle quali tutti hanno tutto il progetto e via dicendo ma chiedono degli estratti e delle parti di loro competenza su cui si esprimono ed è un processo più fluido pur magari sembrando più frammentato. Perché magari hai dovuto fare 3 o 4 riunioni con soggetti diversi ma la differenza è che ognuno aveva piena autorità ad esprimersi sui temi, quindi una volta finita era finita.

D 14: quindi qua il procedimento è più indefinito?

R: li hai dei formulari specifici nei quali devi fare un estratto in una certa scala di una certa cosa, quando presenti un progetto ci sono già un elenco di cose specifiche da tirare fuori dal progetto che sono quelle su cui ti concentri per soddisfare certi criteri. Invece in Italia 10 o 20 copie intere del progetto vanno a uno che deve esprimersi sulla gestione delle acque. Gli arrivano i progetti delle strutture o le armature che proprio non gli interessa. Quindi è tutto molto meno strutturato, burocratico lo è. Li è molto strutturato ma dal punto di vista tecnico molto meno.

D 15: poi vedendo i DPCM che regolano il sistema Rendis mi sembrava un procedimento strutturato,

R 15: dal punto di vista burocratico sì, tutte le fasi i tempi e via dicendo poi nel concreto quando si arriva alla parte pratica e tecnica lo è molto meno e questo è un difetto delle amministrazioni italiane che sono sbilanciate su lato amministrativo rispetto al lato tecnico. Magari hanno mille amministrativi che si occupano di tutti i dettagli, registrare cose ecc e una frazione di tecnici molto più ridotta e quando si arriva al dunque è molto più complessa l'approvazione e la discussione su certi temi.

D 16: quindi possiamo dire che un'altra barriera a un sistema più funzionale è una mancanza di personale tecnico all'interno della Pubblica Amministrazione?

R 16: Sì, la mia compagna lavora in comune a Genova è sovraccarica di lavoro perché nel suo gruppo che si occupa di sicurezza nelle scuole ci sono molti più amministrativi che tecnici e lei si trova a gestire 80 scuole e poi ci sono 5 amministrativi che stanno dietro al suo lavoro quindi c'è davvero una sproporzione esagerata ed è una cosa che ritroviamo spesso e anche parlando con le persone c'è questa carenza. Ma se guardi anche i concorsi, nelle amministrazioni pubbliche chiedono laureati in legge per la gestione di progetti europei, cercano laureati in legge. Si va bene c'è la parte burocratica da capire però poi devi conoscerlo il tema per poterlo gestire quindi c'è un po' questa barriera.

D 17: poi volevo chiedere per quanto riguarda la pianificazione a livello di bacino, non so se avete già partecipato ai processi partecipativi previsti dalla norma

R 17: Ti rimanderei ai colleghi idraulici perché a me non è mai capitato.

D 18: durante il policy roundtable ci dicevi che uno dei problemi per il mainstreaming delle NBS sono anche il quadro normativo non allineato, la mancanza di linee guida, e specifiche tecniche.

R: si collega a quello che ti dicevo primo quando parlavo di mancanza di strumenti per le piccole e medie imprese perché il quadro normativo ha delle parti dedicate specificatamente alle NBS, problemi sui materiali, definizioni delle azioni, tutte le cose che riguardano l'ingegneria; e anche strumenti a livello di letteratura manca un po' di esperienze per consentire piccoli studi o a singoli professionisti di fare delle verifiche, che poi come ti parlavo della regione Lazio ti chiedono comunque tutti i soggetti pubblici una prova della validità delle soluzioni. Molte NBS sono empiriche e il lavoro che abbiamo fatto con Operandum è stato proprio quello di renderle ingegnerizzate, valutabili e quantificabili in termini di azioni e comportamenti previsti. Quindi ti confermo che questa è un problema proprio perché ...se tu devi progettare un edificio che sia in cemento armato, in acciaio, in muratura puoi anche qualificare la muratura storica e fortunatamente in Italia ci sono tutte le

normative e i capitoli normativi che se ne occupano e via dicendo, tante cose sono fatte anche in ambito idraulico per soluzioni più standard, non c'è un vero e proprio riferimento ne normativo ne tecnico per le NBS. Uno sforzo che abbiamo fatto nel progetto, non solo sulla duna, è lavorando con altri partner per cercare di adattare quello che c'è alle NBS in termini di materiali e via dicendo ma anche studiare i metodi per valutare le azioni, i comportamenti, le modellazioni per vedere il comportamento delle soluzioni facendo delle ipotesi di ricerca, mancava della letteratura. Confermo quanto detto nel policy roundtable.

D 19: ho provato ad andare a vedere della normativa dove si parla di soluzioni integrate, però vengono citate in macrocategorie e poi non si va nello specifico. È difficile giudicare, anche quella parte di normativa che intende promuovere soluzioni integrate e NBS, si parla del 20% almeno dei finanziamenti destinati a questo tipo di soluzioni, ma immagino che poi questo si presta a interpretazioni.

R 19: c'è un gap tra l'idea di finanziamento che adesso se ne parla anche di più di certe soluzioni e poi di strumenti. Cosa intendo per normative? Intendo normative tecniche, quelle che ti consentono di applicarle certe idee o certi indirizzi. In Italia è abbastanza forte devo dire la normativa sull'efficienza energetica degli edifici, che ha seguito le direttive, le ha sviluppate implementate e migliorate per certi versi e chi si occupa di quel tema sa cosa prendere sa che fare. Alla fine finisce anche un piccolo studio magari non farà la cosa fantasmagorica ma riesce a muoversi invece per quanto riguarda le NBS manca tutto il supporto delle normative tecniche.

D 20: questo andrebbe fatto a livello ministeriale?

R 20: Sì il ministero dei lavori pubblici e come sono fatte le altre normative per le costruzioni. Ci sono vari strumenti come sono state le circolari anche dei vari ministeri ad esempio dei beni culturali, paesaggistici, quelli a cui fa riferimento la sovrintendenza. Per gli edifici storici vincolati non potendo rispondere alle normative, gli edifici nuovi o riqualificazione di edifici esistenti standard non vincolati hanno emanato delle circolari con le eccezioni o comunque diversi parametri e diversi criteri di valutazione della sicurezza sismica di edifici vincolati. Una minore mitigazione del rischio perché c'è un bilancio tra il valore del bene e il rischio sismico quindi mi consenti di intervenire senza magari andare a snaturare l'edificio. Manca qualcosa di equivalente in ambito sulle NBS in senso lato dove si impongono criteri meno severi su materiali, opere durate, oppure ci sarà un ciclo produttivo diverso. Distribuzione degli investimenti in modo che tu comunque hai un opera, che non è un muro di cemento che offre determinate garanzie però nel complesso funziona bene finalizzato magari in fase di manutenzione nel complesso agevolate però le normative tecniche devono andare dietro a queste proprietà altrimenti è difficile che diventi più attrattivo o comunque che sia privilegiata come scelta. Se fossi un piccolo studio, dici il muro lo faccio così, l'azione è quella, lo dimensiono così, perché con il comune so che più o meno funziona in questo modo e via. L'altra devo studiarla, devo studiarla le soluzioni e poi come faccio a farla entrare nella normativa? come faccio a fare le verifiche? devo rivolgermi a qualcuno di specializzato e perdo un po' di interesse.

D 21: da ignorante su questioni tecniche mi viene da pensare che standardizzare questioni relative a un edificio è più semplice rispetto a interventi sul territorio oppure no?

R 21: Sì e no nel senso che esistono, dipende a che livello, o normativo o tecnico in letteratura ci sono dei cataloghi di soluzioni o degli esempi di soluzioni. Per dire a livello normativo c'è un po' più di varietà però ad esempio uno potrebbe partire dalle soluzioni specifiche in ambito costiero, tipo di costa e tipo di soluzioni e elencare le normative. Anche in ambito delle strutture delle costruzioni, erano normative base e poi sono state aggiunte specifiche per aspetti industriali, infrastrutturali, stradali e via dicendo. Hai degli input in più quindi è vero quello che dici ma intanto si potrebbe partire da una

normativa standard dedicata e poi fare degli addendum specifici per il tipo di opera per il tipo di rischio e tipo di soluzioni e cercare via via di aumentarla la casistica. Quindi è difficile anche perché non si è fatto ancora nulla e se devi affrontare tutto dall'inizio è complicatissimo. La stessa cosa magari venti anni fa sulle murature prima dei vari sismi c'era meno attenzione ed era tutto più empirico e nel frattempo si sono adeguate e hanno preso in conto anche situazioni più specifiche a livello regionale e via dicendo. Adesso ci sono strumenti per la mentre prima dovevi un po' inventarteli.

D 22: ritieni che si sia avviato questo meccanismo per adeguare il sistema a questi nuovi approcci?

R 22: A mio avviso no ed è quello che dicevo che manca e ripeto speriamo che con il PNRR oltre a fare dichiarazioni di intento si riesca ad agire anche in questo ambito. Per ora non ho ancora visto nulla. Di questo tipo.

D 23: quindi a livello politico sta mancando l'input?

R 23: magari a livello politico un po' di input c'è ma non è ancora arrivato verso la parte tecnica e negli stessi ministeri e via dicendo. Anche la situazione particolare di instabilità di governo, elezioni, ha sospeso qualunque tipo di azione ma dovrebbero un po' muoversi. Se vogliono sfruttare questi fondi per...

D 24: anche la strategia nazionale di Adattamento Cambiamento Climatico e conservazione biodiversità se poi non si traducono in realtà...

R 24: arrivano fino al momento in cui c'è da fare la valutazione di impatto ambientale, c'è ancora qualcosa perché lavoro con i colleghi che le fanno e c'è qualcosa, ma quando scendi di livello e un po' più sul pratico c'è meno.

D 25: sicuramente negli ultimi anni tra covid, guerre e crisi politiche...

R 25: si hanno rallentato e distolto l'attenzione da queste cose, forse si.

Ringraziamento e saluti.

Intervista 9

Intervista a Respondent 9, tecnico del Consorzio di un consorzio di bonifica Emiliano. Intervista condotta online in data 17/10/22 in collaborazione con Teresa Carlone.

Premesse:

C'eravamo visti già in uno dei forum che avevamo organizzato. Come ti spiegavo al telefono stiamo facendo questo giro di interviste per chiarire questo quadro della mitigazione del rischio in Italia e in Emilia-Romagna, e per ricostruire la struttura e i processi che caratterizzano questo sistema. Inoltre vorremmo indagare come si inseriscono le NBS e a che punto siamo con il processo di mainstreaming per individuare le barriere alla loro diffusione.

Prima di iniziare volevo chiedere l'autorizzazione al trattamento dei dati e la possibilità di registrare questa intervista.

D1: inizierei chiedendoti qualcosa sul tuo background e la tua formazione

Mi sono laureato in ingegneria ambientale triennale e magistrale all'Università di Modena. Il percorso non si è mai specializzato in un ambito. La formazione è stata a 360 gradi e completa senza particolari approfondimenti andando dall'ingegneria sanitaria e ambientale passando per le Valutazioni di Impatto, geotecnica, geologia, strutture, idraulica, idrologia, rifiuti quindi veramente di tutto anche depurazione con formule biologiche per i depuratori. Dopodiché finita la laurea, ho mandato via un po' di Cv e ho iniziato a lavorare prima della fine in un'azienda metalmeccanica che fa le macchine per tetrapack. Poi dopo ci sono stati problemi di cassa integrazione e ho mandato via i cv per cercare un altro impegno e sono stato assunto nel consorzio di bonifica dove praticamente mi sono iniziato piano piano ad occupare prima di idraulica. Abbiamo acquistato il software di modellazione idraulica, abbiamo cominciato a fare dei modelli complessi, non più solo un singolo canale ma una rete e vedere come risponde quel bacino, piccolo o anche più grande ad un certo tipo di evento in modo tale che potessimo valutare sulla base di queste sollecitazioni gli interventi migliori per cercare di risolvere il problema compatibilmente con fonti di finanziamento esterne o interne. Dopodiché con una serie di finanziamenti legati al PSR, alla fine sono venuti avanti anche grosse progettazioni. Quindi oltre le piccole progettazioni fatte, si è cominciato a fare delle altre più importanti e siamo entrati nell'iter autorizzativo di queste grandi opere. Partendo dal progetto fino ad arrivare, durante l'esecuzione dei lavori ai controlli e ai monitoraggi. In quel caso li ho approfondito, una valutazione di impatto ambientale che dopo è stata ripetuta in altri interventi, ci siamo iniziati a strutturare anche sotto il punto di vista della valutazione di tutti gli impatti, emissioni potenzialmente negative durante la realizzazione di un'opera che un po' in generale manca in tanti progetti ma questa è una mia opinione che mi sono fatto nell'arco degli anni guardando progetti di tantissimi altri enti o esterni. Siamo partiti dagli impatti da cantiere che è la parte più importante perché le nostre opere, a posteriori, non è che hanno delle emissioni, sono lì, sono delle infrastrutture e al massimo quando fai un impianto consumi l'energia elettrica e l'allaccio alla rete. Il beneficio della salvaguardia idraulica è impagabile rispetto al consumo di qualche Kw quando va l'impianto due volte l'anno quindi non è quello. Dopodiché, abbiamo approfondito qualche aspetto geotecnico e adesso, sono uscite altre nuove Norme Tecniche Costruzioni, nel 2018. Poi dopo l'altra metà dell'attività è legata ai rapporti con gli enti, tutto l'aspetto burocratico gestionale che esula dall'ingegneria vera e propria. Quindi tavoli tecnici quando c'è stata la siccità quest'anno ma anche negli anni passati ci sono state estati nelle quali non se la si è passata troppo bene. Quest'anno è stato eclatante però...dopodiché non so redazione e aggiornamento del piano e delle mappe di gestione rischio alluvioni, conferenze dei servizi. Anche corsi di formazione perché abbiamo tenuto qualche lezione sia con l'ordine degli ingegneri che agli studenti universitari, tra l'altro proprio di Bologna e quest'anno tornano per la prima volta dopo il covid e tornano in visita agli impianti. C'è questo aspetto tecnico e burocratico di gestione dell'ente e i rapporti con gli altri enti. E poi l'aspetto comunicativo perché come tecnici ci chiamano, poi adesso sono il capo settore di un gruppo giovane, quindi o vado io o va uno di loro però ci chiamano magari nelle domeniche organizzate con la Siam piuttosto che Legambiente o il fai.

D 2: Mi incuriosiva la questione del software: è stato complicato nel senso c'erano già le competenze per poterlo usare o sono strumenti semplici che possono essere utilizzati anche da chi non ha un background apposito?

Alla fine la persona tutto, non è tanto quanto tu sai di quella cosa nello specifico. Io non l'ho neanche mai fatto una tesi in idraulica né in triennale né in magistrale. Lo abbiamo comprato scaricato il manuale e dici per due mesi tu fai solo quello. È solo una questione di tempo e di impegno, provarlo approfondirlo.

D 3: Li si possono inserire anche scenari climatici?

Scenari climatici non ce ne possiamo occupare noi direttamente, o meglio essere parte attiva protagonista per una questione di tempi. Però in questi 8 anni che sono qui abbiamo lavorato con soggetti e altri enti che si occupano di queste cose. Entrando nel dettaglio è più a cavallo tra il tecnico e quella parte burocratica di gestione dell'ente perché, faccio un esempio: Arpa e a Bologna il servizio idro meteo e clima con alcuni collaboratori il gruppo di Marletto Vittorio che ormai è in pensione c'era Giulia Villani e Tomei, i due operativi, avevano sviluppato all'interno di un progetto simile a quello che è Operandum, un software di previsione agrometeorologica. Cioè il software ti dice a una settimana e a al trimestre successivo, al trimestre il bilancio idro-agro climatico, sulla base delle colture presenti sul territorio e le caratteristiche di quelle aree, quanto viene irraggiato dal sole mediamente, di cosa sono fatti i suoli, quale è l'oscillazione stagionale della falda media perché non si sono degli strumenti che misurano, praticamente loro davano una revisione di bilancio, cioè di quanta acqua avevamo bisogno le colture. Poi settimanalmente invece su nostra richiesta ci dava la previsione in ml di fabbisogno idrico alla coltura per ogni particella colturale, presente sul nostro territorio. Un dato di elevato dettaglio. Veniva dal fatto che loro avessero vinto un bando europeo dell'horizon 2020 insieme ad altri istituti, c'era il CMCC, quindi c'erano loro Arpa e uno studio privato di Rimini che si chiama ecosistema che fanno questa attività in maniera approfondita, cioè di previsione meteorologica, agronomica, e tutto quello che è il mondo del cc, ma non lo fa per mesi, lo fanno anche previsioni a 70 anni perché in Romagna c'è un comparto dell'ortofrutta che è una potenza economica a livello mondiale e lì ci sono interessi per diversi. Loro vinsero questo bando e poi cominciarono al primo anno a interessare dei potenziali stakeholder per capire quali fossero le esigenze quindi ci incontrammo facendo una chiacchierata, ci piacemmo e dissero volete venire una volta in regione che vi mostriamo cosa facciamo e ci hanno mostrato il software. Questo software di previsione decennale, il CMCC coordinava tutto, ci hanno buttato dentro come stakeholder e noi gli abbiamo dato le informazioni sulle particelle colturali presenti sul nostro territorio in modo che loro potessero caricarli all'interno del software per vedere il fabbisogno e poi praticamente andavamo settimanalmente a testare quello che era il loro dato. Loro ci davano la previsione e noi vedevamo, definiti i contorni, il perimetro di alcuni sottobacini molto controllati, perché il problema della nostra rete è che non è una rete che nasce per l'irrigazione, nasce per la bonifica, 150 anni fa, sono canali reti che si sviluppano per asciugare i terreni e tenerli più possibile non alluvionati. Quindi, se l'obiettivo era non avere le paludi, dopo riconvertire in irrigazione va bene quando arriva la meccanica con le pompe ma la rete non è strutturata per quello. Noi teniamo l'acqua per un solo punto di pompaggio ma magari con quello servi 70 mila ettari di territorio, non è semplice ma individuati dei piccoli sottobacini che hanno molto controllo perché ci sono dei sistemi di passaggio, confrontavamo il dato di pompaggio con quella che era la previsione. Dovevi accettare un errore e uno scarto del 10%, oltre ci si domandava il perché. Si è fatta questa attività per tre anni e facevamo un reportino, convengo a Stoccolma, Cordoba e Venezia e sotto questo punto di vista ci siamo resi disponibili ma non abbiamo sviluppato i software con i codici di calcolo. Poi sono venute fuori altre attività di collaborazione su progetti simili tra cui il vostro. Un altro ce l'abbiamo con questo studio della Romagna con il quale ci siamo trovati bene. Si chiama ecosistema insieme al consorzio dell'Emilia centrale, Iren che gestisce il servizio integrato di acqua gas e luce nelle province di Reggio, Piacenza e Parma, la parte più emilina, poi c'erano altri soggetti, comunque in quel caso si sta facendo uno studio di bacinizzazione sul secchia?? Però questo studio, ecosistema sviluppa tutto dal punto di vista modellistico e poi noi conferiamo o meno quello che sulla base della nostra esperienza è il risultato del loro modello. Non andiamo a farli noi perché non andiamo a farli noi.

D 3: Questo influisce sulle vostre progettazioni? E sulla pianificazione?

Sì, per meglio dire in un caso è successo però si sa cominciando adesso e non è che proprio si riesca dare una risposta certa. Al telefono abbiamo parlato del problema di comunicazione culturale ecc,

chiamiamolo come vogliamo, certe cose vanno dette con sincerità senza dover fare per ogni cosa un bilancio costi e benefici e allora non lo faccio. Il bilancio lo devi fare su una scala temporale, per cui magari non hai neanche l'informazione di farlo. Questo progetto qui, durato tre anni, ogni anno alla fine, quando presentato il report dicevano "siete soddisfatti? Lo possiamo utilizzare? A chi possiamo venderlo? Se ha dei modelli e delle potenzialità tecniche da poter vendere ad altri stati o organizzazioni, sempre con la stessa finalità lo fa ed è quello l'obiettivo ma non si può pensare di prendere tre anni di dati e farci una modellazione statistica. Anche in idraulica ti dicono prendi venti anni di piogge e ci fai un DR20, forse due anni. Non ha molto senso e noi l'abbiamo provato a dire e si vedeva che c'era delle volte più l'interesse a concretizzare un risultato nero su bianco sull'immediato che altro. Questo perché in tre anni nei tre sottobacini studiati uno è rimasto costante come risultato ed è quello che ci ha fatto verificare, noi lo sapevamo già che quell'area è deficitaria, ovvero che tutti gli anni gli diamo il 40% di tutto quello che avrebbe bisogno. Per due motivazioni: la rete è quella e non è che adesso possiamo bittare giù case, espropriare e allargare i canali e altro perché serve più acqua. Perché essendo cambiato il clima il fabbisogno è cresciuto delle colture, e l'altro motivo è che non c'è acqua nel fiume. Noi la prendiamo dal Panaro che questo anno stranamente ne ha avuta rispetto agli anni passati ma ci sono state annate in cui il fiume al 20 di giugno era secco e non c'era il DMW nonostante noi avessimo spento gli impianti. Se il fiume non c'è il deflusso minimo vitale a giugno sicuro non fai la stagione fino a settembre. E infatti avevamo deciso di prendere l'acqua dal Po facendo tutto un giro enormemente più lungo allacciandoci agli impianti già esistenti e a reti che riconvertite avrebbero potuto pompare l'acqua verso le zone alte, facendo un giro intorno all'acqua riuscivamo a portarla nel punto più lontano e poi andava anche nel resto del territorio. Si è logico, per contro dispendio in più di energia ma avevamo visto che altrimenti quell'area lì se la situazione dovesse peggiorare nel corso degli anni muore, quindi anche lì è stato un semplice bilancio costi benefici però ecco con uno studio del genere non può darti un risultato sicuro. Poi quando è statistica non lo sei mai sicuro però un conto è dare un dato con risultato certo, sono cose che uno le verifica, da segnali di positività e poi devono continuare ad essere finanziati altrimenti non è una banca dati sufficiente.

D 4: Ti volevo chiedere qualcosa in più sulla struttura del consorzio di bonifica, come è strutturato e come è gestito.

C'è l'apice della dirigenza con il direttore generale, il tecnico e amministrativo. Poi adesso c'è l'altro ambientale si chiama. È il direttore del settore comunicazione montagna agroambiente. Sono queste 4 figure. Ovviamente sotto ognuno di loro rispettivamente ci sono gli altri, tecnici e per quanto riguarda il direttore amministrativo personale e la cassa e la ragioneria, e sotto l'altra agroambiente c'è la parte dell'appennino, la comunicazione e questo altro settore che si occupa proprio di tutti quegli aspetti meramente ambientali quindi analisi di terre e acque. Partecipano ai tavoli tecnici e gruppi di lavoro dove si affrontano le nuove normative a livello nazionale e regionale. A livello nazionale, il referente regionale va a riportare il lavoro interno. Di solito queste attività sono coordinate dall'associazione nazionale dei consorzi di bonifica che c'è a Roma come associazione di tutti i consorzi di Italia e ogni regione ha la sua AMBI. Questa associazione nazionale. Detto questo, il settore tecnico e quello della comunicazione si intrecciano e collaborano per quegli aspetti che ti accennavo prima come anche l'amministrativo con il tecnico per il discorso del bilancio. Tutte le spese sono spese tecniche in quanto il gruppo tecnico è diviso praticamente nel mio settore, quello tecnologico che sarebbe impiantisti e poi dopo c'è un altro settore di attività tecniche generali e poi dopo ci sono le tre sedi periferiche del consorzio. Succede che le tre sedi lavorano per la manutenzione e la gestione ordinaria annuale del territorio, quindi espurghi, spacci, piccoli interventi di consolidamenti per criticità puntuali, conferenze dei servizi quando veniamo chiamati noi ad esprimere un parere, problemi con singoli cittadini. Può succedere qualcuno con la casa, il campo e poi tutta la gestione irrigua durante

l'estate. Le sedi gestendo il territorio fanno veicolare l'acqua all'interno dei canali e regolati i manufatti. Tutta la regolazione è fatta da gruppi di operai dove c'è un referente per ogni sotto zona all'interno di questi macrodistretto e ognuno si occupa del suo. Loro poi sono tutti coordinati da un referente. Poi c'è l'altro settore che è attività tecniche generali che si occupa un po' di tutto con le sedi periferiche, le supporta quando ci sono dei lavori da fare che sono dovuti a progettazioni che vengono da finanziamenti esterni. Noi come ente, nel caso in cui ci sia una calamità naturale, o ci siano particolari esigenze chiediamo fonti di finanziamento pubblico esterne e le utilizziamo per realizzare queste opere. Apro una parentesi: con il bilancio nostro facciamo la manutenzione ordinaria di tutto, ovviamente poi si gestiscono alcune criticità dell'ultimo minuto alle quali devi far fronte. Come gestione e manutenzione ordinaria che sono gli impianti e i canali ma tutto anche le macchine operatrici, escavatori, trattori, cingolati, gruppi elettrogeni, disponiamo di una struttura forte da questo punto di vista. Le sedi, gli automezzi, perché giriamo moltissimo in macchina per tutto il territorio. Capita di fare un migliaio di km in una settimana. Dopodiché quando si verifica una calamità o c'è un'esigenza particolare oppure ci sono dei grossi finanziamenti come il PNRR i Ministeri ti mandano una lettera e le regioni ti dicono abbiamo x milioni di euro, cosa mi proponi? Allora si fa il progetto e lo si manda fuori, in quel caso tutti i finanziamenti sono pubblici perché la spesa è talmente grande che non si potrebbe mai coprire con il bilancio del consorzio.

D 5: il bilancio del consorzio deriva dalle quote dei consorziati?

Si arriva la bolletta come quella della luce del gas e dell'acqua una o due volte l'anno dipende dall'importo che uno paga perché c'è chi ha capannoni industriali enormi che hanno una rendita catastale di centinaia di migliaia di euro che paga anche 20.000 euro di bonifica. Poi è logico che il contributo viene pagato a seconda dei beneficiari che hai. Se hai un beneficio solo di scolo paghi sulla base di indici a seconda del territorio dove ti trovi se invece irrighi paghi la bonifica comunque più l'irrigazione. Quindi concludo, c'è questo settore che aiuta le sedi per le progettazioni e i lavori più semplici, come i consolidamenti spondali dei canali con piccoli manufatti e poi ci siamo noi che facciamo tutta la parte di rapporti con gli enti come settore più tutte le progettazioni complesse. Nei rapporti con gli enti c'è anche la gestione del consorzio compresa la parte di bilancio e comunicazione e le progettazioni complesse sono tutte queste del PNRR, i grossi impianti dove c'è della meccanica dell'elettromeccanica dell'edilizia e quant'altro. Il settore tecnologico, cioè gli impiantisti gestiscono tutti gli impianti.

D 6: i comuni che ricadono all'interno del vostro consorzio che ruolo hanno

I comuni sono innanzi tutto parte fondante del consiglio di amministrazione, questo delle volte alcuni comuni se lo dimenticano però hanno un ruolo non da poco perché ci devono essere sempre tre sindaci. Questo è importante perché loro sono i rappresentanti di tutti gli altri comuni come quella parte che porta la voce anche del cittadino che ha solo l'abitazione, non anche quello che ha il capannone industriale o la grossa azienda agricola e quindi ha un problema sia di scolo che di irrigazione. Infatti quest'anno che l'acqua non c'era è stato un problema, perché giustamente dicono pago e voglio l'acqua però l'acqua non c'era nel fiume. Detto questo praticamente i comuni sono fondamentali nel momento in cui noi proponiamo degli interventi sul territorio. Perché innanzitutto sono la nostra nave che ci deve traghettare verso l'obiettivo finale, nel porto, ci deve far sbarcare perché noi chiediamo loro le autorizzazioni, sono tutti quei iter che vanno da conferenze dei servizi ai sensi dell'articolo 53, poi se siamo in Lombardia cambia, però c'è la conferenza dei servizi per approvare il progetto c'è da apporre il vincolo preordinato all'esproprio, c'è magari da capire nel dettaglio la realtà della zona. Nella campagna ci può essere un cittadino che è più comprensivo e uno che non ti fa neanche poggiare il badile sul bordo del suo terreno che tu gli stai risistemando il canale davanti casa, avrà più sicurezza idraulica quando passa la piena, che non gli frana dentro la recinzione

ecc. abbiamo altre realtà nelle quali la gente fa l'orto nel canale. I comuni sono fondamentali che ci devono supportare nell'attività fatta sul territorio e anche come segnalazione di criticità e necessità. Poi abbiamo anche un portale e lo può fare anche il singolo cittadino però i comuni...non me ne occupo perché se ne occupa il catasto e il settore sotto l'amministrativo che conteggia appunto la bolletta per ogni singolo cittadino però loro se non sbaglio avevano fatto questo tasto sul nostro sito che uno clicca, si apre un font che tu compili per una eventuale segnalazione, una frana, delle colonie di nutrie. Una volta non è poi così sbagliato erano addirittura i proprietari e i piccoli proprietari di casa che facevano la manutenzione quindi giravano sui canali. Non era il consorzio, una volta si andava a cavallo e non c'era tempo di fare tutto il gito. Ora i nostri operai girano in auto molto molto, ma non si può essere da per tutto. Magari la famiglia di nutrie si sposta da un canale all'altro, lo segnali all'ente competente regionale, se ne occupa il settore dell'agroambiente, c'è un protocollo per catturarle fai la segnalazione, loro escono prontamente due giorni dopo ma quelle magari si sono spostate. Le segnalazioni sono importanti.

D 6: invece i vostri rapporti con la regione in quali occasioni si verificano?

Si sono verificati o in casi di calamità, perché non andiamo a parlare con il ministero con cui parliamo solo per grossi finanziamenti per cui loro scrivono, il ministero delle politiche agricole manda la nota, ho questo fondo che cosa presenti? La regione fa ho la stessa cosa quando riceve soldi dai ministeri o in caso di calamità tramite la protezione civile, l'agenzia regionale, raccoglie tutte le segnalazioni, vede quello che è il bilancio. Quella che è la cassa poi viene assolta dal ministero e dice "bene, in quello che mi hai chiesto ti posso finanziare questo e quest'altro". Poi ci sono anche altri uffici regionali che elargiscono questi finanziamenti e lo possono fare anche loro sulla base di emergenze quando c'è stato il sisma per esempio, poi il servizio geologico e sismico dei suoli, struttura regionale, aveva la firma ultima sulla congruità della spesa. Loro dicevano ok il progetto è approvato, va in gara d'appalto per fare i lavori e quelli sono i costi. Poi c'è la cassa della ragioneria della regione che versava nelle nostre casse i soldi spesi però diciamo che erano loro non era proprio la protezione civile. A parte le emergenze, soprattutto il servizio della difesa del suolo magari annualmente sulla base di alcune richieste nostre, abbiamo avuto quella frana che non è piccola, è venuto giù 100 metri di canale. Questo può succedere soprattutto vicino le strade perché con i carichi che passano su alcune strade non pensate per quel regime di traffico dopo anni la sponda comincia a cedere. Quindi c'è la strada, c'è il canale danno i fondi a noi e sistemiamo tutto. Si fa di necessità virtù e siamo contenti tutti. Il comune, noi se la strada è provinciale si passa per l'autorizzazione della provincia. L'ufficio competente per le strade o l'ANAS, perciò questo è un po' la sfera dei rapporti con la regione con il punto di vista dei finanziamenti. Poi per quanto riguarda eventuali leggi che escono c'è quel discorso dei gruppi di lavoro fatti con i rappresentanti di ogni consorzio che si trovano con il referente dell'AMBI ER e poi lui e magari altri vanno in regione o scrivono un verbale o relazione per spiegare quali sono le nostre considerazioni. Con la regione c'è un ottimo rapporto, c'è proprio un dialogo quindi si riesce a lavorare in maniera più spedita.

D 7: il vostro territorio rientra tutto nella regione ER o tocca altre regioni

Tocca altre regioni.

D 8: questo non vi complica avere a che fare con tre regioni diverse?

Questa su è Lombardia. Tutta questa è Emilia-Romagna e sull'appennino è Toscana. La natura è più semplice della politica e dei confini amministrativi, questo è un bacino idrografico. Cosa che mi permetto di dire sarebbe più semplice per tutto, uno dice vabbè p solo l'acqua, no è tutto. Se io ho una criticità in provincia di Modena che non è solo questa che vi sto indicando ma è anche a Carpi e capita delle volte nelle quali la gente...si forse va data anche un po' di informazione e si potrebbe fare di più

però ci vorrebbe il tempo per farlo e noi in questo momento come tecnici non lo avremmo, adesso ci è richiesto di fare tre lezioni a vari gruppi, università cittadini e un misto di ingegneri e neolaureati però il tempo non c'è. Si sente alluvione a Modena uno chiama il numero di reperibilità e poi scopri che sono in comune di Carpi. Non va bene perché se io sono in emergenza non puoi chiamare il numero di reperibilità se il problema non è il mio, quando ci fu la rotta del Panaro qui, già facevamo una ventina di chiamate l'ora e non puoi ricevere anche chiamate superflue. Però detto questo il confine idrografico renderebbe tutto più semplice. Tutto quello che piove lì dentro viene raccolto dalla rete idraulica e finisce in un punto. Quello è anche confine amministrativo quindi anche competenza tra vigili del fuoco, protezione civile, noi. Chi è lì dentro in un'emergenza si trova lavoro e basta mentre hai un gruppo di vigili da Carpi che è stessa provincia ma deve venire ma è al di là del fiume e non riesce a passare perché i ponti sono chiusi perché rischiano di inficiare la stabilità. Così si perde efficienza nell'operatività quando si è in emergenza idraulica. Il nostro comprensorio è tutto il bacino idrografico del fiume Panaro

D 9: ai tempi delle autorità di bacino esisteva per esempio l'autorità di bacino del Panaro?

Si c'erano per ogni fiume, adesso non è che non ci sono più, sono riamate esattamente identiche ma sono confluite all'interno della protezione civile e i tecnici che prima incontravamo negli uffici autorità di bacino del fiume Panaro e fiume Secchia, i cosiddetti STB sono confluiti nella protezione civile. C'è anche una divisione dei ruoli e un raggruppamento e una divisione dei ruoli chiara. Voi immaginate che la via Emilia fa da spartiacque, tutti i fiumi naturali a nord della via verso il Po sono gestiti da AIPO, quelli a sud verso l'appennino che erano servizi tecnici di bacino sono passati alla protezione civile che ha inglobato il servizio tecnico di bacino. In mezzo a questa infrastruttura naturale, questo reticolo naturale, partiamo dall'appennino di torrenti, fiumi che poi diventa di grandi fiumi verso la pianura, in mezzo c'è tutta la rete di bonifica. In Appennino non c'è bonifica ma la nostra attività risale a circa gli anni '80 ed è legata ad un accordo per cui, avendo il consorzio il personale, le competenze tecniche e i mezzi opera, e qui tornano ad essere importanti i comuni, sulla base di segnalazione dei comuni o protezione civile su eventuali criticità. Tutti questi puntini sono su corsi d'acqua secondari ma naturali, sui quali noi andiamo a intervenire facendo briglie e sistemazione di versanti e quant'altro.

D 10 quindi AIPO a nord e protezione civile sull'appennino.

Si Aipo i fiumi naturali mentre tutti i canali sono i nostri

D 11 quindi tutto questo sistema complesso una delle criticità è la difformità tra sistema naturale e amministrativo oppure no?

Alla fine si va a risultato perché c'è l'esperienza, poi la protezione civile dell'Emilia Romagna sono anni che porta avanti a livelli provinciale dei momenti di incontro e condivisione. Ci si conosce per nome, non è l'ingegner Tizio, o Caio, il geologo ecc, ci si chiama davvero per nome, ciao Stefano e Francesca e quando si è al telefono in emergenza non sei lì a pesare le parole ma c'è un dialogo spontaneo che aiuta tantissimo perché c'è la fiducia totale l'uno nei confronti dell'altro. Il discorso che facevo sui confini amministrativi è che ecco, in un evento sismico, lì si può operare, con gli eventi idraulici il comprensorio del bacino idrologico è quello fisiologico per la natura quindi anche lì, nel caso in cui un evento colpisca due bacini c'è una parte di mezzo divisa da un lato e una dall'altro, comunque la macchina di mette in moto. L'altra volta sono venute Protezione civile da Toscana, Lombardia, Veneto e Piemonte durante la rotta del Panaro era venuto l'esercito i vigili del fuoco dalla Romagna. Si va a scala di emergenza regionale e interregionale a quel punto. Era più una considerazione sul fatto che i confini amministrativi non tornano mai con quelli dei bacini idrografici.

È una cosa più da ingegneri idraulici che ci domandiamo come mai non è così e all'università ci siamo fatti la stessa domanda.

D 11: invece per il sistema di pianificazione degli interventi a livello di autorità di bacino, partecipate anche voi al ciclo di pianificazione?

Si poi dipende dal grado di coinvolgimento che loro ritengono più opportuno in quel momento però adesso per esempio nell'ambito del PNRD ci siamo visti con l'autorità di bacino del Po per segnalare quegli interventi più strategici in modo che loro quando avessero riportato al Ministero le esigenze del territorio avrebbero potuto fornire una scala delle priorità degli interventi nostri e immagino fatta anche con gli altri consorzi. Con l'autorità di bacino si è lavorato a stretto contatto per il PGRI, che è stato un'importante svolta a livello nazionale perché lo si è fatto per tutti i macro bacini idrografici perché si è affinato quello che era il vecchio Piano di Assetto idrogeologico, quindi entrando nel dettaglio delle varie zone di rischio. Infatti c'è personalmente ho trovato importante la specificazione del livello del rischio più che la pericolosità che c'era anche prima nel piano di assetto idrogeologico che con altre terminologie e altre scale ma era ben chiaro. Vedere delle mappe di rischio che puoi dire qui ho il petrolchimico a Ferrara. Magari anche quello è scontato però è più d'effetto. Quindi c'è stato un approfondimento di questi temi fondamentale. L'ultima revisione è stata all'inizio del 2021 e adesso ogni 6 anni bisogna aggiornarlo secondo direttiva Europe e sottolinea l'attenzione voluta dal legislatore europeo oltre a quello nazionale. Non so se questo può interessarvi per esempio anni fa quando venne presentato, una seconda volta, perché la prima volta raccolsero tutte le informazioni e pubblicarono il piano poi fecero una rettifica, non mi ricordo di preciso, ma si andò a specificare delle norme attuative di questo piano e si fece una riunione in regione per parlare del problema del rischio alluvioni della comunicazione con la cittadinanza che vediamo ancora oggi essere difficile sotto certi aspetti perché continua a morire la gente andando a prendere la macchina in garage. Con il fatto che non viene riconosciuta nell'assicurazione come vengono riconosciuti i danni all'abitazione la gente dice sono 20 o 30 mila euro li sotto, io non vivo nell'oro e vado a prendere la macchina. E lo posso anche capire. In questo incontro in regione c'erano questi ingegneri tedeschi e uno olandese che aveva uno studio privato che faceva della comunicazione e formazioni con i tecnici e la cittadinanza in materia di rischio alluvioni, su da loro sappiamo quali sono i problemi, questo è uno studio a partita iva che vive solo facendo comunicazione con i tecnici e la cittadinanza e la popolazione. Per loro è molto sentito e ci hanno fatto vedere degli spunti interessanti. Nelle esperienze che presentarono, loro applicando la direttiva del rischio alluvioni, in un paese in cui c'è tanta piovosità loro avevano 44 punti di criticità in tutta la Svezia. La nostra mappa è colorata da Aosta a Caltanissetta e viviamo in un territorio estremamente fragile e chi vive nel resto d'Europa non se ne rende conto.

D 12: i vostri input alla pianificazione arrivano in base alle vostre ricognizioni immagino e poi avete anche il compito della progettazione no?

Pianifichiamo gli interventi di manutenzione ordinaria e sai che con alcune cadenze dovrei fare alcune opere per mantenere le infrastrutture efficienti. Poi però all'interno di questa pianificazione abbiamo dei margini di oscillazione nel caso in cui ci siano delle necessità e delle specificità. Questa più che una pianificazione in termini di intervento, pianificazioni come quelli che sono conosciuti come piani territoriali o comunali noi non entriamo nel dettaglio ma siamo entrati nel dettaglio solo nel PGRI perché i comuni e le province oggi prendono le informazioni dal PGRI. È stata una semplificazione dal punto di vista dell'attività perché essendo l'ente titolato alla salvaguardia idraulica, io do le mie informazioni in termini di rischio alluvioni, i piani sono sotto ordinati e si riferiscono a lui. Anche lì l'aspetto comunicativo è quello che un po' torna sempre qualunque discorso apriamo. All'inizio non è stato semplice e gli studi privati venivano da noi e dicevano che cosa dobbiamo fare? Si viene adottato un piano magari qualcuno non lo sapeva e non è stato recepito nei piani comunali e c'è stata

confusione ma come tutto quando c'è una novità però adesso strutturata la cosa non dobbiamo neanche più

D 13 stiamo entrando a regime? Quindi quello è un punto di riferimento fondamentale e mi dicevi rispetto a prima e alle vecchie mappe, ora oltre al rischio ci sono anche le esposizione al rischio, ovvero gli asset che possono essere colpiti?

Prima le mappe erano solo sul reticolo naturale, c'erano le fasce ABC invece adesso è stato integrato dal reticolo di bonifico chiamato secondario di pianura e in più non hai una mappa di pericolosità in cui dici l'evento con il tempo di ritorno ma è anche una mappa di rischio sulla base di quello che c'è sul territorio in quel momento poi c'è l'aggiornamento ogni sei anni però in sei anni è vero può cambiare qualcosa ma insomma se cambia qualcosa, se cambia qualcosa di magro in sei anni è una fascia temporale in cui questo si dovrebbe completare. Se si inizia al quinto anno di un aggiornamento e finisce dopo tre anni lo aggiornerai con qualche anno di ritardo ma non è quello insomma. È sicuramente un'informazione di dettaglio per tutti, cittadini e progettisti.

D 14 dopo aver fatto questo quadro complicato della situazione ti senti di definire questo sistema funzionale ed efficace alla mitigazione del rischio? Quali sono le criticità principali e cosa si potrebbe fare meglio?

L'unica cosa adesso sembrerà pretenzioso però le devi provare le cose per vedere quali sono gli aspetti da sistemare o meno. Sotto il punto di vista della salvaguardia idraulica e del fabbisogno irriguo perché sono due cose che saranno sempre più in emergenza. Uno perché gli eventi sono diventati estremi e l'altro perché l'evento estremo comincia ad essere tutto l'anno. Non piove, piove una volta impulsivo e quella volta che piove non soddisfa, dal punto di vista del fabbisogno irriguo ci deve essere, sempre lì un aspetto comunicativo dell'importanza dell'acqua in generale. Senza entrare nel dettaglio consideriamo che la città di Ferrare utilizza l'acqua del Po come acqua potabile, e anche le acque di falda c'è chi ha i pozzi privati e se non c'è acqua nel canale vado con il pozzo. Va un attimo sensibilizzato sull'importanza dell'acqua perché alla fine è tutto collegato ed è veramente un ciclo dalla irrigazione a quello che beviamo. Non solo anche in termini di scarichi perché le acque dei deuratorie finiscono nei canali l'olio fritto non lo butto nel alvandino che poi non lo riesci a depurare e se tutti lo facessero il canale muore e muore la fauna. Maggiore attenzione verso gli sversamenti dei singoli. Sotto il punto di vista della protezione idraulica ho fatto gli esempi dello scantinato, però sensibilizzare su che cosa sia il rischio ma anche su come funzionano i canali e sul fatto che se diamo una comunicazione, a quel punto data l'allerta bisogna veramente stare attenti alla cosa. Cioè nel momento in cui c'è una piena o altro, non girate e non andate lì a vedere. A nonantola c'erano tanti curiosi che ci vedevano montare le motopompe di emergenza. Non è un problema quello ma andarci a piedi con cautela, seguendo le indicazioni dei vigili, lì non si può andare, lì si può girare e sicuramente non mettersi in macchina. Anche solo per noi trovarsi all'incrocio sembra una sciocchezza così di dettaglio però mi trovo in un incrocio, ho un camion in bilico con sopra una motopompa da 44 tonnellate e questo deve fare una manovra in una via stretta, si incrociano due macchine e perdiamo 40 minuti. Gli effetti durante la piena del Panaro, noi siamo riusciti a piedi, non siamo riusciti a momenti a piedi a tornare alla macchina dal punto dove avremmo dovuto posizionare la motopompa perché l'onda di piena ci è venuta contro e 40 minuti può fare la differenza. Ho detto cifre a caso, 40 tonnellate e 40 minuti. Però è questo e anche la gente gira in macchina è un problema.

D 15: altri enti con cui abbiamo parlato ci hanno fatto riferimento al problema di personale dovuta a questioni strutturali ma anche a nuovi pensionamenti e mancanza di assunzioni negli ultimi anni. Anche voi avete riscontrato questo problema?

Noi no perché fate conto che nel mio settore siamo io due ragazze e tre ragazzi e il più vecchio ha 36 anni, poi ci sono io che ne ho 33. Anche nelle sedi periferiche si sono assunti 3 negli ultimi 4 anni, 4 ragazzi e uno poi è andato via per motivi personali. Però tre sono rimasti solo nel tecnico. Poi anche nell'amministrativo ne sono stati assunti un altro paio. Negli ultimi anni se andiamo a fare un bilancio abbiamo una dozzina di unità nuove e giovani. Il problema però è che con gli altri colleghi è verissimo e lo riscontro tanto. Veramente tanto perché il problema è che sono soprattutto il nostro mestiere che devi tramandare. Non puoi dire ti assumo e dopo sei mesi vai bene. In altre professionalità può andare bene come nella metalmeccanica. Quando si tratta di pianificazione e gestione di un territorio, noi che sia AIPO, autorità di bacino e protezione civile ci vuole un sacco di tempo dia dal punto di vista tecnico che amministrativo perché le leggi sono infinite. Capita che un tecnico del comune mi chiami e mi dice non avete considerato quella legge. Si è vero, per una specificità poi non avete ancora tutto quindi assolutamente sì, è un problema che va affrontato e poi altra cosa, piuttosto che parlare di spending review o altro un ente pubblico dovrebbe essere appetibile anche per un ragazzo. Qualcuno che ha voglia di iniziare e metterci i suoi anni ad imparare. Invece molto spesso a me capita che quando vado dagli studenti universitari e gli chiedo che domanda avete e non scherzo ma la prima domanda è quanto guadagni?? Siamo fuori. Al di là delle morali e dell'etica non gli posso neanche dare torto, quindi magari un tecnico viene assunto all'inizio e prende 1300 al mese netti, con 14 mensilità poi piano piano progredisce. Capisco che una ceramica ti offre di più ma devi decidere se fare una cosa che ti piace o fare le piastrelle e guadagnare una volta e mezzo o il doppio. Scegli tu, anche questo la maggior parte dicono bah non ci penso due volte e anche se sto chiuso 12 ore in giorno compreso il sabato prendo 2000 netti al mese e va bene così. Purtroppo ormai gli ingegneri li hanno declassati a tutti i livelli. Questo è un altro problema culturale non so comunicativo. Questo però è un altro problema, facciamo difficoltà a trovarli, noi sono un anno che cerchiamo un architetto e non riusciamo a trovarlo. Adesso dobbiamo vedere con il PNRR se hanno incentivato la cosa che è positiva di nuove assunzioni o no però stiamo aspettando che ci dicano qualcosa. Però noi assumiamo con il curriculum, non essendo totalmente pubblici, noi siamo un ente privato di diritto pubblico economico, quindi riusciamo ad avere ancora il margine per fare dei colloqui con il curriculum e qualche interrogazione o chiacchierata con il candidato. Poi si fanno anche i concorsi per carità però quando ci sono queste situazioni qui di emergenza, la rotta, il sisma, quindi c'era qualcuno che lavorasse e rimpolpasse le fila. A me nonn hanno fatto il concorso ma hanno fatto il colloquio e basta. Questo ci aiuta. Voi non so se avete parlato con altri consorzi

D 16: noi abbiamo parlato con protezione civile regionale, Arpae anche hanno avuto lo stesso problema però ecco appunto loro possono muoversi solo tramite concorso.

Cv più alla fine quello che è il bando della protezione civile perché dei miei compagni universitari, anche lì per esempio Modena è veramente attiva come territorio vedendo sia noi ma anche la Protezione Civile. I miei compagni ne hanno assunti 4, più hanno assunto anche altre persone però 4 ragazzi che hanno studiato a Modena e cresciuti a Modena che proseguono l'attività e questa è una cosa meravigliosa perché lo vedi che ci tiene, è casa sua. E c'è anche l'aspetto sentimentale della cosa.

D 17: nel complesso il giudizio è positivo?

Si assolutamente sì.

D 18: adesso vorrei aprire il capitolo NBS, già ne avevamo parlato rapidamente all'interno del forum e volevamo approfondire un attimo alcuni aspetti e innanzitutto chiederti quando è stato la prima volta in cui hai sentito parlare di queste soluzioni e se chiamate in altro modo avete adottato questo approccio con il consorzio anche in precedenza?

La prima volta ne abbiamo parlato quando si è proposto, Senadsol, un altro progetto con il professor toscano e praticamente si parlò di queste NBS. Ne parlammo anche un'altra volta con un professore di Parma forse in pensione. Se poi mi dovesse venire in mente il nome vi dico. Come docente aveva organizzato il labirinto di acque a Parma. Il professor Palloni. Ne abbiamo parlato con loro ma era più una chiacchierata che altro poi so che adesso sta prendendo piede e c'è anche un altro progetto H2020 dove ci hanno fatto vedere queste specie che stanno testando con radici che si ramificano e aiutano a strutturare la sponda e ridurre i franamenti. Sappiamo che ci sono, abbiamo cominciato anche negli anni a proporre, infatti erano entrati in ottima graduatoria due interventi win win del ministero dell'agricoltura e dell'ambiente che ci avevano chiesto degli interventi integrati ambientali e idraulici e avevamo proposto qualcosa però sotto questo punto di vista in totale franchezza come è andato? Avevamo trovato un intervento che provasse a rinaturalizzare una parte del corso ma l'altra doveva essere consolidata strutturalmente. Il consorzio di Reggio aveva fatto un progetto life per la rinaturalizzazione quindi per interventi solamente NBS però hanno avuto un sacco di problemi sotto due punti di vista e l'altro purtroppo, vi chiedo comprensione per il termine, ambientale logistico perché essendo diventate delle zone che immediatamente si popolano di fauna e di alcune specie vegetali, loro sono costretti a una manutenzione troppo particolare delle specie vegetali e nella manutenzione ordinaria del canale non riuscivano a fare gli interventi con il regime al quale siamo abituati perché c'è il periodo della schiusa, c'è il periodo della migrazione di quell'altra specie. P davvero un dialogo aperto e sincero, è giusto rispettare però il problema è che quello è uno strumento di salvaguardia idraulica e forse ci si dovrebbe parlare di più tra chi è competente in una materia e chi in un'altra per capire se c'è un punto di incontro. Perché qui vengo ad un aspetto di cautela che abbiamo tutti i consorzi. Non vorremmo che se facessimo un intervento troppo spinto poi dopo siamo paralizzati nella gestione di quella infrastruttura.

D 19: troppo spinto sul versante ambientale?

Si perché una cassa di espansione, Burana ha un uso plurimo, cassa per la salvaguardia idraulica, di laminazione della piena di due canali, quindi praticamente tiene all'asciutto sia Castel Franco Emilia che Sant'Agata e San Giovanni in Persiceto dove c'è il polo Lamborghini e automotive ed è molto importante. Funziona anche da cassa come approvvigionamento irriguo perché con le ultime piene primaverili, per cui dopo non abbiamo la necessità di svuotare la cassa in modo da evitare un potenziale rischio in caso di seconda pian, tratteniamo tutta l'acqua delle piene tardo primaverili e le usiamo l'estate per l'irrigazione quindi riduciamo il consumo di energia elettrica, la manutenzione degli impianti ecc. il problema quale è stato? Che negli anni si è popolato di specie ed è diventata un'area SIC ZPS. È andata a ricoprire un valore ambientale enorme, adesso però ci troviamo con la cassa che ha il volume ridotto e andrebbe riportata in efficienza ma fare una manutenzione è diventato faticoso. Però ci si sta muovendo perché proprio in uno dei gruppi di lavoro si parlava nell'ambito della Vinca di semplificare il procedimento per la richiesta di parere nell'esecuzione delle manutenzioni ordinarie.

D 20: questo a livello ministeriale o regionale? (1,17,13)

Regionale, dal punto di vista della salvaguardia idraulica c'è da darci un occhio per fare certi interventi.

D 21: al vostro interno dubito ci siano figure come biologi e ecologi

No quello no, è talmente sporadica la collaborazione in tal senso che si va con affidamento esterno con alcune particolarità. Anche dal punto di vista impiantistico e elettrico abbiamo elettricisti e periti che fanno piccoli progetti ma se devo progettare un impianto con una rete di alimentazione in media

tensione, ci rivolgiamo al mondo esterno. Studi privati di solito. Proprio per avere il progetto confezionato. È molto operativa la collaborazione

D 22: nel breve medio e lungo termine di aspettate che questo tipo di progettazioni aumentino o comunque come consorzio di bonifica la vostra attività non ve lo consente più di tanto?

Noi visto come ti avevo illustrato la struttura degli uffici facciamo sempre dei progetti quando si ravvisano delle criticità, quando si prevede che si stiamo per palesare alcune criticità in alcuni punti del territorio e cosa va fatto. A livello macrostrutturale quello lo sappiamo già. Con il PNRR abbiamo presentato tanto, non potevamo chiedere 100 milioni, abbiamo chiesto importi anche importanti perché siamo arrivati a chiedere, e dovremmo aver ottenuto 70 milioni per un impianto da 60mila litri al secondo di bonifica proprio. In più 3 interventi da circa 25/30 milioni di euro, adesso sto vedendo l'adeguamento prezzi che fine ci fa fare però sempre su punti, reti diffuse sul territorio, la non farai mai tutto. Magari ne progettiamo degli altri, li mettiamo nelle banche dati ministeriali e regionali e quando ci sarà nuovamente un sacco di finanziamento lo prenderemo e lo riutilizzeremo. Non è che ci fermiamo. Gli esterni vengono coinvolti per progettazioni molto specifiche. Magari per brevi consulenze, indagini geologiche, non abbiamo le macchine per fare le indagini con il geologo. Queste cose continueranno ad andare avanti.

D 23: Questo processo di mainstreaming delle NBS, mi sembra di capire che siamo ancora in fase embrionale. In generale al di là del consorzio, ti aspetti un incremento esponenziale di questo tipo di soluzioni? Oppure rimarranno esempi marginali?

Ci andremo molto cauti all'inizio. Qui c'è l'altro problema sempre comunicativo e culturale. Se uno sbaglia viene impiccato. Quindi nessun tecnico dice quando io non ho la certezza che un intervento strutturale mi risolve il problema io metto a rischio un centro urbano con un intervento magari meno strutturale di cui io non ho evidenza realizzativa e infatti, nelle occasioni in cui se ne parlò. Proposi come interventi una guida a livello non solo regionale ma proprio ministeriale, c'è un ministero che dice, io ti redigo delle linee guida. La regione emilia romagna l'ha fatto, interventi di rinaturalizzazione, ce l'ho lì dentro il manuale. Io ti propongo aree pilota, si fanno insieme e lo si fa insieme dalla comunicazione iniziale fino a poi l'utilizzo di quella infrastruttura e vediamo come risponde. Lo facciamo su piccole porzioni. Guardiamo un paio di anni come risponde a eventi di piena più o meno gravi e decidiamo come procedere. Non può essere un fai l'intervento NBS e il tecnico dice si dai lo faccio lì e poi in realtà salta fuori che viene giù appena terminata. Sotto questo punto di vista c'è un aspetto culturale e comunicativo che non riguarda solo la cittadinanza ma anche le altre amministrazioni. Siamo troppo bravi come genere umano a puntare il dito contro l'altro quindi uno magari lo sta facendo per dire vediamo degli interventi meno impattanti. Io mi rendo conto che se mi frana la sponda di un fiume, arginato che rischia di mettere a repentaglio la vita delle persone allora ok. Porto i massi ciclopici dalle dolomiti ma non posso pensare vita natural durante a tirar giù le dolomiti e piantare dentro agli argini dei fiumi, quindi assolutamente d'accordo a studiare e andare avanti ma non può essere un passaggio tipo interruttore on/off. Nell'immediato i tecnici del consorzio non è che si lancino così.

D 24: poi il manuale non ha valenza di legge, in caso di problema non ci si può appellare a quello. È un problema anche di formazione dei tecnici? Non c'è questa certezza che poi funzioni l'intervento magari anche perché...questa è una cosa che è emersa in altre interviste ovvero se mancano quelle figure ibride che siano in grado di progettare in modo integrato.

Si, nel caso in cui noi abbiamo chiesto a quelli un po' più della vecchia guardia solitamente ti rispondono con un no perché io ho la certezza che dopo 40 anni di lavoro che una cosa funziona e perché devo iniziare a fare altro spendendo oggi anche un po' di più perché è una novità, e ha dei costi

maggiori, il problema è che una cosa finché non diventa standardizzata, è un ciclo produttivo anche di quel tipo di materiali i cui costi sono leggermente maggiori, e loro dicono non esiste che io mi affacci a queste nuove opportunità. Per quello il discorso di una guida pubblica con finanziamenti fatti apposta per avere aree pilota, studiarli e poi vedere che cosa ne venga fuori. Nel momento in cui vai da qualcuno e dici queste sono le evidenze degli studi fatti e vedo un consorzio simile, un canale simile, mi leggo la relazioni idraulica del canale, vedo le foto di come ha risposto a questa piena o a quell'altra anche lì senza dover per forza cercare un risultato positivo perché per forza ci saranno delle NBS che non danno evidenze positive in quel frangente magari ne da un altro e viceversa. Però a quel punto sicuramente per tutti gli altri sarebbero maggiormente bendisposti. Un intervento strutturale ti mette al sicuro, pianti delle palancole dentro un argine e quello non va più da nessuna parte. Piantare delle palancole d'acciaio dentro un argine di un fiume, se si può fare dell'altro meglio. Se è solo una questione di tempi e di come si struttura il percorso. Non penso che sarà un no a vita.

D 25: già la tua generazioni di ingegneri e di tecnici è più propensa e credi che sarebbe in grado di adattarsi a questo altro sistema?

Si in questo win win per comunicare in maniera cauta, cosa avevamo detto. Bene, c'è evidenza del fatto che la sponda quando è inclinata due a tre, rapporto di altezza e base di due a tre. La nutria tende a non fare la tana o sono casi molto sporadici allora noi modifichiamo la pendenza del canale facciamo due panche più appoggiate con una golenina al centro. È logico però che se devo mantenere la sezione di deflusso, nel momento in cui ho un canale trapezoidale e per aumentare la sponda me la mangio per questo, l'altra la devo irripidire e quindi sull'altra c'è un intervento di difesa spondale, il sasso con una fondazione portante. Non è che dall'altra parte ci si è andati leggeri in termini strutturali però dall'altra parte c'è una strada quindi consolido definitivamente una strada e non avrò più problemi e eviti il rischio di incidente e ho rinaturalizzato l'altra sponda. Vediamo come va, sono prove logicamente. Dirti di fare tutte e due le sponde no perché dovrei allargare il canale, va fatto l'esproprio, per cui entri in un iter per cui non riesci a muoverti da per tutto in questo modo. In campagna dove c'è del seminativo si potrebbe provare, un canale che si allarga cambia la risposta alla piena, si può provare però devono essere cose localizzate, ragionate e un percorso strutturato. Non può essere che c'è questo finanziamento e vedi cosa mi vuoi riuscire a fare.

D 26: Un altro tema interessante è anche quello degli espropri. Infatti rinaturalizzazione da non tecnico mi sembra di capire che voglia dire riprendersi degli spazi e questo poi vuol dire levare spazio ad altro quindi terreni agricoli ecc. Come ci approccia a questa problematica?

Di solito cerchiamo un accordo bonario quando facciamo un intervento di esproprio. Adesso noi allargamenti di canali in termini di rinaturalizzazioni non li abbiamo mai fatti ma credo nessun consorzio, quello dell'emilia centrale ha fatto delle vache di invaso laterali che erano piccoli bacini di laminazione. Di solito cerchiamo gli accordi bonari, ci sono delle rabelle che danno il valore agricolo e sulla base del valore di mercato della zona e del tipo di coltura che lui ha si cerca d'accordo nei range previsti da legge. Se non si dovesse arrivare all'accordo bonario a quel punto di deve essere tramite l'esproprio. Qui c'è un problema perché l'esproprio lo possiamo fare solo con finanziamento pubblico che ci dichiari la pubblica utilità. Dobbiamo andare dal comune, apporre il vincolo preordinato all'esproprio con una conferenza dei servizi e non è mai agevole perché partono in ritardo, tu hai il finanziamento e devi rispettare dei target temporali. Adesso stiamo avendo un sacco di problemi con il PNRR, la legislazione non si sposa con quelle che sono le tempistiche dettate su questo quadro europeo. Poi capisco che per prendere soldi si è andati dall'UE e si è detto in 5 anni facciamo tutto. Nel mezzo io tutte le autorizzazioni da ottenere, quel procedimento 90 giorni, quello 60, vado dal tecnico e gli dico mi dai un parere dopo 15 e dice no, io indico la conferenza e fino al 59 giorno uno può esprimere un parere. È tutto farraginoso e sotto il punto di vista degli espropri lo è tanto perché si

può arrivare all'atto forzoso nel quale il proprietario mette di mezzo l'avvocato, bisogna chiamare i carabinieri. Noi cerchiamo sempre di cercare accordi bonari, fortunatamente essendo l'ente più diretto sul territorio c'è un ottimo dialogo, poi certe animie di persone, quindi quello più o quello meno disponibile lo trovi sempre ma alla fine un accordo lo si è sempre trovato. Sentendo i colleghi che hanno più di una certa età, carabinieri a casa non gli si sono mai mandati.

D 27: in altri casi ci è stato detto che associazioni di categoria, agricoltori potrebbero essere una barriera alla diffusione delle NBS proprio per questo motivo

C'è qualcuno che è ben lieto di vendere, il figlio magari fa un altro lavoro, lui sta arrivando alla pensione e dice va bene certo lo do via il pezzo di terreno o anche l'appezzamento intero e amen. C'è chi invece ci vive ed è molto più restio. Poi io da un certo punto di vista lo comprendo anche. Perché insomma lo fa di mestiere l'agricoltore e non è qualcosa di ereditato che magari da un affitto e da un po' di meno quindi può venderne una parte. Questo potrebbe essere forse il secondo ostacolo alle NBS, cioè individuale aree pilota per studiarle, delle zone in cui non sia problematico o perlomeno sia poco problematico partire perché altrimenti se impieghi già dei mesi e dei miliardi per iniziare a fare il lavoro è tutto tempo sprecato.

D 28: Ti vengono in mente altre barriere alla diffusione delle NBS?

Il discorso fatto all'inizio è già abbastanza ampio, la questione che riguarda gli enti che approvano ma anche di riflesso una questione culturale di cittadini visto che l'ente magari e il comune la prima interfaccia con il cittadino. Chi arriva lì dice stanno piantando un canneto da una parte, hanno fatto una golena sul canale, magari la sponda me l'hanno irripidita, dice prima il canale era bello dritto, l'acqua scorreva, adesso ci sta il problema e di là è venuta giù o il canneto ha dato un'altra sorta di problema di deflusso della piena, di vorticosità, adesso sto elencando le prima cose che mi vengono in mente. Anche questo è il problema principale ed è molto molto ampio e non è così banale.

D 29: prima era anche emerso in modo indiretto il problema della codificazione delle NBS quando parlavi dei manuali, linee guida

Si magari aggiungere delle appendici, quel discorso di testarle ma senza il peso del risultato perfetto una vota testata. Io accetterei anche che si da il finanziamento, si fa uno studio strutturato e ti dico andiamo a farlo lì. Poi lì non va bene e risistemo il canale come era prima. Accettare anche con serenità il fallimento. Noi italiani siamo sempre portati a pensare male che lo si è fatto. Per statistiche se ne fai dieci ne fallirai due o tre ma gli altri avendo conoscenza del territorio non falliscono. Però non si può guardare solo i tre che sono stati un fallimento, è questo il discorso. Quando dopo emetto le linee guida faccio un'appendice e dico l'intervento di tipo A questi sono i casi, io mi studio il modello idraulico di quel caso, la realtà del territorio e dico questo tipo di piena su questo territorio passa così e provo a fare un analogia con il mio. Stessa cosa per intervento di tipo A B C.

D 30: avevamo già parlato brevemente di procedure autorizzative. Pensi che le NBS meritino procedure semplificate per il fatto di essere in teoria meno impattanti o comunque è giusto procedere con l'iter standard? In termini autorizzativi per noi l'aspetto più brigoso è quello delle autorizzazioni ambientali, gli screening o la VIA. Sono sacrosante, assolutamente, poi in realtà la mia da tecnico di un consorzio dell'ER non è una lamentela perché l'ER è anni luce avanti, però nel momento in cui io ho queste soglie nette e se faccio un'opera più di quella soglia sono paragonabile al privato che ha fatto una ceramica con le sue quantità di emissioni o l'impianto di biomasse. Delle volte per noi diventa un po' farraginoso negli iter. Tutti gli interventi che facciamo per missione istituzionale sono volti o alla salvaguardia idraulica del territorio o all'approvvigionamento idrico. Due finalità assolutamente con scopo di pubblica utilità e parola di salvaguardia perché anche approvvigionamento irriguo su un territorio che si desertifica, poi se ne hanno problemi e conseguenze a livello sociale,

economico e politico. Le NBS in termini di valutazione di impatto se io decido di fare una nuova bretella, un bypass a un canale, che tutto riqualifico in questo senso ma lui allungando il percorso e facendo una sorta di cassa di espansione, mi diventa un intervento che supera una certa soglia io allora per andare in un certo iter mi dilunga i tempi. In condizioni normali non è un problema ma se ci dovessimo ritrovare con regole simili a quelle del PNRR è un problema che non vale la pena dover affrontare. Io inteso come tecnico se devo fare anche solo uno screening che dura 90 giorni più la richiesta di integrazioni che arrivano allora lo faccio ma io devo avere un anno per fare il progetto e farmelo approvare, poi da lì cominciamo a parlare di un anno di gara d'appalto e tre anni per fare i lavori. Il problema fondamentale è solo come relazioniamo le scadenze dei finanziamenti con gli iter autorizzativi, solamente questo perché un intervento del genere che ha qualche impatto durante il cantiere dove si muovono i mezzi e possono fare rumore. Però anche lì se sono in un'area di campagna questo si riduce in nulla. Visto che la legge non può dire, io do la soglia sul tipo di intervento per vedere se ricade in una VIA o no, più do una soglia di zona. No, va bene così ma nel momento in cui io redigo la relazione, se sono in una zona di sola campagna la scrivo di 10 facciate e il parere magari lo posso avere anche in 30 giorni, non dico 15. Se invece l'intervento lo faccio dentro un centro urbano, c'è un canale a cielo aperto in un parco cittadino è giusto che sia completato il tutto.

D 31: quindi un sistema più flessibile?

Si la parola giusta è flessibilità a seconda dell'intervento e calzare le tempistiche dei pareri rispetto a quelli che sono le tempistiche di target del finanziamento.

Ringraziamenti e saluti

Intervista 10 e 11

Intervista a Respondent 10 e Respondent 11 condotte da Matteo Mannocchi e Teresa Carlone il 17/02/2022 in modalità online.

Presentazioni

EP 1: sono responsabile attività pianificazione MAB Unesco dell'ente parco Delta del Po, il mio ufficio si occupa di progetti europei, attuazione tra life, un Horizon, Interred, abbiamo un po' di progettualità. Questa è l'attività che stiamo facendo e con il supporto del dottor C. stiamo lavorando su due LIFE, ne abbiamo in corso altri due con due regioni, con 4 regioni per il bacino. Uno è il Lifeill per l'inserimento delle anguille. Un altro Life riguarda invece gli aspetti più naturalistici, di lagune e anche life transfer, anche gli impianti infanearobici, in sacca di Goro. Io ho lavorato per 20 anni nel comune di Goro e sacca di goro e conosco bene le vicissitudini della realtà.

EP 2: ci siamo già incontrati durante il meeting che avete già organizzato, sono consulente esterno, lavoro per un ventennio su tutto il delta, diciamo sul delta geografico, sono un biologo maturato sul campo e che ha maturato una certa esperienza in materia.

Premessa e introduzione: anche io volevo ringraziarvi per essere qui ed averci dato disponibilità da subito. Per noi è importante avere la prospettiva dell'ente parco per avere prospettiva diversa dalle istituzioni con le quali ci siamo concentrati finora. Fino ad ora non avevamo avuto occasione di

confronto con qualcuno con un background come quello vostro, quindi biologia flora e fauna. L'incontro è diviso in due fasi. Ci interesserebbe avere la vostra opinione sul sistema di mitigazione e gestione rischio idraulico e poi focus specifico sulle Nature-Based Solutions e la loro accettazione e sul processo di mainstreaming che è iniziato e vogliamo capire a che punto siamo.

D 1: Negli ultimi anni molti stravolgimenti a proposito di mitigazione del rischio, ritenete che il sistema sia migliorato negli anni e quali aspetti sono cambiati maggiormente in meglio o in peggio?

EP 1: l'impostazione che ho visto in questi anni è stato affrontando non tenendo conto dei Cambiamenti Climatici e c'è tuttora un aspetto molto ingegneristico e molto idraulico e non si è tenuto conto di questo aspetto. Della prospettiva 50 e 100 anni e di come pianificare su territorio costiero ma non solo. Oggi ci troviamo ad avere risorse PNRR ma i progetti sull'asta del Po sono prettamente ingegneristici, ci troviamo in due progetti, uno la rinaturazione del Po affidata al MITE che ha come soggetto beneficiario l'autorità di bacino per il po e come soggetto attuatore L'AIPO. L'AIPO sta predisponendo delle schede progettuali che sono partite come scheda generica predisposta dal WWF che ha avuto la lungimiranza di parlare di rinaturazione ma che poi si sta concretizzando in schede prettamente idrauliche. Noi stiamo cercando di metterci una pezza parlando di ricreazione di golene e ampliamenti dell'alveo del fiume ma questo non è particolarmente sentito o abbinato alle tempistiche del PNRR. Tornando ad asta del Po, altri finanziamenti MITE da più di 100 milioni, in cui si fa l'opposto rispetto a quello che fa da occhiobello (?) per la rinaturazione. Da un lato 357 milioni, riforestazione rinaturalizzazione quindi l'indicazione è ridurre barriere che esistono lungo il tracciato per aumentare la superficie idraulica, dall'altro lato però problema di navigazione e il progetto prevede la classificazione in classe quinta del bacino del PO per andare verso Ferrara e Ravenna e Cremona come portualità e quindi alziamo le barriere e così si alza il livello e riescono a navigare più navi. Noi stiamo dicendo a entrambi guardate che ci sta un controsenso però ci sono le tempistiche del PNRR e quindi non si può più di tanto modificare la questione. Quello che dico è che c'è un approccio ancora molto poco sostenibile dal punto di vista dei cambiamenti climatici ed è l'approccio in generale anche dal punto di vista della concertazione. Spesso il ministero è partito con una procedura e si è dimenticato di interpellare gli enti parco e anche gli enti gestori delle reti natura 2000 che forse qualche pezza potevamo mettercela. Ci chiamano a fine procedura e quindi da lì nascono le problematiche. Noi come ente parco come approccio, graziano è lungimirante in questo, nel 2010 abbiamo fatto un piano di gestione della rete natura delta del po, anche ribaltata nell'area ferrarese, sia come interventi leggeri che non vadano a impattare con sassi e quant'altro ma anche con la cosa più importante, prevedendo di creare delle casse di colmata e delle casse di bacini idraulici che potessero servire nel momento in cui c'è acqua a fare da contenimento e poi restituirla nel momento in cui c'è siccità. Sono due aspetti fondamentali, uno diminuire l'ingressione salina di falda delle arginature. Voi sapete che il delta è sotto il livello del mare, 2-3 metri sono bacini chiusi, l'altro è quello di ridare acqua dolce quando serve e creare specchi d'acqua che consentissero la presenza di flora fauna e quant'altro. Questo però non è stato molto applicato, lo stavamo riproponendo adesso in ambito PNRR ma vi dico è una grana tura perché quando c'è l'aspetto ingegneristico e altri aspetti di gestione territoriale, compresi i consorzi di bonifica, non è sempre facile far capire che questo è un investimento a medio a lungo termine e poi darà risultato. Per cui servono forme di concertazione molto stringenti e una verifica dei bilanciamenti economici che queste attività fanno in ambito territoriale sia in termini di capitale naturale che in termini economici per l'agricoltura. C'è stato un esperimento nel quale abbiamo partecipato con graziano che aveva fatto lo IUAV di Venezia ipotizzando un volo pianificatorio (?) un po'azzardato e cosa succedeva se il delta venisse allagato perché un po' la subsidenza e l'aumento del mare, per valutarne gli aspetti economici e cominciare a pianificare i nostri comuni e le spiagge, come Volano. Se effettivamente si può pensare a una pianificazione graduale e mediata dell'arretramento delle strutture di costa e quindi qui poi si entra in

tutta la problematica e discussione aperta della strategia marina che è un argomento che va sicuramente messo in campo nella valutazione complessiva dei costi benefici ma anche della concertazione con le popolazioni locali. Non è facile per noi dire al comune di Porto Tolle che a un certo punto dovrai arretrare perché forse conviene lasciarlo che difenderlo con arginature ecc. Questo sempre di più con aumento del costo dell'energia. Tenere conto che il nostro consorzio di bonifica consuma 2 milioni di euro per elettricità per tenere asciutti i nostri bacini, se penso adesso andranno 6 milioni di euro. Vuol dire che casa mia che paga 200 euro all'anno di consorzio bonifica ne pagherà 600.

D 2: quando parli di approccio ingegneristico è inteso in contrapposizione a quello ecologico?

EP 1: non è in contrapposizione ma la formazione ingegneristica tende sempre a risolvere la problematica più immediata e più di competenza. Non è che l'ingegnere dell'AIPO non conosca i criteri di ingegneria ambientale o naturalistica ma è che occorre uno sforzo di progettazione e di coinvolgimento di altre competenze che non è funzionale all'operatività del lavoro. Se io già ho un progetto in casa che rimetto a posto e mi dice che mettendo giù tot metri cubi di sassi, mettendo la barriera, risolvo il problema idraulico, quindi mettono in sicurezza l'arginatura da A a B non vado in cerca di dire si potrebbe fare in un'altra maniera allargando l'alveo del fiume perché su questo non ho esperienza su questo ho la rapidità di intervento. È molto brutale e pragmatica, ma la mia responsabilità è salvare dall'alluvione. Se tu mi dici si può salvare in maniera diversa ma io non l'ho mai fatto e siccome c'è un rischio come ingegnere e come investimento vado sul sicuro. Con AIPO discutiamo, io ho parlato con il responsabile navigazione e questi sono gli argomenti e sono anche comprensibili perché tutti noi abbiamo delle responsabilità, un ufficio, degli obiettivi da raggiungere. Si deve lavorare di più e si vede rischiare di più. Noi volevamo ricreare una golena in un'ansa del Po di cormola che è già destinata ad essere golena solo che AIPO si tiene quella sabbia lì come riserva per rialzare gli argini quando occorre. Io gli ho detto: vabbè scavatela e mettila in un altro posto in un deposito e te la porti però questo comporta dei costi e conviene lasciarla lì e dire a noi che non si può fare la rinaturalizzazione. Questa è la brutale pratica odierna degli uffici.

D 3: è un tema emerso durante la tavola rotonda, la policy roundtable, il tema sulla responsabilità e sull'uso più consolidato di tecnologie che si rifanno all'infrastruttura grigia è un tema che è emerso. È una barriera per cui le NBS fanno difficoltà a diffondersi e divenire parte integrante della pianificazione. Mette davanti la ricerca di fronte a una questione davvero importante. Il rischio è fare tanti progetti ma con pochi impatti che rimangono tra di noi

EP 1: sulla ricerca si apre un fronte, ho il dente avvelenato da un po' di anni, ricerca e ricerca applicata, si deve uscire da questa cosa. La ricerca deve anche e soprattutto servire ad aumentare il livello culturale della popolazione e devo avere la capacità di tramettere cosa io ho deciso e come si applica. Noi abbiamo sempre avuto ma abbiamo risolto un problema per dire dell'impatto di fanerogami nelle lagune che durava da anni, studi sulle fanerogame. Queste piante acquatiche che sono molto utili, se nessuno spiega bene e gli fa vedere come potesse essere applicati, puoi fare la ricerca più bella che vuoi ma rimane un convegno nel quale si discute ma quando si deve applicare nel posto diventa...serve un modo diverso di affrontare la ricerca e i progetti. Questo è anche un limite dei progetti europei. Sempre siamo stressati dai per forma di spesa, gli obiettivi di progetto e tante volte si perde di vista quello che è l'efficacia del progetto stesso. Per cui anche tutto il mondo della ricerca e dei progetti Horizon, deve avere un taglio più applicativo.

D 4: è una battaglia che stiamo cercando di portare avanti e Operandum e si prova a superare questi problemi, il coinvolgimento degli stakeholder e le attività di uptake per avere un impatto anche sulle politiche. Tutta la progettazione europea oltre a stressare vuole anche che tu abbia un impatto nell'ambito in cui lavori.

EP 1: noi abbiamo organizzato il forum mondiale di riserve biosfera UNESCO, nel 2017 con 95 paesi, 150 giovani ricercatori da tutto il mondo e avevamo i nostri selezionati, una 30ina. UNESCO ci ha mandato tomi da leggere, tutta fuffa, io ho detto quando andate ai tavoli di lavoro scompigliate tutto. Rompete le palle a tutti dicendo che è inutile che ci parliamo addosso e che la valutazione è quanto sono bravo e scienziato e quanto sono bravo con l'inglese, rispetto al fatto che siamo qua per discutere e da giovani ricercatori che vogliono rompere le palle. Non dico Greta Thunberg ma più professionale e scientifica. So che voi avete le vostre rogne ma rompere un po' le scatole e uscire dallo schema c'è la riunione di partenariato, c'è la riunione di concertazione e cerchiamo di stuzzicare un momento di discussione tra i vari enti perché è ormai indispensabile soprattutto per i cambiamenti climatici e un approccio molto più pratico con i portatori di interesse e l'aspetto economico.

D 5: l'ultimo anno del progetto sarà per noi uscire fuori dal progetto stesso. Volevo chiedere a Graziano un giudizio sull'assetto istituzionale e della governance del rischio. E poi entriamo anche un po' più nello specifico nel ruolo dell'ente parco ovvero in quale fase della gestione del rischio siete coinvolti, pianificazione, più operativa, volevamo avere più chiaro questo aspetto qua e le interazioni con gli altri enti che si occupano di mitigazione del rischio.

EP 2: dunque, negli ultimi diciamo 20-30 anni qualcosa è cambiato ma pochissimo. Io sono uno spin off dell'università, oltre 20 anni fa una parte non trascurabile del nostro lavoro era spiegare cosa era lo sviluppo sostenibile, adesso è di moda ma nessuno sa cosa è veramente. Qualcosa è cambiato, però Marco ha fatto l'esempio dei bacini polifunzionali, pianificati nel piano di gestione nel 2009 e non sono ancora stati realizzati. Non si chiamavano ancora NBS, marco giustamente ha elencato approcci ingegneristico che definisco così anche io. Non in termini riduttivi o negativi. Nel corso degli anni ho lavorato con tanti ingegneri, geologi e addetti e il punto è che ci sta una modalità di lavoro consolidata, quindi faccio quello, basta. Due mi permetto di dirlo, è più semplice, è innegabile. Traccio delle linee rette, la cosa più semplice in assoluto. Già cominciare a lavorare con le linee curve è già più complesso, calcolo il volume di un corso d'acqua come se fosse un tubo liscio, non ha nulla a che vedere con la realtà. È una semplificazione estrema. Io ho lavorato per 15 anni con consorzi di bonifica e il calcolo ingegneristico è la portata, tutto il resto non esiste, anzi da fastidio. Ripulisco così il mio calcolo è più preciso e perdo tutte le altre funzioni e questa è tutta la differenza. E il cambio non c'è (Min 31) e non esiste ancora e assolutamente. Si fanno progetti, ci sono anche risultati misurati della convenienza anche economica ma il punto è che l'altra cosa che è emersa alla roundtable, che ho detto serve il co-design e la co-progettazione. Io devo ammettere che sono rimasto sorpreso che in un progetto che parlasse di NBS, alla fine l'unico biologo ero io che non ero neanche dentro il progetto. Non si può parlare e realizzare o progettare opere con sistema NBS senza parlare di organismi viventi che hanno i difetti che ho elencato, non sono fissi né nell'arco di un anno né nell'arco dell'opera quindi devo progettare pensando come si sviluppa. Ho fatto pianificazione per servizi ecosistemici che erano NBS in ambito urbano è più facile cercare di climatizzare un area con il climatizzatore, qualunque mitigazione climatica dovuta a evapotraspirazione e ombreggiamento è più complessa. Se pianto una qualunque specie arborea, perché non sono solo alberi, ma sono specie diverse, che hanno caratteristiche diverse, non devo attendere che cresca e il risultato mi varia nel corso dell'anno. Quindi devo decidere quale specie, che tipo di foglie, unica soluzione, magari mi filtra anche le polveri, è molto più complesso. Cosa succede alle radici che faccio altre opere, al massimo faccio le fondamenta e so quanto sono grandi, già mi seccano quindi la grande differenza è che è più complicato ma esistono molti più vantaggi. Altro elemento o entra nella norma e nella legge e tutti devono lavorare così, altrimenti continueremo a fare progetti, io e Marco andremo in pensione, voi continuerete a fare progetti ma non si faranno mai. Linee guida non sono obbligatorie e quindi si continua a mettere giù massicciate, cemento armato perché è più semplice. Io misuro, traccio una linea, meglio se retta, faccio barriera verticale e faccio prima. Il livello medio marino sale di 50 cm, facciamo diga di due metri e

sono sicuro. Molto più semplice che progettare bacini polifunzionali, in cui magari aumentano le sedimentazioni, i tassi. Progettare su periodi di tempo che non siano i 2 o 3 anni ma progettare sui 20 o 30 e quindi non ci sta niente da fare. O si accetta questa cosa del co-design e deve entrare nella norma altrimenti le NBS non passeranno mai. Rimarranno sempre progetti. Entrata la difesa della natura nella costituzione, se passa come letto non credo ci staranno grossi cambiamenti anche perché è stata usata una terminologia che in alcuni punti c'è molto da discutere. Non so chi l'ha scritta ma si parla di animali?? Come se quella fosse la biodiversità.

D 6: si questa era la prospettiva diversa di cui parlavamo all'inizio. Quindi ci sembra sia anche un problema di competenze all'interno degli enti che poi decidono quale tipo di soluzione andare ad attuare, siete d'accordo?

EP 2: assolutamente sì, in un altro esempio di Nbs progettata nel 2011, quando è stata proposta si è scatenata una risatina, dopo 3 anni hanno fatto tre opere di quelle proposte tra cui 2 fuori progetto. Se si va avanti così, 10 anni per ottenere un risultato, o entra nelle norme o altrimenti non se ne esce.

D 7: a proposito di norme, secondo te dove si potrebbe agire maggiormente, decreti del ministero, all'interno dei criteri, inserire premialità, all'interno degli strumenti di pianificazione?

EP 2: nessuna premialità. Si opera in questo modo perché+ è giunta l'ora ed è economicamente conveniente, faccio un esempio: dove ci sono risultati misurati per cui è più conveniente un'opera Nbs, di quella tradizionale, quindi bisogna che sia imposto. Posso sembrare un attimo eccessivo ma è un po' come le lampadine a incandescenza, che cosa vogliamo fare? Per legge si eliminano e basta. Si è fatto così, non ci sono altre soluzioni. Fosforo nei detersivi, tutto l'alto Adriatico, mucillagini, come si fa come non si fa? Si toglie per legge il fosforo e basta e si usano altre formule. Si danno i tempi di smaltire i magazzini e quant'altro. Sporte e buste di plastica si eliminano per legge e basta. Non dobbiamo raccontarci le cose. Con i tempi ovviamente anche lì. Ma premialità no. Non abbiamo neanche il tempo. Io non sono climatologo ma sotto, le previsioni del cambiamento climatico, rischiamo e non abbiamo decenni per aspettare. Voi abitate a Bologna e anche lì qualche rischietto c'è e la città è stata riempita di torrenti coperti.

D 8: io (D 2) ho seguito il progetto del PUG piano urbanistico generale e uno dei temi principali era quello del rischio idro-meteo nella pianificazione a 10 anni perché+ i canali tombati all'interno si stanno ribellando con situazione di piena o siccità.

EP 1: l'aspetto della pianificazione poi deve passare attraverso la norma, una volta che l'hai ben previsto fatto tutto poi c'è l'abitudine di dire lo metto in norma non come divieto ma come buona prassi ma a quel punto lì non lo fa nessuno. È una delle questioni, non è che non si sappia e c'è anche un aspetto che abbiamo visto noi del mondo economico nel senso che le imprese che operano nelle nostre lagune. Loro hanno il loro business plan sul sasso e se tu gli vai a dire di mettere dei pali, e delle questioni nelle quali il guadagno immediato è meno, a più lungo termine e quant'altro hai delle grosse resistenze e poi agiscono a vari livelli sui divieti e sulle attività progettuali quindi occorre proprio un tempo e dei giovani ricercatori che devono scompigliare le carte.

D 9: C'era sembrato di vedere che questo settore specifico si continui ad agire seguendo l'emergenza e quindi la velocità di esecuzioni, e c'è stato un crollo di bottiglia per tanti anni e ultimamente si è cercato di accelerare per recuperare il tempo perso. Quindi ragionare in un'ottica di cambiamenti climatici e quindi in un'ottica a medio e lungo termine ci sembra che ancora non siamo entrati in quella logica là. Sia nel PNRR come anticipato prima come in altri atti normativi che ci sembrano andare verso il "facciamo presto, non importa come".

EP 1: la difficoltà lì del PNRR è quella, essendo una pianificazione che arriva da un po' di anni, l'attuazione e la tempistica di attuazione da la scusa a non agire e progettare. Molti progetti tirati fuori dall' autorità di bacino sono progetti che datano 2009 e quindi hai una quantità di risorse che si fa fatica a impegnare in maniera coerente con politiche che adesso l'Europa mette in piedi. Però qualcosa si muove e noi nel nostro piccolo qualcosa proponiamo e cerchiamo di rompere le scatole con osservazioni e con aspetti. Ma è molto legato a un aspetto spot diciamo, per progetto singolo, le trivellazioni piuttosto che lo scavo di un canale, un arginatura, più fatica a far agire in ambito territoriale più ampio.

D 10: voi come ente parco in quale momento intervenite e con quale modalità? con protocolli strutturati oppure se le vostre interazioni dipendono principalmente da rapporti personali con i tecnici delle varie agenzie?

EP 1: Noi dall'inizio abbiamo impostato la nostra interpretazione di ente parco che era un po' criticata in Europa. Perché piuttosto che occuparci strettamente di tematiche ambientali strette, della specie x, che non è che non si faccia, ma l'approccio è sempre stato quello di agenzia di sviluppo che non c'è. Il criterio che io ho sempre adottato, tante che abbiamo fatto la candidatura per la riserva di biosfera, è che posso arrivare alla tutela della singola specie vegetale o animale, passando attraverso l'impatto della concertazione e dell'aspetto per cui l'uomo è al centro della salvaguardia. E se l'uomo è al centro, dovrebbe essere un matto, a parte che le ultime vicende russe ci lasciano il tempo di pensare, però matto a farsi del male attraverso, e quindi la tutela della natura viene di conseguenza. E forse più efficace per cui c'è sempre stato un approccio anche dal punto di vista normativo e della pianificazione che va in questa direzione e quindi noi siamo stati riconosciuti dalla regione, organizzazione di gestione della destinazione turistica. Non perché facesse piacere occuparsi di turismo ma perché così abbiamo impattato il mondo turistico balneare sulle spiagge ma non solo, avendo una carta in mano della gestione dell'organizzazione e poter dire ok, voi partecipate ai finanziamenti del turismo, se ci mettiamo d'accordo che le vostre progettualità devono avere l'impronta ecologica come elemento di valutazione oppure abbiamo (?) vace la ces (?). Quindi un approccio dello strumento che stiamo usando per approcciare il discorso del turismo per quanto riguarda invece il MAB è stato anche questo uno strumento, dicendo che è una convenzione che io ho fatto da un po' di anni. La nostra legge nazionale la 394 ha avuto il suo tempo perché legge fatta in un momento in cui c'era un'aggressione a livello nazionale di cemento sulle coste ecc. Quindi aveva chi l'ha impostata e gruppi di pressione che l'hanno portata avanti sia politici e sociali, vi è la necessità di bloccare lo scempio quindi divieto, divieto, divieto. Quel tempo è passato, si deve passare a una nuova forma per cui è molto più importante mettere degli obblighi dopo che ho concertato e fatto capire che l'obbligo ha un valore economico che riguarda il capitale naturale in generale e l'aspetto naturale, Quindi devo proprio, come ente, cambiare approccio quindi se per noi è diventato molto più difficile, e lì entrano in gioco altri aspetti legati al mondo naturalistica. La 394 è nata con delle competenze, dei tecnici che sono biologi, naturalisti e adesso occorre apporto multidisciplinare per portare avanti determinate questioni. Quindi non è detto che sempre a direttore o responsabile del parco ci debba essere un biologo naturalista, quindi un approccio che cambia molto. Dal punto di vista tecnico come agiamo? Sul fatto che la regione ci ha riconosciuto come ente gestione della rete natura 2000 per cui interveniamo su tutto il bacino del Po, anche fuori dalle nostre competenze e in più ci hanno attribuito gestione del Sic marino appena istituito al largo della costa. Oggi con Graziano abbiamo fatto riunione perché forse prendiamo le tenue di Chioggia dopo due anni di. Quindi l'approccio è quello di dire come ente, sia dal punto autorizzativo che di valutazione, cerco su questo non tanto e solo di divieti ma concertazione con altri enti per riuscire a portare questi ragionamenti che stiamo facendo. Direi che molto ancora ha carattere personale, di struttura di collaborazione con tecnici come Graziano a altri e quindi si crea un gruppo di persone che la vede così. Ma dal punto di vista istituzionale si fa fatica a

convincere la parte politica che questo ragionamento è pagante dal punto di vista dei rapporti perché vai a mettere e creare dei rapporti di forza che non sempre sono capiti dalla politica. Faccio due esempi, nel momento in cui io, consorzio di bonifica dico: l'altro giorno hai scavato un canale di bonifica, l'hai regimato dritto, mettendo sasso e argini più pendenti in cui la nutria ha pure più spazio, forse se lo allargavi e facevi progetti di rinaturazione e prendevi 5 metri di qua a un contadino e 5 metri di là però la sezione aumenta; delle cose che sembrano semplicissime che però questo crea un po' di problematiche. Noi come ente parco abbiamo fatto osservazioni per le trivellazioni in adriatico davanti a Ravenna. Non avevamo competenza però come portatori di interesse abbiamo fatto le osservazioni. Per la revere del Po abbiamo fatto osservazioni e abbiamo creato non pochi problemi. Anche con l'accusa di dire che ci fate perdere il finanziamento perché le osservazioni erano troppo spinte. Quindi è ovvio che devi avere la forza ma per adesso la stiamo portando avanti per esercitare le tue possibili funzioni anche non istituzionali ma quelle di semplici portatori di interesse ma anche fuori dal tuo ambito di attività. Questo finché sei dipendente indeterminato, altrimenti rischi molto di più.

D 11: i rapporti istituzionali chi li gestisce?

EP 1: dal presidente, dal consiglio direttivo che per la prima volta, mentre prima con la legge 36 la direzione era fatta dai sindaci, stavolta la regione veneto ha ridotto il numero quindi da 11 li ha portati a 5 in cui ha messo dentro anche due soggetti rappresentati le associazioni di categorie quindi primario e servizi. In parte serve e in parte meno perché, questo in generale per enti parco, perché i sindaci fanno fatica a uscire dalla mentalità da sindaco. Quindi si immagina un parco fatto da nove comuni e un insieme di 9 sindaci. In realtà la visione di parco dovrebbe essere sovraordinata ai singoli interessi per cui quando vado a toccare i cacciatori ho un comune che mi spara contro ma quasi, se tocco gli agricoltori ho altri problemi, ci sono sempre in mezzo. Per fortuna ci sono i tecnici. Però dove ti giri ne becchi una però è bello vedere che si riesce a ottenere qualcosa. Però ecco le attività istituzionali sono così dal punto di vista dell'approccio e secondo me da noi stanno dando un buon risultato anche perché la regione veneto ci sta aiutando. E alcuni dirigenti, ci stanno dando, anche per esperienze personali, molto appoggio. Il limite che vedo nostro è che nella struttura nostra è molto personalizzata che non dovrebbe essere perché dovrebbe essere strutturata e si fa fatica, e diventa ancora una cosa molto soggettiva.

D 12: nel senso che mancano delle procedure standard per?

EP: manca la strutturazione dell'ente come funzione, quello che dicevo, e l'ho sempre detto sia quando ero direttore e adesso che sono funzionario, manca la condivisione di questo obiettivo per cui, ripeto, se io dipendente a tempo indeterminato le faccio comunque mentre se non è strutturato dentro una strategia di visione dell'ente, molto soggettiva quindi una volta pensionato io boh, vediamo.

D 13: vuole aggiungere qualcosa a proposito graziano?

EP 2: ha fatto un quadro Marco, lui è istituzione, io lavoro da esterno, al massimo prendo qualche pallottolata.

EP 1: i cacciatori più pericolosi sono quelli istituzionali, non i cacciatori veri. Con quelli siamo amici, è come guardia e ladri, io faccio i controlli, ci conosciamo tutti, ogni tanto mi rigano la macchina ma fa niente, i più pericolosi sono gli enti.

D 14: per quanto riguarda PAI e PGRA voi agite sempre tramite osservazioni o avete parte più attiva?

EP 1: siamo stati coinvolti a suo tempo dall'autorità di bacino, per esempio con progetto strategico del Po, finanziato nel 2011, era un progetto che l'autorità di bacino aveva ancora nel cassetto. Ed è

interessante perché è da lì che sono partiti i contratti di fiume già finanziati, poi caduto il governo Prodi e arrivato Berlusconi ha tagliato 210 milioni già finanziati per il progetto strategico del Po e quello teneva in conto di parecchie fasi di concertazione e parecchie parti di progetti di sostenibilità. Anche io come dice Graziano sono preoccupato dal fatto che il termine sostenibilità, come adesso il termine PNRR sembra come sant'Antonio, per fortuna c'è il PNRR, forse io ho fatto prima di voi con il ministero non si rendono conto di cosa vuole dire sostenibilità. Il PNRR sta risolvendo qualsiasi cosa ma anche le semplificazioni legate al PNRR c'è una grande, non posso dirlo perché siamo registrati, ma non semplifica molto le cose. Ma è giusto che sia...

D 15: anche perché poi il PNRR come è strutturato mette le amministrazioni di fronte a un processo molto complesso di strutturazione dei progetti e molte di loro sono impreparate dal punto di vista delle risorse, amministrative. Quelle del PNRR lo stiamo seguendo con quelli del dipartimento ed è molto complesso e adesso c'è la chimera della transizione ecologica nel quale si dice la stessa cosa in modo molto fumoso e secondo me, faccio un passo indietro ma sono anche dei ritmi di produzione progettuale che non aiutano la sperimentazione di soluzioni che non sono quelle consolidate.

EP 1: ritorniamo a quello che diceva Graziano. Se ci fosse capacità di programmazione allora avresti la visione multidisciplinare di programmazione e quando arriva il PNRR allora sei pronto. Se invece devi aspettare che arrivano le risorse che i tempi che ci sono insomma non ce la puoi fare.

EP 2: aggiungo un elemento, il cemento che mi risulti entra nel paniere del PIL, le NBS no. Quindi poggiarsi su una NBS, una qualunque istituzione, i parchi qualcosina fanno, però altrimenti si continua con il cemento armato e altri elementi no. Per cui neppure sembrano soldi spesi con tutti i benefici che ci sono, regolazione microclima e servizi ecosistemici e alberi di vario specie a vario titoli non entrano nel pil, se vendo climatizzatore sì. Cosa vuoi andare in transizione ecologica?

D 16: quella dei servizi ecosistemici è uno dei temi principali.

EP 1: Come valutare questi altri spetti che vengono rendicontati in altro modo. Per cui quando si va a scegliere poi in... ettaro per dare strumento di pianificazione territoriale, per introdurla anche nei Pat e nei vari strumenti. Devi cominciare a spiegarlo anche perché le amministrazioni cominciano a crescere come amministratori e come possibilità di gestire il territorio. Tenendo presente che io ho sempre detto che negli ultimi anni sto lavorando per essere disoccupato perché il sistema dei parchi deve lavorare per essere abolito se non in alcune aree di particolare. Ma il resto è una struttura che deve per forza autoeliminarsi lavorando per la consapevolezza delle amministrazioni comunali e pubbliche che vedano la tutela ambientale come elemento proprio, non ho bisogno di mettere un'ulteriore struttura che ha l'ufficio tecnico, il direttore ecc,

D 17: finora loro non hanno strumenti per valutare impatto ambientale di un intervento?

EP 1: si passa attraverso le varie Vinca e Vas che vengono fatte dallo stesso, e vengono valutate e anche lì, nella valutazione poi ci sta sempre una difficoltà di rapporti tra enti. Anche noi lo abbiamo fatto e come dice Graziano serve un sistema giuridico che ti obblighi e che ti valuti, intanto sei obbligato e poi valuti gli impatti l'economia e tutto. Assolutamente deve essere così perché noi appunto abbiamo valutato la VINCA o la SINCA del vevere Ferrara fatta dall'Università di Parma e non dico che lo abbiamo demolito ma quasi ma non ci sono i tempi per rifarla e verrà fatta così. Ma veramente se non ci sta approccio diverso

D 18: anche lì è un problema di competenze? Mancano figure all'interno delle amministrazioni in grado di farlo?

EP 1: il nostro è un caso tipico, noi come impostazione avevamo sempre impostato, questo è sul nostro piano ambientale quindi fatto digerire dai nostri amministratori, il fatto di non aumentare la struttura come dipendenti ma di creare un approccio pubblico/privato nelle gestioni che è un po' quello che facciamo con Respondent 11 e altri professionisti, una serie di altri professionisti e univeristari. Li torniamo al tema della ricerca, a parte le lotte tra università, e siete un mondo che conosco bene e che mamma mia, quando ci sono le lotte tra docenti e le cose è una roba pazzesca, però si fa fatica anche nell'approccio in università ad ottenere quello che tu vuoi come ente perché manca l'abitudine a rapportarsi con il mondo imprenditoriale e anche degli enti pubblici. Si fa fatica e anche la stessa università deve cambiare la formazione vostra, delle figure per avere questo anello di congiunzione tra le esigenze dell'ente e con le varie professionalità, tema emerso nel forum dei giovani.

D 19: tema ricorrente e trasversale, c'è bisogno di nuovi corsi nuove impostazioni sicuramente anche all'interno delle università.

EP 2: come si può parlare di NBS se neppure c'è la consapevolezza di cosa siano? Prima avevi chiesto delle competenze, si ce ne sono pochissime. Per dare il livello sono stato intervistato dall'istat. Stiamo facendo la ridefinizione delle professioni, avevano la loro lista di domanda. Mi fa piacere che l'Istat sappia che esistono gli ecologici. Oltre a me, quanti ne avete intervistati in Italia? 2 ne eravamo. È una figura un po' lontana da essere riconosciuta e presente se si vogliono applicare le Nbs, non vi dico nei comuni che al livello amministrativo hanno importante impatto, ma anche a livello regionale e nazionale. Se non c'è qualcuno che si occupa di queste tematiche all'interno delle istituzioni come potrà mai essere applicata?

D 20: volevo farvi una domanda, a che punto siamo con il processo di mainstreaming delle NBS in italia? Siamo in una fase embrionale? In un momento di crescita? in un momento pre-esponenziale? Oppure?

M: al livello italiano embrionale ma puntale, ci sono esperienze abbastanza consolidate, diciamo che qui poi bene o male una progettazione di qua o di la si fa, non è che non ci sia niente, non la vedo tutta nera. Al livello nazionale siamo proprio al livello molto embrionale invece.

EP 1: concordo sull'embrionale ancora assolutamente, embrionale, la difficoltà è che nessuno è abituato, tranne una manciata di persone, nessuno è abituato a lavorare con organismi viventi. Bisogna avere delle conoscenze sugli organismi viventi altrimenti come è possibile? Prima anche di formare persone, un po' come con il coronavirus, pandemia, medici e infermieri non li trovi al supermercato. Mi servono se va bene 5-6 anni per avere un neolaureato, non un esperto, un neo laureato, stessa cosa per un ecologo. Dove li vado a prendere se non li formo e due magari gli do da lavorare? e qualcuno magari va all'estero. Qui solita situazione italiana già vista.

D 21: mi sembra di aver visto che per i biologi in Italia i maggiori sbocchi sono nella medica, nella farmaceutica ..

EP 2: no paramedici ma qualcosa di simile, si la nostra è costruita come una disciplina legata alle scienze mediche, riconosciute anche le competenze ambientali. Io ho fatto da poco quest'anno o l'anno scorso, l'ordine nazionale biologi ha istituito un gruppo relativo alla parte ambientale, discipline ambientali, l'anno scorso, nel 2020.

D 22: problema italiano?

EP 2: ho esperienza all'estero e diciamo che in Italia, è molto più forte il problema. Forse perché all'estero c'è una maggiore elasticità. L'esperienza all'estero negli stati uniti c'è un'elasticità estrema

nel raccogliere i frutti della ricerca e trasportarli nel mondo reale. Da noi i tempi sono una generazione ma il mondo non va più con questi tempi, forse nell'800, non più.

D 23: avevamo parlato di alcuni degli aspetti che contribuiscono all'accettazione o meno delle NBS, abbiamo già parlato del quadro normativo, altri aspetti che erano emersi erano quelli culturali, ovvero sia da parte dei singoli progettisti sia da parte delle cittadinanze, per questioni di percezione di efficacia delle Nbs, ci chiedevamo se questo anche potesse influire nell'accettazione o meno e volevamo sapere la vostra opinione a riguardo e se pensate che questo sia un aspetto rilevante.

EP 1: nella nostra realtà le attività economiche piccole, piccole artigiani e agricoltori hanno una sensibilità maggiore, sono meno vincolati e molto più sensibili e in parte più preparati degli amministratori. Gli amministratori sono legati al fatto che devono essere eletti e che devono fare 1000 altre cose. In questi ultimi 10 anni, perché c'è stato lavoro intenso di rapporto diretto con le singole realtà. C'è una sensibilità maggiore rispetto ad altri anni. È cresciuta la consapevolezza della singola realtà e del singolo cittadino, c'è la disillusione e l'impotenza e l'incapacità e la non conoscenza di come rendere operativi queste sensibilità sia dal punto di vista normativo che dal punto di vista...noi abbiamo piccole aziende, cacciatori, piccoli pescatori, esperienze fatte pochi mesi fa con graziano. Siamo andati nel mondo della pesca e se gli parlavi di fanerogami e non sapevano cosa voleva dire ti mandavano via non a fucilate ma quasi. Con il fatto che siamo andati insieme a fare il sopralluogo, dove metterle e come fare a strutturale. Questo vuol dire per svariate motivi, una sensibilità. Si è cresciuti su questa cosa. Io spesso in passato, i coltivatori diretti si faceva certi discorsi e non entravano neanche in ufficio. Adesso c'è collaborazione e questo vale anche per i cacciatori, nel senso che loro sono i primi che ti dicono collaboriamo assieme per fare una caccia sostenibile e un prelievo venatorio sostenibile, facciamo lotta ai bracconieri ecc. è un processo da mettere in atto con fasi di colloquio, proprio di rapporto che non risolve quasi mai con sistemi di concertazioni codificati, quelli sono un livello superiore. Noi abbiamo avuto il piano ambientale che è stato in ballo 15 anni, nel 2012 l'abbiamo risolto con la concertazione dello spritz, che vuol dire mettersi ogni mattina presto tipo le 5,30, frequentare una serie di bar, quindi 5 e 6 caffè dove passano cacciatori e agricoltori e la sera giro degli spritz sempre. Discuti e intanto ti conoscono nel territorio e quindi l'amministrazione che tu rappresenti viene riconosciuta come elemento del territorio. E poi fai il metodo govs e tutti i metodi di concertazione perché il presidente delle associazioni degli agricoltori o cacciatori che viene nella riunione ufficiale deve aver superato le forche caudine del suo consiglio di amministrazione nel quale ha i veri portatori di interesse che gli rompono le balle o dire no non mi va bene. La strategia, parlo a livello di delta ma può essere una metodologia da applicare con le dovute scale, di rapportare a vari livelli il ragionamento in modo da facilitare la controparte a far passare un tipo di ragionamento che deve vari temi. Cosa voglio dire: ci deve essere capacità dell'amministrazione di avere una comunicazione molto più capillare rispetto a territorio. Molto più su questi temi, poi su altri si può andare più... però su temi ambientali e di conoscenza serve. Poi tu puoi mandare l'esperienza fatta la relazione con sisinesi del piano ambientale all'associazione cacciatori, questi non la leggono neanche perché ne hanno già parlato con te al bar, con lo spritz e non la leggono neanche. Qui torniamo al discorso iniziale e occorre che le amministrazioni e la loro strutturazione abbia una faccia che non è solo la faccia politica e istituzionale ma anche la faccia tecnica di lavoro. Io mi sono sempre ripetuto e sentito dire, il presidente passa e tu rimani, se ti devo dire una cosa so dove devo venire a beccarti, se me lo dice il presidente e domani non c'è più poi si innesca meccanismo ma, per tematiche ambientali è importante, della mancanza di credibilità della politica, ma c'è anche un sistema sociale che si è modificato. Dal punto di vista molto operativo se voglio fare entrare questi ragionamenti devo avere una capillarità di intervento e questo l'università oppure il vostro impegno è molto importante e la strutturazione dell'ente locale che sia molto credibile e che abbia una faccia spendibile

D 24: riassumendo possiamo dire che non l'adeguata comunicazione non esiste un problema di efficacia delle NBS?

EP 1: sicuramente l'obbligo e sicuramente questo aspetto di comunicazione capillare, far capire cosa è, anche proprio di tecnologia, se nelle varie riunioni NBS, l'abitudine anche nella terminologia a essere compreso, non solo dal pescatore ma anche dal, perché io l'ho sentita negli ultimi mesi qua ma se me lo dicevi Nbs un po' di tempo fa ti avrei risposto che cavolo? Io se ho lavorato nei comuni e facciamo riunioni con i tecnici e cominciamo a discutere in questi termini questi si cappottano indietro perché non dico niente per non fare brutta figura ma poi non ti rispondono e non ti seguono ma penso neanche gli ingegneri dell'AIPO se non gli fai l'esempio concreto. (min 32)

D 25: mi hanno detto che c'è stata difficoltà a introdurre la tematica all'interno dell'Aipo

EP 1: adesso nel Pnrr ci sta la valutazione, non ricordo la sigla, dhns, del miglior impatto ambientale, il progetto oltre ad avere la Vinca ecc devi fare questo doc. Tutti chiedono come si fa, quale cosa devo fare, devi autocertificare che l'intervento che fai ha il minor impatto ecologico. Oltre alla Vinca ecc ci sta questo altro documento che nessuno sa come viene fatto e come sarà fatto e lo scopriremo.

D 26: per quanto riguarda il livello di rischio nel quale si interviene secondo voi questo anche potrebbe essere un fattore che incide sulla scelta Nbs o soluzione tradizionale? Sono due aspetti correlati il livello di rischio e il tipo di soluzione preferita?

EP 2: per me sì, esattamente quello che si è detto all'inizio, le soluzioni tradizionali, tiro su una diga, uso massicciate, le ho sperimentate negli ultimi 50 anni, uso quelle e basta e poi nessuno guarda che hanno avuto grossi problemi e non sempre hanno risolto oppure hanno risolto temporaneamente e poi bisogna rimetterci mano con costi ingenti. Non è il costo dell'opera eseguita e basta ma nel tempo, questo non è mai calcolato, è chiaro e va tutto spiegato molto bene, tornando alla comunicazione. Progetti mai, norme con il co-design, bene, mettiamoci d'accordo con la terminologia, tra ingegneri, economisti, biologi, ci sono terminologie differenti, richness per un biologo vuol dire una cosa che gli altri non conoscono, non usiamo le sigle. O le conosciamo o non si può andare in giro a parlare di NBS che a mala pena poche persone sa esattamente cosa siano. Ma anche parlare di ecosistemi e di biodiversità o cominciamo a parlare di cose di cui sappiamo tutti altrimenti è impossibile parlare, mentre un muro o una diga sanno tutti che cosa è. Chiaro che scelgo quella, perché no. Il condizionatore, piglio con il telecomando, so cosa è, perché dovrei scegliere altro?

D 27: c'è un tema, e questo è il filo rosso, che ha unito tutto il lavoro di questo progetto e di altri progetti che hanno a che fare con accessibilità del linguaggio per piena comprensione delle cose di cui si sta parlando. Il rischio è che si costruisca un vocabolario di termini che vengono resi molto complessi. Questo fatto li rende poi più ostili rispetto a quelli già inseriti all'interno di un agire collettivo, anche in un processo di decisione collettivo, specifico, tecnico anche se poi si parla di accettazione sociale e quindi di cultura, sostenuta dalle decisioni che sono prese da chi ha il potere tecnico e chi ha il potere politico ma che devono essere poi anche condivise e sostenute da chi questo potere non ce l'ha. Quindi la cittadinanza e tutti gli altri stakeholder, quindi questo di renderlo un linguaggio accessibile e di restituire un po' la multidisciplinarietà dell'approccio che le NBS e la transizione ecologica richiedono. Anzi rappresenta un'ulteriore barriera nella diffusione di queste pratiche a tutti i livelli, sia decisionali che con enti pubblici, che parli di cose di cui ti dicono sì si capiscono, ma poi ti rendi conto che non è così quindi parte del lavoro è sintonizzare i linguaggi. Alcune cose significano alcune cose, noi abbiamo provato nel progetto dal confrontarci sul tema che cosa è un indicatore, un KPI ma come lo costruisci, con quali dati e quindi la sfida grande è lavorare sia in termini di risultati di ricerca. Quindi che provino che le Nbs sono efficaci e rendere questo

discorso e questo linguaggio a chi non è unicamente del settore e produrre un cambiamento collettivo di accettazione e di adesione.

D 28: domanda collegata all'intervento di Graziano alla tavola rotonda. Accennavi a problematiche riguardanti processi autorizzativi per il ripristino ecologico, a quali ti riferivi più nello specifico?

EP 2: in realtà il processo autorizzativo che deve subire qualunque opera che sia tradizionale, sia Nbs, i processi autorizzativi sono esattamente gli stessi e non cambia assolutamente nulla, fatto salvo, quando siamo dentro reti di natura 2000, che è un altro concetto. In questo caso a livello europeo, se parliamo di opere previste dai piani di gestione di aree natura 2000. Lì tutto fila molto più liscio perché l'ho previsto dentro il piano di gestione del sito. Quindi dentro il piano già è previsto che quell'opera ha già un impatto positivo e almeno la parte di Vinca non la devo fare però è un caso estremo e si applica molto poche volte, solo per quei siti che hanno i piani e sono pochi. Non cambia assolutamente nulla che siano NBS o altro fatto salvo queste eccezioni nel vero senso del termine.

EP 1: Noi su questo abbiamo tentato proprio in relazioni ai gruppi di lavoro regionali e abbiamo fatto anche delle linee guida che poi sono e si stanno, perché stiamo confrontandoci con il ministero sulle misure di conservazione degli habitat e sugli obiettivi di conservazione. Su questo avevamo fatto questi piani e linee guida che sono state recepite dalla regione veneto per cui o fai intervento che ricade entro la pianificazione delle linee guida e con quei criteri ti eviti un sacco di valutazioni e autorizzazioni proprio andando in questo senso. Però hanno avuto un parto molto concertato perché l'aspetto ingegneristico di chi scava i canali, l'aspetto economico dei pescatori che nelle lagune ci operano, la parte naturalistica, la concezione di un sistema lagunare e un sistema costiero, ha avuto dei momenti di mediazione che sono stati raggiunti e adesso vediamo come va insomma. Quindi può essere un approccio sempre di discussione e di conoscenze che va nell'aspetto normativo che diceva graziano. Però ci sono rari casi?

EP 1: adesso state anche fatte, life redunez (??) Ha fatto le linee guida per le costruzioni delle dune insomma. Gli ambiti costieri insomma. Bisogna vedere il sistema normativo se le recepisce e come le recepisce ma le linee guida ci sono.

D 29: li dovrebbe partire dal ministero e dalla regione?

EP 1: noi con il ministero e siccome il ministero nelle misure di conservazione approvate dalla regione Veneto ha obiettato a tutta Italia che non erano ben calibrate, gli obiettivi di conservazione, questo fatto stiamo cercando di introdurre delle questioni legate alle lagune. Per esempio, che è una questione che sosteneva molto graziano e non sempre tutti i biologi capiscono, il fatto che un habitat lagunare 1150 possa essere scavato perché lo scavo che serve anche per la navigazione e la pesca va a aumentare il grado di conservazione perché se faccio ricircolare l'acqua ricircola per tutti, per le vongole per la laguna e per l'ambiente. Questi concetti per cui posso introdurre delle questioni che vengono anche recepite a livello nazionale e a livello europeo è un processo che va costruito e per noi questo concetto è durato 3 anni. Adesso ne stiamo parlando ma vi faccio un esempio, quando ho fatto la zonizzazione per la riserva di biosfera, io insieme a graziano, quando parlavamo di aree "core" le lagune erano aree core, e queste aree puoi fare o ricerca scientifica o visitazione scientifica, come la intendeva l'olanda o la svezia, nell'ambito del riconoscimento unesco. Quando io dicevo al ministero o a Bruxelles, ma guarda che in quelle aree core ogni mattina ci sono 1500 pescatori che prendono vongole e muovono 100 milioni di euro. Non è possibile e alla fine anche questa interpretazione di come vanno gestiti gli habitat a livello nord europeo vanno uniformate perché non c'è un uniformità di visione di come fare la conservazione. Alla fine ho dovuto trasportare le aree utilizzate da pesca in aree transition o buffer per riuscire a far fare delle cose e sono state riconosciute riserva di biosfera ma la conservazione la faccio lo stesso come fa il ricercatore che va nelle aree olandesi o della svezia.

Esiste anche una problematica europea di che cosa vuol dire conservazione non tanto dal punto di vista tecnico e scientifico ma quanto quale è l'applicazione territoriale che consente maggior mantenimento e sviluppo della conservazione. Un altro esempio pratico in un progetto life, noi abbiamo le valli da pesca che sono proprietà privata, di un singolo proprietario e sono un'azienda agricola. Questo proprietario non posso impedirgli di modificare il grado salino dell'acqua e modificando il grado salino cambia completamente l'habitat e le specie presenti. Allora quell'approccio che era in una lettera circolare e neanche in una normativa, che mi aveva fatto vedere graziano, l'approccio per cui io devo far capire, far conoscere e concertare con il proprietario della valle, come riusciamo a fare per la tutela è citato in una lettera circolare. Mi ricordo, forse art 6 della direttiva, bisogna andare alla conservazione attraverso approccio concertativo con il privato se ricordo bene. Quindi c'è anche il livello europeo da uniformare la visione.

D 30: è possibile farlo mantenendo una flessibilità a livello locale? Flessibilità di manovra?

EP 1: è l'unica strada senno hai la questione del ti obbligo perché hai fatto distruzione di habitat e altra serie di procedure che non hanno risultato immediato e concreto e tante volte non arrivano neanche in porto, quindi è molto meglio attivare questa visione di conservazione e quali sono le tecniche o le progettualità che poi vanno nella direzione delle buone pratiche di sostenibilità.

Ringraziamento e saluti

Intervista 12

Intervista a Respondent 12, Figura apicale del Dipartimento Nazionale di Protezione Civile, Ufficio III, Attività tecnico scientifiche previsione e prevenzione rischi. Intervista condotta da Matteo Mannocchi in modalità online l' 11/03/22.

Problemi con la registrazione su Domanda 1:

R 1: Le regioni danno indicazioni tecniche e operative su ciò che bisogna fare. È compito delle regioni farlo e quando dico nel bene e nel male perché in alcuni casi le regioni sono molto skillate e molto preparate e conoscono bene il proprio territorio e molto bene organizzate, in altre lo sono meno come su tantissime altre cose c'è un gradiente tra nord e sud per cui tipicamente quelle del nord sono molto più organizzate di quelle del sud su questi temi.

D 2: Secondo lei a cosa è dovuta questa differenza?

R 2: riflette le differenze che ci sono nel paese, non è solo una differenza organizzativa sui temi ambientali, è una differenza organizzativa su tutti i temi, sociali, sanitari ecc. Devo dire che alcune regioni del sud, noi abbiamo di recente lavorato nell'ambito di un PON governance della programmazione che si è chiusa nel 2021, con 5 regioni del sud Campania, Basilicata, Calabria, Puglia e Sicilia per aumentare la governance di Protezione civile e migliorarla. I risultati si sono cominciati a vedere. Le regioni del sud da quel punto di vista ne hanno beneficiato parecchio. Si parte da un progresso che è sicuramente pensante.

D 3: è più un discorso di risorse umane, di strutture, finanziario?

R 3: entrambe le cose, al nord le regioni sono più strutturate anche dal punto di vista del personale, hanno più gente che se ne occupa almeno nei temi che ho io. Qui gestiamo un centro funzionale centrale che è quello che fa le previsioni meteorologiche e che raccoglie le valutazioni di criticità

idrogeologiche che vengono fatte tutti i giorni. Mentre in Lombardia ci sta ARPA, che passa le previsioni al centro funzionale decentrato della regione dove ci sono idrologi e geologi che fanno tutte le valutazioni del caso, molte regioni del sud non hanno lo stesso staff. L'unica ad essere autonoma dal punto di vista meteo, in realtà due, la Sardegna e la Campania. Le altre si appoggiano tutte per le previsioni a noi per dire. Molte delle strutture regionali hanno pochissima gente che poi ci lavora con una o due persone e ci lavorano su questi temi dell'allerta meteo. Sicuro c'è anche un problema di personale dedicato che sia sufficientemente skillato per fare queste cose.

D 4: nel caso specifico dell'Emilia-Romagna possiamo parlare di un esempio virtuoso?

R 4: certamente sì, a livello di Arpa, e anche di agenzia di Protezione Civile. Sono due modelli e esempi virtuosi. Non a caso l'ER dal punto di vista delle previsioni Arpa è una delle due insieme alla regione Piemonte che partecipa alla conferenza sinottica tutti i giorni. Con aeronautica militare, dipartimento protezione civile, arpa ER arpa Piemonte alle 10 del mattino, qualsiasi cosa succeda e concordano quello che è la previsione sinottica. Cioè a scala nazionale qual è la previsione per le successive 24 ore la decidono insieme e ER è quella che fa girare per noi presso il Cineca i modelli meteo che noi utilizziamo. Arpa è sicuramente eccellenza ma non solo nazionale e stessa cosa per protezione civile. Hanno organizzazione interna che non è quella che noi avremmo fatta ma è legittimo perché lo dice la costituzione e loro la loro organizzazione la fanno funzionare

D 5: è la regione che dà gli indirizzi?

R 5: Assolutamente sì

D 6: abbiamo visto che ci sono stati casi in cui ci sono stati disastri, volevo chiedere nonostante queste eccellenze cosa si potrebbe fare di più e meglio?

R 6: discorso molto complicato perché ha tantissime sfaccettature. È vero ci sono stati molti casi e quelli a cui faceva riferimento sono stati rotture di argini. Sistematicamente rotture di argini di questo è importante perché gli argini dei fiumi italiani e in ER ce ne sono davvero tanti, sono vecchi e hanno decine e decine e qualcuno più di cento anni. Nel tempo è mancata manutenzione, è mancata soprattutto come su tutto il paese che ha un deficit di manutenzione enorme. Ai cittadini italiani viene chiesto di fare manutenzione auto, caldaie che sono cose obbligatorie. L'area pubblica con stato regioni ecc non fanno la stessa manutenzione al territorio e la motivazione che viene data è che non abbiamo le risorse per farlo. Neanche il cittadino ha le risorse e per lui ha un costo e deve rinunciare ad altro ma lo fa. Il cittadino cosciente lo fa e io non capisco perché la repubblica non facciano delle scelte e sai che c'è quella roba la devo fare e la faccio. C'è un deficit di manutenzione enorme. A questo supplisce in parte i sistemi di allertamento. Per cui non succedono più nel nord Italia in generale i casi in cui muore tanta gente. I danni economici ci sono perché se esce un fiume danni ci sono ed è inevitabile dal momento in cui l'acqua rompe un argine ma non muore la gente. Cosa che purtroppo invece continua a succedere in altre parti del paese. Anche su questo se lei guarda la distribuzione nel tempo delle vittime di frane e inondazioni, nel tempo dal dopo guerra ad oggi il numero di eventi che hanno fatto tante vittime, più di 20, è andato piano piano diminuendo nel tempo mentre il numero di eventi che fanno 1 o 2 vittime è rimasto costante. Come se si sovrapponevano due segnali, uno di fondo per cui dice: ragazzi quando viene giù la franetta e tu hai la sfiga di trovarti lì ci sta poco da fare. Non saremmo mai in grado come paese di tenere su tutti i versanti del paese però siamo in grado di fare una pianificazione dell'allertamento e tutto, per cui eventi eclatanti ed estremamente catastrofici riusciamo ad evitarli. Quello che le ho detto qualcuno sostiene che possa essere provato dai numeri e in parte ha ragione perché dalle statistiche questo si vede. Altri più conservativi dicono sì, fino al prossimo evento catastrofico. Ci guarderemo indietro e diremo che siamo stati solo fortunati negli ultimi anni. È molto difficile dirlo. Ormai le statistiche tendono a far

preferire la prima ipotesi anche se indubbiamente un evento particolarmente severo può comunque verificarsi. Nell'alluvione del 92 in Piemonte, si concentrò come centroide nella parte bassa nel bacino del Tanaro dove piovve una quantità d'acqua impressionante. Sul bacino piovve un km³ d'acqua. Ci furono più di 80 morti, se uno va vedere durante l'evento ci sta un picco di vittime sulle Alpi a Marallo Sesia, lontano dal centroide dove una singola franetta o due caddero e presero tre baite dove vivevano 12 persone che morirono tutte. Se le frane fossero venute giù 50 metri più in là avremmo avuto 65 vittime invece che più. Ci sta un'alea in questi discorsi quando si parla di vittime molto forti però resta il fatto che cose del genere non ce ne sono più state.

D 7: su grandi numeri leggevo un trend che riguarda il mondo più sviluppato quindi allargando lo sguardo al di fuori dell'Italia

R 7: è facile comprenderlo, nei paesi sottosviluppati e in via di sviluppo i danni sono soprattutto danni alle persone, poi ci sono effetti di lungo termine sull'economia e la mancata capacità di svilupparsi però da punto di vista economico i costi sono bassi perché vanno via baracche, ponti di legno e strade di terra. Danno sociale elevato e elevatissimo. Al contrario nei paesi sviluppati dove le persone si salvano i danni economici sono elevatissimi perché qualsiasi cosa costa tanto.

D 8: prima faceva riferimento alla mancanza di fondi, mi sembra di vedere nelle ultime leggi di bilancio che questi fondi siano aumentati notevolmente per lotta la dissesto e la pianificazione. Più complicato capire se questi fondi si traducano poi in opere vere e proprie sul territorio, qual è la vostra percezione? È migliorata questa trasmissione a terra? E grazie a cosa?

R 8: molto a macchia di Leopardò, anche all'interno, mi passi il termine, sia nello spazio che nel tempo. Anche qui maggiore capacità progettuale e maggiore capacità di spesa al nord in regioni organizzate anche da un punto di vista amministrativo sanno fare le pratiche e portarle avanti. Però anche lì a volte subentra un effetto fatica perché poi una regione anche se ottimamente organizzata come la regione veneto quando prende 4 batoste una dietro l'altra poi non ce la fa più. Quando prende eventi estesi si arriva a superare il livello di capacità gestionale ottimale che può avere una singola regione per quanto skillata e ben staffata possa essere. Una considerazione personale è che l'intera macchina burocratica di questa repubblica è complessa, è troppo complessa, alla fine tutto viene fatto con le regole con le quali si fanno le gare di appalto, si seguono i progetti che è evidenza comune di tutti che ormai sono troppo farraginose. Ci si mette troppo tempo e l'abbiamo visto in più casi. Ci vuole più per progettare. Questi progetti hanno una parte politico-amministrativa, gestionale e una parte tecnica e tecnologica. La seconda è di gran lunga inferiore alla prima. Non è possibile che se per costruire una casa, faccio esempio banale, ci metto 2 mesi, un anno, ci metta tre anni a fare il progetto, a comprarmi la ditta che lo fa. Lo sforzo economico sbilanciato sulla parte amministrativa non è più comparabile. Io sostengo che proprio come dire, in termini energetici, l'energia dovrebbe andare nella costruzione dell'opera e dell'oggetto, se l'infrastruttura intorno costa più del ponte c'è qualcosa che non funziona. Adesso è tuttora così, la parte tecnologica è meno preponderante della parte burocratica, amministrativa e economica. Io non voglio sottovalutare, molto importante ma non può essere preponderante e dovrebbe essere marginale.

D 9: abbiamo visto vari tentativi di superare questo problema, partendo dalla cabina di regia, fondi progettazione centralizzati, istituzione dei commissari al dissesto e nonostante questo ancora siamo nella stessa situazione?

R 9: penso proprio di sì, nel senso che c'è poco da fare, sono palliativi. Quei tentativi fanno emergere una cosa. Si pensa che con una semplice e migliore organizzazione, con misure più skillate si possa risolvere il problema. C'è quello non capace, ci metto uno capace e risolve. In parte è vero però quello capace, da solo, fa poco. Un allenatore di calcio se ha una squadra di brocchi o se ha delle regole che

gli impediscono di fare gol non segnerà mai. Per cui penso che sia più radicale il cambiamento che serve. Poi tutte le forme di coordinamento aiutano, ma le evidenze di questi anni portano e dire proprio quello. Serve dell'altro.

D 10: tornando al discorso tecnologico e anche alle NBS, come si inseriscono in questo grado? Rappresentano un approccio nuovo spendibile già da adesso oppure..

R 10: tutte le attività, adesso va di moda chiamarle verdi, la risposta di fondo e corta è sì, assolutamente sì. In particolare per le attività che hanno a che fare con il dissesto idrogeologico. Io fui uno dei grandi critici quando il primo ministro Renzi fece partire Italia Sicura, la lotta contro il dissesto e si partì con l'idea di grandi progetti. Alcuni di questi poi così grandi non erano ed era giusto farli, il passante a Genova del Bisagno. Fare in modo che se piove tanto la stazione Brignole non vada sotto acqua, ok. Però l'idea è che concentrare tutto in pochi progetti grandi gestite da poche persone che appare economicamente molto efficace ed efficiente fa in modo che il territorio venga gestito da gente che non necessariamente lo conosce. Io avrei preferito una polverizzazione. È apparentemente meno efficace nel breve periodo ma facendo fare tante piccole cose a tanta gente sul territorio. Sono i piccoli interventi che potrebbero fare la differenza. Faccio a me stesso un'obiezione: ci sono situazioni come il Bisagno, talmente eclatanti e forti dove comunque bisogna agire e io dico va benissimo. È come in ospedale con il triage, se sono tutti in fila con il codice giallo e arriva uno con il codice rosso è giusto che passi. L'importante è decidere cosa è codice giallo e cosa è codice rosso. Una scrematura a livello nazionale delle cose più rilevanti, bene. Potranno essere fatte il primo e il secondo anno ma poi finiscono perché non è che ne abbiamo un miliardo di situazioni critiche. Dal momento che le altre sono situazioni locali, tutto quello che ha a che fare con tecnologia green può essere utile, nelle aree urbane in particolare. C'è sempre questa cosa, su questo anche gli ingegneri idraulici hanno idee diverse e scuole diverse, io non so dire sono un geologo di formazione. Per evitare che ci siano grossi problemi di inondazioni una strategia è quella di fare in modo che l'acqua rimanga più a lungo dove piove. Se nella città porto del verde e faccio i tetti, se ho una quantità di azioni che singolarmente vogliono dire poco, il singolo tetto, il singolo giardino, il singolo parco è quasi irrilevante. Il singolo pannello sul tetto in casa, a me fa la differenza, per la collettività la fa pochissimo ma non se ne vede il vantaggio perché se tutti ce l'hanno e tutti lo fanno il vantaggio per la società c'è. Il vantaggio per la società continua a esserci perché l'hanno fatto tutti, c'è un effetto gregge come per i anche se uno non lo può fare è la stessa cosa. Servono due cose, incentivi anche economici a farlo e skill per farlo. Una cultura dei liberi professionisti.

Dicevo secondo me, c'è un problema di skill, se lo dicono mi volano addosso insulti però c'è una tendenza anche comprensibile a fare quello che si è capaci a fare e non quello che serve. Quando una va e gli dice devo fare giardino o tetto verde, raccogliere acqua e usarle, il geometra o geologo di turno tira fuori una soluzione standard che lui ha già fatto sa fare ecc. Perché costa meno ecc e non è detto che si la migliore. Nel dissesto questo è particolarmente vero. Al CNR dove facevo il ricercatore facevo sopralluoghi per il Dipartimento a seguito di eventi frane ecc e quello che ci veniva proposto era fare un muro, dei pali. Questo perché era molto semplice da fare, vado lì e qualsiasi operaio lo sa fare. Sarebbe stato molto più utile levare acqua dalla frana molto più risolutivo ma significava fare sondaggi, fare buchi, mettere dei dreni. Noi dicevamo alle imprese ma perché non imparate a fare quello perché diventate più skillati fate di più e qualcosa che funziona e risolutivo. Lì c'è problema di skill di dimensioni delle imprese che sono piccole. Per fare questa cosa c'è una soglia minima. Se tutti fanno tutto tutti fanno tutto male. In altri paesi la dimensione minima degli studi di ingegneria sono molto più grandi mentre da noi molti studi da una persona, 2, 3. Per fare queste cose che sono intrinsecamente multidisciplinari e integrate ho bisogno di studi che abbiamo masse critiche più grosse.

D 11: dal punto di vista dell'autorità pubblica, qual è il modo per costringere queste imprese ad evolversi; criteri per bandi, intervento legislativo? Ministeriale?

R 11: capisco le conseguenze negative di quello che sto per dire, ci vorrebbero meno regole e più capacità di analisi di problemi e dei progetti e di controllo dei progetti mentre vengono realizzati. Esempio: se costruisco una galleria io posso dire ti pago ogni tot metri di galleria. Lui risponde faccio un metro che facile, uno difficile, poi tendo ad essere cautelativo e tiro su il prezzo. In Austria è nata una filosofia: io ti pago su quanto è difficile scavare, vengo io a vedere in galleria. Un metro è costato poco e te lo pago meno, poi 5 metri complicati e te lo paghi di più. Questo presuppone che lato stato ci sia gente skillata in grado di valutare. Comporta anche che il costo del progetto non è definito a priori mentre io adesso lo vedo definire prima. Non è un'eresia. Passa l'idea che c'è una negoziazione continua tra chi paga e chi realizza. Io mi rendo che questa è fantascienza amministrativa. O si torna a un sano rapporto tra parte pubblica e privata o non ne usciamo. Poi lei mi farà l'esempio del ponte Morandi, la manutenzione è carenza della parte amministrativa pubblica che non ha capacità, non ha le skill e non è organizzato per fare controlli. Il primo che sbaglia lo mando in galera butto la chiave e non lo voglio più vedere. Però non è che perché qualcuno ha sbagliato non uso più quel sistema. Le conseguenze si vedono.

D 12: provando a fare una stima così a braccio, secondo lei a che punto nel processo di mainstreaming di questo tipo di soluzioni? Ancora in fase pre-embrionale, embrionale, o siamo pronti....

R 12: dal punto di vista tecnologico siamo a un buon punto. Le idee ci sono, le soluzioni ci sono. Dal punto di vista della loro applicazione diffusa siamo molto indietro. Difficile fare esempi ma mi viene da dire, il mio primo PC l'ho comprato 35 anni fa, in ufficio ero l'unico ad avercelo per 5 anni. Adesso ce l'hanno tutti. Ovunque stanno spostando tutto su computer portatili. Noi siamo ancora al fatto che la tecnologia del portatile esiste, sono troppo pochi quelli che la usano e quindi paradossalmente la tecnologia evolve anche più raramente e lentamente.

D 13: anche perché a livello internazionale è un po' che se ne parla, le varie istituzioni stanno anche spingendo su questo discorso qua, prima evidenziava il problema quasi culturale dei progettisti, quello che ci chiedevamo noi è se all'interno del sistema autorizzativo non sarebbe il caso di prevedere dei percorsi semplificati visto che per definizione in teoria sono meno impattanti? oppure secondo lei dove sono questi colli di bottiglia che impediscono una diffusione?

R 13: su questo non glielo so dire, non occupandomi di progettazione non le so dire dove sono i colli di bottiglia operativi. Ci sono sicuramente, io però in generale, allora, in protezione civile quando ci sono emergenze andiamo in deroga tantissime cose. Con il potere di ordinanza uno può andare in deroga. Io l'ho sempre trovata una cosa che concettualmente non funziona. Anzi fammi un percorso, aiutami con un percorso più semplice perché adottato una soluzione di ingegneria naturalistica lo ritengo concettualmente sbagliato. Cambia la regola fin dall'inizio per cui sia semplice anche utilizzare quella indicazione perché altrimenti sa cosa succede? Succede che dove quell'intervento potrebbe non funzionare o dove addirittura sarebbe dannoso, il progettista è tentato a farlo perché è più semplice farlo. Ed è una scorciatoia. È il problema delle scorciatoie. Poi quello diventa un canale privilegiato che non è detto funzioni. Uno la scorciatoia la pensa per il caso a,b,c però poi vengono applicate magari anche ad altri casi. Perché non si rivede la norma madre e si rende facile fare quello e le altre cose.

D 14: lei aveva parlato durante l'incontro di gennaio aveva parlato di accettazione sociale, se mi può spiegare meglio a cosa si riferiva se più lato del cittadino che dalle istituzioni.

R 14: stavamo parlando di cambiamenti climatici e dei effetti, ci sono cose che, è molto difficile da spiegare. Ogni tanto ritorna fuori il discorso, per esempio, che per i rischi naturali servono

assicurazioni personali. Uno si deve assicurare perché se viene l'alluvione ha qualcuno che gli ripaga casa ecc, per carità, da un punto di vista teorico è vero però in Italia i conti fatti dicono che questo costa troppo al singolo cittadino. Diventa e viene percepito come una tassa. Ecco, un'altra tassa. Assolutamente vero però penso anche che ci voglia una coscienza collettiva che dice sì è vero è un'altra tassa. Lo stato e la repubblica mi vengano incontro però io devo fare qualcosa perché se aspetto che l'amministrazione faccia tutto per me non ci arriviamo. Soprattutto in un momento in cui il clima cambia, l'ambiente pure, in modi che si i modelli ci dicono e i modelli ci dicono ma mica lo sappiamo se sarà proprio così. Secondo me qui ci vuole un'accettazione collettiva di responsabilità. Le faccio due esempi. Noi facemmo un lavoro sulla percezione dei rischi naturali in Italia da parte della popolazione. Lo studio e articolo pubblico disponibile "perception of natural hazard" su rivista che si chiama NHESS e lì dentro se cerca il mio nome o quello di Paola Salvati lo trova sicuramente. Una delle cose interessanti è che facciamo anche una domanda e chiedemmo agli italiani quali erano su una lista a risposta chiusa quale era il problema più grosso sui rischi naturali? La valle d'aosta e trento risposero il cambiamento climatico. Questo da un lato era vero perché le montagne sono sentinelle del cambiamento climatico perché lo si vede prima e più forte anche perché altri problemi come abusivismo, corruzione, lì si sentono meno. Tutto il meridione da Napoli, Calabria, Basilicata e Sicilia i cittadini hanno risposto è l'abusivismo edilizio. Loro ne sono assolutamente coscienti che in qualche modo è colpa loro. L'abuso ha una parte pubblica che glielo ha lasciato fare ma c'è una grande parte privata che lo ha fatto l'abuso. Questo campione è piccolo ma fatto da Doxa e loro ci garantiscono che fosse statisticamente significativo. C'è una coscienza degli italiani a farlo e questa è the bright side of the coin. L'altro, the dark side, è che adesso ho avuto contezza che poi questa capacità non viene usata bene perché se io ho un bonus edilizio che mi permette di fare il cappotto e di migliorare casa mia ma il risultato netto è che sono aumentati i prezzi, che la gente ha truffato, sia il cittadino che l'impresa, non può funzionare così. Se ci freghiamo da soli non può funzionare. La cosa più grave è che non ce ne era bisogno perché chi costruiva quei soldi li avrebbe guadagnati lo stesso perché avrebbe avuto altri clienti. Altra gente sarebbe stata in grado di farlo quindi perché buttarsi sul mucchio dei soldi velocemente e tutti con un po' più di razionale di avremmo guadagnato tutti. Così necessariamente lo stato ha reagito di nuovo chiudendo i cordoni della borsa, mettendo regole dure, minacciando di morte chi lo fa. Lo sappiamo tutti che diventano inattuabile per quello serve un patto sociale per cui ci rendiamo conto che dobbiamo cambiare. Per carità, alcune cose possono essere spinte. L'esempio può essere forviante. Se solo 5 anni fa si contavano le macchine elettriche o ibride se le potevano permettere solo i ricchi adesso stanno aumentando perché grandi marchi dicono tutto ibrido o elettrico è una spinta forte a farlo. Poi tutte le batterie dove vanno a finire? I dubbi ci sono. Lì c'è stato un incentivo e c'è stato un trend che è partito, si è superato un tipping point e adesso il sistema va da solo.

D 15: questa necessità di accettazione sociale si debba tradurre anche in maggiore partecipazione nei processi decisionali?

R 15: cosa che noi in Italia non siamo capaci a fare rispetto ad altri paesi, oppure meno capaci. Non siamo capaci a discutere e prendere decisione. Ne da parte dei cittadini ne da parte delle istituzioni che tipicamente hanno atteggiamento che impone una soluzione. Se la imponi è inutile che mi chiedi di venire al tavolo o se ci vengo io tiro su il cartello non sono d'accordo. Da altra parte mancata capacità di accettare una decisione collettiva che viene presa, il NIMBI e tutto quel filone. Da lì anche ci vuole un livello di accettazione, cultura ecc. Il passo grosso lo deve fare la PA essendo più trasparente, mettendosi in gioco, la capacità di chiedere scusa quando uno sbaglia. Dirlo, abbiamo sbagliato. Dall'altra parte se uno fa un errore non può essere impiccato. Da noi le responsabilità, parte di questa difficoltà della PA a essere trasparente è legata al fatto che se io sbaglio mi mettono in galera e buttano via la chiave. L'amministrazione non impara. Il passo forte debba essere fatto lato PA.

D 16: in teoria dei processi partecipativi esistono sia per i piani sia per la via ecc, poi non so nella pratica come e se avvengono.

R 16: anche lì non ne ho grande contezza, sono cose in cui, ci deve essere troppa proattività da parte delle associazioni e dei cittadini. IN ER ho assistito ad un esempio di queste cose fatto molto bene poi magari il risultato non è stato buono. Tempo fa ci fu la costruzione dell'autostrada, il nuovo passante tra Bologna e Firenze, ci fu un contenzioso perché nello scavare una delle gallerie ci fu un problema e vennero danneggiate delle case. Noi venimmo coinvolti dal prefetto di Bologna che ci chiese una consulenza tecnica. Alla fine la Regione e il vice presidente che era anche assessore alla Protezione civile convocò una riunione in regione. Una sessione open trasmessa in streaming quando ancora era una parolaccia e tutte le componenti che avevano qualcosa da dire, associazioni, la società autostrade, gruppi di pressione, cittadini aveva uno slot di tempo in cui parlare, esprimeva le sue cose e non c'erano altri in sala, parlavano ai politici in fondo al tavolo, dicevano la loro per 20 min e poi c'erano altri 20 min di discussioni e domande. Noi entrati per ultimi, la parte tecnica è stata l'ultima. Le domande sono state pertinenti, difficili, complesse ed è stato un esercizio dal mio punto di vista del rispondente complicato ma io penso sia stato un reale esercizio di democrazia. Io so che la regione a valle di quello aveva preso decisioni e mi piace pensare che non sia stato solo un esercizio di finta trasparenza ma secondo me no. Penso che occasioni del genere siano potenzialmente molto utili. Cose del genere non sono semplici da fare, però ce ne sono.

D 17: mi sembra che si vada verso la necessità di fare in fretta, anche adesso considerando il PNRR dove c'è un'aggiunta di oneri per la PA.

D 18: è vero, la fretta c'è e abbiamo bisogno di fare in fretta però questo non vuol dire non volersi confrontare. Bisogna avere il coraggio. La mia generazione non è nata e non è capace a fare queste cose perché non gli è stato insegnato. Se io vado a una riunione di quelle, io ci parto preconcepito. Ci perdo ore ma io ho già deciso quello che farò. Se tanto è già presa non funziona. È da un punto di vista psicologico la gente lo capisce e mi tira le pere. Se invece c'è una sincera volontà di cambiare, con un tempo predefinito, ci chiudiamo in una stanza, chiunque ha da dire le cose le dice e poi si arriverà a una decisione. Quello possa essere utile. Ripeto, non è banale e bisogna cominciare dalle scuole elementari. Bisogna insegnare alla gente a discutere, ad esprimere il proprio parere, a mediare, sentire cosa dice l'altro, ad arrivarci ad avere un punto di caduta che è interesse di tutti. Culturalmente non siamo capaci, altri paesi sì. In particolare fa molta fatica a farlo la Pa.

D 19: mi sembra di capire, che le vedute si stia ampliando all'interno della PA. Lei vede anche la macchina dalla protezione civile ad essere agente di cambiamento? Predisposto alla innovazione?

R 20: assolutamente sì, uno dei grossi vantaggi, c'erano già prima, però adesso la protezione civile non fa più cose, adesso nel 2022 non è più la protezione civile che faceva tutto con Bertolaso. Non dico che fosse sbagliato. C'erano norme diverse, noi non facciamo più quello. Noi siamo utili se riusciamo a coordinare bene i pezzi di sistema che ci sono la fuori e questo presuppone che siamo in grado di mettere tutti attorno a un tavolo e farli discutere tutti. Molte delle persone, io sono in dipartimento solo da 2 anni, molte delle persone, non tutte, dentro questo palazzo questo lavoro lo fanno tutti i giorni e sono capaci a farlo, qui c'è un luogo fisico che incarna questa cosa. Si chiama la sala del comitato operativo. È un tavolo lungo con a capo il capo del dipartimento della protezione civile, lungo i posti ci sono i componenti di tutto l'esercito, la difesa, i centri di competenza, le regioni, l'Anas, la Tim, la sanità. Ci sono tutti e assieme si prendono delle decisioni. Non è facile eh. Molte volte ci si scontra, ci si scorna, però si prendono delle decisioni tecniche che poi diventano decisioni politiche.

D 20: anche a livello regionale la PC funge da coordinatore?

R 20: assolutamente sì. Io penso che noi siamo da questo punto di vista un buon modello.

D: credo che anche a livello Internazionale la Protezione Civile italiana sia stimata

R: non significa che noi siamo bravi, significa che gli altri sono peggio.

D21: ultimissima domanda, secondo lei l'accettazione delle NBS dipende anche, dalla percezione di efficacia ma anche dal contesto di rischio nel quale ci trova

R 21: sicuramente sì, è anche comprensibile. Io faccio spesso paragoni con il mondo medico. Se uno ha mal di testa magari una tisana e quindi non una pastiglia è disposto a prenderla. Se il medico gli dice guarda che quel mal di testa deriva da un tumore al cervello la tisana non se la prende. Detto questo, in Giappone quando costruiscono un'opera spendono dei soldi per rendere quell'opera meno brutta e impattante, per dipingerla e mascherarla dentro, c'è intrinseca nell'opera la capacità di essere più integrata dentro al paesaggio e dentro la natura. Non è un paradosso per loro, poi ci costruiscono anche il tempio scintoista o buddista perché poi cogliono che la divinità protegga quell'opera. Cose del genere andrebbero fatte poi su alcune cose non è fattibile e potrebbe essere controproducente. Opera ingegneristica non NBS è molto puntale e più chirurgica e può funzionare molto bene. La Nbs il massimo lo da quando è estesa su territorio esteso ma poi diventa di difficile applicazione, è complicata, gli effetti collaterali non li conosce nessuno per cui ci sono entrambe le cose. È comprensibile, non le so dire se giusto ma tenderei a pensare di sì che in parte ci sia anche un effetto legato alla accettazione e alla severità del problema e alla dimensione dell'opera.

D 22: Per quanto riguarda le controindicazioni, ne abbiamo parlato con dei biologi che ci ha fatto presente che c'è una carenza di biologi e di personale con competenze naturalistiche che sappiano aiutare progettisti ecc

R 23: nel centro Italia soprattutto, è pieno di foreste che sono state piantate negli anni 20 30 e 40 fino ai 50 dello scorso secolo con essenze non autoctone perché crescevano velocemente, i pini marini, i pini di Aleppo. Come dire, adesso sono quasi diventate endemiche, stanno lì da 100 anni però non erano una vegetazione originaria nostra. Quello si porta diverse conseguenze con sé, biologiche ecologiche ecc. è facile dire pianto questo perché è veloce. Le faccio un esempio di esperienza personale. A Perugia c'era nel piano urbanistico che se uno costruisce casa deve anche piantare degli alberi che siano dei Lecci che sono alberi che crescono con una lentezza esasperante. Io ho costruito casa ma per quando dovevo buttare giù il leccio ero alto 5 metri. Il compromesso è che tu planti un leccio e una robinia. La seconda cresce subito e ti fa verde e fresco subito e piano piano cresce il leccio. Poi succede che la robinia prende il sopravvento e il leccio non crescerà mai se non poti quell'altra. Le soluzioni ci sono ma vanno usate con attenzione, prende i vantaggi di entrambi e non ha bisogno di stravolgere il paesaggio con un albero che cresce velocissimamente ma che è di un clima tropicale e con il nostro paesaggio non c'entra niente. Sembrano cose banali ma in realtà fanno la differenza.

D 23: ci sono tantissimi casi di distruzioni di ecosistemi involontari, per

R 23: i famosi pesci siluro dei laghi mantovani o sul Po. Introdotti perché dovevano mangiare dei predatori ma sono talmente grossi e voraci che si sono mangiati tutto e ci sono rimasti solo loro.

D 24: le info raccolte destinate a ricerca e per strutturare i prossimi passi di OPERANDUM: spero che anche l'evento di gennaio sia stata un'occasione interessante di scambio. Anche l'università prova a proporsi come elemento innovatore

R 24: è il suo compito o meglio dovrebbe esserlo

Ringraziamenti e saluti

Intervista 13

Intervista Respondent 13, ingegnere dipendente di un ente che si occupa della gestione di fiumi, argini e canali nel bacino del Po. Intervista condotta in modalità online il 25/01/2022 in collaborazione con Teresa Carlone.

Richiesta autorizzazione al trattamento dati e alla registrazione

Intervista:

Domanda: per quanto riguarda la prima tematica volevamo capire, se, oltre alle attività operative sul campo, avesse un ruolo anche nella pianificazione e più in generale quali sono le interazioni con gli altri enti:

A livello di pianificazione facciamo poco, siamo ente strutturale che si occupa degli interventi sul territorio per quanto riguarda il tema della difesa idraulica, caliamo sul territorio quelli che sono gli indirizzi degli enti sovraordinati, nel nostro caso Autorità di bacino del fiume Po, adesso Autorità di distretto che Pianifica sulla base di competenze territoriali quelli che si chiamano Piani di Assetto Idrogeologico e pianifica anche ascoltando quelle che sono le evidenze che vengono dal nostro punto di vista. Ente pianificatore può dirti “mettiamo argine in questa fascia, una cassa di espansione in questa zona”, chiaro, è un indirizzo pianificatore generale che all’inizio può essere un punto sulla mappa però l’ente recepisce anche le voci del territorio e le nostre voci tecniche che possono dire “li non ha senso mettere un’arginatura meglio da un’altra parte”. C’è un’interazione in questo senso. Adesso abbiamo in corso un progetto di ampliamento della cassa di laminazione sul secchia, adeguamento cassa esistente, al contempo l’Autorità di bacino sta provvedendo a pianificare l’ampliamento alla cassa per tempi di ritorno centennali, per fare ciò noi siamo già partiti con le verifiche con Unibo per capire se questo intervento ha senso dal punto di vista idraulico. Questo per dire che la pianificazione c’è ma c’è anche interazione con enti interessati direttamente sul territorio. Quindi questo scambio funziona.

D: Tramite quali canali si svolge? (min 8.44)

Contatti diretti, loro sono strutturati in maniera diversa nel senso che hanno un settore che sta in sede che si occupa solo di quello, ovviamente questo settore deve fare riferimento a tutto il bacino del Po e quando devono fare riferimento a una pianificazione nel sotto bacino si rivolgono agli uffici locali. Mentre loro sono centralizzati noi siamo suddivisi e radicati sul territorio, adesso ci sono 15 uffici operativi sul territorio. Fa comodo a loro, c’è gente che ormai è molti anni che sta sul territorio e conosce bene le realtà locali e fanno riferimento a loro.

D: Rispetto a questa progettazione condivisa, tu riesci a vedere delle dinamiche simili, strutturate, o ricadono su rapporti consolidati a prescindere dalla struttura? (min 10.02)

È più una questione di rapporti consolidati nel tempo con il confronto, non c’è una struttura consolidata, è una questione di relazioni tra figure tecniche di riferimento che sono abituati a confrontarsi su queste tematiche e sentirsi quando c’è una pianificazione in corso e la stessa cosa avviene più o meno con la regione. Anche se in realtà chi è più vicino a questo modo di pianificare è

l'autorità di bacino, la regione adesso fa delle cose un po' diverse che sono i PGRA e su questo loro lavorano per quello che conosco io nella realtà modenese e emiliana lavorano più in autonomia.

D: Questo doppio binario della pianificazione rischio alluvioni e aspetto idrogeologico, facciamo fatica a capire come interagiscono (min 12:00)

è una scala gerarchica nel senso che l'autorità di bacino pianifica su grande scala su nuove aree di espansione, nuove opere idrauliche a grandissima scala. A scala locale ci sono delle regioni che in funzione della pianificazione di bacino vigente, definisce le aree a rischio nei dintorni di queste opere di difesa. Per cui in base al fatto che un'area di territorio sia classificata di fascia a b o c in base ai rischi, loro dicono "essendo quest'area inserita in questo contesto, essendo il fiume con determinate caratteristiche, adeguato alla sua difesa per tempi di ritorno ventennali il rischio di alluvione di elevata entità è importante" e quindi classifica l'area ad elevato rischio. A livello gerarchico, c'è un primo approccio che è quello della Programmazione di Bacino e un secondo approccio che più che pianificatorio, è anche di pianificazione, ma è anche soprattutto quello che serve per definire un rischio in base alla vulnerabilità dell'area.

D: quali sono i criteri che determinano questa valutazione? Conformazione del territorio, dati meteo? (min 14)

Una determinata distanza dal corso, si trova su un alto morfologico, è evidente che quell'area sarà meno soggetta al rischio rispetto a un'area di basso morfologico depressivo e più soggetta, come Bomporto che si trova in un basso morfologico e in una conca e quando c'è un problema idraulico l'acqua arriva tutta lì.

D: Negli ultimi anni abbiamo assistito a molti stravolgimenti nel modo di affrontare il rischio: le direttive europee, nuove tecnologie, nuovi assetti istituzionali: cosa rende il sistema più o meno adattivo e integrato?

D: Anche partendo da esperienze concrete, collegare la risposta a esperienze specifiche

L'aspetto principale è quello economico, nel senso che determinate soluzioni richiedono sforzi importanti. Noi abbiamo chiuso un cantiere da 8 milioni facendo 2 Km di interventi di difesa (4.000 euro al metro). Per dire che certe tipologie di interventi sono molto invasivi e hanno impatto economico importante, queste altre tecnologie di cui stiamo parlando sono più economiche e ci permetterebbero di applicarlo su più tratti di difesa. Poi ci sono anche considerazioni di carattere ambientale. Abbiamo usato tonnellate di ferro dal Belgio e solo di trasporto immaginate che cosa possano significare. Oltre all'impatto della cava stessa. Questo è limitato in parte dal fatto che il pietrame che usiamo sono scarti di lavorazione.

D: in questi casi vengono fatti dei LCA su questi interventi e come viene scelto se fare un intervento piuttosto che un altro

No, l'altro aspetto che secondo me manca è un inquadramento normativo che le regolamenti e che le inserisca all'interno del contesto in cui si opera. Abbiamo chiuso da poco una VIA che considera cose come polveri in quartiere, rischio contaminazione falda, mettere in pericolo nidificazione picchio, e in realtà poi tutti questi altri aspetti che sono secondari ma che hanno un impatto, nella VIA non è previsto che siano considerati e mancano le basi normative. Mancano anche dal punto di vista tecnico nel senso che quando si fanno verifiche specifiche tipo stabilità e le verifiche alla non è previsto che siano considerate attendibili delle verifiche fatte sull'applicazione di queste tecnologie (nbs).

D: Secondo te ci sarebbero le competenze all'interno degli enti per fare questa analisi? Oppure si potrebbe complicare la fase di autorizzazione (min 22)

Competenze ce ne sono, e ci si può anche affidare a società di ingegneria esterne che lo fanno di mestiere, la collaborazione pubblica/privato in questo caso si fa. Noi per fare valutazioni di impatto flora e fauna ci siamo rivolti a studi specializzati in queste cose. Noi siamo ente tecnico e ingegneristico e abbiamo poche competenze naturalistiche e biologiche e ci dobbiamo affidare spesso a queste collaborazioni.

Mentre da un punto di vista tecnico, tra tecnica tradizionale e NBS noi abbiamo tutte le competenze in entrambi i casi, magari manca il tempo, dall'altro punto di vista ci serve più supporto.

D: Il PNRR può dare lo stimolo per una mitigazione del rischio meno invasiva? va nella giusta direzione? (min 25)

Sembrerebbe di sì, dall'Unione Europea gli indirizzi sono quelli, manca il sostegno di una normativa di base che renda più applicabili ma se inizia già così a livello di politica europea per segnare la strada è già qualcosa. Ma dovranno avere supporto pratico che aiuti a indirizzarsi in quel senso, tenuto conto che la scelta è stata quella di indirizzarsi su progetti che avevano già una struttura, già più che in fase embrionale. Era già un indirizzo che si stava prendendo.

D: nella gestione del finanziamento avranno un ruolo importante le amministrazioni locali, che tipo di ruolo hanno e come ti immagini il rapporto con pubblica amministrazione: che tipo di ruolo hanno enti come il vostro in questo tipo di interazioni? Difficoltà spesso rilevata per le strutture rigide delle amministrazioni locali (min 29)

Il progetto da 360 milioni sul Po li conosco, ho visto qualcosa ma non ci lavoro direttamente e non ti so dire quali siano i rapporti tra AIPO e gli altri enti, mi aspetto che ci sia collaborazione piena per ottenere il miglior risultato possibile, ormai questi interventi essendo nati da una linea di indirizzo che richiama il vecchio piano di gestione dei sedimenti dell' autorità di bacino, essendo finalizzati a proteggere idraulicamente zone critiche, mi aspetto che ci sia piena collaborazione. Quello che gestiamo noi come ufficio operativo di Modena, siamo gli unici che gestiamo un progetto PNRR, da 27 milioni per rendere la cassa di espansione del fiume seccia, fruibile da un punto di vista irriguo per fare uso plurimo della cassa. Attingere acqua che poi va nella rete consortile a irrigare i campi della rete intorno, principalmente coltivati a pereto. Emilia Romagna produce il 65% delle pere italiane. Settore in difficoltà non solo per problemi irrigui ma anche per cimice asiatica, anche perché nel modenese manca spesso la possibilità di irrigare e va in crisi il sistema. Questo per dire che la collaborazione in questo senso parte da noi come Autorità idraulica, passa per il consorzio di bonifica dell'Emilia centrale che si occupa di prendere acqua dalla cassa (sollevarla) nei canali e consentire così l'irrigazione nei periodi più siccitosi. Anche in questo caso si vede il progetto come un qualcosa finalizzato a creare una collaborazione tra attori che possono intervenire e collaborare perché è negli interessi di tutti. (min 33)

D: questo input da chi è arrivato? Associazioni di categoria e interessi vari? Il rapporto con questi attori chi lo gestisce? La politica o anche voi avete modo di interagire con questi attori?

Interagiamo anche noi. Il progetto è fatto da noi e dal consorzio che conosce la rete di distribuzione idrica e sono loro che interagiscono con le associazioni di agricoltori, e quindi è una catena. Il progetto lo abbiamo presentato in collaborazione con autorità di bacino, chiesto all'interno di un progetto ministeriale che si chiama piano invasi che è stato inserito tra quelli destinati a essere finanziati con PNRR. Una catena che sembra funzioni almeno per ora. Siamo un po' in ritardo perché i tempi sono stretti e siamo in ritardo. Ci sono questioni tecniche che non siamo riusciti. Avendolo presentato come piano invasi ce la siamo presa comoda, con il PNRR siamo rimasti spiazzati per cui adesso dovremmo muoverci velocemente.

D: prima parlavi di quadro normativo mancante in riferimento alle gerarchie tra unione Europea, Italia e contesto locale, A cosa ti riferivi?

La politica dell'UE è fortemente indirizzata, come nel PNRR per NBS, mentre da un punto di vista strettamente ,non a livello di pianificazione ma applicativo, se devo decidere: se devo decidere tra un diaframma in calcestruzzo o una parancola, ho tutta la possibilità di fare le verifiche previste dalle normative sulle costruzioni, da normative vigenti. Se devo scegliere altro come prati armati, fascinate o altre opere di difesa non ce li ho. Tornando ai nostri colleghi dell'autorità di bacino, hanno pubblicato dei quaderni tipo, vecchi di venti anni, dove ci sono delle scelte di ing. Naturalistica previsti come opera di difesa spondale o arginale, poi di fatto se chiamo un progettista e dico di progettare quelle cose la non lo fa oppure lo fa malvolentieri perché non sono previste come tipologie di interventi nelle cose tecniche per le costruzioni, o decreti che si sono succeduti nei vari anni. Manca anello di congiunzione. Il Ministero dovrebbe aggiornare queste norme tecniche. Anche delle linee guida come gli eurocodice potrebbero arrivare degli stimoli essere degli strumenti perché poi vengono recepiti dalle norme tecniche

D: si collega al tema della responsabilità:

Si non si prende la responsabilità di firmarla. Poi in Italia ci sta il tema degli ordini professionali, forse in Italia siamo gli ultimi a livello europeo ad avere degli ordini così fortemente vincolanti alle attività che si fanno.

D: questo si aggancia alla seconda tematica che volevamo trattare ovvero all'accettazione delle NBS, tra cui diverse categorie di attori: in base a quanto emerso negli scorsi incontri noi abbiamo evidenziato dei fattori che secondo noi hanno un impatto sull'accettazione: min 41

Bisognerebbe avere la sfera di cristallo e ci sono tanti fattori che limitano l'accettazione e la diffusione a gradini scala, da quello normativo alla cultura che si è sviluppata lato progettisti e vado sul sicuro su quello che garantisce massima sicurezza e sono più tranquillo, come anche la percezione della popolazione: esempio di un'applicazione di pianificazione, è più semplice farsi vedere per un argine rialzato piuttosto che fare un arretramento e cedere terreno al fiume per cui sono più sicuro. Dal punto di vista sociale possono dire il terreno è mio e perché devo fare questo sforzo??? E devo lasciare spazio al fiume per ritornare a una naturalità o comunque andamento non stretto tra due arginature. La visione sta cambiando e sembra che sia più sensibilità e indirizzo verso decisioni di questo tipo. Come tutti i cambi culturali deve avere il suo tempo per essere preso e digerito

D: a tal proposito voi siete supportati per portare avanti un dialogo, che dovrà essere intrapreso con attori locali affinché soluzioni accettate, fate in autonomia, avete previsto degli strumenti di dialogo?

Facciamo tutto in autonomia. Potrebbe esserci l'idea di coinvolgere di più le varie associazioni di categoria, ma vedo che per questo aspetto si fa molta fatica. C'è esigenza di badare al mantenere la situazione invariata perché sembra la più sicura e tranquilla piuttosto che andare a raccontare le pratiche che possono essere più di impatto, che comportano rinunce per qualcuno, perdite della possibilità di usare una golena per esempio e impiantarci un frutteto, per prenderla abbassarla e farne un'area di espansione diventa complicato da questo punto di vista. Non c'è un percorso di dialogo politico e di condivisione, per ora a livello nostro di progettazione siamo tutti abbastanza ognuno per la sua strada.

D: a proposito del progetto del Po, dare naturalità al fiume vuol dire levare spazio a qualcun altro e subentrano interessi sociali e politici (chi dovrà gestirle?):

Questo è un bel tema e sono senza argomenti. Dovrebbero essere attivati dei tavoli però dalle poche esperienze che ho queste cose si tirano per le lunghe e oggi come oggi non ci sono i tempi e rischia di essere scelte calate dall'alto. Che diventi poco gradita da quel punto di vista. Non lo so come si affronterà.

Da noi ancora non siamo su questi temi, siamo indietro e non ha molto senso sentire chi sarà oggetto di arretramento d'argine e siamo ancora in fase di attesa.

D: al di là di mancanza di codificazione, e della cultura, hai notato che dal punto di vista dei tecnici sia aumentata o meno la fiducia nelle NBS, la conoscenza e la fiducia nell'efficacia delle NBS:

Mi sembrerebbe di no, mi sembrerebbe che ci sia più attenzione ad andare su approccio che garantisca il massimo del risultato senza rischi, perché un certo tipo di soluzione è innovativo e non conosciuto in maniera profonda. Alcune tecniche di ingegneria naturalistica si applicano da tanti anni però sono dal punto di vista dei tecnici e studi di progettazioni sono viste più come interventi accessori a qualcosa che ha un intervento fatto con un'altra tecnologia, la soluzione risolutiva è sempre quella di maggior peso a livello strutturale. In alcuni casi è anche quella dalla quale non si può prescindere ma non sono così frequenti questi casi e frequentemente si potrebbe optare per altri tipi di soluzioni.

D 2: rispetto alle nuove competenze, i tecnici non hanno questo interesse, ma le nuove generazioni che possono entrare a collaborare con enti e agenzie come le vostre: noti che c'è una maggiore propensione a interessarsi a queste tematiche? Chi ha fatto un lavoro sempre in un certo modo è meno disponibile a tentare misure alternative rispetto a chi si affaccia a questo mondo in una prospettiva più giovane: noti la stessa rigidità oppure un'apertura maggiore?: Si parlava con Silvana di aprire delle sezioni specifiche all'interno dei percorsi di laurea.

In generale c'è più attenzione. Questione più che tecnica è culturale. Penso che Nelle nuove generazioni c'è più attenzione per questo tipo di tematiche. Però per quello che riguarda l'aspetto tecnico è una cosa che dovrebbe arrivare a livello formativo e a quanto ne so c'è davvero molto poco. E anche in ambito universitario il corpo universitario non si rinnova con questa facilità. Se non arriva un input formativo come universitario o di scuola superiore una volta i vecchi geometri venivano formati in un certo modo. Ci vorrebbe una spinta anche in quel senso lì. Per diffonderne conoscenza, poi se uno ha la possibilità di scegliere si indirizza e fa le sue valutazioni. Adesso è anche difficile avere sul piatto della bilancia i due aspetti. Adesso si parte indirizzati con un punto di vista, poi se arriva un collega che ti da consiglio, che ti dice e orienta poi inizi a prenderlo in considerazione altrimenti la scelta è una direzionale

D 2: noi stiamo ragionando in un'ottica di multi-attori con componente di sapere tecnico e esperienziale che fonda che la pianificazione possa essere aderente ai bisogni del territorio. Uno dei lasciti di Operandum è di integrare questi saperi. Prima volta che parlo con scienze dure e dobbiamo armonizzare linguaggio. Sono d'accordo che condividi la riflessione sulla necessità di formare un pensiero laterale e non ortodosso in virtù delle grandi sfide del cambiamento climatico. Prime volte che in sociologia dell'ambiente che si parla di impatto del cambiamento climatico. SI dovrebbe formare un sapere che apre possibilità di usare tecnologie non ortodosse. L'università dovrebbe aprirsi a realtà come le vostre.

Mentre il mondo delle scienze umane è sempre disponibile al dialogo e ha visione ampia, il mondo delle discipline tecniche ha bisogno della rivoluzione per poter cambiare, ti deve cascare la mela in testa allora capisci che è successo qualcosa, oppure arrivare quello e gli dicono sta fermo e lo appendono per i piedi. C'è sempre bisogno di qualcosa di rivoluzionario per indirizzare il pensiero su vie diverse. È un'esagerazione perché avviene tutto per step anche se serve quel punto di rottura che finché non arriva si fa fatica.

D: una curiosità più legata a Operandum: cosa ne pensi di questa soluzione di prati armati, sono spendibili su contesti di larga scala sia economico e tecnico:

io avevo già sentito parlare di Prati armati, avevo qualche remora perché parlando con altri tecnici che non gradivano questo approccio e avevo avuto riscontri sia positivi che negativi e ero curioso di vederlo applicato su un caso mio che potessi monitorare io. Adesso sembrano funzionare, non escluso che si possa pensare di utilizzarlo in altri casi. È una tecnica conosciuta ma controversa, so di un'impresa che gli ha fatto casa perché non sono arrivati alle soluzioni che si aspettavano però nel nostro caso sembra funzionare.

Anche su larga scala voi avreste agilità di manovra?

Si sui nostri ambiti di competenza non c'è bisogno di chiedere autorizzazioni e procedure particolari. Poi c'è comunque parte interna di progettazione, computazione di intervento, affidamento. Dal nostro punto di vista il limite è burocratico. Noi possiamo affidare direttamente lavori per 150 mila euro. Però non potremmo dire a un'impresa che deve utilizzare per forza quella tecnologia lì perché sarebbe una limitazione del mercato e andrebbe studiata come tipologia, è un problema di affidamento degli enti pubblici.

D: anche perché ci sono poche imprese in grado di fornirlo

In Italia ci sono solo loro. Uno può mettere nel capitolato determinate specifiche, per cui essendoci solo loro, chi deve farlo sa che ci sono loro, è un po' delicata come attività, si può fare però.....

D: avevamo già parlato in altri contesti di procedure autorizzative, e favorire NBS, mi viene in mente che durante ultimo incontro è uscito fuori la mancanza di premialità per soluzioni win-win all'interno del quadro normativo: sai perché sono state rimosse?

Non lo so, effettivamente c'è stato un cambio di indirizzo e mentre prima era un elemento che poteva dare un punteggio a livello dei progetti da finanziare per cui si saliva come punteggio, negli ultimi decreti questo è scomparso. Non so per quale motivo. Forse perché hanno valutato.....Questi sono indirizzi che arrivano diretti dal ministero, prima sui fondi Rendis c'era questa classifica che conta numero di popolazione interessata da un certo tipo di intervento e che trova benefici, adesso questo criterio è stato tolto. Sarebbe da capire dalla regione come mai cambio criteri.

D: Mi collego a quanto detto con la professoressa Toth per coinvolgere. Aut di bacino e regione per forum.

Loro hanno spinto molto forte verso progetti europei e mi sembra strano che non partecipino.

Intervista 14

Respondent 14 è un/una professore/ssa di fisica che partecipa al progetto OPERANDUM. Intervista condotta in data 22/11/2021 in collaborazione con Teresa Carlone in modalità online.

D 1: in poche parole con questo file volevamo ricostruire il processo di interazione con i vari stakeholder in vista del forum per avere una panoramica chiara per capire quali aspetti andare ad esplorare e chiarire durante il forum.

Io ho avuto contatti telefonici con una persona della municipalità di Goro dell'ufficio tecnico ma non mi ricordo come si chiama ma è nel famoso file con tutti gli indirizzi. Devo dire che a Goro rispondo sempre, sono anche gentili però poi quando, dal momento, mi hanno detto a tutti i meeting che sarebbero venuti poi in realtà no. Però diciamo a parole sono molto gentili. Con la persona dell'ufficio tecnico dovevamo incontrarci diverse volte ma per problemi vari abbiamo rimandato. A tutti gli incontri l'ho sempre invitata e lei a parole diceva che sarebbe venuta ma non ci è stata. Dal punto di vista del sito però. Adesso sto cercando il nome e poi ve lo dico.

Praticamente nel frattempo non dico che l'ho bypassata ma ho fatto diversi giri nell'area in tutto l'arco del canale e nel porto e ho individuato delle zone. Adesso si tratta di contattare Aipo. Dopo avere ricevuto i dati da Naturalea si tratta di piantare piantine sul bordo del canale. AIPO si dichiarò molto interessata alla cosa. Aipo è lo stesso referente che abbiamo per il Panaro ma dopo potrebbero uscire fuori persone più competenti per Goro.

L'attività è stata contattare più volte con questa persona e poi un gruppetto a cui piace documentare la zona dal punto di vista naturalistico. Ci ha fornito il materiale per il filmato sull'isola dell'amore e ci ha dato disponibilità per fare il video nella zona in cui planteremo le piante. Hanno trovato Operandum molto interessante.

D 2: come definiresti il tuo livello di conoscenza del sistema di governance del rischio?

Il mio livello di conoscenza del sistema di governance molto basso prima di Operandum. Adesso è più chiaro ma è molto variegato a secondo della zona nella quale ti stai rapportando. Non è molto omogenea però Adesso conosco più le dinamiche le interrelazioni e le procedure. Non è molto omogeneo. Per la duna adesso è chiaro quali sono i passaggi necessari, per quanto riguarda i fiumi c'è AIPO si occupa di tutto e si può bypassare la parte amministrativa che invece hai nella duna oppure nei territori che appartengono al demanio.

D 3: quindi delle procedure chiare esistono ma è difficile individuarle oppure cosa?

Per quanto riguarda la Duna veramente un casino, scusa il termine. Per la duna è una procedura complessissima e che penso sia la stessa per tutti i lavori che riguardano le zone delle spiagge, ma penso che siano le stesse anche per zone pubbliche dove c'è interesse tipo i parchi, penso a quelle zone. Poi In altre zone dove ci sono associazioni forti puoi appoggiarti alle associazioni, non so. Delle volte penso, io abito vicino al parco regionale di Monte Veglio e a volte penso, ma qui sarebbe la stessa cosa? Forse no perché qui c'è entità forte come l'ente parco. C'è anche lì dove mettiamo la duna però può essere che a seconda delle zone nelle quali ci sono cittadini coinvolti maggiormente che possono prendersi loro carico di una serie di procedure, non lo so. La duna è stata un macello. Invece per quanto riguarda i fiumi anche lì è stata una scoperta perché basta chiedere ad AIPO. Quindi due estremi. Quindi spero sia così anche per Po di Goro così in un mese implementiamo le Nbs, vorrei fare all'inizio del prossimo anno. Adesso vorrei andare a gennaio da Naturalea per capire quali sono, per me è una cosa nuova che non ho mai fatto, quella del mettere come monitoraggio idraulico, e siccome non aiuta nessuno, per cui la parte che riguarda il Panaro può essere utile e giusto perché sono misure simili alcune ma la maggior parte sono diverse. In ogni caso lì loro si considerano impegnati totalmente. Per cui volevo andare da Naturalea per capire quali sono i sensori da mettere importanti.

L'iter sarà questo: vado da Naturalea adesso ci sta questo nuovo ricercatore di Silvana, un fisico che si chiama francesco Barbano e lui verrà con me perché il suo progetto di ricerca si basa anche sul PON, basati su appoggio di enti privati industrie ecc. Lui farà un periodo da Naturalea. L'idea è andare prima possibile forse a inizio anno. Anche per farsi dare le piantine e se riesco tornare a casa con le

piante altrimenti me le spediscono, ma soprattutto capire come installare il loro sistema che adesso è in contenitori, installarlo a terra e in campo. Quindi questo training accelerato, torno e nel frattempo, l'importante è avere i dati, senza non riesco a fare niente, una volta avuti i dati pianifico area, dimensione, e gli accordi con Aipo e in primavera, inizio primavera l'idea è quella di mettere queste piante in un pezzo dell'argine di Po di Goro. L'NBS in questo caso è una pianta alofite tipo la salicornia che hanno la capacità di vivere in ambienti molto salini. Cosa succede? Durante l'anno normale queste vivono normalmente non l'acqua dolce ma durante i momenti estivi l'acqua del canale si abbassa moltissimo perché c'è la siccità e l'acqua del mare rientra. In quel caso si studia come reagiscono queste piante e come queste piante riescono ad abbassare e trattenere la salinità nell'area circostante, è una cosa piccola e un esperimento. È un esperimento importante perché ce ne sono molti pochi perché altri rischi come il flooding sono molto studiati mentre per il salt intrusion sono rari. Quindi sarebbe uno dei pochi in ambito Nbs, in Operandum l'unico e quindi se riusciamo a farlo è molto bello. Adesso è tutto oscuro perché abbiamo aspettato tutti gli esperimenti di Naturalea che ancora non sono finiti, loro continuano a dire che ci danno i dati ma io non li ho ancora visti.

D 4: il vostro ente di riferimento è AIPO?

Si al momento, io non ho ancora fatto riunioni formali perché appunto c'è questa incertezza sull'esperimento, se mi dicono ma quanto deve essere grande, quante piante non posso dirlo ancora. Prima devo avere dei dati più certi però so già che sono interessati perché ho parlato con Parodi e loro sono molto interessati perché AIPO, quando ci sono questi eventi di sale, loro hanno punti di prelievo lì nel Po di Goro, e gli arriva salata e l'acqua la usano sia per irrigare campi nell'entro terra e per darla alle persone quindi ha bisogno di fare trattamenti pazzeschi quindi avere un modo NBS e comunque aumentare la conoscenza che riguarda questi eventi, per risolverli o migliorarli è importantissimo.

D 5: ricordo che anche il consorzio di bonifica era molto interessato

Infatti io siccome sono sempre impegnatissima, aspettavo proprio il forum per fare public relation e mi aggancio e da lì in poi attivo un processo così non sto a raddoppiare che ne ho troppe, sfrutto il fatto che lì ci sono almeno spero quelli che ho visto l'altra volta, in modo da agganciare e organizzare dei meeting nel periodo di natale e avviare in modo più pressante la cosa.

D 6: anche quello è l'obiettivo del forum. Avete avuto riscontri sulla partecipazione del forum da parte degli stakeholder?

Il Feedback più entusiasta è di Ferretti, del vecchietto, lui sia al forum che anche dopo tramite mail era interessato ad essere informato e coinvolto. Poi purtroppo il comune di Goro a parole sono molto disponibili e interessati ma poi non vengono ai meeting. Io aveva già organizzato dei meeting in presenza solo che una volta ho avuto io un problema e una volta lei e alla fine non lo abbiamo fatto però telefonicamente non solo lei ma anche l'ufficio tecnico è interessato a tutti i lavori che facciamo.

D 7: può essere una cosa valida invitarli il due?

Li abbiamo invitati e adesso possiamo provare a chiamarli di persona ma dubito che vengano all'incontro perché sono più persone, da quello che ho capito, da presenza. Durante il covid hanno fatto giorni di lavoro a casa ma se ho capito bene loro sono alla vecchia, vogliono parlare vis a vis.

D 8: noi proviamo lo stesso, avendo degli stakeholder dispersi in tutta la regione, capisco che Po di goro ha le sue necessità

Si proviamo e speriamo che vengano, gli stiamo un po'addosso. La richiamiamo al telefono. Arrianna Leonardi. Ferrajolo è già stato chiamato ma era interessatissimo.

D 9: creare linee guida con questi stakeholder. Cosa facciamo all'incontro?

Presenterei gli esperimenti e i prossimi passi visto che sulle procedure dal nostro versante ce ne sono poche come dicevo prima. Quindi quel giorno serve per delineare, mostrare e definire i percorsi. In ambito urbano fanno quasi tutto loro nel senso, qui tu sei proprio parte integrante del fare, chiedere permessi, il percorso, il progetto esecutivo, sei molto, non dico lasciato a te stesso però parte attiva.

D 10: sono strutturati, vuoi per la dimensione del contesto amministrativo, in ambito urbano è più definito, hai ufficio del settore ambiente che si occupa della specifica li. È ovvio che loro hanno procedure più consolidate. Operandum ha aperto una riflessione su quali sono i percorsi autorizzativi per implementazione NBS, che come dici tu hanno una dimensione piccola localmente ma richiedono tanti livelli di ... (min 28)

Infatti secondo me è molto importante, visto che la duna, quando è successo il macello dell'anno scorso, ha mostrato anche che c'erano diversi comuni interessati a piazzare la duna, alla fine è stata spostata a Volano, e la zona è sempre quella più o meno. Invece, per incitarli a spostarla questa duna sono stati coinvolti, e lo sa Margherita chi c'era a quei meeting, dei comuni fino a Rimini. Hanno messo su una competizione, c'erano comuni della Romagna del sud che stavano quasi per pigliarsi la cosa. Quelli di Volano ecc si sono dati una mossa, l'evento era stato un po' così ma sarebbe il caso di invitarli questi qua. Non mi ricordo quali fossero e dobbiamo chiedere a Margherita.

D 11: la sentiremo presto. Quindi l'incontro per ridefinire la localizzazione della duna ha destato interesse

Secondo me possono essere interessatissimi a partecipare e capire tutto quello che è l'esperienza di operandum.

D 12: potrebbe essere un'occasione anche per altri enti amministrativi o di governance tipo comuni, altri enti che se mai si dovessero trovare in situazioni del genere hanno comunque un minimo più chiaro quale è il percorso procedurale, e di progettazione...

Poi detto tra noi è perché interessa Operandum in questo caso, dovesse interessare il comune cambia tutto. Noi abbiamo avuto anche molto ostruzionismo da parte di chi era, adesso non mi ricordo quali erano le persone che si sono piantate però ci sono state persone all'interno dell'amministrazione che ci hanno rallentato. Se non ci fossero stati questi personaggi forse l'avremmo fatta un anno prima. Ma per fortuna forse perché sarebbe stata distrutta dalla mareggiata. Però questa persona non collaborava per nulla. Poi quando si è innescata la competizione con altri comuni per trovare sito nuovo, poi c'è stato un cambio di governance, adesso sono più veloci. Al di là della lentezza il processo è complesso perché bisogna fare una domanda, il progetto, il progetto esecutivo, la conferenza delle regioni ecc, ormai lo sappiamo. Tutto questo è un percorso abbastanza standard al di là dei tempi e lo abbiamo capito vivendolo. (33)

D 13: la mia sensazione è quella che strada facendo si capiva dove andare però ecco se riuscissero a fare in qualche modo una traccia, tipo la duna.

La traccia è quel famoso schema a tre livelli di Margherita che è una traccia oggi molto chiara. Per quanto riguarda il PO, possiamo chiedere ancora una volta, è una procedura simile al Panaro e chiedere ancora una volta a Elena ma lei tagli corto e dice basta chiedere a Aipo.

D 14: loro hanno al loro interno tutto un sistema procedurale che include tutto e mi sembrano abbastanza collaborativi

Hanno abbastanza libertà. I consorzi di bonifica sono soggetti molto interessanti per Operandum perché hanno tutta l'attività di gestione dei canali dell'Emilia e non solo.

D 15: volevo aggiungere una cosa, ovvero pensavamo anche in ottica di mainstreaming delle NBS se era il caso di allargare il discorso non solo alle questioni procedurali ma anche a quelle di pianificazione, visto che appunto avremo una serie di rappresentanti di enti pubblici a vario livello, che concorrono alla pianificazione territoriale.

Questo sarebbe stupendo, è il vero scopo di Operandum, se la nostra esperienza serve per ampliare, modificare e integrare la pianificazione, abbiamo vinto, abbiamo avuto successo insomma.

D 16: adesso si chiude il ciclo secondo di pianificazioni della mitigazione del rischio alluvioni

Inoltre ci saranno altri input dal PNRR penso nei prossimi anni.

D 17: sono stati stanziati 360 milioni per la rinaturazione del bacino del Po. Questo tema, considerando che lavoriamo con stakeholder tecnici proviamo a inserirlo. Come queste scoperte e dati raccolti come possono alimentare le decisioni che loro prendono nell'allocazione di queste risorse finanziarie. È una congiunzione interessante. Considerando che il PNRR batte molto su transizione ecologica e con questo appunto anche nelle infrastrutture e azioni di mitigazione. Quindi secondo me si possiamo metterlo a tema. E capire anche loro, i loro bisogni, avendo questa possibilità, quanto ne sapete, quali dati vi servono, quali competenze vi servono e in qualche modo si permette a Operandum, di condividere il sapere accumulato in questi anni, e come si integrano quelle progettazioni. Potrebbe essere un tema del policy roundtable. Quanto ne sanno i tecnici, io non so l'ufficio ambiente del comune X. Quindi esportare il sapere prodotto in Operandum che possa essere concretamente utilizzato.

D 18: per l'incontro dividerei le tematiche in: procedure, pianificazione e una terza che potrebbe essere la struttura in se della governance e il coordinamento, visto che abbiamo visto le difficoltà di coordinamento tra ArstePC e AIPO per quanto riguarda la duna che è la questione che ha rallentato di più il progetto.

Si, si da voce e da lì nasce una comprensione maggiore di come loro si inseriscono in tutto ciò e anche idee

D 19: quello che emergeva dal Logbook è che ci sono voluti mesi per avere l'accordo. Non si capiva chi era il referente che è cambiato tre volte. Il tema è anche quello di individuare cosa facilita o rallenta i processi tipo turnover negli uffici ecc, definizione di ruoli e competenze, dato umano di persone ecc

Per il prossimo incontro dare più voce ai partecipanti e meno introduzione con dati di Operandum.

Ringraziamenti e saluti

Intervista 15

Respondent 15 professore/ssa di ingegneria idraulica che partecipa al progetto Operandum. Intervista condotta in collaborazione con Teresa Carlone il 25/11/21 in modalità online.

Personal/ Research team and research environment

D1: Il team di Elena è composto interamente da ingegneri, lei è quasi civile. Collaborano con il team di Beatrice che composto da modellisti e fisici. Carmine e Gottardi??? sono geotecnici e si occupano del suolo mentre lei e Alessio Domeneghetti sono idrologi e costruttori idraulici. Lei usa modelli flussi e deflussi e si interfaccia con Guido Rianna del Cmcc con cui preparano scenari climatici. Guido e il suo gruppo preparano gli scenari climatici poi lei trasforma le piogge e gli input meteo in portata nel livello del fiume e nel bacino di monte, Alessio si occupa del modello idraulico quando l'acqua è dentro il fiume, quindi la propagazione dell'acqua nel fiume e modelli di allagamento. Beatrice entra nel modello di Alessio che da monodimensionale diventa bidimensionale e poi Beatrice lo rende tridimensionale. Carmine e Gottardi seguono l'argine stesso, il suolo e il controllo di erosione. Elena Beatrice e Alessio studiano le forzanti. Chi si occupa più nello specifico della NBS è Carmine e Gottardo con la consulenza di un agrario Marco Bitelli.

D2: Il team è interdisciplinare?

R: si interdisciplinare ma non transdisciplinare. È facile lavorare all'interno di questo team grazie alle competenze affini. Sul lato disciplinare si intendono tutti ed è facile lavorare. Ci sono piccole incomprensioni tra geotecnici e idraulici. Tra climatologi modellisti e climatologi impiantisti (Guido) c'è differenza, differenze filosofiche, di approccio ai dati, qual è la verità ecc. Io misuro con Pluviometro mentre il climatologo si fida più della stima da radar. Guido essendo climatologo impiantista ha approccio più vicino a quello degli ingegneri. Prati armati sono Lombardi e non hanno concorrenti in Italia.

D3 quali sono i problemi e gli aspetti critici dell'Open Air Laboratory Panaro?

R: Partiamo dall'evoluzione storica del progetto. Porcu ha parlato dell'application e uno di loro conosceva Prati Armati e sapeva che volevano testare le piante sugli argini e in un contesto bagnato e Porcu l'ha inserito nel progetto. Io ho contattato Aipo e a loro interessava il progetto e hanno dato disponibilità per il test. Gli Stakeholder sono stati identificati a monte. Dopo che il progetto era stato finanziato abbiamo ricontattato Aipo per cercare il caso di studio. Certi non andavano bene perché era acqua ferma dentro un canale (proposto da Aipo) ma serviva capire l'effetto delle piene. Dopo alcuni sopralluoghi, abbiamo capito che non si può stare su quello che loro chiamano argine perché deve rimanere sgombro, si può sulla sponda interna ma non sul corpo. Le piante erbacee andavano bene perché non cambiano caratteristiche interne di resistenza idraulica). Prati armati era interessato a presentare ad Aipo perché sono potenziali clienti e sono andati volentieri all'incontro. Loro tengono segreti i semi che ti danno e hanno contratti grossi con ferrovie e enti pubblici. Aipo stesso era interessato perché seguono non solo il coordinamento sul fiume ma altri tipi di lavori nei quali pensavano che potessero servire, erano abbastanza scettici sul fatto che questo tipo di pianta potesse essere così risolutiva e miracolosa come venduta da Prati armati. Il nostro contatto Aipo è Stefano Parodi che è un tesoro altrimenti sarei uscita dal progetto già da un anno e mezzo dove già ero isterica, le dispiacerebbe anche per Stefano. Prati armati hanno un modo di fare molto Lombardo, vengo faccio, produco, risolvo, però dando poche info e tenendo segreti i semi. Hanno presentato davanti a Stefano e dei colleghi. Dopo Prati armati si è rilevata meno collaborativa o perché confusi o troppo impegnati e quindi sono stati assenti nella fase di laboratorio. I test in laboratorio sono stati per me complessi perché abituata a lavorare al computer. Gestione della canaletta e gestione del laboratorio difficoltosa perché da dividere con altri, compreso il tempo del tecnico. Gli acquisti sono molto complessi in Università, per delle cose su misura. Nella fase di laboratorio Prati Armati sono spariti e hanno mandato semi per posta dopo parecchio tempo senza dare nessuna assistenza per piantumazione nella canaletta. I semi erano cresciuti male e radi, dopo 4 mail hanno risposto che era normale per la tipologia dei semi stessi che danno il meglio nel lungo periodo. Li abbiamo chiamati per un

sopralluogo ma non venivano. Margherita ha proposto di chiamare Naturalea che sono spagnoli. Per stimolarli gli hanno detto che ci sono dei concorrenti. Prima che venisse Naturalea c'è stato il lockdown e hanno ripiegato con Prati Armati. La semina non si poteva fare in primavera ad aprile perché mancavano di fondi che non erano al Difa per un misunderstanding oltre che per il lockdown. Prati armati avevano iniziato a chiedere il pagamento, e ogni volta che dovevano rispondere ad una mail chiedevano i soldi che sono arrivati a fine agosto.

Sulla questione capitolato e pagamenti, i soldi arrivati ad agosto e piantumazione prevista per settembre ma erano impegnati. Loro hanno proposto fine settembre. Bisognava preparare il terreno che l'ha fatta gentilmente la ditta di AIPO al di fuori del loro contratto. Ci sono stati scambi di foto per capire se andavano bene i lavori con la ruspa. Prati armati voleva anche che facessero i buchi. Le ultime foto andavano bene ma poi erano impegnati anche a fine settembre. Li hanno forzati a venire con mail minatorie e sono venuti il 6 ottobre. Nei contratti loro garantiscono che le piante crescono e garantiscono sulle caratteristiche nel lungo termine. I semi costano X volte quella normale e li abbiamo pagati e ora c'è il rischio che spariscono. Perché non si sono presentati nonostante una ricerca che può aiutarli in nuovi sviluppi? in un settore in espansione e che può rovinare in qualche modo la loro reputazione nel caso non funzionassero? Loro sono in ballo con Aipo che potrebbe essere il loro potenziale acquirente. Mancanza di fiducia e scetticismo sui risultati? Sono distratti? Fase di transizione interna all'azienda tra padre e figlio. Non si sa il motivo. Aipo di disponibilità estrema, è un argomento che gli interessa e ci sono sempre. NBS nuovo settore, azienda lontana.....

D4 Ci puoi descrivere il contesto fisico dell' Open Air Laboratories:

Aipo sono responsabili anche dei fiumi Modenesi come Secchia e Panaro che ha più problemi di erosione. Loro non hanno in gestione gli argini a monte che lì non sono proprio arginati. Io avrei preso in considerazione la sezione prima della cassa di espansione perché più facile da modellare. La cassa di espansione viene regolata a mano con delle regole non chiare. La cassa non ha avuto il collaudo. I modenesi e i cittadini sono attentissimi alla questione delle piene. Cercare una sezione dove c'era stato un cantiere poco tempo prima perché più sgombra e più accessibile. Per questo Aipo ha scelto quel tratto. Però il punto non ideale per lei perché difficile da modellare. Tratto soggetto a erosione che non fosse crollato. Analisi del suolo effettuata da Carmine. Hanno scelto loro quel punto come test, pezzettino piccolo da vegetare e che protegge quell'argine lì. La soluzione non è definitiva come una cassa di espansione ma se dovesse funzionare AIPO può decidere di mettere quelle piante su altre sponde e argini.

AIPO gestisce tutto, e non c'è stato bisogno di chiedere permessi come il permesso di lavorare. Nessun permesso perché Aipo è gestore di tutto e non so neanche se Stefano internamente abbia comunicato la questione. Nessun percorso autorizzativo a carico dell'OAL leader.

I cittadini modenesi sono molto attenti alla questione delle piene, ci sono state Interpellanze, gruppi consiliari di minoranza in comune, sono andati a Roma per la questione della cassa di espansione e del collaudo. I cittadini conoscono il fatto loro.

Lei ha avuto contatti tramite i volontari e il referente per il comune di Bomporto, brunetto Righi che è responsabile dei volontari ed è il referente del sindaco. D e Roberto sono altri volontari con c'era stato un incontro anche con D 2 e Maurizio. Poi con brunetto per telefono a febbraio-marzo prima del lockdown. Poi a luglio per telefono. Ping-pong con Prati Armati e lui ha avuto problemi di salute nel periodo della semina e aveva dato il telefono di un collaboratore che non ha risposto. A breve proverà di nuovo a contattare i volontari della protezione civile della sezione provinciale. Loro sono stati avvisati nel giorno stesso della piantumazione perché Prati Armati ha dato notizia troppo tardi e anche

loro non hanno risposto. Loro si sono offerti di fare monitoraggio e foto, cercano le crepe, controllo animali ecc e bisognerà risentirli a breve. Loro sono obbligati di fare questo giro ogni due settimane. Però ogni comune ha in gestione il suo tratto di argine. Altro argine potrebbe essere altro comune. Chi dovrebbe fare sorveglianza sono quelli di Bomporto che andranno ricontattati. Il rapporto nella protezione Civile non sembra buonissimo e brunetto dice che contatta il sindaco solo per cose importanti mentre più difficile il contatto con gli altri volontari. Con il Comune si sono solo parlati al telefono. Serve altro contatto. Il Sindaco sa molto poco.

D5 Avevi già avuto a che fare con questo approccio di co-development, co-deployment in altri progetti? Avete notato benefici dal punto di vista tecnico oppure è stato un peso? Come valuta il processo?

Io non avevo mai adottato questo approccio con gli Stakeholder perché prima il suo operato era limitato all'accademia. Il lato tecnico senza Aipo e Prati armati e con le loro info e potere non sarebbe stato possibile, erano necessari ma anche obbligatori in fase di co-design e deployment. I volontari visti ancora poco e preoccupata per il futuro per incastrare delle persone che in realtà non hanno voglia perché ha notato negli atteggiamenti dei stakeholder incontrati in autunno scorsi la preoccupazione di essere coinvolti in un altro progetto. Se si incontrano delle persone con interesse bene altrimenti coinvolgere tanto per è una fatica. La protezione civile servirà per monitoraggio ma considerando che già sono volontari, di quando si possono espandere le richieste verso questi? Altri chi possono essere? Il comune di la dal fiume, Consorzio di bonifica, i cacciatori, associazioni.... Però solo se sono interessati e necessari altrimenti lo ritiene appesantimento perché le cose sono tante, le risorse poche, tutto abbastanza faticoso. Tornassi indietro non lo rifarei. Sono richieste tante energie anche emotive e ci sono alcuni contrasti. Gli stakeholder più vicini sono una risorsa, gli altri magari vanno giusto informati. Mancano le risorse umane per coinvolgere.

I finanziamenti confusi non hanno aiutato anche per i materiali. Ci sono dei dissidi interni per la ripartizione di risorse umane e finanziarie sui diversi OAL. Le dune hanno molto più personale rispetto a questo OAL e più soldi. Nella duna hanno Arpa, Rina ecc. Margherita risponde sempre subito perché ha molto sostegno nel suo team. I soldi che hanno servono per acquisti o servizi. La duna ha una macchina da guerra dietro.

Quello che viene chiesto a loro in termini di pseudo dissemination e coordinamento è più facile mentre per me è pesante. Alcuni partner sono inutili, a parte naturalea e Glasgow, gli altri sono inutili. Tipo mettere OAL history sulla piattaforma, riunione con i Finlandesi con indicatori peregrini sono appesantimenti, la descrizione per il progetto X. Noi come cosa positiva nel progetto vedo quello di fare cose pratiche e con alcuni stakeholder, tra cui il gruppo di social scientist. Altre cose come compilare tabella degli indicatori viene visto come appesantimento pazzesco. Non c'è grande stima con altri partner internazionali a proposito dello sviluppo di NBS esclusi gli austriaci e gli Scozzesi. Lato management e partenariato cerca di evitarlo e fare meno possibile perché gli scambi non sono arricchenti. Chiedono e basta e sono monodirezionali.

D 6: Il lato circoscritto dell'OAL lo ritieni positivo? Avevi delle aspettative rispetto al processo?

Era capitato in altri progetti di avere a che fare con AIPO e anche con CAE che è l'azienda che fa....però non era così necessaria la loro approvazione e si andava avanti a prescindere. Che comunque, in generale la collaborazione multidisciplinare è sempre interessante e si imparano tante cose. Nel caso precedente riguardava un progetto su un ponte del fiume Secchia. Il rapporto con i volontari è nuovo ed è stato molto interessante e li ho anche invitati ad un convegno l'anno scorso

perché sapevo che i volontari della provincia di Modena sono il fiore all'occhiello in ambito di rischio idraulico e conoscerli in quell'incontro le ha fatto scoprire tante cose anche nell'incontro con i volontari e i social scientist.

D 7: Quali sono i lati positivi nel coinvolgimento degli stakeholder e qual è la lezione importante che ti ha insegnato questo progetto?

R: lato ingegneristico è sempre importante tener conto del fatto che la realtà che è molto complessa, contare sulla collaborazione dall'esterno è utile per capire che in alcuni casi alcuni passaggi non è detto che siano fattibili nei tempi che avevi in testa.

D 8: per voi è utile?

R: Non saprei, credo di sì. Sono preoccupata di questa ansia di contattare altri stakeholder nelle fasi in cui centra poco del progetto anche se riconosce che non si possano coinvolgere solo nei giorni precedenti alla chiusura per fare dissemination.

Quella sul Panaro è più innovativo mentre altri OAL usano tecnologie più consolidate che sono più facili da raccontare agli stakeholder. La duna anche è nuova però in altri paesi europei non è così. E questo si ripercuote sulla strategia di coinvolgimenti degli stakeholder, loro già erano partiti con l'idea di sviluppare quella e c'era poco spazio per modificare il progetto. Era l'unica idea e che tra l'altro aveva dei margini di errore. È diverso il loro modo di porsi rispetto ad altri NBS dove magari ci sono state assemblee pubbliche per decidere cosa fare mentre noi avevamo in testa già tutto dall'inizio e non c'era da scegliere. Altri OAL invece potrebbero avere da raccontare di riunioni con ambientalisti ecc mentre qua sul Panaro no.

Intervista 2

La mia collaboratrice è in India per un matrimonio e io faccio fatica a stare dietro agli stakeholder.

D 1: intanto volevamo fare un recap degli ultimi avvenimenti nel vostro sito, discutere dei temi da trattare durante il forum, trattando un po' gli aspetti critici emersi durante il processo di co-creation e di coinvolgimento. E poi un'opinione personale sul sistema di governance e il quadro normativo, in base a quelle che sono state le tue esperienze. Governance ovviamente nel contesto di gestione del rischio.

R: si avevo chiesto a Ludovica e Carmine di metter intanto le cose in cui c'erano anche loro e io non ho fatto delle riunioni senza di loro, in alcuni casi sono andata da solo ma per il resto sono stati contatti in comune. Io ho perso un po' traccia da quando Ludovica è partita, Carmine ha più cose con lui abbiamo fatto più cose. Non so bene a che punto sia quel file lì.

D 2: Se riuscissimo ad avere quei passaggi fondamentali che ci sono stati così anche noi abbiamo un quadro più chiaro. Ci eravamo lasciati che eravamo in fase di semina...

R: poi abbiamo fatto poco, c'è stata la fase di monitoraggio che ha seguito Carmine con poca interazione con gli stakeholder perché avevamo un'azienda nostra che ci ha aiutato a fare i buchi, che preparava gli strumenti ecc, per cui ha lavorato molto lui con tecnici di laboratorio nostri e con questa azienda che però non è negli stakeholder perché ha fatto solo delle cose tecniche. Lato monitoraggio, abbiamo lavorato abbastanza ma senza stakeholder, nell'ultimo anno abbiamo lavorato molto sui modelli, poi abbiamo fatto sui modelli degli incontri con altre figure in AIPO che ci dovevano spiegare meglio come funziona la cassa di espansione. Perché dovete sapere che in mezzo tra le nostre misure idrometriche affidabili e il nostro OAL c'è la cassa di espansione che non è chiarissimo come

funzioni e non lo sanno neanche loro. Quindi abbiamo fatto qualche incontro con loro per capire come modificarlo perché noi dovevamo necessariamente la modellistica inserirla in forma semplificata. Abbiamo fatto alcune assunzioni che abbiamo condiviso con loro per inserirle nel modello. E li abbiamo coinvolti loro e li anche diversi, c'era una persona nuova che collabora con Stefano parodi in AIPO che è un ex universitario che è stato nostro assegnista per tanti anni e che anno assunto li e c'è stato degli scambi con lui e ce ne saranno altri con altri professionisti. Lato modellistica c'è stato questo di contributo e di collaborazione con gli stakeholder. Lato monitoraggio del suolo no, nel senso che eravamo abbastanza autonomi, ogni tanto ci sentiamo con AIPO per la questione della piena. C'è stata all'inizio di dicembre una piena e i nostri strumenti hanno avuto dei pasticci. Carmine con il tecnico li hanno rimessi a posto, AIPO ci ha fatto vedere le foto e abbiamo valutato con loro se spostare i pali, alla fine non li abbiamo coinvolti più di tanto e a un certo punto dopo la primavera Carmine ha sistemato gli strumenti che adesso vanno. Erano stati i connettori dei cavi che erano andati in cortocircuito. Poi invece abbiamo fatto un sopralluogo finalmente con prati armati in giugno, sono venuti e sono gli unici a distinguere le piante perché per noi ogni spiga è uguale, loro invece sono in grado di dire questa è mia e questa non è mia e quindi è cruciale solo che questo lavoro che per me andrebbe fatto in sei mesi invece siamo riusciti a farli venire a giugno e non sono più tornati, ci sono stati gli sfalci che anche li, loro a un certo punto ci hanno detto di farli mentre all'inizio doveva essere zero manutenzione e quindi anche zero sfalcio dove normalmente non si sfalcia, e quindi a giugno è stato fatto. Hanno detto che secondo loro era meglio perché c'è tutto il tema dell'infestazione che adesso non vorrei aprire più di tanto perché effettivamente è il tema secondo me nostro del che piante crescono li. È chiaro che le due semine sono diverse. Una sono le piante prati armate e le altre sono quelle standard e dentro crescono le infestanti e quello che cresce può essere un mix di tutte queste cose. In particolare, però appunto su questo dovranno fare degli approfondimenti e non ne abbiamo parlato in nessun consesso, c'è però aspettavamo di capire meglio e c'è il tema, loro avevano l'impressione che le piante che sono cresciute nella parte che deve essere nel prato tradizionale non siano loro ma che li ci siano le infestanti e alcune loro, le loro si sono estese sin dall'inizio perché i semi si sono sparsi con il vento e poi con la piena. Loro hanno l'impressione che le loro si siano estese anche all'altra zona. Però anche perché loro sono gli unici a saper dire queste cose, e ci sono entrati fino a un certo punto, aspettavamo di vedere che crescano di più. Anche perché andando avanti le loro dovrebbero essere più resistenti delle altre mentre sulle infestanti non lo sappiamo perché le infestanti sono belle potenti di norma, e per quello loro volevano che sfalciassimo, per fare in modo che le infestanti venissero isolate però questo è un tema che ancora dobbiamo capire bene. Però è chiaro che il loro ruolo serve per capire cosa fanno, noi aspettiamo perché tutto quanto va a regime con quelle piante li nel tempo, quindi superato l'anno, loro ci hanno detto che sarebbero serviti un paio di anni. Cerchiamo di capire un po' nel tempo sperando di convincerli a ritornare sull'argine, loro girano guardando due spighette che a me sembrano uguali e dicono questa è mia o questa non è mia e questo possono farlo solo loro ma si muovono a fatica. Al forum dovrebbero venire perché a loro interessa farsi vedere. Adesso magari nel forum lo tirerò fuori questo discorso di cosa è infestante e cosa no e quindi tirarlo in ballo davanti agli altri per convincerli davanti agli altri venire. Però non so bene come dirlo perché appunto bisogna politicamente capire come dirlo senza generare panico o sfiducia nella tecnica io dirò che darò per scontato che loro torneranno con frequenza e a quel punto loro lo diranno davanti a tutti. Una volta che lo hanno detto poi magari si sentono in dovere visto che lo hanno detto davanti a della gente che sono committenti futuri. Questo sarebbe il mio piano per convincerli a tornare più spesso. Aipo sono molto disponibili e dato che lato governance sono loro che comandano e non c'è mai nessun problema, sono loro che dicono si può fare e si fa. Secondo me loro al loro interno non hanno moduli di nessun tipo, e non credo che Stefano quando va a casa e ha deciso una cosa...; informa gli altri perché è utile ma non hanno bisogno di chissà quale procedura perché l'argine è roba loro. Quando andiamo sui ponti conviene avvisare la provincia, perché è quella che chiude i ponti, dicevo i ponti perché l'unica volta che sono andata da sola, volevamo spostare uno strumento da ponte

Motta a Bomporto e abbiamo fatto un sopralluogo. Io e gli elettricisti di AIPO e anche li loro sono arrivati serenissimi tanto qui non c'è problema qua mettiamo un nuovo palo che per fare, con elettricista pagato dall'università sembra manco e che servisse chi sa che, loro invece serenissimi hanno detto avvisiamo la provincia quando c'è da fare qualcosa che impatta il ponte, Punto. Dato che la provincia gestisce la mobilità, se per qualche motivo serve fermare il ponte per montare qualche strumento bisogna avvisare la provincia per capire. Di norma noi non impattiamo la provincia, i nostri mezzi passano dalla strada che porta ad allargare, e una volta che AIPO è autorizzata noi non abbiamo bisogno di chiedere niente a nessuno. AIPO governa e opera, le cose le fanno loro e io anche sono più tranquilla, è un palo montato da loro sul loro argine e sono molto più tranquilla che se non avessi mandato la mia ditta. Quando abbiamo fatto i buchi loro sono stati avvisati, i buchi nella sponda e sapevano cosa si faceva però anche li non hanno chiesto un'autorizzazione, sono davvero disinvolti. Vengono a guardare quello che facciamo, lo abbiamo concordato prima quanto a fondo andiamo. Da quel lato non siamo molto interessanti diciamo che ci va tutto bene. Le brighe sono gli acquisti che dobbiamo fare in università, la non è proprio la governance, quello sì che è un problema, ogni cosa che abbiamo fatto è dovuta passare per procedure interne nostre quindi lato governance questo sì che è un problema. Sul procedimento autorizzativo lato loro non c'è. Se in futuro lo devono fare loro lo fanno in tempi... Intervento pagato da noi in mesi ma questo è legato al fatto che facciamo gli acquisti, per dire prati armati li abbiamo pagati noi e questo comporta complessità. Non so quanto possiamo generalizzare, alcune pratiche sono state complesse perché passavano da università ma in futuro, giustamente si spera che non passi dall'università, ma in futuro da applicare non è complesso, questo volevo dire, distinguiamo quello che è stato complesso per noi da quello che sarà a regime. Lo stesso varrà per la duna, se la duna la costruiamo, dipende chi la fa. Però è chiaro che li è più complesso probabilmente, per noi no perché loro fanno tutto.

D 3: sarebbe interessante capire cosa consente a AIPO questa estrema flessibilità.

R: loro sono gestori e loro sono l'ente che controlla quello che si fa lì, loro sono responsabili, gestori e attuatori della manutenzione. Loro chiaramente seguono una serie di regole e la loro vegetazione segue, hanno tutti i loro bandi di gara, su quello possiamo entrare con loro. Su quello che fanno a regime, anche perché il nostro ufficio di Modena, le regole sono uguali per tutta Aipo che è interregionale quindi tutta la pianura e il bacino del Po. Quindi per quello che loro fanno in modo ordinario, ci sono delle regole che loro condividono su quanto spesso vanno fatte le cose, e come vanno fatte, per quanto riguarda le sperimentazioni a discrezione loro però possiamo benissimo chiederglielo quando lo vediamo. Stefano aveva girato a Filippi e Piovani l'invito al forum che però loro non avevano risposto perché loro sono murati con il PNRR e la rinaturazione del Po e altre cose che hanno sotto mano. Io sono andata martedì scorso e mi ha detto che glielo aveva girato poi però bisogna vedere se vengono. Invece che venga Eugenio Sarti della provincia ingegnere, la vedo dura, capisco che è coinvolto fino a un certo punto. La protezione civile, Brunetto Righi mi ha scritto, quel giorno lì c'è il bacino, non è sicuro di riuscire a venire. Lui è lì come rappresentante del comune perché nel consiglio comunale ma l'argine non è competenza loro. Potrebbe essere già più interessante che la protezione civile, che è ancora meno coinvolta, che in questo periodo fanno monitoraggio delle tane, fanno foto e diciamo se ce le mandano, ma non fanno parte dei processi autorizzativi e sono meno cruciali. La provincia poteva avere volendo...

D 4: qualcuno della protezione civile sarebbe interessante

R: sì perché in alcuni casi i lavori passano da loro

D 5: quelli della Bonifica Burana?

R: si ha detto che ci provava ma non era sicuro perché ha dei cantieri, lui è molto carino è giovane, quelli di UNIMORE non ce la faceva, non hanno risposto i cacciatori, non ha risposto la protezione civile dobbiamo vedere per Valentina e Paolo Piovani di AIPO.

D 6: possiamo anche capire con lui e fare incontri ad hoc specifici

R: si è molto disponibile

D 7: ti volevo chiedere se prima di questa esperienza avevi avuto a che fare con il sistema di governance del rischio?

R: no per fare una cosa nella pratica, dipende, ho avuto a che fare con diversi enti però magari per altre cose, con AIPO anche avevo avuto un progetto precedente, con Protezione Civile ci ho lavorato per tanti anni ma su cose diverse come allertamento, cose diverse e persone diverse però a che fare con enti che gestiscono il territorio sì. Facciamo tirocini, convenzioni, quindi...

D 8: si quindi volevo chiederti qual è la tua impressione generale, non so se hai visto l'ultima sezione del file che ti avevo mandato nel quale avevo elencato una serie di spunti di riflessione. Partendo per esempio dal constatare: se le competenze sono distribuite in modo chiaro e adeguato; se gli enti locali hanno le competenze e le risorse umane e finanziarie per assolvere al loro compito; se il grado di coordinamento tra i vari enti è sufficiente? cosa lo rende tale e cosa è migliorabile?

R: se si parla di gestione dell'acqua la situazione è molto complessa, io la conosco solo fino a un certo punto. La pianificazione è molto complessa, c'è il ruolo della regione, il ruolo di AIPO, dell'Autorità di Bacino, ci sono dei piani che sono comunali e quindi in generale la gestione dell'acqua è molto complessa. Alcuni enti sono sottodimensionati, alcune attività non è chiaro chi la debba fare, questo in generale. È un problema che non vedo nella nostra NBS ma più generale. Le misure sono fatte da ARPA che comunica fino a un certo punto con loro, ci sono i consorzi di bonifica, i rapporti sono molto complessi, le misure per dire già sono distribuite in modo strano. Le misure perché io lavoro moltissimo con i dati e per me è cruciale, però invece anche la parte di modellazione è molto complessa la gestione dell'acqua. Io non sono un'esperta però partirei appunto dagli input che arrivano dal livello europeo. Gli uffici nostri sono in evoluzione perché gli stessi organismi sono cambiati. La stessa autorità di bacino del Po sono da poco anche una parte di bologna ormai è una parte di zona oltre Po, che una volta non aveva. Ci sono evoluzioni continue, ci sono piani vecchi nati con meccanismi vecchi che nel frattempo devono modificarsi ma finché magari non scadono li tengono ancora buoni. Ci sono temi su cui che in questo momento a me non toccano però il deflusso minimo vitale, ci sono temi, gli sfruttamenti, le concessioni che impattano una quantità elevata di attori ed è un sistema estremamente complesso come è normale che sia. Perché tutto è limitato quando si parla di acqua, non nasce in città, nasce in un bacino e quindi chiaramente, essendo l'acqua un fattore di interesse da tutti i punti di vista, da un lato è una risorsa dall'altra è un rischio ed è chiaro che è coinvolto una quantità di enti mostruosa che non sempre sono ben collegati tra loro. Poi chissà, ci saranno gli esperti economisti e pianificatori che studiano meglio le relazioni tra i diversi strumenti pianificatori e competenze, però lato mio in questo progetto particolare, lo vedono fino a un certo punto. Perché finché siamo nell'argine è chiaro chi fa cosa se invece andiamo alle opere di pianificazione esterna è già molto più complesso, ci sono interessi economici e sociali più complessi, e il sistema è molto più complesso.

D 9: il nuovo sistema di pianificazione introdotto con le direttive europee, ci hai mai avuto a che fare?

R: in forme indirette ma è complesso perché appunto ci sono strumenti che devono scadere e che devono essere sostituiti. I piani di bacino distrettuali si intrecciano con i piani regionali precedenti, noi abbiamo il tema dell'interregionale che in altre regioni non c'è. Se ho una realtà in cui è condiviso da

più regioni e ogni regione ha le sue regole per calcolare il deflusso minimo vitale è un problema poi andare a uniformare.

D 10: li è l'autorità di bacino che subentra per omogenizzare?

R: non hanno un braccio operativo ma ruolo di pianificazione poi la relazione che hanno con AIPO e con le regioni sono molto complesse e io non ci vorrei entrare. Però è tutto abbastanza complesso e non è chiarissimo chi debba fare cosa e in che tempi. Tra gente che studia queste relazioni e io non sono esperta. Mi capita o quando lo spiego agli studenti o quando ci sbatto contro ad alcuni problemi. Chi fa la professione ad esempio lo sa cosa è che dovrebbe andare a chiedere e sa meglio come funzionano io non facendolo vedo di meno la catena autorizzativa.

D 11: sarebbe da approfondire anche nel forum perché in un'ottica di mainstreaming di NBS, capire...

R: alcune figure mancano perché se regione non è presente, se autorità di bacino non c'è e non è detto che se viene uno è quello competente per quell'aspetto. Noi abbiamo già degli OAL tutti diversi e diversi hazards. Noi abbiamo scelto il Po e siamo partiti da una realtà molto complessa quindi non so se ci si va contro perché richiede un lavoro molto impegnativo e non mi sembra che abbiamo le competenze e le persone dentro per fare questo tipo di lavoro che davvero è un lavoro a tempo pieno, capire come funzionano e come migliorare i rapporti.

D 12: si capire anche quali sono, in un'ottica di mainstreaming dove andare a insistere per...

R: ogni problema ha una catena diversa.

D 13: per una diffusione delle NBS a quale livello bisogna puntare e il nostro obiettivo è di allargare la platea anche con il Policy roundtable, non so se ne sei già a conoscenza che, sarà un evento a gennaio. Stiamo invitando appunto non solo i nostri stakeholder ma anche figure provenienti da livelli amministrativi superiori sia regionali che nazionali. Per fare anche questo discorso più ampio e legare le NBS al piano di adattamento nazionale, quindi ai vari strumenti legislativi e di pianificazione esistenti. Poi saremo in grado di darti più dettagli. La nostra impostazione è anche quella di uscire dall'OAL. Poi si potranno trattare anche aspetti economici legati alle NBS. Ci saranno diversi panel con un rinfresco nel mezzo.

D 14: ritieni che il sistema di governance sia adeguato e abbia le caratteristiche necessarie per rispondere alle problematiche legate ai cambiamenti climatici? se sia in grado anche di progettare e pianificare a seconda degli scenari di rischio? La pianificazione sia integrata ovvero se prende appunto in considerazione i vari aspetti legati alla gestione del territorio.

R: l'adattamento ognuno lo fa a modo suo. Non esiste un'unica gestione di scenari climatici, un'unica modellistica per dire cosa mi aspetto in ogni punto. Ogni ente singolo si muove in modo autonomo. Posso fare un progetto, posso decidere di inserire l'adattamento climatico e chiederò al professionista che lo fa. Spesso sono figure esterne, la modellazione degli scenari climatici e la modellazione dei flussi non la fa Aipo ma la fa in parte Arpa e in parte ognuno lo fa con cento collaborazioni. Se vediamo lo stesso Panaro con collaborazione Unibo, unimore, uniparma, per cose diverse in momenti diversi, non hanno giustamente dentro una sezione di ricerca e sviluppo che si faccia le cose. Arpa in parte ce l'ha ma fino a un certo punto e quindi non è che sono in grado di progettare in funzione dell'adattamento climatico. L'adattamento climatico non sappiamo neanche da che parte deve andare, non abbiamo ancora nemmeno una partner nel progetto non abbiamo uno scenario unico di riferimento, abbiamo 5 scenari possibili e tutto un mondo di studiosi però non c'è un singolo modo. Da lì poi come gestire e che scenario di riferimento prendere, è difficile che abbiamo un piano unico, è un approccio locale, può capitare che ci ritroviamo che la cassa è stata progettata per lo scenario tale e

il ponte di fianco con un'altra logica, è così in gran parte di Europa. Non so quanti siano gli enti in grado di avere un unico scenario di riferimento e un'unica modellistica di riferimento o un ensamble ma un ensamble condiviso. Quindi non è banale, lo scenario climatico permette tuttora di dire quello che vuole in base allo scenario che ha preso, è chiaro che uno è dalla parte della sicurezza e uno scenario di no regret, quindi nel dubbio, se non costa troppo di più, cerco di mettere un di sicurezza rispetto alle varie possibilità che sono emerse. Però decidere quale scenario usare e come usare in funzione di dove vuole arrivare dal punto di vista politico. Se l'obiettivo è andare avanti con la cassa perché è importante sistemarla collaudarla e metterla in funzione dovrò spaventarti dicendoti se non ti dai una mossa sarà ancora peggio tra 50 anni. Se invece l'obiettivo è lasciare tutto come è, dipende, sono decisioni che hanno anche uno componente politica legata all'economia, non è che non vogliono fare cose ma devono pur scegliere. Non mi sembra ci sia un'unità di intenti e questo è facilitato sicuramente dalla frammentazione delle competenze perché non c'è un responsabile e io posso sempre dire è stato lui che non ha voluto, non ci sono i fondi, è stato lui che non ha scritto e poi si fa lo scaricabarile. Questo però come abbiamo visto in AIPO post inondazione hanno spostato la referente in un altro ufficio perché serviva un capo espiatorio, hanno fatto il balletto dei referenti, che era la mia referente originaria, per far vedere che hanno fatto qualcosa. L'aspetto economico, politico, di percezione sociale, è tutto molto complesso però lo sapete anche voi

D 15: quindi manca un coordinatore?

R: ma vale per tutti i posti, non è che negli altri paesi, in confronto di come vengono gestite le magre in Europa emergano idee più chiare perché dipende. Ognuno gestisce il suo pezzo di acqua diverso e ognuno può avere una sua opinione e un suo modo di agire che però è comprensibile, non è come Tper che deve interagire con diversi comuni, però se gli autobus non funzionano io lo vengo a dire a te che sei la direttrice che non ho abbastanza corse per portare gli studenti in fiera. Poi tu potrai dire che non ci sono abbastanza fondi e a quel punto sarà l'assessore ai trasporti della regione, che ti dice non ha i fondi per aumentare le corse. Però è già più corta la catena. Le competenze sono tantissime e stratificate nei secoli e quindi anche alcune posizioni...io posso decidere che non deve abitare nessuno nella zona che periodicamente viene allagata, però se i proprietari non possono venire sfrattati quelli rimangono lì e continueranno a fare richiesta di rimborso, purtroppo. Però per la gestione delle piene alcuni paesi, penso agli avvenimenti più recenti, per le magre sono un problema meno sentito in modo meno diretto, non è chiara una gestione unica, chi debba fare cosa, quando, come agire, c'è un piano, non c'è neanche quello. Sulle piene ci sono dei piani con dei passaggi, complessi anche quelli, però ci sono delle soglie di allarme, delle figure che vengono allertate, c'è una catena di informazioni che devono essere mandate delle persone specifiche. Però anche lì, una volta che io mando l'avviso a tutti, la prefettura ecc, poi ho fatto il mio lavoro con la PC regionale e cosa va a succedere, se io avviso tutti è come se non avviso nessuno. È giusto che tutti siano informati ma non esiste una catena di comando sempre definita tanto è che fanno dei tavoli di volta in volta per le emergenze perché ogni caso è diverso. Anche quello è complesso, non c'è una piena uguale all'altra, quindi difficilmente anche partendo da un'esperienza passata si può avere la soluzione perfetta. Poi certo le catene di comanda si possono migliorare. Però già parlare di emergenza è un conto e gestire la pianificazione è un altro. Gestire le emergenze è AIPO e PC, però l'autorità di bacino non è coinvolta in casi di emergenza. Se invece parliamo di pianificazione a lungo termine c'è la PC, gli uffici della regione che seguono questi meccanismi e poi certo c'è di nuovo AIPO, c'è un po' meno protezione civile e allertamento però poi tanti fondi passano da lì anche per le misure strutturali. Prevenzione ed emergenza il compito della protezione civile, quindi deve tenere entrambe le competenze e non è mai chiarissimo perché i fondi passano da una parte e poi dall'altra. Sono cose d'emergenza passa per la pc che ha delle procedure più snelle anche rispetto agli appalti ecc, se sono cose più lente potrebbero passare da AIPO e dalla

regione. Non è chiaro anche i lavori che vengono fatti delle volte sono fatti da uno e delle volte dall'altro in funzione dei finanziamenti che sono arrivati, quindi è complesso.

D 16: si infatti vediamo delle sovrapposizioni spesso.

R: di grazia se si informano. Poi un piano unico

D 17: poi mi sembra di capire che c'è qualche problema nella condivisione dei dati con ARPAE

R: anche lì non si accordano e l'altro giorno mi diceva Stefano che quell'idrometro, da modellista è un idrometro importante, storico, era attaccato al ponte che è crollato l'anno scorso che è più a monte rispetto al Panaro, non l'ha sostituito, l'ho sostituito con un altro. Ora, un idrometro non sostituisce un altro perché sono sezioni diverse, io ho interrotto una serie statistica, improvvisamente invece delle pere ti danno le mele tante sono simili, no caro non le posso mettere nello stesso insieme, quindi hai interrotto il campione e lo stesso vale per me, per i modelli, per chi li usa per qualunque motivo. Anche lì si decide gli strumenti sono di Arpa, servono per il controllo del territorio, alcune di questi strumenti sono strumenti che sono stati normati e entrano nel pacchetto di quelli che servono per la protezione civile. Evidentemente quello di ponte Samone non è tra quelli protetti e si può toglierlo, però non sono solo io che lo uso ma anche AIPO. Alcuni strumenti sono di AIPO, però giustamente anche gli altri. Sui dati basterebbe una cosa molto più semplice, chiunque possiede uno strumento, al mondo d'oggi a partire di quello che è stato fatto dagli anni 2000, rendere condivisibile con gli altri, a partire dagli anni 2000 la PC ha fatto un lavoro nel quale sono stata coinvolta, di acquisizione dei dati in tempo reale di strumenti che appartengono ad altri gestori. Consorzi di bonifica, Romagna ATO, singola provincia, vengono visti dalla PC però poi vengono visti, vengono mantenuti gli strumenti, no, non è detto perché non sono strumenti che ufficialmente sono di Arpa, che poi già con la protezione civile sono due cose diverse e vanno d'accordo poco. Perché una volta che vai a pestarti i piedi è chiaro che ognuno ha le sue competenze ha un comando pensare che loro non sono altrettanto bravi nelle cose che sono in comune, poi nelle cose in cui ognuno ha le sue riescono a collaborare anche meglio.

D 18: in generale l'accesso ai dati e ai modelli....

R: si capisce che decide Arpa che cosa fare dei suoi dati e non c'è un controllo diretto di cose serve agli altri enti, si da per scontato che c'è funzioni, loro possono fare delle richieste però non necessariamente gestisce lo strumento la stessa persona che lo usa cosa come è capitato spesso chiedere ad Arpa delle info che per loro sono cruciale e che loro non ce le hanno e dobbiamo chiederle ad ARPAE, ma cose importanti tipo le scale di deflusso che sono le curve che servono a trasformare un livello idrometrico in una portata, ovvero il volume d'acqua che passa in un'unità di tempo in una sezione. Sono cose importanti che peraltro poi vengono utilizzate per fare i loro progetti, nel senso che poi quelle info li le passano agli ingegneri che poi fanno progettazione e modellistica, da dove sono venute, come le hanno fatte, per che periodo sono valide loro spesso non lo fanno. Quando abbiamo chiesto informazione ad AIPO che ci ha rimpallato su Arpa che alle volte ci ha aiutato ma alle volte no. Loro stessi sono parzialmente disorganizzati, cambiano le persone, una cosa e l'altra e non è detto che i dati ci siano. Adesso io sul tema dei dati sono un po' sensibile, però non necessariamente l'utente finale., è anche va bene che i gestori pubblici, dati che servono a tutti, non è che servono solo ad AIPO, sono condivisi per fortuna, in EM sono abbastanza ben condivisi, in altre regioni no. Altro tema problematico per un bacino interregionale. I dati non sono comunicati tutti nello stesso modo nelle varie regioni e già studiarle è complesso.

D 19: molto interessante anche questa questione.

R: una volta da una parte c'è un sistema nazionale, diviso in circoli locali ma nazionale, adesso invece ogni regione fa a modo suo, alla fine degli anni 90 c'è stato un gran buco nel passaggio di consegne e molti dati sono mancanti. Hanno iniziato a fare ognuno a modo suo, sia fare misura a modo suo, più che a fare misura a raccogliere i dati, perché poi le misure alla fine sono standard, e pubblicarle anche, ognuno le pubblica a modo suo, in tempi diversi. È sempre molto faticoso alla fine raccogliere i dati quando bisogna andare fuori regione.

D 20: questo pensi possa essere un tema interessante da proporre durante il forum quello della condivisione dei dati tra i vari enti?

R: sì che poi oltre ai dati temporali ci sono tutti gli altri dati invece che sono dati statici e come gestire certe mappe impegnative, credo che sia un problema anche in altri OAL. Anche le informazioni che hanno i cartografi per dire regionali. C'è il tema dell'interregionale perché l'ambiente è un tema regionale, così di normativa ma invece il bacino idrografico è interregionale. Quella è la natura e quindi alcuni aspetti legati all'interregionale nel bacino del Po ci sono perché per quanto sia ne Aipone Autorità di bacino hanno competenza specifica su alcune cose e le misure sono affidate alle regioni, poi loro le vedono. Però c'è stato tutto il periodo che le misure della Lombardia non erano affidabili, non erano in scala e poi ogni regione poteva avere le sue, la val d'aosta, e quindi poi chi deve usare queste misure in modo uniforme fa fatica e credo che per la pianificazione sia un problema non avere delle misure coerenti.

D 21: anche perché la pianificazione è interregionale adesso, è al livello di bacino

R: sì di distretto sì e sicuramente è un problema, poi loro hanno gli uffici regionali e conoscono bene i loro territori però non riescono, non è facile avere una gestione unica di temi che sono sempre condivisi.

D 22: sì questo è molto interessante

R: è assolutamente molto complesso e io stessa lo vivo in forma periferica perché non ci sono mai volutamente, perché bisogna metterci a tempo pieno per capire come funzionano le azioni per autorizzazioni, chi viene prima e chi viene dopo e chi alla fine dovrà concludere alcune cose. È molto complesso.

D 23: sì ce ne stiamo rendendo conto. Io ho finito le domande e non so se volevate aggiungere qualcosa...

Ringraziamenti e saluti

Intervista 16

Intervista a Respondent 16, fisico/a, dipendente di un'agenzia regionale, e partecipante del progetto Operandum. Intervista condotta in data 25/11/2021 in collaborazione con Teresa Carlone in modalità online.

Premessa e Domanda 1: Riassumiamo un po' gli obiettivi della chiamata di oggi che è fare il punto sullo stato dell'arte del tuo sito, fare il punto su tutti i passaggi principali degli ultimi mesi che magari ci siamo persi e magari in particolare nella fase del cambio di sito di sperimentazione, e poi questo per portarci a individuare quelle tematiche che vorremmo approfondire nel secondo incontro del forum di settimana prossima. E ti faremo qualche domanda per capire qual è la tua opinione e il tuo pensiero sul

sistema di mitigazione del rischio. Vogliamo iniziare dalla ricostruzione del processo degli ultimi mesi, potresti farci una p e se riesci a farci una panoramica sarebbe ottimo.

R 1: io ho lavorato sul vostro file, soprattutto le parti che mancavano e le parti principali magari non sono stata così puntuale come ero stata per compilare il diario del primo periodo però insomma lo sono stata abbastanza e ho riportato le fasi principali e ho aggiunto nella sezione 2, 6 incontri che a volte sono doppi e poi tra un incontro e l'altro ho evidenziato dei passaggi amministrativi o eventi importanti da conoscere e che scandiscono il tempo. Cosa che magari non c'era nell'altro caso, prima nella prima fase, io mi limitavo a riportare i contenuti dei contatti che avevo avuto, riunioni, telefonate e contatti in generale. In questo caso ho inserito anche tutti i passaggi, l'inizio e la chiusura della conferenza dei servizi, approvazione del nuovo accordo, e tutte queste informazioni in più. Non entro nel dettaglio ma per vostra comodità posso spiegarvi cosa è successo. Nel dicembre 2020, una serie di mareggiate hanno sostanzialmente eroso profondamente l'area e il sito di progetto e la protezione civile ha comunicato che il sito non era più idonea per la costruzione della duna. Poi interruzione natalizia, molti eventi che hanno interessato anche il resto dell'Emilia-Romagna e la protezione civile, tra interruzione natalizia e altri eventi di urgenza del territorio non era molto disponibile nei nostri confronti. Non lo era normalmente e figuriamoci in quel periodo. Poi ci sono stati dei cambi di dirigenza però di fatto c'è stato il miracolo che è entrata in scena una nuova dirigente che ha iniziato ad attivarsi in modo molto efficace e a marzo è stato individuato un nuovo sito di progetto. Ci è stato comunicato e a questo punto ci è stato un confronto con Rina perché il problema non era soltanto individuare un nuovo sito di progetto ma rifare tutto da capo. Una mole di lavoro impressionante, non prevista, mole di lavoro che è pesata tantissimo su Rina ma anche sulla protezione civile e su di noi perché a parte gli elaborati di progetti che sono numerosissimi, il numero di relazioni, relazioni ambientali, planimetrie ecc.

D 2: se è possibile accedere a questa documentazione mi interesserebbe.

R 2: attualmente ho il progetto definitivo ma quello esecutivo sta per essere consegnato entro lunedì alla Protezione Civile però in ogni caso ti posso mandare il progetto definitivo che già ci dà un'idea di che cosa si tratta e metterò in condivisione una cartella perché è molto pesante. Sono delle cose che devono rimanere private e che non devono essere diffuse.

D 3: i passaggi sono consegnare i progetti alla protezione civile e poi tutti gli atti amministrativi all'inizio si pensava di poter fare una cosa più snella che non fosse necessario rifare l'accordo di collaborazione tra Arpa e protezione civile e che non fosse necessario ripassare in giunta e invece no, a settembre abbiamo la nostra direzione amministrativa che ci ha imposto di rifare tutto da capo incluso il passaggio in giunta. Quindi tutti i documenti da rifare e i vari atti nel termine, un macello. Un'altra cosa che vi posso passare è un elenco di tutti gli atti che sono stati prodotti e ci metto pochissimo che sono già pronti. Quindi questo è stato tutto il processo, insomma è stato rifatto tutto e adesso siamo nella fase, in fase di consegna del progetto esecutivo e anche del capitolato speciale d'appalto, dello schema di contratto e tutti questi documenti devono essere convalidati dalla protezione civile e a questo punto sarà possibile iniziare con la gara di affidamento dei lavori. Quindi tra dicembre e gennaio inizierà l'affidamento per la gara dei lavori che verrà super super accelerata, rispetto al normale, non so come faranno, però questi sono quelli della protezione civile che, questa cosa verrà controllata direttamente da loro.

D 4: in questo caso come funziona? C'è una lista di impresa a cui loro si rivolgono, o per questo tipo di intervento innovativo servono aprire nuovi canali?

R 4: ecco, rispetto a questo ti dico una cosa che mi è stata riferita da loro. Le ditte che si occupano di queste opere sono pochissime, sono quasi inesistenti da quello che ho capito sul nostro territorio e mi

hanno anticipato che sarà comunque una bella impresa trovare qualcuno di specializzato, lo spero però immagino che sia probabile che si presenti una ditta disponibile sul territorio che magari non ha tanta esperienza. Dall'altro lato, chi le ha già costruite, e parlo delle esperienze in toscana dice anche che non sono delle lavorazioni così complicati. Richiedono cura ecc ma non sono lavorazioni complicate. Queste sono comunque, una sperimentazione a tutto tondo a partire anche da questo momento. L'ideale sarebbe stato poter guidare tutto, fin dall'inizio progettista..., si l'ideale sarebbe stato poter scegliere con calma, tutto compresa la ditta. Poter chiamare la ditta particolare che magari ha operato in toscana, ha lavorato bene, ma le procedure di gara non lo consentono ma neanche il budget assegnato, doveva essere impostato tutto in modo diverso perché comunque è una sperimentazione e siamo al di fuori di quello che si fa tradizionalmente; quindi, è più complicato.

D 5: servirebbe un sistema più flessibile in caso di sperimentazioni innovative?

R 5: sì e la possibilità di andare a trovare la ditta giusta, anche i tempi, e anche dei budget diversi, insomma tutto quello che non si può fare con budget limitati, i limiti dei progetti europei, covid in mezzo. L'ambiente in cui ci troviamo a lavorare non è uno scherzo.

D 6: invece il nuovo accordo, abbiamo notato che per ottenere il primo avete pensato non poco, in questo caso è stato più semplice ottenerlo?

R: per due motivi, ci siamo trovati di fronte persone più proattive e quello sicuro ha aiutato. Però anche perché l'accordo è stato sì modificato e soltanto in alcune parti e la struttura è rimasta la stessa. Era complicata perché è un accordo atipico, come ho detto tante volte, il problema è che se si vuole operare sul territorio bisogna coinvolgere come partner gli enti che sono competenti, ovvero quelli preposti ad operare sul territorio. E invece eravamo parte noi, noi di ARPAE, che siamo un'agenzia di supporto alla regione, noi eseguiamo studi ambientali di vario tipo, monitoraggi ecc di supporto, non costruiamo opere, non progettiamo. Noi ci eravamo proposti per il monitoraggio dell'opera, per gli studi climatici e la modellistica e avevamo proposto come idea la costruzione della duna. Noi nella nostra realtà veniamo in contatto con tutti questi enti che costruiscono ecc e abbiamo delle idee dal punto di vista della progettazione però ecco, se ci fosse stata coinvolta la protezione civile fin dall'inizio, cosa che, premesso che, forse non si sarebbe fatta coinvolgere non so, comunque...avremmo avuto l'ente preposto a costruire, avremmo potuto saltare un sacco di passaggi amministrativi compreso questo accordo che è stato anche molto complicato da comporre. C'è stata anche la questione dell'IVA, c'è stato lo sforzo di poter usare quei soldi dell'IVA per la costruzione dell'opera perché erano pochi. C'è stata tutta una forzatura del sistema che ha portato a un prolungamento. Nella seconda fase, abbiamo guadagnato tempo, la seconda volta e con il secondo accordo perché c'era una disponibilità perché l'accordo era fatto.

D 7: cosa ha impedito una maggiore collaborazione nella fase precedente? Perché avete riscontrato questo basso livello di collaborazione?

R 7: perché la protezione civile è un'agenzia che è impegnata in interventi di urgenza soprattutto. Una protezione civile che vedeva la nostra duna come una cosa laterale che non aveva priorità e qua torno a ripetere il discorso del coinvolgimento degli enti preposti direttamente. Se fosse stata coinvolta direttamente, lei avrebbe messo la duna fra le priorità. Abbastanza elementare come ragionamento, terra terra. Io, comunque, questi concetti li ho riportati nella parte di esperienza all'interno dell'OAL dove c'erano già le vostre frasi che ho modificate. Perché io mi sono confrontata con il mio direttore e dicevo anche l'altra volta, è bene che vengano fuori le cose che non hanno funzionato nell'ottica di dare un contributo per fare funzionare in futuro. Però bisogna far esprimere delle valutazioni un attimino più, non dico edulcorate però essere un po' più generici perché erano un po' troppo pesantini

perché ricordiamoci che al forum noi ci troveremo a parlare a molti di questi funzionari con cui ci siamo interfacciati in questi mesi.

D 8: quello è un documento di confronto interno, l'obiettivo è che si migliori nelle prossime esperienze.

R 8: esatto, bene. Quindi si questa è la risposta e le difficoltà all'inizio dettate dal fatto che non era la priorità per una serie di motivi e

D 9: vedi anche un problema di attribuzione di competenze? Mi sembra di capire che alla protezione civile viene assegnato tutto il ciclo di mitigazione del rischio, dalla prevenzione alla gestione delle emergenze ecc

R 9: no sono distribuite in modo chiaro e comunque devo dire che c'è tanta competenza in termini di conoscenza e preparazione. Io ho visto che quello non è mai mancato. Non è neanche troppo difficile capire chi fa cosa.

D 10: mi riferivo al fatto che alla protezione civile viene attribuito tutto il ciclo di mitigazione prevenzione e emergenza del rischio, quindi magari è un problema di mancanza di risorse umane e finanziarie

R: si questo discorso delle risorse umane l'ho riportato ed è un periodaccio, a parte i pensionamenti, in questi anni sono andati in pensione tantissime figure dirigenziali, anche in Arpa è andata così, non sono state sostituite in certi casi e anche diversi funzionari con la memoria storica che non sono stati sostituiti. Quindi questo diciamo non ha aiutato proprio per niente. Per quanto riguarda l'ente parco, con loro mi sono interfacciata pochissimo. Ho fatto diversi tentativi e ho visto con i miei occhi che durante uno dei primi tentativi, se prima c'era un attimo di interesse quando hanno capito che il progetto era già partito, era già stato finanziato e che non eravamo in fase di proposta, e hanno capito che erano fuori dai finanziamenti e dalle attività ho visto spegnersi e venire giù la saracinesca sulla faccia e poi in effetti non abbiamo ottenuto molto. Diciamo che hanno risposto alla conferenza dei servizi, lì sì, sono stati coinvolti ufficialmente e lì sì sono espressi però la fase di co-design quasi niente.

D 11: impossibile coinvolgerli per il 2?

R 11: sono stati invitati ma per ora ho ricevuto soltanto una risposta da parte del servizio geologico della regione, gli altri non mi hanno, anzi il servizio geologico mi ha chiesto anche del materiale. Però il servizio geologico in questi anni mi ha sempre servito tante informazioni, dati, foto, quasi collaborato. Per quanto riguarda gli altri....

D 12: Beatrice ci ha detto che c'era stato molto interesse anche da altri comuni nella fase in cui si cercava il secondo luogo di sperimentazione della duna e quindi stavamo pensando che potrebbe essere interessante provare a coinvolgere anche loro visto che avevano dimostrato interesse.

R 12: posso fare una correzione? I comuni non sono mai entrati, non è vero che, è sempre la protezione civile che ha provato a contattare i vari servizi comunali per trovare un nuovo sito. Però non c'è stata una vera risposta e comunque sono proprio i servizi della protezione civile che hanno individuato più siti di interesse ma no, non abbiamo dei feedback dai comuni. E i comuni sono tra quelli invitati al forum.

D 13: Come pensi che possiamo procedere per invogliarli a partecipare?

R 13: non saprei proprio perché non ho esperienze in questo senso. Come Arpa non abbiamo contatti diretti con i comuni. Io per caso ho un contatto con un dirigente del comune di Cervia che so essere

l'unico tra tutti i comuni a essere particolarmente interessato alle NBS, partecipa ai progetti europei. Poi dipende anche molto dai personaggi e io per caso, con il mio lavoro l'ho conosciuti e in effetti con lui ho provato a parlare e a interessarlo ma solo che anche l'ultima volta era pienissimo di lavoro, non ha partecipato ma ha mandato una sua collaboratrice e altri nominativi che ho messo tutti lì dentro. Li avevo contattati a parte dicendo che il nominativo me l'aveva dato lui. Io più di questo non saprei cosa fare non avendo mai avuto dei rapporti diretti con queste persone. Probabilmente, voi siete in grado magari contattandoli indirettamente di attirare la loro attenzione. Non è molto diffusa comunque questa interesse nei confronti di queste materie perché magari sono appunto persi dietro al loro lavoro quotidiano che magari gli riempie tutta la giornata. Magari non sono nella posizione di prendere delle decisioni, insomma, secondo me è più un lavoro che dovrebbe essere fatto a livelli alti per essere efficace. Finché vengono i livelli alti sono difficili da raggiungere, non saprei proprio guarda, sarà che non è neanche la mia materia che mi è molto distante.

T: nell'altro forum di relativo al vostro sito chi è che è venuto?

M: una collaboratrice di questo tipo di Cervia che è già stata invitata, sono stati richiamati tutti. Come dicevo non mi hanno risposto, e mi ha risposto solo il servizio geologico.

T: ha senso fargli una chiamata e dirgli che abbiamo mandato questa mail

M: se volete farlo voi ok, io non credo di poter aiutarvi oltre a questo perché non li conosco direttamente nemmeno io, non saprei che cosa aggiungere, proprio non saprei. Poi si D 2 di questa cosa ne avevamo parlato e ti dicevo che in effetti se volete provare a fare una chiamata sfruttando anche le vostre capacità di approccio probabilmente potrebbe aiutare.

T: ti chiedo se ci mandi una mail con i contatti così proviamo a chiamarli noi

M: nella tabella ci sono anche tutti i numeri di telefono.

T: quindi quelli che c'erano nello scorso forum erano lei e?

M: non mi ricordo più ma erano pochi. Avevano confermato diverse persone che alla fine non si erano presentati. Morolli che stavolta però non mi ha risposto. A quello prima ho mandato anche mio marito

T: adesso chiamiamo e vediamo chi può venire.

D 14: sicuramente non è un sistema che incentiva la partecipazione

R: purtroppo no, c'è poca sensibilità perché non si vede il guadagno immediato.

D 15: cambiando argomento, come Arpae hai mai partecipato a processi di pianificazione, PGRA PAI?

R: fatto piani no, magari ho contribuito ad alcune parti della strategia del cambiamento climatico legato alle coste. Una cosa gestito dalla regione e noi come Arpae sinc abbiamo pesantemente contribuito ognuno per la propria parte, io e la mia ex unità abbiamo partecipato a questa cosa della costa.

D 16: la strategia di adattamento della regione?

R 16: si a cambiamenti climatici e poi tutti i progetti di interventi che vengono svolti negli ultimi 20 anni sulla costa richiamano sempre, diciamo i principi della GIZC, anche di queste cose ho parlato qua negli appunti che vi passerò.

D 17: quindi quei processi di pianificazione che secondo normativa devono essere partecipate da un numero ampio di soggetti poi, sei a conoscenza sull'effettivo livello di partecipazione?

R 17: quello che ti posso dire è che appunto, come dicevo prima, da anni si lavora sulla definizione di piani di adattamento a livello territoriale, regionale e istituzionale e vengono promossi tutti questi processi decisionali partecipativi. Però manca ancora una governance a livello alto per l'attuazione di queste azioni, siamo in una fase, ancora indietro da questo punto di vista. Manca un piano a livello nazionale ancora di adattamento ai cambiamenti climatici che poi potrebbe essere questo il piano adatto per contenere tutto questo tra cui l'indicazione di dare priorità agli interventi naturali. Esiste adesso in Italia una strategia di adattamento con vari settori di intervento ma non un piano approvato operativo che mi indica le modalità e che disponga di una adeguata copertura economica per rispondere alle azioni. Quindi questo è il quadro in cui ci troviamo. Mancando quello poi manca tutto il resto a cascata.

D 18: ho visto che la regione Emilia-Romagna si sia mossa bene. Il piano regionale

R: sì la regione ER è sempre avanti, rispetto ad altre regioni però siamo ancora distanti da avere una ricaduta pratica che faciliti certe operazioni.

D 19: quindi manca un'integrazione verticale tra gli enti o c'è una carenza normativa? Cosa manca per mettere a terra questi interventi?

R: per questa cosa della normativa mi sono fatta aiutare dal mio direttore e vediamo cosa dice anche lui. consentire una diffusione delle NBS. Qui lui mi richiama sempre il discorso della mancanza di un piano nazionale di adattamento. Operativo e approvato. Quindi questo è la copertura economica. Per quanto riguarda la normativa non ti saprei rispondere. La normativa bisognerebbe conoscerla bene e il mio lavoro è un altro. Però si parlava delle NBS che non sono ben codificate, ci siamo trovati a dovere costruire in una zona protetta e quindi con numerosi vincoli ambientali. In più la NBS non era codificata tra i progetti contenuti nella disciplina della valutazione dell'impatto ambientale dei progetti che è una legge regionale che si collega al testo unico dell'ambiente che parla della procedura di via. Non essendo codificato abbiamo dovuto presentare una relazione al servizio che si occupa della valutazione ambientale della regione e fortunatamente è venuto fuori che la nostra opera non avrebbe impattato negativamente e abbiamo così potuto evitare tutta la procedura di VIA che avrebbe comportato dei tempi inaffrontabili anche all'inizio del progetto. In realtà non era codificata però alla fine è andata bene, perché altrimenti qualsiasi altra opera con altre caratteristiche o dimensioni avrebbe richiesto anche una VIA completa, trovandoci a lavorare in una zona protetta. Probabilmente immagino che la normativa non sia ancora pronta a affrontare e valutare magari le NBS che sono nuove. Non rientrano tra gli interventi che sono stati compilati e valutati negli anni scorsi e sono, fanno parte degli allegati di questa normativa.

D 20: quindi c'è bisogno di fare valutazioni caso per caso?

R: o caso per caso oppure appunto non so, probabilmente c'è qualche parte della normativa che accoglie e risolve anche questo tipo di problema ma forse non la conosco io.

D 21: per quanto riguarda i criteri che poi assegnano la procedura?

R: sì la normativa riporta degli allegati con un elenco di opere che per ogni opera prevedono una certa procedura. Se l'opera non è contemplata da quelle conosciute fino a quel momento, rimane fuori e non è codificata e noi ci siamo trovati in questa situazione.

D 22: in questo caso gli uffici regionali sono stati reattivi?

R: si ma hanno chiesto tante informazione e in fretta e furia. Rina ha dovuto compilare il progetto, perché loro hanno voluto un preliminare per valutare il tipo di opera.

D 23: quindi avete fatto il pre-screening o la valutazione di assoggettabilità?

R: no abbiamo evitato la procedura sin dall'inizio, è stato una relazione tecnico ambientale, nel quale leggerai il titolo per quesito in merito di praticabilità di una procedura in ambito di via, praticamente è un quesito questo ed è una cosa che viene ancora prima. La procedura di assoggettabilità, viene ancora prima. Proprio è un quesito, il dirigente ci ha richiesto un progetto preliminare. Non una relazioncina leggera con una descrizione vaga dell'opera. Tutto, collocazione, grandezza, volumi, materiali, tutto, logistica, le operazioni sul terreno.

D 24: Quindi diciamo avete già indicato nel documento gli aspetti principali anche tutte le cose aggiuntive che vorreste approfondire durante il forum?

R: ho lasciato le vostre frasi e ne ho aggiunte altre in corsivo che sostituiscono le vostre frasi che corrispondono o sostituiscono, che erano affermazioni e altre volte c'erano delle domande. Ho fatto una formula, cercando di rispondere a tutte le domanda e di aggiustare il tiro per rendere le cose più morbide. Io ho riscontrato questo e non ho aggiunto altro rispetto ai concetti che avevate già inserito voi.

D 25: una curiosità rispetto a quello che ci ha detto Paolo ieri, che è molto interessante rispetto al nuovo approccio di gestione del rischio e di come si integrano i modelli previsionali e climatici all'interno di tutto il processo. Lui ci ha spiegato che in questo momento siamo in una fase di transizione nella quale, invece che partire dalla previsione per poi selezionare gli interventi si procede prima analizzando le necessità del territorio per poi inserire modelli climatici in un secondo momento. Voi in ARPAE vi occupate molto di modellistica, anche voi state andando in queste direzione?

R: non so bene di cosa stiamo parlando perché io non mi occupo di pianificazione. In Arpae da noi facciamo le previsioni del tempo e a cascata le previsioni delle piene e del rischio idrogeologico con il servizio geologico e siamo quelli che fanno partire le allerte, allertiamo la Protezione Civile che a sua volta decide come intervenire sul territorio. Abbiamo dei sistemi di early warning system per la costa basata sulla modellistica meteorologica, modellistica idraulica, oceanografica e quella morfologica costiera. La parte di modellistica è questa, però questo appunto per gli interventi sul momento, per la pianificazione a livello generale, secondo me chi può rispondere meglio sono appunto la regione e i vari servizi regionali che si occupano di ambiente. Dal punto di vista di programmazione degli interventi la protezione civile si immagina una cosa del genere.

D 26: rispetto al ruolo di RINA così importante nella ricostruzione post "delirio", non capisco perché per me è molto difficile averli all'interno del nostro forum ed è una domanda che ti faccio, loro mi pare abbiamo avuto un ruolo abbastanza importante

R: loro sono stati bravissimi e assolutamente fondamentali, hanno progettato l'opera, hanno dal punto di vista tecnico ma anche il progetto comprende la parte economica. Hanno tutte figure davvero valide e sono stati supportati da una ditta che abbiamo coinvolto noi e che si occupa di ingegneria naturalistica. Loro non sono specializzati in ingegneria naturalistica. Lì c'è stato forte apporto di questa ditta ma loro sono stati fondamentali nelle situazioni e anche nel preparare tutti i documenti per la conferenza dei servizi e per le autorizzazioni, e adesso hanno rifatto tutto da capo. Parlo di Fabrizio Tavaroli, Donato Zangani, e adesso anche Giorgia Respondent 7. Loro sono presenti in tutte le altre situazioni, ho avuto di recente un'intervista sulle exploitation e avevo bisogno di loro. Tante cose che ti dico io te le ripeterebbero loro. Per il coinvolgimento degli stakeholder, loro stanno a Genova. Sono stati fondamentali, hanno tutte le figure specializzate in tutti gli ambiti, progettazione dal punto di

vista economico, ambientale quando c'era la preparazione dei report che sono stati presentati nella conferenza dei servizi, li hanno fatti tutti loro.

D 27: all'inizio chi li ha contattati?

R: loro erano partner di progetto e appena è stato finanziato il progetto, sono stati contatti ancora prima che iniziassero. Ci siamo viste con Silvana per dividerci i compiti, in fase di proposta non avevamo avuto contatti con loro e non li conoscevamo. Presentato a Silvano un quadro che era questo e aveva proposto l'opera ma non la potevamo costruire noi di Arpa e neanche progettare perché non siamo progettisti. Silvana aveva pensato che sarebbe stata Rina a fare tutto e da allora è iniziata questa collaborazione strettissima, quotidiana, ci sentivamo spesso nei primi anni, di recente c'è stato meno da fare, non è vero, ma diciamo che le attività sono avviate però è andata avanti soprattutto nel primo periodo quando la protezione civile non si era nemmeno attivata, Rina ha fatto tutto da sola senza le indicazioni della protezione civile, poi ha dovuto mandare tante cose quando la Protezione Civile ha iniziato a essere più operativa. Come partner di progetto era un'eccellenza.

D 28: Su early warnign system sono stato recentemente a un workshop di questa azienda americana che ha sviluppato questo software e riescono a mandare messaggi tramite cellulare alla popolazione in zone di rischio, volevo chiedere come funziona il sistema italiano se ne sei a conoscenza, il vostro regionale, e se è possibile adottare queste soluzioni o per qualche motivo non si può fare.

R: quello che ti dicevo prima già funziona, a livello italiano non lo so, le varie regioni hanno diversi livelli. Sono tutte diverse, non ti posso dire in regione Emilia-Romagna quando partono le nostre allerte partono anche in determinate fasi, secondo determinati criteri che non ti so dire nel dettaglio. Anche se tra un po' dovrei conoscerli bene perché sono entrata, ho cambiato area e dovrei fare quel lavoro lì delle allerte. Partono una serie di messaggi ai comuni, alla Protezione Civile, ai comuni, a tutti i servizi che gestiscono il territorio, a vari livelli, c'è tutto il sistema molto complicato e anche automatico.

D 29: quindi non direttamente alla popolazione?

R: poi i comuni avvertono la popolazione, con Twitter e anche messaggi però non ti so dire precisamente ma su internet dovresti trovare. Però arrivano anche alla popolazione i messaggi.

Ringraziamenti e saluti

Intervista 17

Intervista a Respondent 17, professore/ssa di fisica e membro del progetto Operandum. Intervistato in data in collaborazione con Teresa Carlone il 15/12/21 in modalità online.

Premesse: Stavo riassumendo quello che vorremmo fare oggi, in funzione del forum e poi come ti dicevo farti qualche domanda più specifica sul sistema di governance del rischio per il mio progetto di ricerca.

D: prima di OPERANDUM ti eri interfacciato con questo sistema di governance e con i vari enti che lo compongono?

R: sicuramente è la più importante, la prima no perché ho lavorato in altri 3 progetti europei, dove inevitabilmente, c'era dentro anche il tema del rischio, ho collaborato a contatto con chi fa early

warning per heatwaves, però diciamo il contatto era davvero come dire marginale nel senso che ci si scambiava informazione dati e ci si confrontava in ambito multidisciplinare però molto meno di come si fa in Operandum quindi direi di sì ma in maniera meno centrale rispetto a quello che avviene in Operandum

D: quindi non eri tu che si interfacciava direttamente per questioni amministrative?

R: io mi interfacciavo con chi poi si interfacciava con la governance.

D: Quindi qual è la tua opinione dal punto di vista del funzionamento di questo sistema? le competenze sono distribuite in modo adeguato, se gli enti abbiamo delle risorse adeguate per assolvere ai loro compiti.

R: non lo so perché ho sempre lavorato in altri paesi d'Europa e in Italia questa è la prima esperienza. Quello che ho visto in altri paesi, il più simile è la Spagna. Dall'altro lato manca sicuramente, c'è un po' di distacco su certi aspetti culturali che poi è una barriera. Quindi non si riesce sempre a essere convincenti su come è formulato il problema dal punto di vista scientifico o comunque è faticoso e non si può improvvisare nell'interazione con quelle parti lì e rappresenta una barriera e questo l'ho potuto toccare con mano. A loro devi dare, hanno una mentalità molto all'antica per cui è tutto molto deterministico, è tutto bianco e nero e c'è una certa resistenza ad accettare approcci probabilistici con una quantificazione dell'incertezza ampia, le grandi incertezze in generale, che sono una cosa un po' più nuova scientificamente.

D: quindi anche un sistema poco propenso ad utilizzare soluzioni e approcci innovativi e sperimentali?

R: sostanzialmente sì, poco propenso a utilizzare tutte le informazioni a disposizione se quelle informazioni non hanno certe caratteristiche che per loro non sono ottimali, un punto di grande incertezza. Nel mio caso, tu hai un'informazione che ti dice che c'è un 60% di probabilità che la temperatura e le heatwaves saranno più probabili è difficile digerire questa informazione probabilistica e renderla utilizzabile

D: hai notato che ci sono dei fattori in altri contesti in cui lavorato che possono facilitare questa acquisizione di modalità più innovative rispetto alle tue esperienze pregresse? È una cosa che tu contestualizzi in un contesto di tipo italiano? Oppure

R: è un po' generalizzato ma i paesi che sono più avanti nella comunicazione e divulgazione di aspetti legati al Cc alla climatologia, come funziona il nostro pianeta riescono a gestire meglio questa cosa. Ho visto che corsi di formazione per professionisti per i membri della pubblica amministrazione tecnici, negli ultimi anni, erogati da diversi enti sovranazionali e cercano di mitigare questo aspetto e mi viene in mente una scuola di Arpa in cui qualche anno fa parlavano di probability and uncertainty in meteorology organizzato da Arpa a Bologna e mi sembra che c'è un ruolo importante nella formazione. L'Italia è esposta da quel poco che ho potuto vedere.

D: poi si traduce nella difficoltà di pianificare a medio e lungo termine?

R: sì si traduce o si potrebbe tradurre nel non utilizzo di un certo tipo di informazione perché è associata a una grande incertezza. Un'informazione incerta viene vista come un'informazione di poca utilità. Non dobbiamo utilizzare nel pianificare diciamo, possiamo trascurare.

D: uno dei temi che vorremmo affrontare durante il forum è anche quello della pianificazione quindi anche come inserire le NBS all'interno dei cicli di pianificazione. Il nuovo ciclo inizia quest'anno. Questo discorso dell'incertezza sarebbe interessante da trattare all'interno del forum

R: direi di sì. Ci sono due importanti rivoluzioni in atto. Una è una rivoluzione e una è una lenta marcia inesorabile nel mondo della scienza e del clima. La marcia inesorabile è quella di produrre simulazioni in grado di quantificare sempre di più l'incertezza e quantificare anche segnali piccoli, legato alla produzione di ensemble di simulazioni climatiche, quindi tante realizzazioni, poi una simulazione climatica che ci permettono di quantificare variazione del clima anche piccoline. Poi insieme a queste anche questa idea di fare simulazioni ensemble si propaga anche nelle simulazioni a scala più piccola per valutare gli impatti del cambiamento climatico, il clima regionale e via dicendo. Adesso abbiamo prodotti erogati dai servizi compernicus, Cop CC service, che già ci permettono di fatto di fare una stima del rischio con una quantificazione dell'incertezza anche se grossolana. Questa cosa è destinata a migliorare perché stante a quel livello di prodotti si passerà dal mondo simplified al mondo SICS, cioè da modellistica vecchia a modellistica più recente. Questa è la lenta marcia, la rivoluzione è quella che stiamo facendo, che stiamo mettendo in atto noi negli OAL: un approccio in tema di rischio che il World Climate Reserach Programm ha declinato ribaltando appunto la catena tradizionale. Prima noi nel fare la pianificazione partivamo dalla previsione e poi passavamo dalla previsione all'azione. Prima si prevede il segnale del cc e poi si capisce come agire. Invece il WCRP ha codificato un nuovo modo di lavorare, laboratori multidisciplinari come l'OAL e la definizione che adotta è sorprendentemente simili alla realtà dell'OAL, in cui però non si fa che si prevede e poi si agisce ma si capisce quali sono le necessità del territorio e poi si integrano le informazioni sul clima del territorio. Operandum è abbastanza pioniere in questo modo di operare. Secondo me è una riflessione interessante.

D: questo ancora si traduce in approcci sperimentali come Operandum ma non su larga scala?

R: si parla di un'agenda di ricerca che verosimilmente impiegherà alcuni anni prima di essere tradotta in operatività. Il WCRP ha di recente aggiornato il proprio programma di ricerca nel quale ha individuato 5 filoni principali, uno di questi si chiama my climate risk, si chiama proprio così e l'idea è proprio quella di partire dalla piccola scala, le esigenze del territorio, e da lì costruire un approccio alla pianificazione e alla gestione del rischio che tiene conto dell'informazione sul clima però appunto è un agenda di ricerca. Questo modo di lavorare esiste già fatto tra le righe di documenti report di vario tipo di diversi uffici, WHO, esiste questa cosa come prassi ma non è ancora ben codificata e ancora ben agganciata ai dati sul CC. Non è una cosa mainstream.

D: nella letteratura di governance del rischio si parla non più di controllo e gestione del rischio ma anche di accettazione del rischio, flessibilità attenzione nel contesto nel quale si agisce ecc, tradurlo su larga scala mi rendo conto che siamo all'inizio. (min 17)

R: tradurlo su larga scala, tutto l'approccio funziona su piccola scala e scala locale, pensato per far funzionare tutto su scala locale e poi tradurlo su larga scala richiede una metodologia che non passa più per l'OAL. L'OAL riguarda la fase sperimentale diciamo e poi bisogna tradurlo in guidelines, protocolli, policy brief, non so come si chiamano queste cose.

D: ho una riflessione sulla necessità di rendere mainstream questi approcci sperimentali context situated, che rende più complessa la definizione di linee guida che possono essere seguite all'interno di varie contesti perché o si fanno molto generali e poco stringenti o il rischio è che sono delle linee guida che fanno fatica a essere applicate a contesti che hanno delle differenze in termini di hazard, di sistema socio-ecologico, quindi quale possono essere secondo te una modalità con cui si strutturano questi linee guida che devono essere più generali ma situate più specificamente, bisogna fare più operandum, più coinvolgimento degli sh, più lobby?

R: bisogna fare Operandum 2, non più Operandum, non replicarlo in altre realtà territoriali ma fare O 2. Secondo me l'unico sforzo è uno ma è grande è quello di generalizzare un approccio dove tu puoi,

noi stiamo cercando di farlo, arrivare a scrivere una metodologia che ha dentro hazard, territorio X, che ha dentro segnali di Climate change Y, e che non ha bisogno di essere ancorata a un certo tipo di realtà locale. Eventualmente sh con le loro categorie per una parte. Diciamo in tal senso se uno riesce a generalizzare una metodologia poi al posto del Hazard ci mette heatwave al posto del territorio X ci mette Bologna, e alla fine il metodo funziona.

DT: rispetto alla formazione, un tema che secondo me è molto importante nella possibilità di costruire un framework nel quale replicare Operandum, come metodologia che come epistemologia quindi un lavoro su più livelli. La formazione delle persone del gruppo di lavoro più orientata alla trans disciplinarità che permette l'acquisizione di saperi che sono trasversali potrebbe essere un valore aggiunto? Non è necessaria? Te lo dico anche in previsione di progetti e finanziamenti europei futuri. Ho seguito un corso sui funds H EU e un valore altissimo è data dalla trans-disciplinarità dell'approccio e il background di chi lavora a un progetto di aver lavorato in progetti che avevano questo tipo di connotazione. Questa è una cosa sulla quale ci stiamo interrogando cioè sulla composizione del gruppo di ricerca e le competenze distribuite all'interno del gruppo di ricerca come influenzano anche la stesura di questo framework. Io parlo in termini anche di come fare un uptake di quello che abbiamo imparato in Operandum e provare già nei corsi di laurea cominciare a istillare un po' questo tipo di approccio. Penso a le discipline che sono rappresentate dal nostro gruppo. Abbiamo un wide range di competenze e uno degli impatti dovrebbe essere questo cioè la necessità di costruire dei saperi che sono già un po' multidisciplinari che non vuol dire sapere tutto ma che esiste anche una parte di sapere che può andare a integrare quel framework di ricerca.

R: si sono d'accordo in particolare su questa ultima cosa che hai detto, per me la multidisciplinarità è una categoria molto umana ed è un modo, vuol dire che il nostro approccio alla conoscenza e al sapere non è adeguato ad affrontare quel tipo di problema e l'unica soluzione che abbiamo è mettere insieme tanti saperi e tante conoscenze diverse e vedere se quella è una formula magica e un'alchimia che funziona. Secondo me c'è bisogno e sarebbe bello avere figure che partono già formate da un ambito che oggi chiameremo multidisciplinare ma che in pratica sarebbe una disciplina del futuro. Una nuova disciplina che si occupa di gestione del territorio con una grossa base di conoscenza, funzionamento e principio del sistema e della componente umana dall'altro. Secondo me ad oggi e immagino vista la velocità di reazione del sistema accademico in generale, la multidisciplinarità sarà l'unica arma che abbiamo. Poi chi lo sa è un pensiero molto filosofico, non lo so. La cosa importante è che la multidisciplinarità sembra anche che con Operandum che è molto avanti da questo punto di vista è comunque faticosa. Tra gli obiettivi dovrebbe esserci...strumenti e protocolli, da un lato un protocollo per il monitoraggio...quali caratteristiche deve avere un NBS, deve essere fatto da una prospettiva e tenendo conto di un clima non stazionario e abbiamo bisogno di un bel passo in avanti anche della modellistica.

D: il nuovo supercomputer che viene installato a Bologna quanto può aiutare?

R: quella rappresenta una potenza di fuoco che se non ce le hai non le fai. La difficoltà non è avere tempo di calcolo e penso a me stesso, penso ancora oggi a 5 o 6 supercomputer in Europa e non è difficile avere accesso tramite bandi, rapporti di collaborazione all'interno di progetti per cui l'europa ha tutto sommato e l'italia e L'ER anche ancor di più in Italia ha una potenza di fuoco nel mondo del calcolo adeguata per quello che bisogna fare. La difficoltà è avere gli strumenti di calcolo, opportuni e saperli utilizzare perché l'approccio tradizionale al clima io so usare la larga scala, un altro la scala regionale poi c'è un altro che il clima neanche l'ha visto nel suo percorso che fa il modello idrologico e idrodinamico. Tutta la catena passa per un approccio multidisciplinare per cui uno fa una parte poi passa la palla a un altro che passa la palla a un altro. Quando sono stati fatti modelli di clima per la prima volta si partiva da modelli di questo tipo: uno sapeva fare l'atmosfera, uno gli oceani uno la

terra emerse e uno i ghiacci. Quando si doveva fare il clima c'era la necessità che tutte queste componenti parlassero tra di loro, ogni times del processo di calcolo numerico e si è arrivati a un modello di clima che accoppia tutte queste realtà diverse. Questi modelli di clima sono di fatto, assemblano modelli pre-esistenti che ci dicono certe componenti dei sistemi. Probabilmente noi possiamo fare qualcosa di simile. Avremmo bisogno di partire dal dato climatico fare con un click tutta la modellistica che serve per arrivare all'informazione sulla scala locale e metterci dentro le NBS.

D: Rispetto a tutto questo sapere che viene prodotto a livello scientifico che già mi sembra un grande impegno e capacità di gestire flussi di sapere molto complessi, come diventa presentabile e spendibile a chi queste competenze non ce le ha? Molti paesi spendono molte risorse sulla comunicazione e la divulgazione scientifica. Come traslare questo sapere ad altre competenze politiche e sociali?

R: non sono sicuro di saper rispondere bene a questa domanda. Ci sono vari livelli, uno la formazione di figure professionali in grado di lavorare in tal senso quindi capire anche cosa possiamo insegnare a queste figure e l'altra la creazione di tools. Se uno deve fare la modellistica...tenendo conto del clima futuro non puoi fare che chiami uno che sa la bias correction, uno che fa il modello, uno che capisce di dati climatologici, diventa un po' difficile e vorrebbe dire che un ente dovrebbe assumere 5 o 6 figure solo per fare quella cosa lì, immagino sia inefficiente. Da un lato le competenze devono essere formate intorno a un certo tipo di competenze che solo ora stanno arrivando nell'accademia italiana...serve che le figure professionali siano formate con delle competenze adeguate per lavorare in tal senso, sicuramente una formazione multidisciplinare alla figura professionale serve. Poi serve uno strumento tecnicamente avanzato che non richieda grandi acrobazie per essere utilizzato. Tutto quello che facciamo in Operandum, quelle model chain che abbiamo fatto nel WP5, fatto che tu prendi dei dati di questo tipo poi dati di questo altro poi usi questo modello poi fai bias correction, poi metti questo altro modello, poi...tutto quello dovrebbe diventare un unico, all'interno di un unico framework di nuovo e l'utilizzatore prende il framework nuovo e già fatto, clicca e fa un po' di operazioni e ottiene un risultato. Da un lato formare la figura e dall'altro gli strumenti adeguati per rendere la cosa operativa.

D: questo intendi sempre per quantificare il rischio? (min 33)

R: però anche pianificare e preparare l'intervento per arrivare fino a partire per mettiamo in questo punto... quindi non solo quantificare il rischio ma valutare anche l'efficacia dell'NBS e come va fatta.

D: All'EGU se avevi seguito l'intervento della ricercatrice di Monaco aveva presentato tessa, questo strumento per la valutazione dei servizi ecosistemici utile anche a policy maker e stakeholder. Quindi non so, tu intendevi anche un'integrazione di questi strumenti, un miglioramento, non so se hai mai avuto a che fare con qualcosa di simile.

R: non ho capito di questi strumenti,

D: Uno strumento in grado di amalgamare questi strumenti e migliorarli o se avevi avuto modo di avere a che fare oppure se quello che state sviluppando in Operandum è qualcosa di estremamente innovativo.

R: io credo che sia abbastanza innovativo altrimenti in Operandum non ci saremmo dati, messi a costruire questi collage di dati e database, di modelli molto articolati. Avremmo preso uno strumento che faceva quella cosa lì senza bisogno di combinarne altri ad hoc. Immagino che sia assolutamente innovativo e non arriviamo dentro Operandum, li arriviamo a definire sostanzialmente per casi specifici come si fa. Non arriviamo ne a generalizzare l'approccio a tal punto da disegnare le soluzioni del futuro e implementarlo farebbe parte di Operandum 2 generalizzare l'approccio per valutare l'impatto delle NBS nel clima presente e futuro con della modellistica numerica. Poi realizzare uno strumento che non ha bisogno di così tante competenze diversificate per essere utilizzato. Quelle

competenze diversificate si lavora in una fase di ricerca e sviluppo e poi diventa in un strumento che ha bisogno di meno conoscenze e competenze per essere utilizzato.

D: Quindi potenzialmente sarebbe anche in grado di aiutare a fare un'analisi costi benefici di un'opzione piuttosto che un'altra.

R: sì assolutamente sì. È possibile che esistono prototipi in tal senso, soprattutto in problemi semplici che non coinvolgono tante scale. Penso ad esempio alla siccità, tuttavia la scala dell'intervento NBS di solito è piccolina, le NBS non sono opere, non semplice, in certi casi può essere anche più grande e su scala regionale, è più un approccio di management di un territorio vasto, però in generale una NBS di solito è piccolina. Per risolvere l'effetto di un processo, di un elemento così piccolo bisogna arrivare a una scala molto piccola. Quella scala è risolta separatamente dalla scala regionale e globale. Quando si tratta di clima futuro in particolare. Sono approcci modellistici diversi. I modelli globali non risolvono le scale regionali e le scale piccole, non li conoscono perché hanno una griglia finita e troppo grandi e noi dobbiamo fare queste catene modellistiche per cui si prende l'output di uno e si dà l'input all'altro e così via. Il tutto lo si fa prendendo di solito dati già disponibili, fornendo questa catena modellistica.

D: calando questo discorso nel forum cosa potremmo chiedere ai nostri stakeholder? Quali sono gli strumenti che usano attualmente, come pensano che si possano evolvere nei prossimi anni? Oppure presentargli quello che è stato fatto in Operandum e raccogliere feedback?

R: è difficile rispondere. Io dagli stakeholder vorrei raccontare questo modo di raccontare, fino a che punto li convince e cosa manca. Non mi aspetto una risposta definitiva, perché il discorso di formazione e di sviluppo di strumenti è chiaro più a noi che a loro però, diciamo capito dove è che loro non riescono ad agganciarsi e dove loro vedono un gap. Poi dipende da che tipo di stakeholder sono.

D: adesso dobbiamo fare la ricognizione delle presenze. Così poi riusciamo ad essere anche un po' più specifici. Parlando egoisticamente, per noi Operandum ci sono diverse piccole cose che possiamo provare a capire meglio. Intanto la prima palestra per arrivare a gennaio, con le idee più chiare e quindi anche vedere a che livello presentare certi avanzamenti culturali e tecnologici che abbiamo realizzato e quindi una palestra per noi. Possiamo realizzare tante piccole cose, dalle citizen stories avere uno stakeholder che non solo ci fa la Citizen Ctorties per il sito e va bene, non ci ha detto il medico di farla, però con l'idea di avere un suo prodotto che arriva sulla piattaforma ci decida più tempo, si mette a parlare con noi un pochino, ci da qualche feedback in più. Poi io vedo anche , cercare di capire quali sono gli elementi, le NBS gli aspetti, non solo le NBS, ma quale aspetto che noi dobbiamo vendere di più e promuovere di più. Una prima idea ce l'abbiamo, il Panaroper motivi diversi, però la duna nel sito di volano, e la NBS del Panaro ma secondo me non + chiaro a tutti quali sono gli effetti più appealing all'esterno. Se dal forum si riuscisse a capire cos'è che gli stakeholder trovano più sexy sarebbe interessante per usare un termine di Silvana. Sarebbe bello.

D: stiamo anche preparando un questionario per capire quali sono i fattori che aumentano l'accettazione delle NBS. Quello che potresti.

R: non direi che mi sono occupato più della duna, mi sono occupato di tutte quante, in modo proporzionale in modo a quanto queste sono andate avanti. Quindi che cosa vi serve esattamente? Nella sezione tre?

Riflessioni sparse post intervista

alcune riflessioni, spero utili...

OPERANDUM ha gettato basi solide per lo sviluppo di tools di modellistica avanzati e protocolli di monitoraggio per l'assessment dell'efficacia di NBS, utili sia in fase di design e pianificazione che in fase post.

Il passo avanti potrebbe passare per la definizione di protocolli aderenti alle pratiche odierne lato SH (ne ha parlato Silvana in un recente talk al workshop con stati arabi). La stima del rischio associato a Hydro-meter hazards inteso come probabilità di danno è un aspetto centrale per valutare l'NBS anche in clima futuro, l'approccio della comunità che studia l'impatto del cambiamento climatico, come sintetizzato da framework internazionali di coordinamento della ricerca (WCRP), ha messo ora al centro del problema gli SH e la scala locale. L'idea è di capire dal territorio come l'informazione sul clima può essere utile e fornire poi dall'universo dei dati clima un pacchetto di informazione che abbia rilevanza alla scala locale. Con queste premesse è cruciale direi capire quali sono le variabili su cui interviene l'NBS (ad esempio una caratteristica dell'argine) e come l'intervento si riflette su variabili di impatto, in questo gli SH possono essere cruciali

Focus group – stakeholder forum – barriere burocratiche alla diffusione delle NBS

Respondent 13: autorità idraulica competente nella provincia di Modena. Prima volta che partecipa al forum. Loro hanno autonomia per certi aspetti ma non tutti.

Respondent 6: ha partecipato al primo incontro, è interessato soprattutto alla Duna.

Respondents 18: a breve avremo i risultati della sperimentazione in seguito alla raccolta dati effettuata sull'argine.

Respondent 8 si occupano con Respondent 3 della progettazione della duna e della realizzazione della parte relativa al saccone con cerniere di cui hanno sviluppato un brevetto.

Respondent 7: è entrata da settembre nella società di consulenza ingegneristica ed è nuova nel progetto Operandum.

Respondent 3: di supporto per quanto riguarda le tecniche di ingegneria naturalistica. Interessato anche alle problematiche fluviali, sua esperienza principale dato che si è occupato di corsi d'acqua per molto tempo.

Respondent 9: Si occupano della rete di bonifica e irrigazione che servono il territorio della bassa. In appennino si occupano di scolo con manufatti e opere che regimentano il fluire delle acque sia in periodo invernale, sia nel periodo estivo, sia per dare acqua alle utenze e per consolidamento dei versanti. Lavorano in sintonia con comuni e regione e quindi anche con servizio di protezione civile che ha assorbito parecchi servizi tecnici di bacino.

Caterina Girelli (urbanistica comune di Cervia) ha partecipato allo usability test della piattaforma e interessata agli sviluppi, inoltre hanno partecipato al progetto europeo su adattamento urbano e hanno sviluppato una piattaforma. Sono interessati alla duna perché pensano di fare interventi analoghi.

Respondent 16: percorso complicato per la realizzazione dell'opera. Al Bellocchio il problema principale era la collocazione all'interno del parco del delta del po in una zona SIC e ZTS quindi con diversi vincoli. Abbiamo dovuto presentare un progetto preliminare che abbiamo presentato al servizio regionale che si occupa delle valutazioni di impatto ambientale, in forma di quesito. Per fortuna è andata bene perché a questo punto abbiamo scoperto che la nostra opera non doveva essere soggetta a VIA e il percorso autorizzativo si era accorciato molto. Ad autunno 2020 è stato completato il progetto definitivo che stava per entrare in conferenza dei servizi ma è intervenuta la mareggiata che ha stravolto lo scenario. Nel frattempo, avevamo attivato un accordo di collaborazione con la PC per trasferire i fondi e attività per la realizzazione dell'opera. Come Arpaè non possono costruire sul demanio pubblico. Tantissimi passaggi che non stiamo a elencare per questioni di tempo. A questo punto è stato individuato il nuovo sito a Volano nella primavera 2021. Grazie al grande sforzo di Rina che ha rifatto tutto da capo, tutti i documenti da capo, dall'accordo, i passaggi in giunta, gli atti interni di Arpaè, siamo riusciti in questi giorni ad arrivare alla consegna del progetto esecutivo. Rina ha consegnato aspettando che arrivassero i contributi della protezione civile perché è tutto complicato. Conferenza servizi superata questa estate perché è bastato presentare il progetto definitivo. La PC sta procedendo con la gara per assegnare i lavori a una ditta specializzata e prevediamo di procedere con la costruzione per i primi mesi del 2022. Abbiamo anche assegnato i rilievi per il monitoraggio morfologico (dicembre-gennaio). La Ditta andrà a fare i rilievi *ante opera* e dopo saranno fatti due rilievi *post operam* per valutare la performance dell'opera e l'impatto sul paraggio e l'evoluzione della spiaggia circostante.

R18: precisazione sui prati armati. Perché soltanto in questo progetto i prati vengono sfalciati mentre negli altri casi le piante si fermano raggiunta la loro altezza. Questa tecnologia non ha bisogno di manutenzione. In questo caso sfalcio necessario per gli strumenti di misurazione

R3: Progetto dune ha avuto un enorme complessità e vicissitudini in fase autorizzativa e se non fosse stato per margherita non saremmo riusciti ad andare avanti. Sembra assurdo che un piccolo progetto sperimentale e virtuoso, che entra in natura in punta di piedi, sia così complesso e faticoso per essere approvato e preso in considerazione quando l'Italia è travolta da cementificazione. Come osservatore ritiene paradossale la situazione. Come ridurre queste problematiche? Probabilmente un progetto nuovo e innovativo (se fossimo andati a fare una strada o una cosa standard sarebbe entrato in meccanismi rodati) viene visto come una cosa di diverso per cui nella quotidianità e nell'impegno che travolge la quotidianità dei vari soggetti, una cosa nuova che ha bisogno di ragionarci di più può essere messa in secondo piano. Magari non si sono obblighi temporali prefissati in maniera ordinaria rischia di esser emessa in secondo piano, questo potrebbe essere l'atteggiamento psicologico che ha determinato le difficoltà. Cosa si potrebbe fare? Una prima fase di coinvolgimento e preparatorio dei vari soggetti (che all'inizio non si sa nemmeno quali e quanti sono), per coinvolgerli e metterli di fronte a una programmazione. Partire già da subito con delle regole del gioco. Valutare un po' meglio, renderla più cogente e cercare di alleggerire le fasi successive con una forte fase preparatoria. Se si perdono mesi per feedback banale è assurdo e poi prima di avere il parere di qualcuno non si attiva il parere dell'altro successivo con effetto negativo a cascata (min 10 audio 3). Nonostante la conferenza dei servizi l'interazione nelle varie fasi non è efficiente. I progetti sperimentali servono anche a sperimentare le procedure e le difficoltà operative.

R 18: disponibili a condividere informazioni da quelle basilari a quelle più tecniche. Per quanto riguarda il progetto conviene chiedere alla prof per capire quali info si possono condividere.

R 8: condivide ciò che ha detto Respondent 3 e aggiungo che noi abbiamo sperimentato all'interno della sperimentazione nel senso che oltre le problematiche tecniche, non avendo la protezione civile coinvolta nel consorzio, ci siamo confrontati con tutto il processo necessario per mettere in campo

l'opera. Quindi confermo da un lato difficoltà nel recepire qualcosa di diverso dalle pratiche comuni. Rispetto alle opere comuni adottate dalla protezione civile quello che abbiamo proposto è sicuramente un qualcosa di diverso. Questo ha comportato difficoltà in tante parti del progetto: dalla contabilizzazione, alle parti tecniche, al progetto e alle pratiche. Altra cosa che notava è che alla fine per ottenere il permitting per la duna è quasi la stessa cosa che ottenerlo per un'opera ben più grande, alla fine i passaggi e le persone da coinvolgere sono più o meno le stesse. I tempi di attesa sono leggermente minori all'interno della conferenza dei servizi ma il grosso del processo è indipendente dalla dimensione e impatto dell'opera. Mi lego al terzo argomento, come Wp2 leader, avendo seguito la parte di permitting, da paese a paese le NbS possono avere un percorso preferenziale o meno. In Italia, un certo tipo di accettazione di alcuni stakeholder può essere migliore rispetto ad altri tipi di opera, in realtà non ci sono gli strumenti per un canale privilegiato per l'utilizzo di questo tipo di opere. Lo dico anche per altri lavori che abbiamo fatto. Come Rina abbiamo fatto cose con clienti privati tipo ENI e ENEL con i quali abbiamo usato NbS per mitigazioni di frane e dissesto idrogeologico, (minuto 14.20), mentre abbiamo avuto più difficoltà a trovare uno strumento per proporli a enti pubblici se non arriva da loro la richiesta.

R 6: complimenti a M per la tenacia. Parlo togliendomi la giacca del funzionario di Protezione Civile. Sono state dette cose condivisibili sulla necessità di condivisione. Questo tipo di interventi, in fase preliminare e di programmazione, è fondamentale quando si lavora in contesti come quello che interessa la duna, quindi demanio marittimo, dove sono presenti vari interessi in gioco. Lui si trova a lavorare in spiagge con vocazioni diverse, balneare o ambientale, e anche in questi contesti le esigenze sono molte e bisogna cercare di condividere qualsiasi scelta più preliminarmente possibile e potenzialmente in fase di pianificazione. In regione si sta ragionando adesso di dotarsi strumenti tipo di patto di fiume e trasformarli in patto della costa. Non so se sono gli strumenti migliori e se il patto della costa possa essere uno strumento funzionale per la condivisione degli interventi in fase di pianificazione e non solo degli interventi ma più in senso ampio della gestione del territorio, coinvolgendo tutta una serie di stakeholder che vanno dai gestori balneari, gli enti territoriali e tanti altri soggetti che sulla costa hanno i loro interessi. Ritornando al discorso legato alle difficoltà, una delle cause principali del percorso accidentato, sia stato legato agli aspetti burocratici legati alla competenza. Chi aveva in cassa i soldi e la possibilità di fare l'intervento è un soggetto che non ha competenza funzionale e quindi si è dovuto fare una serie di accrocchi amministrativi che quando ci sono persone disponibili filano, quando non ci sono persone disponibili, è brutto dirlo ma non funziona. Le cose funzionano quando ci sono le persone che vogliono farle funzionare. L'idea progettuale è nata in un contesto non favorevole e in un momento non favorevole a poter ridurre le difficoltà ed è stato molto sfortunato. Voglio pensare che non è questo lo standard, vi voglio tranquillizzare nel senso che non è la norma quella di contrastare o di essere scettici su alcune iniziative che siano diverse dalla routine. Non è vero che la PC o i colleghi che si occupano come anche AIPO, siano progettisti con i paraocchi e aldilà delle opere che hanno fatto non riescono a vedere altro. (22,40). Non è così, ci sono probabilmente dei casi con persone che hanno una mentalità troppo rigida, ma ci sono sicuramente, al livello di organizzazione, una piena apertura. Nel caso della duna c'è qualcosa di innovativo dal punto di vista tecnologico. La duna in se non è innovativa come idea. Quello che particolare è la tecnologia con cui questa opera verrà realizzata. Alla base delle lungaggini ci sia stata incomprensione. Rimane tutta una serie di percorsi burocratici che sono inevitabili e necessari, alcune volte, anche se non aggiungono quasi nulla al progetto. Purtroppo quello che mi dispiace, mi trovo spesso a dover affrontare come progettista e come persona che si occupa di procedure amministrative mi trovo a affrontare questi percorsi e nelle esperienze che ho avuto, sono pochissimi i casi nei quali questi percorsi hanno aggiunto e migliorato i progetti. Ma sono stati percorsi che non hanno fatto nulla di significativo se non il timbro e l'assenso a procedere. Esempi: Sto pensando all'autorizzazione che deve rilasciare il demanio marittimo per l'occupazione delle aree.

Il più delle volte anche le autorizzazioni paesaggistiche, che hanno assolutamente titolo di essere considerate e rilasciate, però non riescono a contribuire in nulla, perlomeno negli interventi che facciamo noi tipo profilatura delle spiagge e riassetto morfologico. Aldilà di dire “non toccate la vegetazione o usate lo stesso colore non si va”. Altre autorizzazioni che possono risultare superflue sono le autorizzazioni legate alle agenzie delle dogane che deve controllare il territorio costiero perché ci potrebbe essere contrabbando. Anche questi passaggi richiedono tempo e impegno senza aggiungere nulla. Me ne vengono in mente altre. Nel caso specifico siamo in territorio protetto, una delle autorizzazioni che deve essere rilasciata è quella legata alla presenza di aree sic-zts, il fatto che il territorio ricade dentro il parco, anche qui il vincolo che viene imposto è semplicemente un vincolo temporale legata alla fase di realizzazione di interventi che si, è vincolante e anche limitante perché ci permetto di lavorare solo in pochi mesi all’anno e questo effettivamente diventa una questione rilevante. Sto pensando se il tipo di opera può avere influenza su questo tipo di prestazione e mi viene da dire che, sia che siano NBS o che siano interventi classici è un vincolo che non può essere superato facilmente.

Respondent 9: in merito all’argomento delle autorizzazioni quello che vediamo noi con il consorzio, noi operiamo su un reticolo che ha dei caratteri naturalistici importanti. Per i fiumi è più immediata la cosa mentre per il canale di bonifica sembra meno, però in realtà i canali di bonifica hanno degli ecosistemi che vanno tutelati e molto spesso ci sono delle specie tipo nutrie e gamberi che sono specie aliene nei confronti di altri e quindi spariscono le tartarughe perché ci sono i gamberi. È la natura che si combatte e noi operiamo in questo contesto. In alcuni casi capita che alcuni progetto o interventi per ottenere le autorizzazioni diventi un percorso pieno di spine. Questo è forse dovuto anche un po’ a una reticenza del passato, visto che in Italia per decenni si è fatto qualsiasi cosa in barba alle norme da parte di tutti. Quindi adesso il tecnico che deve rilasciare un parere è eccessivamente, nel senso buono, scrupoloso nelle valutazioni che comportano dei tempi. Un’analisi ambientale comporta dei tempi e il tutto si dilunga. Adesso arrivano dei pacchi di finanziamenti agli enti con dei tempi con dei tempi folli per la legge. Cosa succede? I tecnici che vogliono fare un buon lavoro prendono in mano la norma, adempiono a tutte le prescrizioni, chiedono tutti i pareri del caso, questo poi porta a un blocco dall’altra parte che non è imputabile al tecnico che deve valutare. Siamo in una situazione in cui si procede a due velocità, i processi autorizzativi sono lunghi e farraginosi, c’è un po’ di paura a rilasciare certe autorizzazioni, e dall’altra parte però si chiede a qualcuno, in tempi da cappio al collo, di fare qualcosa per risolvere un problema. Questo è paradossale quando si vanno a realizzare delle opere che è palese che abbiano una connotazione verde. Ci sono interventi sui corsi d’acqua che possono essere classificati come opere di manutenzione verde, gentile e poco impattante. In quel contesto ci si può muovere in questo senso. Non c’è bisogno di intervenire in emergenza, in criticità ma purtroppo viene fuori un mischione con veramente delle lungaggini e dei tempi che non sono compatibili con le opere. Questo è un problema per realizzare questi interventi ma anche altri più strutturali.

R 18: non posso che condividere gli interventi che sono strati fatti. Noi come azienda ci siamo passati attraverso a tutti questi problemi burocratici. Finché non sono stati pubblicati sui prezziari Anas e Rfi voci di prezzo che poi fanno riferimento alle tecnologie di prati armati, per molti progettisti, che avevano capito la tecnologia e sapevano che era una cosa molto furba e che avrebbero risparmiato molto denaro come amministrazione, diventata molto diffide poterla applicare. Le norme e le regole non lo consentivano o meglio lo consentivano ma a volte la persona per poter applicare una tecnologia che andasse a risolvere il problema senza andare a costruire muri o interventi più pesanti si trovava davanti uno scoglio di tecnologia, carte e responsabilità che rimaneva in capo alla persona stessa. Molti progettisti rinunciavano a usare una tecnologia più furba per metterne una più antica che però essendo catalogati nei prezziari era più sicura da utilizzare. Adesso questa cosa si è risolta e molti

progettisti si sono sbloccati e possono usare questa tecnologia dove serve. Anche Aipo ci sta chiamando per una serie di lavori e questi inserimenti, che vanno a colmare questi vuoti burocratici aiutano i progetti e le specifiche utili per andare avanti e realizzare tanti lavori che rimarrebbero in sospeso o che andrebbero fatti a tentativi.

Respondent 13: i prezziari sono gestiti dai vari enti tipo comuni, regioni, ANAS RFI Aipo. Sono formulati facendo delle analisi prezzi su quelle che sono le lavorazioni e i materiali che vengono utilizzati per quelle voci di intervento. Sul discorso autorizzazioni noi siamo più fortunati, nel senso che sfruttiamo molto il fatto di avere possibilità in quanto autorità idraulica. Non dico di avere deroghe particolari rispetto alle tipologie di interventi però il fatto di intervenire su un fiume sul quale siamo noi gli unici enti competenti ci agevola molto la realizzazione di determinati interventi. Ciò non toglie che altri interventi siano soggetti a pratiche burocratiche delle quali si parlava prima e che effettivamente rallentano e non poco la realizzazione degli interventi. Abbiamo adesso in VIA un progetto importante, l'ampliamento della cassa di espansione del fiume Secchia, attivata da gennaio dell'anno scorso e si deve ancora chiudere. In tutto questo abbiamo avuto delle colleghe in regione che hanno fatto un lavoro eccezionale e si sono impegnate moltissimo, nonostante ciò a gennaio se siamo fortunati lo chiudiamo. Quello che fa molto la differenza nei nostri casi è la complessità del progetto. Questo in particolare coinvolge molti enti del territorio, le province, la regione, il consiglio superiore dei lavori pubblici perché ci sono interventi su manufatti in calcestruzzo: per progetti più semplici fortunatamente riusciamo a evitare tutti gli strumenti che come diceva il collega della regione sono passaggi formali che devono essere fatti. Io non ho mai visto un'autorizzazione paesaggistica che aggiunga contenuti o migliori in qualche modo quelli che sono gli interventi. Su quello poi specifico che abbiamo realizzato con Prati armati, alla fine trattandosi di una modellazione di una sponda e di una semina, non ha previsto nessun tipo di autorizzazione particolare. C'è sempre il problema di confrontarci con i comuni interessati nel territorio solo se il progetto in se richiede autorizzazione paesaggistica ma in questo caso il progetto non lo richiedeva. Il comune non ha mai detto niente di particolare. Questa è la nostra esperienza poi ripeto, per progetti più complessi, anche noi finiamo nel grande calderone delle conferenze dei servizi e valutazione di impatto. Non so come funzionava prima della conferenza dei servizi che è uno strumento nato per velocizzare le procedure. Ho sempre utilizzato questo strumento. È uno strumento che velocizza sicuramente.

Altri passaggi da evitare dipende da tipologia del progetto. Tornando all'esempio del progetto della cassa del Secchia è chiaro che entrano in gioco diversi fattori. La stessa area è zona SIC per cui bisogna coinvolgere anche il servizio ambiente della regione, è molto calato su quella che è la complessità del progetto. In questo caso appunto, il progetto è stato relativamente semplice perché non c'è stato bisogno di coinvolgere comuni e province è molto agevolata la realizzazione.

Respondent 6: in merito al discorso prati armati, ricordo quando ero su un altro territorio. mi è capitato di occuparmi anche corsi d'acqua nel ferrarese e c'è stata un'occasione di intervento con una soluzione simile a prati armati però all'interno di un'area protetta in un parco. Solamente per fare la superficie più piccola di quella fatta con vostro intervento ha fatto una richiesta specifica che le piante, che non erano le classiche che si seminano, fossero piante sterili. Prati armati ha delle problematiche analoghe in caso di utilizzo in aree protette?

R 18: ho passato 20 anni a spiegare cose che molto spesso non sono state comprese. Noi abbiamo selezionato in 30 anni piante autoctone della zona di intervento. Abbiamo fatto così in Africa, Messico, nord America, Lombardia. Per la sterilità abbiamo notato una cosa. Su terreni sterili, (se sono terreni fertili cambia tutto e anche la infestazione che si sviluppa, vedi il caso in esame nel quale stiamo lavorando) per esempio se viene tagliata una strada che rende sterile il terreno perché vengono

sbancati metri, la natura per portar le piante in quel terreno ci ha messo migliaia di anni. Per installare altre specie erbacea, occorre adottare una serie di tecniche che non appaiono. Due esempi: alcuni tipi di concime particolare, le intercessione, le colle di tipo particolari, che non sono le colle sintetiche che impediscono la germinazione, ma sono colle di riso che nutrono le piante quando si associano a flora batterica. Le sementi che vanno trattate e seminate in periodi opportuni perché la natura fa in modo che certe sementi non possano germinare se non vengono vernalizzate, cioè se non subiscono un ciclo di inibizione di proteine antigerminali che si può fare mettendoli in frigo o tenendoli al freddo per due o tre anni. Quindi quando noi seminiamo le piante sul cantiere, se non riesce o nascono poche va rifatto da capo. Ci sono delle tecniche di auto incompatibilità inter-generiche e inter-specifiche che possono essere attuate. Se io prendo un esemplare, in vitro ecc, le piante gemelle quando vanno a impollinarsi producono dei semi sterili. Noi abbiamo superato le obiezioni dimostrando sul campo che dove seminiamo noi dopo non c'è infestazione e a livello scientifico si può dimostrare tutto. Le posso mandare un file dove lei vedrà che sul cantiere fluviale tipo Pordenone, una delimitazione millimetrica dimostra la presenza delle nostre piantine anche dopo 15 e 20 anni. Quindi si usano piante autoctone e riusciamo la propagazione della specie perché soprattutto se i terreni sono sterili altrimenti le piante comunque non riescono a propagarsi e non hanno la forza. Ci vuole il bootstrap, tirarsi su gli stivali per uno strappo contro la natura per metter lì delle piante che lei non vorrebbe. L'abbiamo sempre fatto. A forza di lavorare Legambiente è diventato uno dei nostri partner più formidabili. Io sono ing. nucleare e con loro ho poco da spartire però dicono che i prati armati sono una buona notizia e ci favoriscono in molte situazioni e hanno capito che la nostra tecnica è davvero verde. Tutto non si può avere. È meglio la frana o piante installate che combattono fenomeno erosivo? Siamo riusciti ad avere il consenso di tutti, da zone Unesco, parchi naturali, santuario d'Europa e Dolomiti cosa che prima ci era giustamente preclusa perché non possedevamo quella gamma di piante autoctone che adesso abbiamo. Visti i risultati eclatanti, siamo pubblicati su accademia dei Lincei e dei Georgofili, massima accademia botanica italiana dove dicono che è una cosa furba. I successi sono andati via via scemando. Io ho fatto la corte ad Aipo per oltre 20 anni e improvvisamente ci hanno fatto chiamare per un'altra serie di realizzazioni dicendo che questa è una cosa furba. Io ero andato con il lanciapiammine da Aipo ma non mi avevano ascoltato. ti ho fatto pubblicità io

Respondent 19 (min 4.35 forum 4): questa giornata è capitata a fagiolo perché anche noi abbiamo in corso la progettazione di un cordone dunoso qui a Milano marittima e per dare gambe al progetto si stiamo approcciando al discorso delle autorizzazioni all'interno della conferenza dei servizi e adesso so a chi rivolgermi. Per noi che siamo sulla costa, considerando che la regione sta mettendo a punto la strategia del GIDAC per la gestione integrata per difesa e adattamento costiero. Che questo possa essere di buono auspicio per andare in una direzione di sostenibilità e utilizzo delle NBS e una semplificazione delle procedure in ambito autorizzativo per i comuni della costa, non solo per la duna che è solo uno dei tanti interventi previsti anche nel GIDAC. Quindi forse c'è una sensibilizzazione maggiore sia ai piani alti che non, grazie anche ai percorsi che sono stati fatti all'interno del GIDAC per la partecipazione e la diffusione almeno conoscitiva per la realizzazione della strategia, può essere che ci siano dei passi in avanti e che in futuro ci sia una semplificazione in tutti questi aspetti autorizzati. Penso che anche i colleghi della costa e chi vorrà implementare le NBS se lo augurano.

Laura Sandra Leo (min 7.20 forum 4): seguo quello che detto Caterina. L'esempio di un altro comune o ente che ha intenzione di replicare quello che è stato fatto in questo progetto. La piattaforma mira a dare informazioni di questo tipo su ampia scala. Se venisse da voi un altro comune per un consiglio sulla replicabilità dell'intervento che consiglio daresti? Si riesce a generalizzare e trasferire quello che si è imparato da questo progetto? Se voi aveste lo scettro cosa cambiereste nel processo autorizzativo?

Respondent 13 (Min 10 forum 4): mi interessa il discorso sui processi autorizzativi anche a livello europeo, sapere se anche loro sono soggetti a iter deliranti. La cosa più rapida sarebbe arrivare ad aver

un progetto esecutivo snello da poter gestire in maniera rapida senza cadere nelle interferenze con altri enti. Purtroppo dipende dalla complessità del progetto. Non si può prescindere da interloquire con ente parco se parliamo di aree protette. Quello che dovrebbe essere ragionato di più sono le compensazione che ci vengono chieste. Io come autorità idraulica, a mio vedere, la priorità sulla protezione di una specie che è un animale protetto senza motivo, in quel caso non vedo perché questo debba rallentare le attività sul territorio.

Respondent 8: deliverable 2.1 e piattaforma trattano percorsi autorizzativi in ogni OAL. Il problema è che sono così specifici che è difficile generalizzare. Bisogna ragionare su quanto è trasferibile su altri casi.

Respondent 6: più che bacchetta magica l'obiettivo è quello di fare lobby e codificare pubblicamente quello che sono le NbS. Sulla base di questa categorizzazione poi sia più semplice individuare percorsi semplificati. La logica del percorso semplificato è nella nostra legislazione, poi è vero che in Italia quando si semplifica diventa tutto più complicato. Ci sono autorizzazione tipo la paesaggistica una serie di eccezione per cui certi interventi non sono soggetti o semplificazione. La regione per alcuni interventi, di natura verde, sono esenti da VINCA. Sarebbe importante che le NbS venissero istituzionalmente codificate, ben riconoscibili e ben chiare. Devono essere assimilate dai tecnici ma anche dalle legislazioni.

Respondent 18: più burocrazia è più corruzione, si mettono vincoli per poi risolverli in modo strano. Siamo stati scelti sul ponte san giorgio che ha sostituito il morandi. Lì in tre giorni siamo entrati in cantiere. Il ponte è costato di più ma lo hanno fatto in due anni. Chi più spende meno spende, tenere tutto fermo è un danno immenso. Il ponte è un esempio. Italferr ha detto vogliamo prati armati e nessuno ha detto niente.

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