



Enabling Effective Engagement, Investment and Implementation of Natural Assurance Systems for Water and Climate Security

Josh Weinberg, Kanika Thakar, Roxane Marchal, Florentina Nanu, Beatriz Mayor, Elena López Gunn, Guillaume Piton, Polona Pengal, David Moncoulon

► To cite this version:

Josh Weinberg, Kanika Thakar, Roxane Marchal, Florentina Nanu, Beatriz Mayor, et al.. Enabling Effective Engagement, Investment and Implementation of Natural Assurance Systems for Water and Climate Security. Greening Water Risks, Springer International Publishing, pp.367-384, 2023, Water Security in a New World, 978-3-031-25307-2. 10.1007/978-3-031-25308-9_18 . hal-04096409

HAL Id: hal-04096409

<https://hal.inrae.fr/hal-04096409>

Submitted on 12 May 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

Chapter 18

Enabling Effective Engagement, Investment and Implementation of Natural Assurance Systems for Water and Climate Security



Josh Weinberg, Kanika Thakar, Roxane Marchal, Florentina Nanu, Beatriz Mayor, Elena López Gunn, Guillaume Piton, Polona Pengal, and David Moncoulon

Highlights

- Key issues to improve enabling conditions to support the uptake of NBS and NAS range from connecting an evidence-base to an experience gap through to creating an enabling regulatory environment.
- Opportunity areas to promote the uptake of NBS and NAS arise by facilitating their financing and implementation, which include finding solutions to de-risk private sector investment in NBS.
- Further opportunity areas to effectively engage the insurance sector include increased scope for scientific exchange and cooperation, awareness raising on climate risks and policy dialogue on risk reduction and environmental regulation.

J. Weinberg (✉) · K. Thakar
Stockholm International Water Institute (SIWI), Stockholm, Sweden
e-mail: josh.weinberg@siwi.org

R. Marchal · D. Moncoulon
Caisse Centrale de Réassurance (CCR), Paris, France

F. Nanu
Business Development Group (BDG), Bucharest, Romania

B. Mayor · E. López Gunn
ICATALIST S.L., Las Rozas, Madrid, Spain

G. Piton
Université Grenoble Alpes, INRAE, CNRS, IRD, Grenoble INP, IGE, Grenoble, France

P. Pengal
Institute for Ichthyological and Ecological Research (REVIVO), Dob, Slovenia

18.1 Introduction

While there is increasing enthusiasm and support at a global level to promote NBS; scaling investment still requires enhanced coordination, capacity, and confidence among public authorities that would be primarily responsible for accessing their financing and overseeing their implementation. The demonstration cases in the NAIAD project detailed in the previous chapters show that the implementation landscape is very diverse across European countries, and even more so when comparing contexts across different continents.

This chapter investigates the enabling conditions and policy settings that are more conducive to the uptake of NAS and discusses how to effectively engage with the insurance sector as part of that process. Building on learnings and resources from the NAIAD project, it highlights opportunities and challenges to support the mobilization of green infrastructure as part of NAS schemes.

18.2 Overview of Key Challenges and Enablers for NBS and NAS

The recent *Review of progress on implementation of the EU green infrastructure strategy* (EU 2019) concluded that “experience illustrates that ecosystem-based approaches such as GI, nature-based solutions, ecosystem-based adaptation, natural water retention measures and ecosystem-based disaster risk reduction measures are cost-efficient policy tools; but they are not used to their full extent and their potential should be further strengthened at EU level.” This conclusion leads to further questions: if NBS are cost-effective, what impedes their implementation? And how can these challenges be overcome? This chapter examines four frequently cited issues that limit NBS implementation that also directly relate to NAS (several of which have been covered across multiple chapters in this book): (1) connecting an evidence base to an experience gap; (2) capturing full value on cost-benefit assessment; (3) capitalizing on investor demand; and (4) creating an enabling regulatory environment.

18.2.1 *Connecting an Evidence-Base to an Experience Gap*

An obstacle historically mentioned that can prevent investment in NBS is a perceived lack of evidence of the performance of NBS relative to traditional infrastructure assets (EU 2019, Nesshöver et al. 2017). This implies that potential projects are effectively stopped by the engineers and technical project development staff that are not comfortable with NBS before they reach the stage of arranging financing. This can be particularly important when considering NBS to provide a service such as

flood risk mitigation. While there is a growing number of cases that demonstrate NBS service delivery at a global level, a local evidence or experience gap can still exist. Thus, a key enabler is to mainstream effective performance assessment methodologies for NBS and NAS so practitioners have confidence in using them.

18.2.2 Capturing Full Value in Cost-Benefit Assessment

A second commonly noted issue is a perception that it is difficult to assign economic value to ecosystem services and perform adequate cost-benefit analyses (CBA) of NBS, which are normally a critical aspect of finance preparation and qualification. In this case, it may often be the case that the benefits in terms of water and climate security provided (e.g. flood/drought risks reduction, water supply) are in fact more straightforward to calculate than other benefits provided by ecosystems or a specific NBS. However, learning from the NAIAD cases (see case study chapter Medina) has shown that CBA analysis of an NBS that only considers a single benefit (such as flood mitigation) may not be sufficient to show justification for investment, and it may also fail to include additional benefits of even greater value that would transform the CBA proposition. Thus, the key enabler is the development of integrated CBA methodologies to capture multiple values provided by NBS and NAS (Le Coent et al. 2020). NAIAD has developed tools that support evaluation of risk reduction potential provided by a proposed NBS or GI, as well as tested of integrated Cost-Benefit Analysis methodologies in several cases. These have shown NBS outperforming grey infrastructure alternatives, but also found that the DRR benefits provided were not able to be conclusively assessed as outweighing the cost of the intervention on their own. Thus, NBS aiming at solely reducing water risks cannot be assumed to be economically efficient. Indeed, NBS often appear to be economically efficient particularly when all the benefits generated are considered. This requires strategies to translate multiple co-benefits into revenue flows that can be used for as an argument for project funding. In many cases, it will also involve adapting regulations and procedures to apply public funding to NBS, as different financing bodies may be willing to pay for different types of co-benefits provided.

18.2.3 Capitalizing on Existing and Potential Investor Demand

Another issue often raised is insufficient access to capital for NBS investments (Weinberg et al. 2018). This lack of investor demand from financing institutions is explained by them being either averse to NBS, not aware of them, and/or not able to find appropriate finance instruments to fund them. In recent years, however, very significant developments have occurred in producing financing mechanisms in this area, such as the creation of bonds that explicitly signal to investors that the project has environmental benefits and/or contains NBS components (e.g., green and

climate bonds), the emergence of private-public partnerships that explicitly look at ecosystem functions and interventions for investment (e.g., Flood Re in the UK), and the EU sustainable finance initiative's approach to develop a new regulatory framework that can encompass new and emerging issues (e.g., climate adaptation, NBS). Explosive growth has occurred in the green and climate bonds market in recent years, expanding from upper-income countries (USA, western Europe, Australia) to middle-income countries (China, India, Brazil), including lower-middle income countries (e.g., Nigeria).

A better diagnosis of the finance challenge may be described as a “market gap”. Under investment in NBS is seen a failure, at large, of those looking to access financing to produce viable projects, to sustain and pay back investment. It also, however, signals a failure in the market where the value of services provided by NBS may be undervalued, or the values provided are not monetized sufficiently or made possible through other KPIs to enable investment. This can also be a problem where familiar finance instruments are ill-fitted to non-traditional investments. Each of these scenarios may require public sector interventions and be better considered within NBS/GI strategies. The shortage of bankable projects therefore requires not only capacitation to enable proposals with improved business models, but also can require shifts in financing processes that can better understand and value what these projects offer. Now in many places it may be theoretically more possible to get a loan to implement an NBS but the lack of awareness of the investor (those taking the loans to finance a project) of the advantages of NBS relative to more traditional infrastructure investments and a lack of political will by regulators - or other public policy groups to encourage or favor NBS- may remain as important obstacles. Procedural issues come into play as well. Concern over transaction costs and requirements on staff resources are also likely slowing adoption of more effective and progressive approaches to both climate risk assessment and mitigation options. For plans and projects to access funding and financing it is necessary to prepare a full business case for the entire investment program and each of the projects that make part of this investment program.

To meet this opportunity, there are a number of emerging tools and innovations to support improved proposals for NBS as viable investment projects. This includes those featured in this book, such as the *Handbook for the implementation of nature-based solutions for water security* (Altamirano et al. 2021) can be used to support proponents of NBS to create a more structured project plans and implementation strategies. *The NAS Business Canvas* is another tool that can be applied to any NBS project or strategy in order to identify the most suitable business model for the case. Each can make it easier to engage with public authorities, collectivities and private investors into further project preparation. These tools can be applied, refined and promoted to accelerate uptake of NBS in Europe and globally.

18.2.4 Creating an Enabling Regulatory Environment

Broadly speaking, there are few direct directives, policies or governing institutions with exact mandate over supporting or implementing NBS or NAS. However, there are numerous policies, institutions and governance instrument that are potentially relevant and can impact capacity for investing and implementing them. This can add complexity and challenges for coordination as well as clear processes to facilitate their uptake.

In many countries prioritized actions may still be required to ensure water-risks are recognized appropriately by governments and citizens. One key point of analysis within a national context is clarifying who pays for DRR and ecosystem protection and who benefits from it, particularly when developing dialogue with the insurance sector in this field.

Citizens are often unaware of the natural hazard coverage and terms in their insurance contracts. Here it is important to consider that worldwide it is relatively rare that insurers themselves make direct investments in risk mitigation measures (Atreya et al. 2015). Rather insurers may make insurance coverage conditional upon the uptake of risk reducing actions taken through warranties or ‘must-do’ clauses; provide premium/deductible discounts or client awareness raising (Kunreuther 2019). Instead of investing directly, it is more common for insurance groups to advocate public investment or stricter regulations for DRR (Kousky 2019). The primary actors investing in NBS or NAS schemes will be from public authorities and public financing unless there are reforms or structural changes to the way insurance is provided in most places.

That NBS are considered as viable options for risk reduction is an important step beyond this to ensure the best measures are taken. There are several specific policy mechanisms developed in EU member states that can be considered for application in other countries or even at EU level that have been highlighted in this book (see Chap. 3). The Barnier Fund, for example, which supports implementation activities for DRR by the national insurance scheme, has proven an effective example in France. Together with GEMAPI Law in France, which allows river basin authorities to authorize a tax to finance actions for risk reduction and environmental protection/restoration, there is a strong enabling environment for viable NBS to be implemented.

Policy frameworks to mainstream NAS into the insurance industry need to evaluate the DRR policy processes at the national level, their implementation at local scale, as well as the current and potential financing arrangements and mechanisms to integrate it into the insurance system. Current adaptation policy frameworks will often need to prioritize short term actions to reduce long-term vulnerabilities and impacts. This may further benefit from actions that can facilitate cross-sectoral cooperation, multi-stakeholder involvement, knowledge sharing, bridging local gaps and international cooperation. Importantly, this must effectively connect to the broad ambitions to advance uptake and implementation of NBS to support a wide range of green growth, low-carbon development and sustainability strategies

developed at multiple levels. Challenges and opportunities in this endeavor are discussed in more detail in the following section.

18.3 Enabling Conditions for NAS – Learning from Case Studies

One of the key strengths of the NAIAD project was its ability to test the assessment methodologies and integration tools it has developed in real life scenarios through demonstration projects located across Europe (see case study chapters in this book). Here we first we provide a short overview of the strikingly different conditions for implementation faced and learnings that can be drawn to develop responses that make sense for different contexts. In Slovenia, the institutional implementation environment made it extremely challenging for a NBS to even be considered as option. In France, there are multiple pathways to implementation created by with new and existing measures taken by the government that enable investments in NBS. A third case in the Lower Danube in Romania highlighted a different challenge: public perception of flood risks are low and not in line with actual risk levels faced. This requires investment in risk reduction and finding ways to enable public support for NBS or measures taken to achieve this.

18.3.1 Lessons from Glinščica, Slovenia – Overcoming Political Challenges to Considering Nature’s Solutions

Through a series of interviews and stakeholder engagement processes in the Glinščica catchment looking specifically at the adoption of NBS for flood risk management, the NAIAD team unearthed a broader issue of failed transition to adaptive integrated water management in Slovenia. Ershad Sarabi et al. (2019) point out that barriers to implementation of new technologies, such as NBS, are often socio-institutional rather than technical. Common challenges include a lack of coordination between institutions, unclear roles and responsibilities between parties, low levels of community engagement, and little or no monitoring and evaluation. For the Glinščica catchment specifically, barriers to the adoption of NBS for flood risk management included: a high degree of scepticism from decision makers to engage with local research projects; fragmented practices in water management; institutional knowledge gaps; low interagency cooperation; weak participatory processes and, an acute lack of enforcement and accountability. While legislation has greatly advanced quickly in recent years it is not being fully implemented.

Once the participating stakeholders developed and agreed on the best future strategy for the Glinščica catchment that included an NBS, another barrier was identified: land ownership. While this is a broader issue connected to the struggles

of the EU Common Agricultural Policy, the implementing institutions faced the opposition from land owners (mostly farmers) as the main barrier preventing specifically the implementation of NBS measures (which usually require more space than grey solutions). The Ministry for agriculture, forestry and food, expressed their opposition to using agricultural land for water risk management. On the other hand, the opposition from farmers was not absolute and was impacted by past bad experience with governmental institutions that usually fail to understand and accommodate their requirements. One farmer, for example, expressed his concern with the governmental institutions that prohibited him from building small retention reservoirs on several of his fields, a practice that he learned from German colleagues was supported by the German government. Building a more enabling environment for NBS uptake in Slovenia will take time, effort and resources. Several participating stakeholders noted that top-down guidance and pressure from the EU through the changes in its own policy, regulations and enforcement is a critical lever needed to push more integrated and adaptive water management at large, and considerations of NBS as a result of such circumstances.

18.3.2 Lessons from Brague, France – A Strong Enabling Environment Still Requires Political Will

The Brague DEMO, as Glinščica, is a catchment of intermediate size (5–200 km²) located in south France along the Mediterranean coast. Similar flash flood problems are experienced but the institutional context is very different. Several laws created national funds funded by taxes on insurance premiums to finance flood protection measures and by water bill finance river restoration measures. A recent law, GEMAPI, closed the loop by making it mandatory for any works performed in a river to address risk reduction and environmental restoration. It also allows river managers to raise a local tax, up to 40€/person/year, to finance it. NBS are *per se* measures consistent with this policy context but are not yet mainstreamed.

Lack of confidence regarding the flood reduction capacity of NBS is a key barrier to their implementation. River managers are advised at a daily basis by civil engineers working from consulting companies. Their expertise on computing the physical effects of large civil engineering structures on flood processes are ancient and solid. This experience is, however, much lower regarding NBS effects. Evidence of significant cumulated flood reduction effect of NBS as well as capacity building for design engineers to compute and design NBS with targeted risk reduction objective are needed.

Another barrier is related to lack of decision maker commitment for ambitious NBS projects. In the Brague River, urban sprawling during the 1980s and 1990s confined the river channel in an excessively narrow stripe unable to convey extreme flows. The proposed NBS strategy, namely small natural retention areas in the upper basin and giving room to the river in the lowlands, requires demolishing about 50

houses. Even though these houses have experienced repeated flood events over the last decade and most people are willing to leave, decision makers are reluctant to launch large-scale and ambitious expropriations operations to achieve a consistent vision of the river corridor for the next 50 years. Bringing significant improvements in both river quality and flood risk is feasible but require strong political willingness to launch a long-term integrated plan that will start by a difficult phase of real estate acquisition.

18.3.3 Lessons from the Lower Danube in Romania: How to Confront Overly Optimistic Risk Perception?

Research performed in the Lower Danube case study aimed at understanding the role of natural assurance schemes in complex natural, economic and social contexts. The vulnerability to water-related hazards in the region was mapped and two scenarios were analyzed focused on the total flooding (optimistic planning scenario) or partial flooding (realistic planning scenario) of an enclosure. The NBS risk mitigation solution (a restored pond) would protect communities up- and downstream in the identified location while supporting the diversification of economic activities and sustainable development for the local community (fish farming and eco-tourism). The application of a model developed by CCR provided estimates of the amount of damages related to destroyed and affected dwellings and an average cost per claim. To increase the relevance and the potential for replicable results, the large scale demo approach was complemented with a focus on the valuation of a specific NBS along with other soft-institutional measures to allow assessment of effectiveness, based on a combined bottom-up interest of communities for diversification of economic activities and a top-down concern for reducing the pressure on the grey infrastructure for flood protection by means of a cascade system of green solutions. The approach was synthesized in a business model and a proposal for a financing framework for water security that, with further elaboration, could be used for upscaling the approach within a strategy for recreating the green corridor along the Danube.

The research in the Lower Danube case study included an open dialogue with the local insurance sector. The increased frequency and intensity of natural disasters and the increasing value of both private and public property will result in higher risk exposure. The sector is recognizing the urgency for action (including for prevention) but remains client oriented. It prioritizes ensuring accuracy of forecasting and risk quantification methods, but not prevention or mitigation mechanisms. The Romanian insurance sector is additionally coping with the relatively recent incorporation of insurance concepts in citizens' financial education requiring focus towards raising awareness and building trust. At the same time different regulatory obligations (e.g. GDPR, professional accreditations, etc.) often result in prioritizing the core business and leaving little capacity for actively seeking new business models.

The low level of public risk perception is a recognized barrier towards sector involvement in strategic actions for mitigation of water related risks at the national level. A study conducted by UNSAR¹ (2018) showed that 90% of Romanians surveyed perceived that the climate is changing and 71% are interested in property insurance. Yet, most do not consider floods and droughts as major risks. Partnership with scientists and knowledge providers along with functionality of public-private-partnerships at local level are essential for the identification and implementation of resilience measures in which the sector can get involved or can contribute to. There is a clear acceptance on the advantages for sharing actuarial data and mutualisation of risk levels, however a successful approach needs the support from the financial supervisory authority regulating the market to create and manage the needed instruments at national level. With a concerted approach the sector can contribute to prioritization of green solutions by adapted premiums and underwriting criteria. Incorporating climate change in different sector policies (such as agriculture, territorial development, water, health, education, etc.) can impact in the same direction. The government is the key player here as they are the ones that ultimately have responsibilities to reduce hazards, exposure and vulnerability, influencing policies in different sectors and utilize legislative power via central and local authorities to implement resilience building measures.

18.4 Priorities to Promote Uptake of NBS and NAS

Public institutions responsible for water resources and disaster risk management, such as utilities and local governments, are the main actors currently investing and implementing NBS (Browder et al. 2019). A key driver is often to address risks and comply with national and supra-national environmental regulations, such as the EU Flood Directive, etc. (Mayor et al. 2019, Somarakis et al. 2019). NBS are promoted as strategic investments that can boost the overall performance and climate resilience of infrastructure. Numerous reports and studies have discussed enablers and barriers to the investment and uptake of NBS projects (Weinberg et al. 2018; Stagakis et al. 2019). Common observations highlight perspectives ranging from financial sector professionals stating a lack of access to viable projects ready for investment (e.g. a pipeline of projects), to developers claiming that the key barrier is to access capital investments to implement projects at the scale required (Browder et al. 2019). The truth is that these paradoxical conditions co-exist. Mobilizing investments require both the development of new and improved application of existing financing models, as well as interventions to improve the enabling conditions, like regulations, access to good data and management capacity of NBS projects at all levels. The following sections gives an overview of multiple strategic areas to focus on to enable NBS and NAS to be funded and effectively implemented, and

¹The National Association of Insurance and Reinsurance Companies in Romania.

highlights opportunities to effectively engage with the insurance sector in this process.

The financing of NBS is often hindered by perceived risks on key performance indicators and level of service that can provide, which can lead to reduced confidence by governments, utilities and local authorities to invest (Browder et al. 2019). These perceived risks frequently center around either the institutional structures and capabilities to manage them; or questions around accessing evidence that the NBS will provide the specific service stated (Ershad Sarabi et al. 2019).

18.4.1 Solutions to De-risk Private Sector Investment in NBS

Unlocking private finance can involve overcoming multiple hurdles. Mayor et al. (2019) points out that financiers and institutional investors still consider NBS as risky. There is a high perception of risk of preconstruction and construction phases, and first years of operation. Bankability of projects often depends on appropriate risk mitigation for investors. Private financing can still play a role using refinancing vehicles, allowing entry options to institutional investors in less risky periods (e.g., post-completion of construction). In these cases, additional parties that can guarantee the financing (and have a higher ability to take on the risk), can be important.

Strategies for de-risking investments in green infrastructure for private investors is needed to level the playing field and make NBS easier to develop. The financing for de-risking may come from the public sector, investment banks or other sources, but the basis for the assessment may include the insurance sector. For example, a model where the insurance investor could act as the warrantor for the project, provided the project reaches agreed upon benchmarks is being tested in other regions like in the US and may be considered for replication. This can be done within a green or environmental bond, making a portion of payments to a project developer contingent upon reaching specific performance targets that can provide assurances to the financier (Hindlian et al. 2019). This should keep in mind that more complex financing mechanisms can increase transaction costs and make them only suitable for larger-scale interventions (Mayor et al., 2019). Specific guidance for investors and developers on how to access and develop these mechanisms may therefore also be needed.

18.4.2 Quotas for Financing Natural Infrastructure Projects in Initiatives and Funds

A key lever to explore is to promote policies that mandate investment in risk reduction to receive eligibility for certain forms of financing. This could begin with reviews of viable funding sources where criteria can be added to ensure options to

provide risk reduction, including through green infrastructure/ NBS, are included or at least considered.

18.4.3 Placing Explicit Criteria for NBS, DRR and Adaptation in Green Finance

The EU Sustainability Taxonomy (and the EU Sustainable Finance Action Plan) represents an important opportunity, as it will both widen the total amount of green capital (by gathering more financiers and capital deployed) and deepen its impact (by specifying more criteria for investments that are green in specific areas). This means the explicit criteria for nature-based solutions, green infrastructure for climate adaptation (disaster risk mitigation) will be critically important. As will be the setting of criteria and guidance for the measurement and operation of these projects. This will enable more capital to be invested in NBS, and more of those investments to explicitly target the use of NBS to reduce water related risks.

18.5 Enabling Effective Engagement with the Insurance Sector

Chapter 3 explained the multiple roles that insurers can play to support uptake of NBS and wider understanding of NAS as a strategy to promote resilience and sustainability. Multiple roles apply to both the industry itself, as well as to society at large. This section outlines several ways to effectively leverage support from the insurance sector as a partner, provider, innovator and investor for greater effect, and also points out areas that require increased consideration. These are presented as a sequence of key opportunities for effective engagement between the insurance sector and relevant stakeholders. These are grouped as ‘easy wins’ as well as critical (but more difficult) chances to increase water and climate security.

18.5.1 Scientific Exchange and Joint Action to Raise Awareness on Climate Risks

Insurance companies commonly view themselves as social actors that serve as institutional partners to support resilience in societies (Marchal et al. 2019). There is a clear concern from insurance professionals that investments related to climate change and disaster risk mitigation need to be increased, and investors (both generally and specifically those from the insurance sector) see this as an area the sector will expand in future. The sector welcomes increasing exchanges with scientists,

private companies, governments and new partnerships with stakeholders involved in eco-DRR. There is high willingness and on-going research within the insurance sector to engage directly in the assessment of green infrastructure and NBS. This includes both valuation of the avoided damages and possible valuation of green infrastructure as an insurable asset. The insurance industry can also play a key role in financing studies on nature-based solutions in risk reduction and for the longer-term monitoring of natural infrastructures.

Marchal et al. (2019) further indicated through their survey that there is high willingness to increase the role of insurance companies in awareness raising activities related to the risks posed by climate change and loss prevention to respond to their customers. This role can both be viewed as a form of good corporate governance and social responsibility, as well as a market opportunity for service provision. In some cases, the insurance sector will drive action where the sector sees risks to the sustainability of their business; in others the sector will need to be persuaded more actively to engage as knowledge provider and investor. There are cases where insurance companies act as partners, taking a lead to push for more practical actions and investments to reduce unsustainable (and un-insurable) disaster risk. Denmark Pensions and Insurance, for example, regularly engages with local authorities and has established partnerships with government and developers, so that their company can directly invest in projects to mitigate risks for properties and then recoup the costs for those investments. This form of leadership may be more of an exceptional case than common practice but underscores the importance of the regulatory environment and policy priorities set for the insurance sector and their interactions with other actors like e.g. local authorities, to function.

18.5.2 Policy Dialogue on Risk Reduction and Environmental Regulation

Several reports have highlighted that environmental regulation is also one of the important drivers promoting the implementation of NBS in the EU (Stagakis et al. 2019). Previous studies also identified comprehensive lists of policies and regulations relevant to investment, promotion and implementation of NBS overall (e.g. Stagakis et al. 2019; Ershad Sarabi et al. 2019), though these studies have mostly missed including specificities of national insurance schemes and corresponding legislation. At the EU level, directives specifically relevant to driving investment into NBS effective to flood and drought risks were identified by NAIAD (Joyce et al. 2018).² These studies also commonly note the lack of a single method or regulatory framework suited to this process. Instead the analysis recommends focusing on

²This included the following EU policy, directives and strategies: Cohesion Policy; Biodiversity Strategy; Environmental Liability Directive; Environmental Impact Assessment Directive; Strategy Environmental Assessment Directive; Adaptation Strategy; Mitigation Strategy; Water Framework Directive; Floods Directive; Habitats Directive; and Green Infrastructure Strategy.

finding ways to streamline relevant policies, plans and strategies to support NBS at each level (Somarakis et al. 2019). When initiating such a process, the insurance sector should be considered and included. Here the inputs from insurance companies as risk management service providers can be leveraged, notably through their role in assessing risk and potential avoided damages. This could serve as an enabler for investment improve knowledge on prevention.

18.5.3 Guidance for Insurance Companies to Contribute to Resilience Planning and Investment

This guidance may differ due to specific local, national, and project contexts. However, there are many common, large processes (e.g. in issuing of bonds, city-level adaptation investment planning, land-value capture strategies, etc.) where guidance and road-mapping can be refined and used. The NAS canvas (Mayor et al. 2021) provides a potentially useful framework that can be applied to do this.

18.5.4 Capitalize on the Insurance Sector as Investors

The Global Commission on Adaptation estimates that an additional 1.8 trillion USD of investment is needed over the next decade to increase resilience worldwide (GCA 2019). The GCA claims that targeting this investment to specific areas like disaster risk reduction, water management, the natural environment and more resilient infrastructure would provide over 7 trillion USD in benefits and savings. The World Bank made similar assessments, estimating 1 trillion USD needed to be invested in resilient infrastructure in low- and middle-income countries to provide more than 4 trillion USD in benefits (Hallegatte et al. 2019). The general conclusion is consistent: investment in resilience now avoids higher costs long-term.

The insurance sector is one of the largest institutional investors world. In Europe, it generates annual gross written premiums of over 1.2 trillion EURO and invests more than 10 trillion EURO in the economy (Insurance Europe 2019). Given the scope of their influence and assets, engaging the insurance sector clearly represents a very important opportunity to increase investment in resilience, including in nature-based solutions.

The role of insurance companies as investors is best seen as separate from their role as an insurer and agent for disaster risk recovery or reduction. When issuing green (or sustainability) bonds, companies have interest in finding and showcasing socially responsible investment (SRI) and are keen to find good projects with operational models to fund them and include in their sustainable investment portfolio. This requires a clear demonstration of the benefits (e.g. DRR impacts) and a viable business model from the borrower to pay back the bond. Like all investors,

opportunities that offer a good combination of ROI, stability, and lowest level of risk are sought. While there is increasing interest and activity in increasing green and sustainable investment, a recent report by Share Action (Uhlenbruch 2019) noted there is greater focus of among insurance company investors on the climate change mitigation side than adaptation. The report also stated climate-data was better available for the investment branches of insurance companies than for the underwriting branches for many of the interviewed companies (ibid). These are still obviously important steps being taken. In 2017, the top 15 European insurance and re-insurance companies had total investments in fossil fuel sector of over 130 billion USD; and underwriting of fossil fuel projects and operation were of high importance (in terms the size of their total business) for a majority of those companies (Bosshard 2017). Actions taken to invest in green energy, and divest in activities as coal production and mining, are more straightforward to communicate externally and reduce reputational risks. They can also be viewed as less complex investments with lower perceived uncertainties and transaction costs than (for example, to invest in a solar panel installation project versus an NBS) those taken for adaptation and risk reduction. Incentives are needed to make financing resilience (through NBS) equally attractive as other areas of green investment.

The propensity of insurers to purchase bonds makes investments in NBS projects through green bonds a natural fit (Filkova et al. 2018). Marchal et al. (2019) found that increased investment in sustainability and resilience building actions (sustainable and responsible investments) to decrease their risks and costs (particularly under climate change) was a frequently articulated objective of insurance and re-insurance companies surveyed. Many respondents stated a strong willingness to issue green bonds, as well as to participate in sustainable finance and the circular economy. At the same time, many others indicated that it can be challenging for the insurance sector to directly invest in loss prevention (ibid). Continued efforts are therefore needed to instill confidence and comfort with investments from these institutional investors in NBS as part of NAS.

18.5.5 Leverage Loss Data for More Resilient Municipalities

One area with potentially high value for engagement with insurers is on the provision of loss data. The insurance sector holds information on the historical impacts of weather events, with the most detailed data set on the location and level of damages incurred and how this has evolved over time. Loss data collected by insurance companies can be an invaluable resource for municipalities looking to better plan resilient communities and mitigate their risk from natural hazards such as floods, storm surge, cloud bursts and/or drought, etc. For example, experiences in Norway and other countries in Europe show use how the use of this data could greatly improve the capacity of public authorities to invest in risk mitigation measures (see e.g. Klima 2050). The different aspects surrounding this issue can be explored at the local, national and EU levels. Insurers require a combination of positive incentives

and clear regulation to ensure a level playing field for all companies to be equally required to provide data, as well as the guarantee that the privacy of customer data is duly protected.

The greatest concern from insurance companies stems from how the data can be protected. European privacy laws, for example, make it complex to share address level data. Sharing data at the address level risks the identification of an individual person. In order to avoid breaching the EU General Data Protection Regulation (GDPR), data needs to be aggregated to a level where no person could risk being identified. Otherwise, it holds the potential to disadvantage or discriminate against consumers whose properties have experienced loss previously. Importantly, this should still be done in a way that the data does not lose its value. The aggregation of data at a larger scale, and the sharing of hazard or damage maps is considered as part of the expertise that could be provided by the insurance sector in the frame of contractual agreements with e.g. municipalities. Another important concern for insurance representatives is that data can become available to competitors. This can influence the competitive edge that many insurance companies gain from the ability to out predict their competitors. The public sharing of insurance loss data could also present risks that smaller or foreign insurers will be able to infiltrate the market with little risk or investment, creating an unfair advantage for the different insurance companies. The experience from the KLIMA 2050 project (Hauge 2019) in Norway indicated that companies became more positive to sharing their loss data following multiple rounds of dialogue but stipulated that this kind of data sharing needs to be done at the request of a higher authority. This is to ensure that all companies share equally - or are equally obliged - and guarantee insurance data will be handled appropriately.

18.5.6 Ensure Institutional Investors Underwriting Risks Fully Consider Climate

Currently, we face an environment of increasing levels of financial risk (due to climate change) taken on by the insurance sector; but also increasing cost-competition for underwriting those risks created by investors banking on turning over investments within a shorter time frame and selling their investments for quicker profit return. This strategy enables profit for some investors, but also places them at risk to go bankrupt (at the public expense if they are not solvent). This also undermines the ability of re-insurance to accurately price risk, in line with increasing climate uncertainty. This in turn undermines our ability to guide public investment for protection in line with actual risk levels faced and maintain solvency of insurance and re-insurance markets. It also undercuts the recognition of risks and exposure that may be reduced through NAS, thereby lowering interest in investing in them. Resolving this challenge is both complex and challenging and goes beyond questions on NBS investment.

18.6 Conclusion

The chapter provided an overview of key issues to consider to improve enabling conditions to support the uptake of NBS and NAS designed to enhance climate and water security. This includes taking action to connect an evidence-base to an experience gap, capture full value in cost-benefit assessment, capitalize on existing and potential investor demand and create an enabling regulatory environment.

It pointed out a range of opportunity areas to promote the uptake of NBS and NAS and facilitate their financing and implementation. This includes finding solutions to de-risk private sector investment in NBS, as well as the use of explicit criteria (as well as quotas for allocated financing where relevant) for NBS, DRR and climate adaptation within green financing mechanisms.

Further opportunity areas to effectively engage the insurance sector to promote investment in NBS were also highlighted. This includes broadening partnerships for scientific exchange and cooperation, joint actions to raise awareness on climate risks, as well as policy dialogue on risk reduction and environmental regulation. More challenging but critical areas for collaboration were also elaborated, such as finding ways to better leverage the insurance sector as institutional investors, both to allocate finance to NBS projects and also to ensure that the underwriting of investments adequately consider climate change impacts on risk. Collaboration between public authorities, insurance sector actors and civil society will be critical for effective resilience planning and investment at all levels.

References

- Altamirano MA, de Rijke H, Basco-Carrera L, Arellano B (2021) Handbook for the implementation of nature-based solutions for water security: guidelines for designing an implementation and financing arrangement, DELIVERABLE 7.3: EU Horizon 2020 NAIAD Project, Grant Agreement N°730497 Dissemination
- Atreya A, Hanger S, Kunreuther H, Linnerooth-Bayer J, Michel-Kerjan E (2015) A comparison of residential flood insurance in 25 countries. Working Paper of the Zurich Alliance on community flood insurance
- Bosshard P (2017) Underwriting climate chaos: insurance companies, the coal industry and climate change. Published by Friends of the Earth France, Greenpeace Switzerland, Market Forces, Re:Common, Sierra Club, The Sunrise Project and Urgewald. <https://unfriendcoal.com/wp-content/uploads/2017/06/Coal-insurance-briefing-paper-0417.pdf>
- Browder G, Ozment S, Rehberger Bescos I, Gartner T, Lange GL (2019) Integrating green and gray: creating next generation infrastructure. Washington, DC: World Bank and World Resources Institute. © World Bank and World Resources Institute. <https://openknowledge.worldbank.org/handle/10986/31430>. License: CC BY 4.0
- EC (2019) Commission Staff Working Document. Additional information on the review of implementation of the green infrastructure strategy. Accompanying the document report from the Commission to the European Parliament, the Council, the European an Economic and Social Committee and the Committee of Regions. Review of progress on implementation of the EU green infrastructure strategy. SWD/2019/184 final
- Ershad Sarabi S, Han Q, Romme L, Georges A, de Vries B, Wendling L (2019) Key enablers of and barriers to the uptake and implementation of nature-based solutions in urban settings: a review. *Resources* 8(3):121

- Filkova M, Frandon-Martinez C, Meng A, Rado G (2018) The green bond market in Europe. Climate bonds initiative. Available at https://www.climatebonds.net/files/reports/the_green_bond_market_in_europe.pdf
- Global Commission on Adaptation (2019) Adapt now: A global call for leadership on climate resilience. Available at https://cdn.gca.org/assets/2019-09/GlobalCommission_Report_FINAL.pdf
- Hallegatte S, Rentschler J, Rozenberg J (2019) Lifelines: the resilient infrastructure opportunity. Sustainable infrastructure Washington, DC: World Bank. © World Bank. <https://openknowledge.worldbank.org/handle/10986/31805>. License: CC BY 3.0 IGO
- Hauge ÅL (2019) Attitude in Norwegian insurance companies towards sharing loss data. SIWI World Water Week, Stockholm, Sverige, 25–30.08.2019. Downloaded at https://static1.squarespace.com/static/54ff1c6be4b0331c79072679/t/5d778390fe618371434635f3/1568113557410/WWW_Attitudes+to+sharing+loss+data_25.08.2019_%C3%85LH.pdf
- Hindlian A, Lawson S, Banerjee S, Duggan D, Hinds M (2019) Taking the heat: making cities resilient to climate change. Published by Goldman Sachs Global Markets Institute. Downloaded at <https://www.goldmansachs.com/insights/pages/gs-research/taking-the-heat/report.pdf>
- Insurance Europe (2019) Annual Report 2018–2019. Downloaded at https://insuranceeurope.eu/sites/default/files/attachments/Annual%20Report%202018-2019_WEB.pdf
- Joyce J, Marchal R, Graveline N, Thakar K, Altamirano M, Tacnet J-M, Zorrilla P Weinberg J, López-Gunn E (2018) DELIVERABLE 8.2; first roundtable report and policy brief. EU Horizon 2020 NAIAD Project, Grant Agreement N°730497
- Kousky C (2019) The role of natural disaster insurance in recovery and risk reduction. *Ann Rev Resour Econ* 11:399–418
- Kunreuther H (2019) The role of insurance in risk management for natural disasters. In: *The future of risk management*. University of Pennsylvania Press, pp 267–285
- Le Coent P, Herivaux C, Calatrava J, Marchal R, Mounccoulon D, Benitez-Avila C, Altamirano M, Gnonlonfin A, Graveline N, Piton G, Daartee K (2020) Is-it worth investing in NBS aiming at mitigating water risks? Insights from the economic assessment of NAIAD case studies, EGU General Assembly 2020, Online, 4–8 May 2020, EGU2020-22537, 2020. <https://doi.org/10.5194/egusphere-egu2020-22537>
- Marchal R, Piton G, Lopez-Gunn E, Zorrilla-Miras P, Van der Keur P, Dartée K, Pengal P et al (2019) The (re)insurance Industry's roles in the integration of nature-based solutions for prevention in disaster risk reduction—insights from a European survey. *Sustainability* 11(22):6212. <https://doi.org/10.3390/su11226212>
- Mayor B, Zorrilla-Miras P, Coent PL, Biffin T, Dartée K, Peña K, Graveline N, Marchal R, Nanu F, Scrieu A et al (2021) Natural assurance schemes canvas: a framework to develop business models for nature-based solutions aimed at disaster risk reduction. *Sustainability* 13:1291. <https://doi.org/10.3390/su13031291>
- Nesshöver C, Assmuth T, Irvine KN, Rusch GM, Waylen KA, Delbaere B, Haase D, Jones-Walters L, Keune H, Kovacs E, Krauze K (2017) The science, policy and practice of nature-based solutions: an interdisciplinary perspective. *Sci Total Environ* 579:1215–1227
- Somarakis G, Stagakis S, Chrysoulakis N (eds) (2019) *Thinknature: nature-based solutions handbook*. ThinkNature. EU Horizon 2020 programme grant agreement No 730338
- Stagakis S, Somarakis G, Poursanidis D, Chrysoulakis N, Enzi (CNR) S, Bernardi A, Mortimer N, Nikolaidis N, Lilli M, Goni E, Van Rompaey S, Jurik J (2019) Policy proposals and decision-making mechanisms for risk management and resilience. Deliverable 5.4. ThinkNature. EU Horizon 2020 programme grant agreement No 730338
- Uhlenbruch P (2019) *Insuring a low-carbon future: a practical guide for insurers on managing climate-related risks and opportunities*. Published by Shareaction. Downloaded at <https://aodproject.net/wp-content/uploads/2019/09/AODP-Insuring-a-Low-Carbon-Future-Full-Report.pdf>
- Weinberg J, Kjellen M, Coates D (2018) Enabling uptake of nature based solutions. In: Coates D, Connors R (eds) *World Water Development Report 2018: Nature based solutions for water*. UN World Water Assessment Programme, Geneva

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

