

# Chapter 8

## NAS Canvas: Identifying Business Models to Support Implementation of Natural Assurance Schemes



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### Highlights

- The NAS canvas enabled to elicit together with the stakeholders the value proposition of NAS and the components required to build a business model.
- The NAS canvas is flexible and replicable to any NAS or NBS strategy regardless of the stage or the context.
- One of the main difficulties in building business models is to engage indirect beneficiaries within the pool of payers and funders.
- Legislation can become either a critical enabler or a barrier for the development and implementation of business models for NAS.

### 8.1 Introduction

Extreme weather events and water challenges have ranked within the top three greatest risks to the global economy for the last 5 years, according to the World Economic Forum annual assessments (WEF 2019). Around 70–90% of the economic losses caused by floods across Europe between now and 2050 can be attributed to the increase in the value of assets in floodplain areas, with the rest attributed to climate change (EEA 2016). Conventional infrastructural measures are expensive – the investment needed in water infrastructure over the next 15 years has been estimated at 22 trillion dollars, which is more than half of the total expected infrastructure investment demand (USD 41 trillion) (WEF 2019). As discussed in

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previous chapters, there is a realisation on the relevance to move earlier into the disaster management cycle while helping to adapt to climate change, by mainstreaming and normalizing NBS as an alternative or complement to conventional grey solutions to prevent or reduce risks, thus increasing resilience and response capacity to water related hazards. However, NBS are facing several specific barriers for scaling up, including the difficulty to access funding and financing schemes from the lack of real examples providing evidence on their capacity and viability, and thus provide investor confidence and lower investment risks. Furthermore, making this type of projects attractive for private and impact investors requires a clear identification and quantification of the value proposition provided by these solutions, as well as a strong business case that ensures return of investment, particularly in the mid to long term. Most NBS projects fail to develop such a business case partly due to the limited data and evidence on the range of benefits provided by NBS, and their respective value. These projects also need to assess how the value generated – in our case by natural assurance services converted into viable schemes – through risk reduction and additional co-benefits can be captured and generate a series of revenue streams that makes them financially viable, similar to the business models developed for private projects providing goods and services. Identifying the “business model” for an NBS project – including a quantified value proposition, the elements required to deliver this value (resources and stakeholders), the costs of delivering this value, the range of beneficiaries and potential pool of clients and the associated possible revenue streams – will be an essential step to build a convincing business case that reduces the perceived risk by investors, also identifying the possible mix of funding sources to cover the whole range of lifecycle costs and also consider the opportunity costs.

In order to support the identification of possible business models for NAS projects, taking into account their particularities like providing public goods and services, the NAS canvas framework has been developed, as well as a template that allows a clear visual representation, entitled Natural Assurance Schemes canvas. The NAS canvas framework and template are built on the basis of a pluralistic approach to the value proposition in a relational manner, considering the whole range of different values (i.e. risk reduction and co-benefits) and spanning the public, collective and private domains. In other words, they display the components, actors and roles involved in the business model, as well as the relations between them following a market service provision logic (supply → service → demand). This chapter presents the NAS canvas framework and tool, as well as the co-design process followed for its application to the case studies. It also discusses the transversal findings derived across case studies, as well as the lessons learnt from the application co-design process, with views to replication and upscaling of the tool.

## 8.2 The NAS Canvas Conceptual Framework

The NAS canvas framework has been developed to guide the identification of the whole set of values generated by both NAS projects and NBS strategies and the set of elements and actors required to capture this value and turn it into a business or marketable service. The framework is aimed to sequentially identify and describe three aspects: (i) the co-design process and modules involved in the provision of climate adaptation (including natural risk reduction) services by an NBS or set of measures (NBS + soft/hybrid/grey measures), from both the supply and the demand side; (ii) the actors involved and their potential roles; and (iii) how the value of these services can be translated into revenues or funding resources required for the execution and maintenance of the measures. Hence, it can be used for the identification of potential business models and the required elements for NBS implementation, but also serves as a comprehensive framework to integrate the different steps from problem identification all the way to project design and implementation arrangements to accelerate NBS uptake for risk reduction and co-benefits (the assurance value). It also helps collect, organise and diagnose the type of information required and available in a way that is useful to engage and convince different stakeholder, particularly problem owners and potential investors to stimulate interest and potential buy in and collective momentum for this type of initiatives.

The NAS canvas framework is an adaptation of the traditional business model canvas, tailored to the specificities of DRR and climate adaptation services, and their contextual framework. It is composed of 8 clusters that go through the different steps required to identify the elements composing a business model for the commercialization of a product or, in this case, a service (see Fig. 8.1). The business model canvas is traditionally used to support companies and businesses to identify and structure their value proposition and the elements required to develop a strong and viable business model for the delivery of a product or service to the market. The most acknowledged business canvas is the one proposed by Osterwalder and Pigneur (2010).<sup>1</sup> The NAS canvas builds on this traditional business canvas model, and expands it, tailoring it to account for the specificities of climate adaptation services, DRR and the development of NAS schemes from potential NBS strategies. To do so, a review of the latest business model canvases for nature and NBS was carried out to identify the state-of-the-art advances in this field. Among the identified approaches (Topoxeus and Polzin 2017; Coles and Tyllianakis 2019; Mc. Quaid 2019; Somarakis et al. 2019), the ‘PPP canvas’ developed by the Inclusive Business Hub was considered the most applicable and aligned with our purpose, as it kept all the original canvas elements and adapted it for ecosystem services provided by nature, thus accounting for non-tangible and non-marketable values. It thus inspired the introduction of two new elements into the traditional canvas: a distinction between direct and extended beneficiaries (components 10A and 10B), impact (component 15), marked in purple font in Fig. 8.2. The canvas was expanded to

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<sup>1</sup> Available at <https://strategyzer.com/canvas>

CLUSTER C. SUPPLY		CLUSTER A. FLOW OF ES SERVICES		CLUSTER E. DEMAND	
<b>STEP 4. WHO IMPLEMENTS</b> Identify the stakeholder who takes the responsibility or initiative of implementing the solution	<b>STEP 1. PROBLEM TO BE ADDRESSED</b> Describe the main problem derived from exposure to water-related risks to be addressed	<b>STEP 9. WHO OWNS THE PROBLEM</b> List the stakeholders affected by the problem.		<b>STEP 10. CUSTOMER SEGMENTS</b>	
<b>STEP 5. KEY MEASURES</b> List of measures composing the strategy, and a breakdown of main measures to be undertaken.	<b>STEP 2. VALUE PROPOSITION</b>	<b>10A. Direct Beneficiaries</b> Stakeholders who benefit from the main value (avoided damages)	<b>10B. Clients</b> Stakeholders who would actually pay for the service	<b>10C. Extended Beneficiaries</b> The range of stakeholders who benefit indirectly from the other services or co-benefits	
<b>STEP 6. KEY RESOURCES</b> Type of resources needed to implement the measures, e.g. funding, knowledge, people and capacity, legal frame, political support, other, ....	<b>2A. Main service and value</b> Identify the main risk reduction service and the associated value as avoided damage costs (see chapter 6)	<b>2B. Other services and values</b> List the co-benefits and associated values estimated using the method in chapter 6.			
<b>STEP 7. KEY PARTNERS</b> key stakeholders you need to engage with to obtain the resources, or to undertake the implementation, e.g. subcontractors, knowledge partners, financing partners, governance partners	<b>CLUSTER B. REGULATORY CONTEXT</b> <b>STEP 3. REGULATION</b> Main legislation enabling or hampering the implementation of the solution. It is also relevant to highlight regulatory gaps.	<b>CLUSTER F. ABILITY/WILLINGNESS TO PAY</b> <b>STEP 11. REVENUE STREAM</b> Identify the potential income streams that could emerge from the willingness of the different type of customers to pay for the services/value generated			
<b>CLUSTER D. COST STRUCTURE</b> <b>STEP 8A. Life Cycle Costs</b> Costs of implementing the NBS measure Including capital, operation and maintenance (see chapter 6)	<b>CLUSTER E. SUPPLY-DEMAND INTERACTIONS</b> <b>STEP 13. CUSTOMER RELATIONSHIPS</b> Describe the type of communication between service provider and clients, e.g. direct assistance, transaction, automated (through a platform), community, etc.	<b>STEP 12. FUNDING COMING FROM</b> <b>12A. Tariffs</b> service use tariffs charged to the clients <b>12B. Taxes</b> taxes charged to the users or indirectly to all citizens <b>12C. Transfers</b> funds provided by the state or other international entities coming from public or international aid funds <b>12D. Private investments</b> private money invested by external private investors or donors, philanthropy investments or investments by private stakeholders (i.e. farmers).			
<b>STEP 8B. Opportunity costs</b> Avoided benefits from implementation of alternatives (see chapter 6 in this volume)	<b>STEP 14. CHANNELS</b> Means of communication between service provider and clients, e.g. mail, email, workshops, online platform, etc...				
<b>CLUSTER H. IMPACT</b>					
<b>STEP 15. IMPACT THROUGH KPIS</b> List the different biophysical, economic or social impacts expected from the implementation of the measure, by using a list of key performance indicators. These can be identified through the method described in Blasco et al. (2022, chapter 7 in this volume). The impact values should be assessed applying the methods in chapters 4 and 5.					

**Fig. 8.1** NAS canvas. Colour legend: **Red:** Traditional business Canvas; **Purple:** PPP business canvas; **Green:** NAIAD project framework. (Source: own elaboration)

ROTTERDAM NAS STRATEGY: URBAN WATER BUFFER, SPANGEN, ROTTERDAM		CLUSTER E - DEMAND
<p><b>CLUSTER C. SUPPLY</b></p> <p><b>4. WHO IMPLEMENTS</b> Municipality of Rotterdam</p> <p><b>5. KEY MEASURES</b> Construction of retention tanks, biofilter and infiltration and recovery wells. Monitoring of water quality to maintain infiltration permit. Automated operation.</p> <p><b>6. KEY RESOURCES</b> Stakeholder engagement; technical expertise; climate adaptation policy programmes.</p> <p><b>7. KEY PARTNERS</b> <b>Operators:</b> Evides Water Utility; <b>End-users:</b> inhabitants, Sparta Stadium; <b>Regulator:</b> Water Authority Delfland Implementing partners: TKI Urban Waterbuffer Consortium</p>	<p><b>CLUSTER A. FLOW OF SERVICES</b></p> <p><b>1. PROBLEM TO BE ADDRESSED</b> Water nuisance during heavy rainfall and lack of green in the neighbourhood</p> <p><b>2. VALUE PROPOSITION</b> Capturing and storing rainwater to avoid water nuisance, while creating a new local source for high quality freshwater supply with one integral solution..</p> <p><b>2A. Main service and value</b> 1400 m<sup>3</sup> of retention to reduce local flood risk = €700,000<sup>3</sup> Alternative local water source, supplying 15,000 m<sup>3</sup> of filtered rainwater per year to Sparta football stadium = €682,000<sup>4</sup></p> <p><b>2B Other services and values</b> Reduced pumping requirements: €75,000<sup>4</sup> Energy savings from reduced water production: €44,000<sup>5</sup> Emissions savings: €8,000<sup>5</sup>. Increased greenery and improved aesthetics resulting in higher property values; €561,000<sup>6</sup> Increased water awareness</p>	<p><b>9. WHO OWNS THE PROBLEM</b> Municipality and inhabitants</p> <p><b>10. CUSTOMER SEGMENTS</b> <b>10A. Direct Beneficiaries</b> Municipality of Rotterdam, Local residents, Local Businesses</p> <p><b>10C. Extended Beneficiaries</b> End user of the water (local football club)</p>
<p><b>CLUSTER D. COST STRUCTURE</b></p> <p><b>8A. Life Cycle Costs (50 year timeframe)</b> Capital expenses: €1,245,876 Regular maintenance: €425,089 Capital maintenance: €16,326 Direct support: €10,000 Indirect support: €18,000 Total: €1,715,291</p> <p><b>8B. Opportunity costs</b> Land where 90 m<sup>2</sup> biofilter is located cannot be used for other purposes (land value of €372/m<sup>2</sup>) = €33,480</p>	<p><b>CLUSTER B. REGULATORY CONTEXT</b></p> <p><b>3. REGULATION</b> <b>Broader context</b> - Municipal water Plan (2011); Municipal Water Plan (revised, 2012), Rotterdamse Adaptatiestrategie (2013); Resilient Rotterdam and Water Sensitive Rotterdam Programs <b>Specific relevant regulations</b> - Groundwater legislation (see STOWA rapport 35A, 2015 - <i>Ondergrondse Waterberging, Infiltratiebesluit bodembescherming 2009</i>)</p>	<p><b>11. REVENUE STREAMS</b> End user of water (football club) - pay for water supply Residents - increased tax revenue through higher property values Water Utility - In kind contributions; operational responsibility in exchange for exploitation of water well</p> <p><b>12. FUNDING</b> <b>12A. Tariffs</b> - Water tariff of €0.91/m<sup>3</sup> to cover operational costs <b>12B. Taxes</b> - Indirect funding through water taxes <b>12C. Transfers</b> - Innovation fund (case specific) <b>12D. Private</b></p>
<p><b>CLUSTER G. SUPPLY-DEMAND INTERACTIONS</b></p> <p>Long term partnerships, Consortium Agreements, Operation &amp; Maintenance contracts <b>14. CHANNELS</b> Direct communication, stakeholder meetings, documentation and reporting on system performance.</p>	<p><b>CLUSTER H. IMPACT</b></p> <p><b>15. KPIs</b> Number of separated sewer overflows to surface waters / year; Target: &lt; 2 per year Amount of infiltrated/stored water; Target: 30,000 m<sup>3</sup>/year Amount of water supplied; Target: 15,000 m<sup>3</sup>/year Quality of water after treatment; Target: Ongoing compliance with legislation on water quality for infiltration and reuse.</p>	

**Fig. 8.2** NAS canvas applied to the Rotterdam case study described in Dartee et al. (2023, Chap. 16 in this volume). (1) Estimates from site data. (2) Value over 50 years, energy use of avoided water production = 0.35 kWh/m<sup>3</sup> (Vewin 2017), electricity = €0.17/kWh. (3) Value of retention = €500/m<sup>3</sup> Gemeente Rotterdam 2019). (4) Value over 50 years, avoided pumping costs = €0.05/m<sup>3</sup> (Arcadis 2019). (5) Value over 50 years, electricity = 569 g CO<sub>2</sub>/kWh (Moro et al. 2018), carbon price of €54/ton (High Level Commission on Carbon Prices 2017). (6) 4% increase on 100 households nearest to UWV (Bervaes 2004), average property WOZ value in Spangen = €140,233 (Gemeente Rotterdam 2019). (7) Value over 50 years, water tariff = €0.91/m<sup>3</sup>. (Source: own elaboration)

incorporate the essence and elements of the economic framework developed by Le Coent et al. (2023, Chap. 6 in this volume; Graveline et al. 2017). The new components coming from the NAS framework are distinguished with green font in Fig. 8.2. This resulted in the NAS canvas framework, which allows to capture the whole set of co-values, actors and contextual settings inherent to NBS strategies that will ultimately determine and condition the structure and feasibility of a NAS business model. The framework is composed of 8 clusters as shown in Fig. 8.1.

- **Cluster A. Flow of natural assurance services**, which describes the problem to be addressed, and the value proposition distinguishing between main value (risk reduction) and other values (co-benefits).
- **Cluster B. Regulatory context**, which lists the main regulatory context, supporting or conditioning the implementation.
- **Cluster C. Mapping the supply**, which identifies the main implementing actors, measures, resources (human, knowledge or economic), and partners required to provide the service.
- **Cluster D. Mapping the costs of the service**, which identifies the main financial costs, distinguishing between lifecycle costs (implementation and operation and maintenance costs) and opportunity costs, as defined in Le Coent et al. (2023, Chap. 6 in this volume).
- **Cluster E. The demand**, which identifies the main problems owners, i.e. people that suffer the problem, who turn into beneficiaries of the solution. These breakdown into direct beneficiaries, clients and indirect beneficiaries, as explained in Fig. 8.2.
- **Cluster F. Mapping ability/willingness to pay**, which makes the connection with how the willingness to pay by the different groups of beneficiaries, can turn into potential revenue streams or funding sources to support the implementation and maintenance of the solution. Funding sources can be of four types: (a) tariffs paid for the use of the service; (b) taxes for indirect payment for the service; (c) transfers from the government or international institutions with public funds; (d) private investment by donors, investors or private users.
- **Cluster G. Mapping the supply-demand interaction**, which identifies the type of relationship established between the service provider and the client, as well as the channels through which communication takes place.
- **Cluster H. Impact**, which displays the expected impact from the implementation of the measures through a series of quantified key performance indicators spanning environmental, social and economic aspects.

### 8.3 Applied Tools and Methods: How the NAS Canvas Is Used

The NAS canvas template was developed as a visual representation of the NAS business model components. This template has been applied in nine case studies for the different NAS strategies considered. Figure 8.1 shows the NAS canvas template

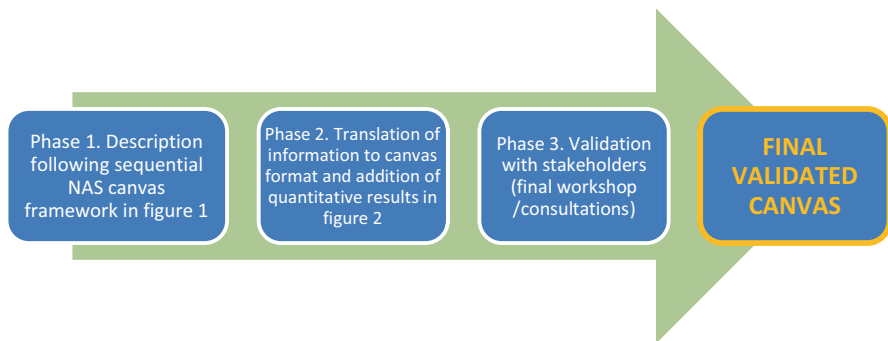
indicating with the different colours the source of the components, i.e. the traditional business canvas, the PPP canvas or NAS's economic framework. In the figure, the components within the clusters described in the previous section are numbered as sequential steps to follow in a specific order to facilitate its use, and a description of the expected pre-filled content instructions provided in each box for all separate components. To apply the tool, the intended user should follow the steps and fill in the information requested. The user will immediately notice how each step builds on the previous steps, following a specific logic that allows the sequential identification of the required information.

The information needed as input to fill in the NAS canvas for the case studies comes from the methodologies and assessments described in the previous chapters in this volume. Figure 8.2 illustrates the actual application of the NAS canvas to the Rotterdam NAS and NBS strategy as described in Dartée et al. (2023, Chap. 16 in this volume). The Rotterdam case study has the most complete and detailed information to fill in the NAS canvas since it has already been fully implemented and it is in the co-design process being replicated to another country, allowing to contrast and complete the assessments with accurate estimations based on empirical evidence.

## 8.4 A Staged Approach in the NAS Canvas Implementation

The application of the NAS canvas framework to the NBS strategies in the case studies to develop NAS, was done in several phases. This included a co-design and collaborative approach as highlighted in the stakeholder protocol described in Lopez-Gunn (2023, Chap. 2 in this volume), and Van Cauwenbergh et al. (2023, Chap. 19 in this volume) – of qualitative and quantitative completion and collaborative validation, following the sequence described in Fig. 8.3.

**Phase 1** During Phase 1, each case study applied the NAS canvas framework in a linear table format to identify and qualitatively describe all the elements required to build a successful business model for the strategy. The description is completed



**Fig. 8.3** Sequence of NAS canvas framework application to the case studies. (Source: own elaboration)

with the quantitative results from the economic analysis (based on Chap. 6) looking first at the main service and value through avoided damage costs (step 2A), co-benefits and results from the valuation (2B), cost structure (8), and impact indicators with KPIs (step 15) from the biophysical and social analyses (based on Chaps. 4 and 5) (see Fig. 8.1).

*Reflection and lesson learnt from the implementation of phase 1:* some case studies applied the full economic analysis and some could only do it partially. In the second case, a qualitative estimation of the information was provided based on the case study team knowledge, which was validated with the stakeholders (e.g. river basin agency staff, etc.). In the particular case of “Other service and values” (step 2B in Fig. 8.2), different methods were selected by each case study to carry out the co-benefits valuation as reported by Le Coent (2023, Chap. 6 in this volume). Therefore, the values provided for the co-benefits were expressed through different indicators, units and approaches, some quantitative and some qualitative.

**Phase 2** During the second phase, the detailed description was revised by the canvas development team and transferred into the canvas format. Several cases had specificities that needed to be addressed through iterations and discussions with the case study leaders regarding the type and depth of the information required.

*Reflection and lessons learnt from the implementation of phase 2:* In most cases the “customer relationships” (step 13) was the most difficult to understand and apply. This has identified the importance in the future to develop a typology of potential customer relationships to help the usability of the canvas to other cases.

**Phase 3** The third phase consisted in validating the resulting NBS strategies into the NAS canvas with the case study stakeholders. This was done in a workshop planned within the stakeholder protocol (see Chaps. 2 and 18) or through alternative consultations with critical stakeholders. A standardized validation exercise was carried out, which entailed splitting the workshop participants into as many groups as strategies to be validated, ensuring the presence in each group of a varied representation of stakeholders that are most knowledgeable to the measures in a given strategy. An A1 printout of the strategy’s canvas was used in each group leading the stakeholders step by step in a facilitated co-design process, to complete and validate the relevant information. In some cases, stakeholders were asked to rank the most probable element within the group (i.e. the most probable agent to pay for the service). The results were fully validated canvases which incorporated stakeholders’ knowledge and perceptions.

*Reflection and lesson learnt from the implementation of phase 3:* some case studies could not validate the canvas in a workshop. Instead, the canvas was validated through one-to-one consultations with the key stakeholders (e.g. in the case of Lodz and Thames).



## 8.5 Common Factors and Lessons Learnt from NAS Canvas Application to Case Studies

### 8.5.1 Lessons Learnt from the Case Studies

The **main value of the case study strategies** is the disaster risk reduction capacity, valued through the avoided damages or insurance value (see glossary of terms). All case study strategies were mainly focused on natural hazards. The majority on flood risk reduction, with the exception of the Medina case study which focused on addressing drought risk. However, in some case studies there was an additional environmental objective for the selected measures that was prioritized by stakeholders, sometimes even higher than the risk reduction itself. This was the case of the aquifer stabilisation and wetland recovery in Medina case study, or biodiversity recovery in natural areas in Glinščica case study. Therefore, these objectives had to be included as main value and main selling points that naturally stirred the interest of potential implementers. This highlights the importance of the multi-value or multi-functionality nature of NBS, which constitutes one of the strongest comparative advantages as compared to grey solutions. Among the **other values (co-benefits)**, all the NAS strategies across case studies provided all three types of co-benefits (i.e. environmental, social and economic) regardless of the type of strategy. In addition to environmental benefits, the creation of jobs, the emergence of additional economic measures through new businesses, or the attraction of tourism are all important common features that need to be valued, valorised and turned into revenues to increase the viability of the scheme and its operation and long term maintenance, both in urban interventions where these benefits are more localized and at the territorial scale. However, the quantification of these values ex-ante is extremely complex, as is reflected in the canvas in Fig. 8.3.

The range of **measures** implemented included a mix of pure NBS (Lower Danube, Glinščica, Brague, Lez, Lodz), a mixture of grey and NBS measures (Thames, Copenhagen, Rotterdam) and a mix of NBS and soft or management measures (Medina). In the case of Medina NBS Strategy 2, which combined crop changes towards drought resilient species (NBS) with groundwater extractions control and creation of WUAS (management measures). This combination proved particularly effective (see Chaps. 6 and 11). Furthermore, it allowed aligning the environmental goals set by the EU Water Framework Directive (through management measures to reduce water abstractions) with the risk reduction and economic sustainability goals facilitated by the NBS.

The range of **resources** required for the implementation of the measures pivot around four main types: funding, knowledge and capacities, stakeholders' engagement, political will, and an enabling regulatory environment. Accordingly, the main **partners** to be involved include representatives from all the stakeholder groups in most cases, from citizens, farmers or service users (i.e. water users), through to governmental and management institutions.

Regarding common factors across critical supply-demand components of the business models – namely **who implements, who benefits and the funding sources** –, a comparative analysis between case study strategies by scale clusters (see Chap. 2 for the classification) was done in order to consider similar scales and somehow similar types of interventions.

Large scale case studies with spatially distributed interventions – namely Thames, Medina and Lower Danube – show a mix between public and private driven implementation and funding, with larger/common use infrastructure being promoted by public institutions (mainly water and land use management agencies), and smaller spatially-spread and individual use/application measures being implemented and funded by landowners or farmers. Funding relies partly on landowner investment capacities and partly on public funding. In this case, this would be facilitated through access to external support from e.g. EU funds or other international bodies as a complement. As a result, one of the perceived barriers is the lack of cooperation and coordination and the reluctance from individual private actors who do not see a clear flow of benefits from implementation (or incentives). Therefore, providing a more explicit list of benefits, as well as additional support or clear incentives for individual private actors through different mechanisms may help get closer to a viable implementable project, including e.g. the compensation or payment for the co-benefits generated. Across the world these incentives have included a range of options like for example, subsidies from cities or regional governments to support these investments, backing to the maintenance expenses, or to the abatement of surface water charges/fees, among others (Ossa-Moreno et al. 2017). In the case of farmers, Payments for Environmental Services have been used widely to support farmers to adopt pro-environmental practices. However, in the context of NAS schemes, payments to reduce flooding risk have not been widely developed so far based on the avoided damages and co-benefits as the NAS propose, with a source of revenue coming from the anticipated avoided damages and costs.

Medium scale case studies – namely Lez, Brague and Glinščica – focused on the river catchment or sub-catchment and surroundings within a smaller area of influence. These cases report groups of municipalities and water management institutions as the main problem owners and potential implementing agents, and therefore a stronger public role. Hence, funding is mainly focused on public sources through specific (and innovative) tax mechanisms like the GEMAPI tax<sup>2</sup> in France, government funds (including national funds), and external funding from international organizations (e.g. EU funding). An interesting and pioneering example in this sense is the Barnier fund in France (see Marchal et al., this volume Chap. 3), which shows the active role played by the insurance sector with a mandatory contribution to fund NBS to reduce risks, as investors that buy into prevention aware of the magnitude of potential future losses and the benefit from early action (to prevent is

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<sup>2</sup>The GEMAPI tax is a recent tax levied at the municipal level to fund measures aiming at the prevention of floods and the management of aquatic ecosystems. This tax was created to support the transfer of this competence from the State to Municipalities, undertaken in the framework of the decentralization process.

better than to cure). Part of this investment could also be into the assurance value of ecosystems to deliver their resilience dividends. Meanwhile, in the case of Glinščica, external funding and perceived interest are considered as the critical drivers to determine the type of agent finally taking the initiative to implement the strategy (either as an NGO, a government or a private entity).

At the small city scale – namely Copenhagen, Rotterdam and Lodz-, most initiatives identify the municipalities as main promoters along with some private investments by neighbourhood communities, private sector or businesses in certain cases (i.e. Lodz). Funding strategies include indirect funding through citizen taxes, external funds from international organisations (e.g. EU grants), or community investments. It is interesting how in the case of Lodz, some public funds from the Municipality have been allocated as ‘civilian budgets’ to citizen organisations, such as ‘Housing cooperatives’, to undertake some of the interventions benefitting collectives within a certain part of the city. This kind of public-private partnerships have been important to engage the citizens and speed up the implementation of NBS in buildings in the city.

Finally, the role of **legislation** stands out as a critical element that can play either as a driver or a barrier depending on the context. The EU legislation (particularly the Water Framework Directive and Floods Directive) is found to be a strong driver and support for the implementation of NBS in most of the case studies. Another highly mentioned set of rules include the land use and rural/urban development agendas that push for innovation towards sustainable development. These pieces of legislation provide the enabling frame favouring the introduction of NBS within the investment and intervention programmes, as their comparative environmental benefits usually align with their overall strategic objectives. On the contrary, dialogues with case studies’ stakeholders revealed that strict rules and protocols on public procurement at the national and municipal level play against public initiatives to invest in NBS. Such protocols and the associated eligibility standards are usually designed for well known traditional infrastructures with short term returns of investment, which often cannot be met with NBS even if the net final benefits are higher. This can hamper the initiative of both interested administrations willing to test solutions, and proactive ones aiming to upscale and mainstream successful pilots, that hold back due to cumbersome or even unsolvable bureaucratic burdens.

### ***8.5.2 Lessons Learnt from the Modular Co-design Process: Transferability of the Method***

The application of the NAS canvas to several case studies, regardless of the context and project stage, showed the flexibility and replicability of the tool, which can be applied to any NAS and NBS strategies in different contexts. Furthermore, the tool could be also applied to NBS strategies that are not primarily aimed at risk reduction, such as climate change adaptation, by changing the main problem to be

addressed and its main value. The tool is easy to use and is focused towards scientists, technicians, project promoters and public bodies who are interested in exploring possible business model alternatives for an NBS strategy or a specific NBS in a particular project (including hybrid options mixing green and grey). The project stage should determine the level of detail of the information to be included in the canvas. In the earlier stage of the project, a qualitative description may be sufficient while a fully quantified characterization should be pursued for projects in the last stages of the co-design process (see Chap. 9). The context should determine the complexity required for the various components, such as the regulatory framework, the implementing partners, the governance and institutional arrangements, and the impact indicators to be estimated. For instance, in the case of developing countries, where the biophysical data or records on disaster damages may be scarce or non-existing (UNISDR 2014), the level of detail or accuracy of the value proposition and impact estimates may be lower. Tools like *eco:actuary* are particularly well suited for these contexts (see Chap. 4 this volume). This may also occur with projects in an early stage for which there are still some design uncertainties (see Chap. 19 on readiness levels). In these cases, the usefulness of the canvas as a tool is to provide a comprehensive and structured set of elements to guide promoters in designing an operational business model, by eliciting the value and impact of the NAS. At this stage, it can help in diagnosing the information gaps and missing elements required to build the business model, that will be also required further on as a basis to develop the business case for investors (see Chap. 9 this volume). The co-development and co-design process at the heart of the tool working hand by hand with the stakeholders can help raise awareness and buy in. It can help to elicit and document in a structured format the needs, interests and potential roles of each stakeholder. This in turn can be critical as shown in Chap. 5 (this volume) to identify trade-offs and strengthen synergies as well creating the conditions for collective action. This can be critical to engage stakeholders to invest resources (time, financial, knowledge, ...) in the process of gathering the missing information, thus lowering collectively the transaction costs that often hamper smaller projects. Meanwhile, it may also help to structure a robust justification on the information needed with a view to apply for funding from e.g. an international body to undertake the preliminary assessments required for a feasibility study (like in the case of Europe a natural capital financing facility).

## 8.6 Conclusions

Overall, the application of the NAS canvas to nine case studies enabled us to elicit together with the stakeholders, in a co-design process, the value proposition of a wide range of NAS schemes based on a range of NBS strategies for different contexts. We also built a map of actors and actions required to pave the way towards their implementation. This single, visual compilation of the expected values, required resources, actors and roles, possible funding streams, regulatory

framework and battery of indicators to measure performance, provides with a strong and comprehensive foundation to help showcase the feasibility and potential impacts from an NBS intervention, and advance towards developing the full business case and implementation arrangements (see Chap. 9). Meanwhile, from a co-design and process perspective, the application of the NAS canvas to the case studies, regardless of the context and project stages, showed the flexibility and adaptability of the tool. This could help with the replicability of NAS, enhancing the potential to develop NBS strategies and specific NBS and hybrid interventions to different contexts.

A few transversal highlights came out from the horizontal analysis of business models for NBS strategies across case studies.

First, it is an important lesson from the application of the tool that a key aspect is **to also engage indirect beneficiaries** within the pool of payers and funders, since often wider society benefits from these NAS schemes. This is in line with the role played by co-benefits in the value proposition of NBS strategies, and the fact that most of the value generated is related public goods and services, which often do not have a market. Most business models are oriented towards the generation of a good that has a market and a stated willingness to pay by clients, this in turn makes the revenue stream and capacity for reimbursement much clearer for potential investors. The fact that risk reduction and most co-benefits are public goods and/or are highly dispersed makes this valuation of willingness to pay more complex as well as its transformation into effective revenue streams.

This work also pinpoints the critical role that regulation can play in setting better rules of the game, acting as a lever for collective action aligning incentives, or making it possible to align incentives, rather than become a burden or a barrier. The legislative provisions provide the enabling frame that give investor confidence and stability, and with the new taxonomy of sustainable finance, as a strong message to tip the balance in favour of the introduction of NAS schemes as potential investments and intervention programmes. Therefore, its formulation and application at the national and local level and accompanying procedures (e.g. procurement and licensing) need to be adapted to include new types of interventions like NAS Schemes.

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