D3.1 Framework for developing finance arrangements for coastal restoration

22/12/2022

WP3

Lead beneficiary: GCF

Author/s: Fausto Favero, Lieke Hüsken, Jochen Hinkel, Heleen Vreugdenhil, Umberto Pernice, Michael Sedlmeier.

REST-COAST

Large Scale REStoration of COASTal Ecosystems through Rivers to Sea Connectivity

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Preface

The Rest-Coast Project (Large scale RESToration of COASTal ecosystems through rivers to sea connectivity) is an EU Horizon 2020 research project (Grant agreement No. 101037097) whose overall goal is to address with effective and innovative tools the key challenges faced by coastal ecosystem restoration across Europe. The approach chosen for this project will deliver a highly interdisciplinary contribution, with the demonstration of improved practices and techniques for hands-on ecosystem restoration across several pilot sites, supported by the co-design of innovative governance and financial arrangements, as well as an effective strategy for the dissemination of results.

The tasks of Work Package 3 (WP3) will focus on issues related to finance for coastal ecosystem restoration. More specifically, our research will focus on overcoming economic and financial barriers to restoration upscaling, through the identification and implementation of innovative and sustainable financial arrangements.

After establishing a framework for developing finance arrangements for coastal restoration (D3.1), innovative business models for nature-based solutions worldwide will be identified and characterised (D3.2). The review will inform the co-development of tailored business plans and scalability plans in each Rest-Coast pilot site for hands-on coastal ecosystem restoration (D3.3). The final deliverable of the work package (D3.4) will make results accessible, replicable and transferable across Europe and beyond, through accessible stepwise guidelines for best practice implementation.

Summary

By delivering a framework for developing finance arrangements for coastal restoration, this document brings the first contribution of Work Package 3 to the Rest-Coast Project.

The overarching purpose of the Rest-Coast research project is to provide the tools to address some of the key challenges faced by coastal ecosystems restoration. To achieve this objective, the Rest-Coast will improve coastal restoration practice and techniques through new hands-on restoration pilot projects, co-design effective governance arrangements and policies, and generate new tools and data for risk reduction assessment. In addition to these activities, Work Package 3 will design innovative financial arrangements and bankable business plans to support the implementation, the long-term maintenance and the scaling up of coastal ecosystem restoration. With the framework developed in this deliverable, WP3 sets the stage for its future tasks by reviewing the state of art in finance for nature-based solutions and coastal restoration, clarifying terminology and key concepts, and by providing tools for a consistent description and analysis of business models for nature-based solutions and coastal restoration projects.

The approach adopted for the development of the deliverable is based on the non-systematic review of existing literature and the comparative analysis of various frameworks, guidelines and reports that have been published in recent years on the topic of finance for (ecosystem-based) adaptation or mitigation projects. The results from the review of existing frameworks revealed the fundamental dimensions and components of the issue of financing ecosystem restoration.

In order to produce a comprehensive framework, the tools for the analysis of project-level business models provided by the present document will be further complemented by future work package 3 deliverables, which will deal with the policy and institutional enabling environment, as well as with step-wise, procedural guidelines for nature-based solutions implementation assistance.

List of abbreviations

ASEAN	Association of South-east Asian Nations	IBA	Important Bird Area
BMDG	Nature-based Solutions Business Model Development Guide	IKI	International Climate Initiative
BMF	Nature-based Solutions Business Model Framework	IN	Abbreviation of document:Investing in Nature (EIB 2018)
BOO	Build-Own-Operate	INPA	Israel Natural Park Authority
BOT	Build-Operate-Transfer	IPCC	Intergovernmental Panel on Climate Change
BNCFF	Blue Natural Capital Financing Facility	IUCN	International Union for Conservation of Nature
BTO	Build-Transfer-Operate	ICZM	Integrated Coastal Zone Management
CC	Abbreviation of document: Capitalizing Conservation (Clarmondial 2017)	IWRM	Integrated Water Resource Management
CCF	Abbreviation of document: Catalyzing Climate Finance (UNDP 2011)	LBIN	Abbreviation of document: The Little Book of investing in Nature (Tobin-de la Puenta, Mitchell, and Mardas 2021)
CF	Cohesion Fund	Lit-rev	Abbreviation of document: Mobilizing private finance for coastal adaptation: A literature review (Bisaro and Hinkel 2018)
CFin	Abbreviation of document: Conservation Finance – From Niche to Mainstream (Credit Suisse AG and McKinsey Center for Business and Environment 2016)	LVC	Land Value Capture
CPI	Climate Policy Initiative	OECD	Organisation for economic cooperation and development
CPR(s)	Common-pool Resource(s)	O&M	Operation and Maintenance

CSRD	Corporate Sustainability Reporting Directive
DB	Design-Build
DBB	Design-Bid-Build
DBFO	Design-Build-Finance-Operate
DBO	Design-Build-Operate
EBRD	European Bank for Reconstruction and Development
EDF	Environmental Defence Fund
EEA	European Economic Area
EEF	Nature-based Solutions Enabling Environment Framework
EIB	European Investment Bank
ERDF	European Regional Development Fund
EPI	Abbreviation of document: Enabling private investment in climate adaptation & resilience (Tall et al. 2021)
ES(S)	Ecosystem Service(s)
ESG	Environment, Social, Governance
ESIF	European Structural Investment Fund
ESMA	European Securities and Markets Authority
ESO	Abbreviation of document: Acting on Ecosystem Service Opportunities (Rode, J., Wittmer 2015)
EU	European Union
FinCC	Abbreviation of document: Financing nature-based solutions for Coastal protection (Eiselin et al. 2022)
FFWS	Abbreviation of document: Handbook for the Implementation of Nature -based Solutions for Water Security (Altamirano et al. 2021)
FS	Abbreviation of document: Keep it Fresh or Salty (Herr, D et al. 2014.)
MIB	Market-based Instrument
MDB	Multilateral Development Bank
NBS	Nature Based Solution
NbS-BMC	Abbreviation of document: Nature-Based Solutions Business Model Canvas Guidebook (McQuaid 2019)
NGO	Non-governmental Organisation
PES	Payment for Ecosystem Services
PPP	Public-Private Partnership
R&D	Research and Development
SDG	Sustainable Development Goal
SFDR	Sustainable Finance Disclosure Directive
SFN	Abbreviation of document: State of Finance for Nature (UNEP 2021)
SLM	Sustainable Land Management
SME(s)	Small and Medium-size Enterprises
SCI	Site of Community Importance
SPA	Special Protection Area
SPV	Special Purpose Vehicle
TIF	Tax-increment Financing
UFF	Abbreviation of document: Why 'blended finance' could help transitions to sustainable landscapes: Lessons from the Unlocking Forest Finance project (Rode et al. 2019)
UNEP	United Nations Environment Program
UNDP	United Nations Development Program
UOF	Nature-based Solutions Upscaling and Outscaling Framework

GBM	Abbreviation of document: A short guide to developing green business models (Antal and Burrows 2018)	VAT	Value-added Tax
GCF	Global Climate Forum	WBG	World Bank Group
GFDRR	Global Facility for Disaster Risk Reduction	WP3	Work Package 3
GHG	Greenhouse Gases	WP5	Work Package 5

Chapter 1. Introduction

Fausto Favero [1,2,] and Jochen Hinkel [1,2]*

[1] Faculty of Resource Economics, Humboldt University, Hannoversche Str. 27 D-10115 Berlin, Germany;

[2] Global Climate Forum e.V., Neue Promenade 6 10178 Berlin, Germany

[*] Correspondence: Fausto.Favero@globalclimateforum.org

Coastal areas are socio-ecological boundary systems that host the complex set of interplays between land and oceans or seas. The sheer amount of interdependent natural processes make coastal ecosystems such as wetlands, seagrass and coral reefs, mangrove forests among the most productive and diverse on our planet. This abundance of resources has always supported human livelihoods, and today about 40% of the global population lives within 100 km from the coast (Cohen et al., 1997). Climate change impacts, including extreme weather events, have resulted in extensive damages to marine and coastal ecosystems, and will continue to do so as global warming increases (IPCC, 2022). Moreover, coastal systems are also threatened by the combination of a number of anthropogenic pressures that arise from demographic growth, increasing economic activities, urbanisation and resource exploitation. The degradation of the environmental conditions of coastal ecosystems drastically reduces their capacity to support biodiversity and deliver climate mitigation and adaptation, among their many other essential functions. The protection and restoration of coastal ecosystems is thus a priority that must be addressed and upscaled to make our society and the environment truly resilient to climate change.

The concept of Nature-based Solutions (NBS) has recently emerged as a promising take on nature preservation and restoration. The NBS concept managed to gain widespread popularity in recent years, primarily due to its ability to adapt to different sectors and contextual variables. By stressing the linkage and potential synergies between nature restoration and sustainable economic development, NBS approaches to societal challenges have been successfully incorporated into mainstream multilateral policy discourses and recommendations. For these reasons, NBS represent today one of the most promising avenues to upscale restoration of degraded coastal ecosystems.

Despite its growing popularity and multilateral endorsements, a number of challenges inherent to ecosystem restoration prevent a swift upscaling of NBS for coastal adaptation. Natural ecosystems are constantly changing, and many of the underlying processes and the interactions with exogenous factors are not yet fully understood by scientists (Berkes and Folke, 1998). In particular, the identification and assessment of contribution of natural and human phenomena to ecosystem services dynamics is problematic, particularly when impacts and uncertainties related to climate change are taken into consideration. Another barrier is presented by the fact that NBS are highly context specific and thus highly local-based, with no single winning formula that can be applied transversally (Cohen-Shacham et al., 2016).

The integration of local and scientific knowledge, and the harmonisation of conflicting interests of stakeholders related to the natural system imply that the definition of appropriate restoration

approaches is resource demanding and time consuming. The lack of sufficient finance indeed represents a crucial challenge for the upscaling of effective nature-based coastal adaptation. Investments in this type of measure needs to increase many-fold, yet the financing capacity of public authorities through conventional funding approaches is narrowing down amidst competition with other public policy priorities (Toxopeus and Polzin, 2021). Incongruencies between short-term decision making cycles and long term NBS implementation and maintenance strategies exacerbate these issues (Kabisch et al., 2017).

Innovation in finance for NBS and other related sectors can bring solutions to close this gap, creating opportunities for the involvement of additional investors, mobilising new resources and improving the efficiency of use for those that have been already deployed. Municipal finance vehicles, public-private partnerships, adaptation/restoration-targeting bonds and funds, land value capture instruments are some of the promising avenues that need to be further explored in the context of NBS for coastal adaptation.

The purpose of **Work Package 3 (WP3) of the Rest-Coast project** is to address the need for effective financial means for the promotion of large-scale coastal restoration in the face of global changes. Four tasks in WP3 will contribute to upscale coastal ecosystem restoration by overcoming economic and financial barriers through innovative and sustainable financial arrangements, focusing on specific project pilot cases but outscaling the results elsewhere.

This deliverable (D3.1) is the outcome of task 3.1 " Stock taking and framework development" which will take stock of the current funding and financing landscape for coastal restoration and develop a consistent framework to be applied throughout the project for scaling up and innovating the funding and finance of restoration. D3.1 will therefore set the ground for the other three project tasks and related deliverables, as illustrated in Figure 1.1.

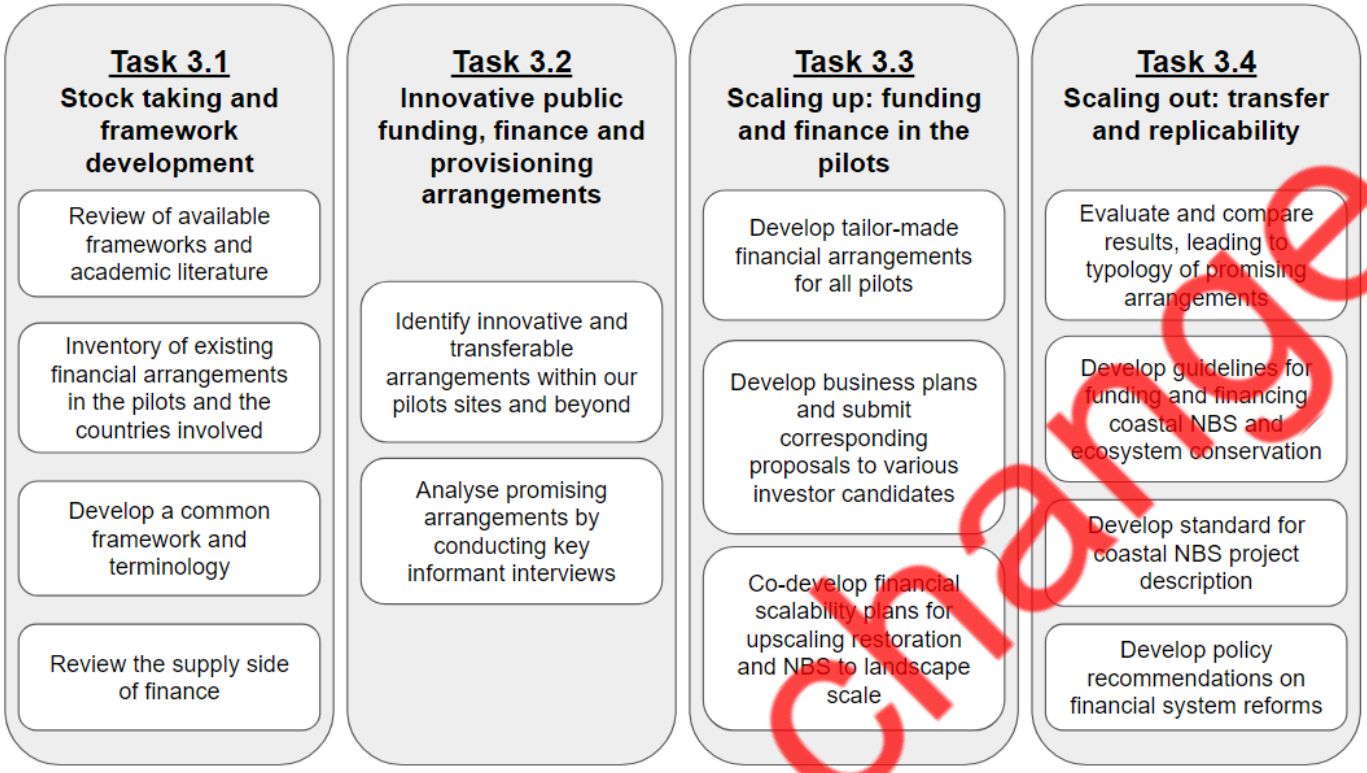

Figure 1.1 WP3 project tasks

The research of our work package will focus on overcoming economic and financial barriers through the identification and implementation of innovative and sustainable financial arrangements. We will explore promising approaches to public and private funding, financing and provisioning that have been applied - or could be applied - to coastal ecosystem restoration and NBS at various spatial scales and latitudes, with the intent of transferring their innovative elements to the Project Pilots.

For each of the pilots, tailored financial arrangements, bankable business plans and financial scalability plans will be developed through intense cooperative interactions with local stakeholders. The NBS Business plan will be a core concept in WP3. It describes the business model and impact, all roles and contractual arrangements between all actors involved in an NBS project, including quantified cash flows and non-monetary rewards, risk, as well as risk mitigation measures, relevant markets and legal structures.

The data and knowledge that will be accumulated throughout the whole process will be used to draw guidelines and policy recommendations to scale out the funding and financing of NBS for coastal adaptation. By translating our results in easily accessible propositions, we will support the replication and transfer of our achievements in future coastal restoration initiatives.

The relevance of the financing dimension for the upscaling of NBS projects stems from the fact that, while the overall level of climate change investments has been increasing in the latest years, NBS are failing at attracting finance from the private sector (Toxopeus and Polzin, 2021), and rely almost entirely on public funding. From a financing perspective, NBS projects are diverse in terms of

investment size, timing and revenue generation, risk profiles, public acceptance, co-benefits and dis-benefits generation. In a similar fashion, financing arrangements are also composite of several variable elements, as they differ in terms of involvement of public and/or private actors, revenue generation mechanisms applied - e.g. taxes, tariffs, transfers -, financial vehicles, procurement models. The respective compositeness of NBS projects on one side and financial arrangement on the other leads to a multiplicity of possible combinations, which can be theoretically and empirically explored in pursuit of innovative and effective practices. In addition, the terminology used to describe the financing of restoration and NBS is inconsistent across sectors and organisations, which hinders scientific advancements and the application of existing resources and knowledge to projects under development.

This deliverable will thus set the foundations for the rest of our research by developing an analytical project-level Framework, which we call "**NBS Business Model Framework (BMF)**", that consistently describes restoration/NBS projects and the structure of their business models. In order to develop this, the starting point will be the identification and review of existing frameworks for the analysis of financing and funding of NBS and other nature-related projects. We find that the consistency across these frameworks is not always strong, as different approaches are grounded on different assumptions and adopt different perspectives and/or foci. Despite the different approaches adopted, ultimately the various documents address the same issue, so we describe how they relate to and complement each other around this common conceptual core. In addition, we derive and characterise the fundamental building blocks that compose our selection of frameworks and guidelines, i.e a synthesis of the common/comparable elements mentioned and discussed, as this will provide us with insights on which elements should be considered for a comprehensive analysis of a NBS business case.

WP3 will ultimately develop a comprehensive **NBS Upscaling and Outscaling Framework (UOF)** for the analysis and implementation of Upscaled and Outscaled Business models for coastal restoration. With the term upscaling we refer to the expansion of a project to a larger scale within its existing context, while outscaling refers to the replication of a successful business or innovation model in new contexts.

The UOF will consist of three fundamental dimensions, or secondary frameworks (Figure 1.2).

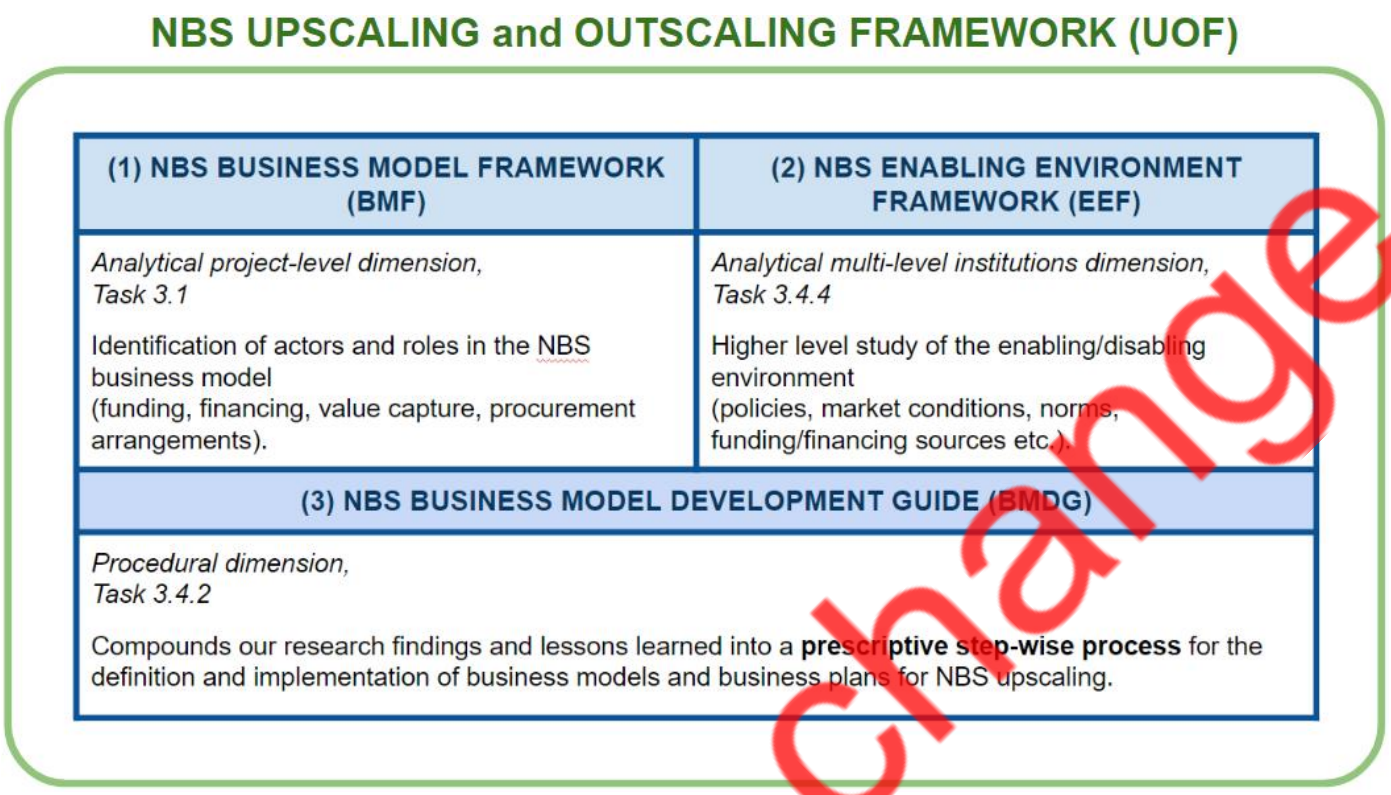

Figure 1.2 Structure of the NBS Upscaling and Outscaling Framework and description of its three dimensions

The first dimension is the already mentioned BMF, which focuses on the analysis of the project level and seeks to identify directly involved actors and to understand the contractual arrangements between them, to develop the business model, identifying funding and financing, mechanisms for revenue generation and procurement of works and services. This framework will be used in WP3 to describe the various NBS pilots and to identify which financing arrangement fit to which kind of NBS. With the exception of minor integrations and refinements, the BMF will be fully developed in the present deliverable as its main focus.

The second dimension of the UOF is the **NBS Enabling Environment Framework (EEF),** which analyse the multi-level institutional context of NBS business models, and is meant for a higher level study of the enabling/disabling environment within which NBS are embedded - policies, market conditions, norms, funding/financing sources etc. -. This framework will primarily benefit from the research and outputs expected for Task T3.4.4 of WP3 dedicated to policy recommendations and the upscaling of NBS financing and funding - which in turn builds on lessons learned from T.3.3.3-. For this reason, while some of the key concepts for this level of analysis are already addressed in the present deliverable, the framework will be fully developed in the future, in order also to capitalise on the findings of Work Package 5 (WP5) (in particular from T5.2 and T5.3) of the Rest-Coast Project on transformative governance for restoration and upscaling.

The third dimension of the UOF is the **NBS Business Model Development Guide (BMDG)**, which will compound our research findings and lessons learned from the previous analytical frameworks and the development of tailored business plans in each pilot into a prescriptive step-wise process for the definition and implementation of business models and business plans for NBS upscaling.

Similarly to the EEF, the BMDG will thus be developed at a later stage, complementing the analytical frameworks - the BMF and EEF - to form the overall, comprehensive framework for upscaling and outscaling of coastal adaptation NBS, the UOF.

Contribution of WP3 to the overall REST-COAST work plan

The ultimate objective of the Rest-Coast project consists in the implementation of upscaled coastal restoration and the demonstration of its capacity to provide low-carbon adaptation, reducing coastal risks and providing gains in biodiversity for vulnerable coastal ecosystems. WP3 plays a vital role within the project, as it will address one of the most important challenges to achieve these goals, i.e. understanding and overcoming financial barriers, while leveraging on available opportunities. The implementation of innovative solutions and the transformation of financial structures will also be critical to keep citizens, stakeholders and policy makers engaged with the pilots and committed to the long-term maintenance of coastal ecosystem restoration.

The work of WP3 is based on a systemic approach that will integrate it to the work plan and tasks of other work packages (Figure 1.3): the study of financial viability and sustainability will have as its object the upscaling restoration activities investigated in Work Packages 1 and 2, handled from a transformative governance approach by Work Package 5 and connected with the activities and findings of other European project by Work Package 7. Financially relevant data collected within WP3 will also feed into the work of WP4 on the definition of “NBS Building Blocks”, which in turn will constitute a core tool for the development of financial scalability plans.

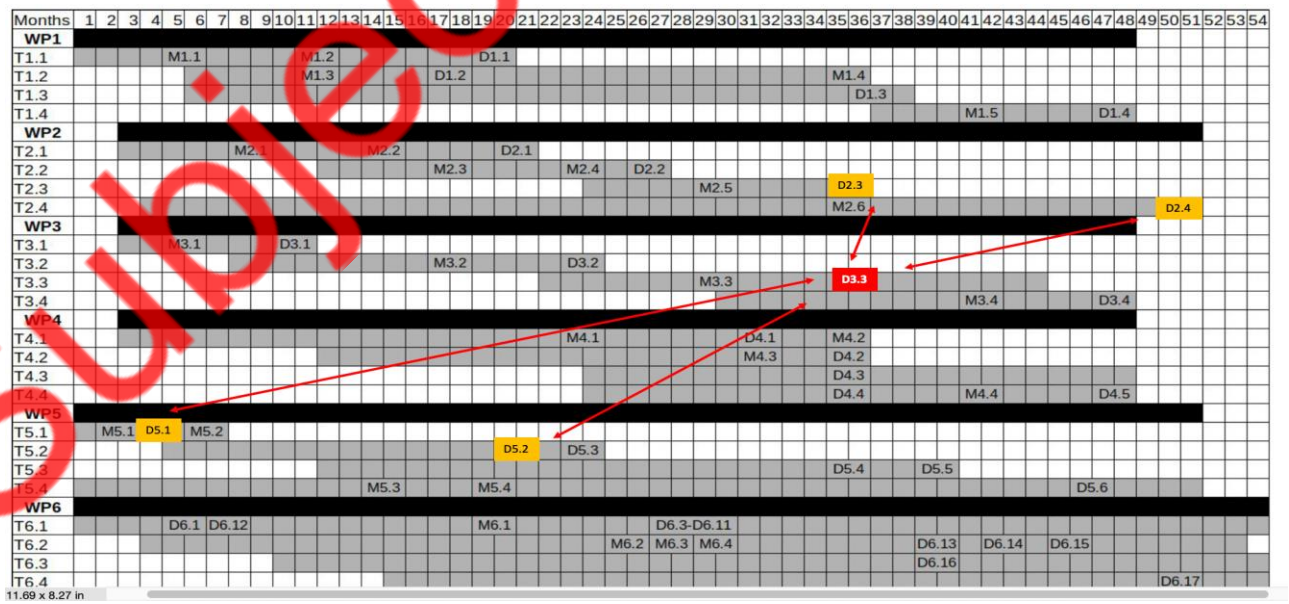

Figure 1.3 Interdependencies between WP3 and other Work Packages.

Chapter 2. Review of available frameworks and guidelines for developing financing arrangements

*Lieke M. Hüsken [3,4,**] and Heleen S.I. Vreugdenhil [3,4]*

[3] Faculty of Technology Policy and Management, Delft University of Technology, Jaffalaan 5, 2628 BX Delft, The Netherlands;

[4] Deltares, Boussinesqweg 1, 2629 HV Delft, The Netherlands

[**] Correspondence: Lieke.Huesken@deltares.nl

Numerous frameworks, guidelines and reports have been developed over the recent years to provide different actors and stakeholders with guidance on financing or creating the appropriate conditions for the implementation of (a portfolio of) infrastructural adaptation or mitigation projects. Some of these specifically address the concept of nature-based solutions or building with nature. In other cases the domain of application is more related to traditional (grey) climate adaptation and mitigation projects but does also address the challenges and approaches related to (project) finance.

Overall, these guidelines touch upon the different types of finance that could be available, how and when to approach different financiers, under which conditions finance can be provided, if and how the implementation costs can be recovered throughout the project lifecycle, and what steps should be taken to design an appropriate financing strategy. Furthermore, barriers and enabling conditions are also extensively addressed in these documents. More often than not the project specific context - including technical, environmental, social, economic, and institutional aspects - determines the financing possibilities.

As a starting point for WP3, a review of these frameworks and guidelines has been conducted. This chapter will discuss the process and outcome of this review. This review has two main objectives. The first objective is to develop an understanding of the types of documents that have been developed. This first objective tackles questions like *who are the main stakeholders addressed, who mostly produces these documents, what specific challenge is being addressed or discussed, and how is the information presented.* This first objective can be thought of as generating a deeper understanding of the typology and characteristics of the documents reviewed. For WP3 it is of importance to understand what has already been developed and for who, in order to avoid repetition of work, to make use of the knowledge already developed, and to contribute to the field by adding to the existing body of work.

The second objective is to derive a set of *building blocks* from the documents reviewed that form the foundation for the further work in WP3. As there are several different approaches and steps defined in the different documents, this activity aims to synthesise this information. These building blocks capture the different elements - such as the type of data needed, or the activities and

analyses that should be conducted - discussed in the reviewed documents which are needed to create a financing strategy for the pilot projects in RESTCOAST (WP3, Task 3).

This review is not meant to be exhaustive but rather to cover a representation of the different documents that have been developed and published. With that, this review activity and consequently this chapter aims to synthesise the available reports, tools, and guidelines, leading to an understanding of the state of the art and consecutively establish common ground for WP3. This chapter discusses the process and outcome of the review in the following way. The first section (2.1) will describe the methodology chosen and present an overview of the different documents that were reviewed. This section also discusses in more detail the focal points and research questions of the review, namely understanding the purpose of the different documents (document typologies) and the essential content elements for developing financing strategies (building blocks). The next section (2.2) will present the main findings of the review regarding the typologies of the document followed by the presentation of the building blocks (2.3).

2.1 Methodology

A selection of 15 relevant documents has been extensively reviewed. Therefore, the documents have been selected with the objective to capture different 'angles' to the problem. In other words, the selection covers publications from different types of authors -e.g., banks or financing facilities, research organisations, governmental institutions -, written by and for different stakeholders - e.g. entrepreneurs, policymakers, conservation and development planners, - and targeting different domains of application (not solely NbS for coastal areas but also broader adaptation and mitigation in other geographic areas). Table 2.1 presents the sample of documents in relation to the domains of application and geographical scope. Information about the variation in authors and target groups is presented in table 2.2.

The majority of documents reviewed here are practitioners documents (grey literature) consisting mostly of guidelines. Some documents have a scientific basis or have an associated publication in a scientific journal. The starting point for the review was the documents identified in the RESTCOAST proposal phase. These initial documents were considered to be a solid starting point as they were identified as important state of the art by scientific experts and expert practitioners in the field. From there a combination of strategies was used to expand the selection of documents reviewed, namely a search on google using combinations of a number of keywords - guidelines, frameworks, financing, strategies, nature, NbS, coast, ecosystem restoration - a backward snowballing approach and further recommendations from experts. The final list of documents considered in this review is presented in table 2.2., including also the document number and abbreviation to be further used throughout this chapter, the publication date, the domain of application, the (corporate) authors, and the funding sources that were identified. Appendix 1 contains a short summary of each reviewed document and an important quote and visual from the document, capturing the essence of the documents in relation to this review.

Table 2.1 Descriptives of the sample of reviewed documents

Document characteristics	**Number of documents from sample**
NBS, biodiversity, ecosystem restoration and conservation	10
Climate adaptation, mitigation and resilience (not focussed on NbS)	5
Coastal zones	3
Non-coastal zones or not specifically coastal zones	12

Table 2.2 Overview of reviewed documents, ordered by year of publication

Doc#	**Abbreviation**	**Title**	**Published**	**Domain of application**	**Authors (Corporate)**	**Commissioned /Funded by**
1	FCC	Financing nature-based solutions for Coastal protection – *A practical review of blended finance approaches with carbon credits from blue carbon sources*	2022	Nature-based solutions for coastal protection	Eiselin et al. (IUCN & Wolfs Company)	Netherlands Enterprise Agency
2	FFWS	Handbook for the Implementation of Nature -based Solutions for Water Security. - *Guidelines for designing an implementation and financing arrangement*	2021	Nature Based Solutions for Water security	Altamirano et al. (Deltares)	European Union - Horizon 2020
3	EPI	Enabling private investment in climate adaptation & resilience – *Current status, barriers to investment and Blueprint for Action*	2021	Climate Adaptation and Resilience	Tall et al., (World Bank Group (WBG) & Global facility for disaster risk reduction and recovery (GFDRR))	See corporate authors

4	LBIN	The Little Book of investing in Nature – A simple guide to financing life on earth	2021	Financing biodiversity conservation	Tobin-de la Puente, J. and Mitchell, A.W. (Global Canopy)	Global Canopy, supported by Agence Française de Développement, Cornell Atkinson Center for Sustainability, Credit Suisse, IDH - the sustainable trade initiative, Mirova, UNDP BIOFIN, WWF, and the German Federal Ministry for Environment, Nature Conservation and Nuclear Safety
5	SFN	State of Finance for Nature – *Trippling investments in nature-based solutions by 2030*	2021	Public and Private Investment in Nature based solutions	United Nations Environment Program (UNEP)	UNEP, Federal Ministry for Economic Cooperation and Development (Germany), Ministry of the Environment, Climate and Sustainable Development (Luxembourg)
6	UFF	Why 'blended finance' could help transitions to sustainable landscapes: *Lessons from the Unlocking Forest Finance project*	2019	Forest Finance	Rode et al.	International Climate Initiative (IKI)
7	NbS-BMC	Nature-Based Solutions Business Model Canvas Guidebook	2019	Business models of Nature-based solutions	Siobhan McQuaid, Trinity College Dublin & Horizon Nua	European Union - Horizon 2020 program
8	IN	Investing in Nature: *Financing conservation and Nature-based solutions*	2019	Nature conservation and Nature-based solutions	European Investment Bank (EIB)	European Commission, EIB
9	GBM	A short guide to developing green business models	2018	Business models for Green businesses	Antal, I. and Burrows, B. (The Ground_up centre)	European Union - Horizon 2020 program
10	Lit-rev	Mobilizing private finance for coastal adaptation: A literature review	2017	Public and private investment in coastal adaptation	Bisaro, A. and Hinkel, J., (Global Climate Forum (GCF))	European Union - Horizon 2020 program
11	CC	Capitalizing conservation - *How conservation organisations can engage with investors to mobilize capital*	2017	Investments in conservation, and sustainability more	Clarmondial AG	WWF
12	CFin	Conservation Finance – *From Niche to Mainstream: The Building of an Institutional Asset Class*	2016	Conservation finance	Credit Suisse AG and McKinsey Center for Business and Environment	See corporate authors

13	ESO	Acting on Ecosystem Service Opportunities - *Guidelines for identifying, selecting and planning economic instruments to conserve ecosystems and enhance local livelihoods*	2015	Conservation and sustainable development	Rode, J. and Wittmer, H. (Helmholtz. Centre for Environmental Research GmbH)	European Union, Thai Government, German Government
14	FS	Keep it Fresh or Salty - *An introductory guide to financing wetland carbon programs and projects*	2014	Wetland carbon conservation and restoration	Herr et al. (IUCN, Conservation International, Wetlands International	Sustainable Peatlands for People and Climate project, financed by Norad, contributions from the GEF Blue Forest project, Blue Carbon Initiative
15	CCF	Catalyzing Climate Finance - A Guidebook on Policy and Financing Options to Support Green, Low-Emission and Climate-Resilient Development	2011	clean energy, mitigation and adaptation technologies	UNDP	See corporate authors

The first focal point of the review is to generate a deeper understanding about the characteristics of the documents and what they contain. As mentioned in the introduction, the first objective of the review is to generate a deeper understanding of the typology and characteristics. To achieve this the following questions are addressed:

- *Who are the main stakeholders (target audience) addressed?*
- *What are the specific challenges or objectives being addressed?*
- *How is the information presented?*

After starting the review targeting the above questions, new insights lead to an additional question, namely *How do these different documents relate to one another (or not)?* This question was derived from the fact that all the documents addressed a similar need,namely addressing the challenge of financing NbS, yet, all the documents were different. In other words, the additional question is about understanding the "bigger picture". This first objective can be thought of as generating a deeper understanding of the typology and characteristics of the documents reviewed and which needs the documents addressed.

The second focal point of this review is to generate an understanding, based on synthesising the different documents, around what is necessary to obtain or do to develop a financing strategy. This information can be relevant for different projects, including the NBS pilots in RESTCOAST. Thus, whilst the first objective mostly considered the typology or form of documents, this second objective is more specifically targeting the content that needs to be addressed to develop a financing strategy. This is done based on a systematic identification of the methodological steps and/or activities that were identified and presented in the different documents. Similar steps from different documents were then clustered and aggregated into building blocks.

Not all the reviewed documents contained a structured or stepwise approach. For example, State of Finance for Nature (UNEP 2021) extensively discusses, as the title suggests, the state of finance, the observed financial flows and the developments that are seen, but does not present an approach for addressing the financing challenge for (NBS) project implementation. Only the documents that present and discuss a methodology or stepwise approach are considered for this part, which are 12 from the 15 documents in the review sample.

2.2 Results: Document Typologies

In this section the results of the first part of the review are presented. At the end of the section a summarising table (Table 2.3) can be found presenting all the findings that are addressed and discussed per (sub)question here.

Who are the main stakeholders (target audience) addressed?

Most of the documents contain an explicit mentioning of the target audience addressed by the authors. Logically, this is strongly connected to the objectives of the document considered. Figure 2.1 shows the range of different audiences that have been targeted by the reviewed documents. They have been categorised into six groups, namely public sector, financial sector, corporate sector, not for profit sector, NbS "implementers" and academia. There is some overlap between these categories but for clarity of the visual they have only been mentioned once. Noticeable is that several of the documents target a combination of different, cross-sectoral, stakeholders simultaneously, signalling that different sectors play a role and signalling the need to collaborate across the sectors in addressing the challenge of financing NbS.

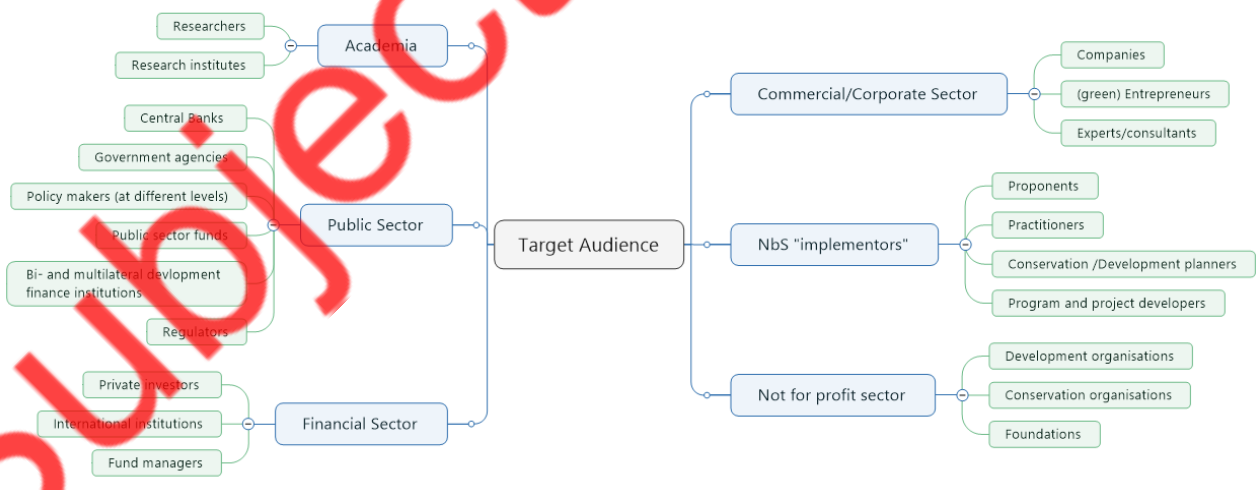

Figure 2.1 Overview of main target audiences in the reviewed documents

What are the specific challenges or objectives being addressed?

Most of the documents also explicitly describe their objectives. From all the objectives we have identified three overarching objectives, and some specific underlying goals. This is presented in figure 2.2 The overarching objectives, which capture the objectives of all the different guidelines, are i) to boost or upscale the implementation of restoration activities or NbS, ii) to unlock other sources of finance to contribute to these activities, and iii) to set in motion cross sectoral and transdisciplinary approaches.

These objectives also implicitly identify the current assumptions or gaps that need to be addressed to enable progress in addressing the challenge of financing NbS. For example, the objective to align private and public stakeholder interests implies that their interests are currently not aligned. Several of these objectives also signal a capacity building need. A learning process is needed to accomplish several of the objectives in order for the stakeholders involved to understand the different fields, processes, sectors and interests involved in addressing the challenge of financing NbS.

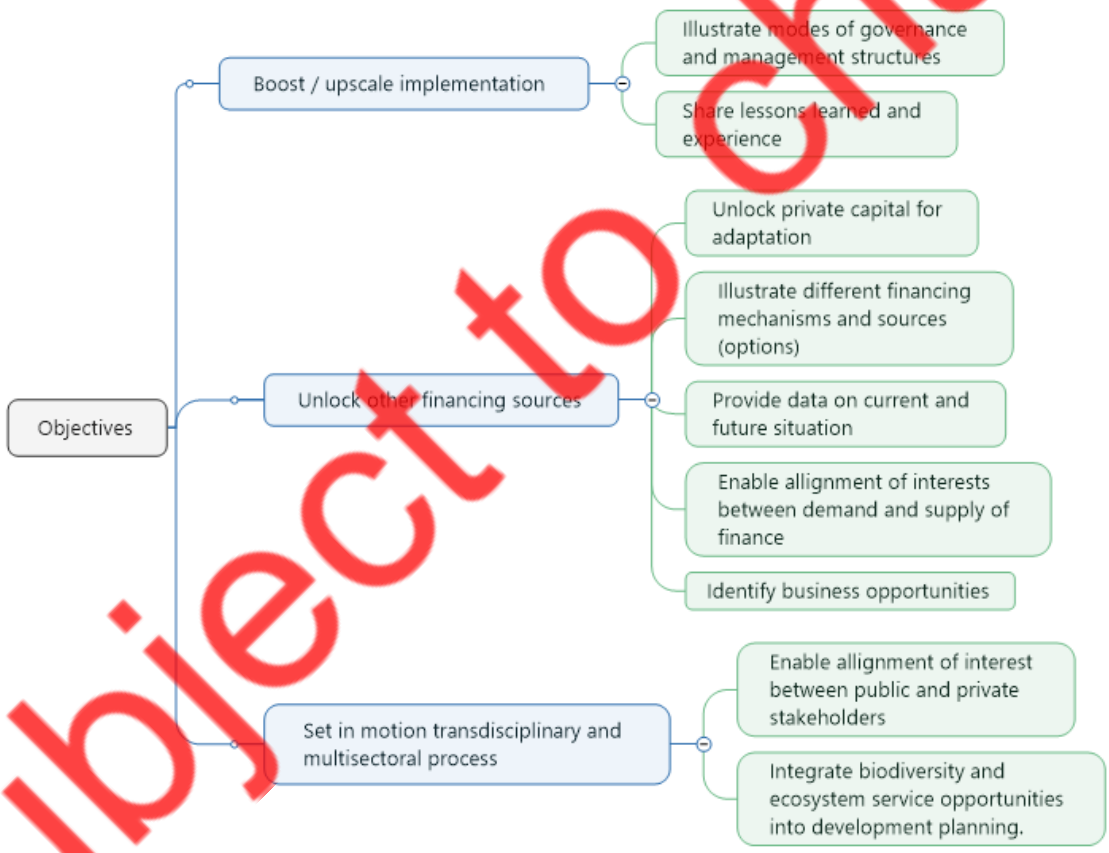

Figure 2.2 Overview of different overarching objectives in the reviewed documents

How is the information presented?

Overall, four categories of content types can be clearly identified in the reviewed documents (figure 2.3). These are **process guidelines** - also referred to as stepwise approach, blueprint, guiding

framework - , illustrating or explaining the **financial landscape,** presenting **analytical frameworks** or diagrams that illustrate some of the identified structures or range of options, and almost all documents present and discuss **examples and experiences.** Some documents contain all of the above and others only a selection.

Within the process guidelines we have further identified variations in the "entry points" taken by the authors of the documents. These are the policy or program level, the project level, or specifically for an ecosystem service of interest or a business opportunity. Within the sections about the financial landscape, a further separation can be made into documents that are dedicated to presenting and analysing (current) financial flows, and documents that tend to focus on presenting the variety of options and instruments one can choose from, including the range of public and private sources as well as other types of policy instruments that could be used.

Figure 2.3 Overview of different content types presented in the reviewed documents

How do these different documents relate to one another (or not)?

All of the reviewed documents are about the same topic, namely increasing and finding (the appropriate) finance for the project or objective concerned. Yet, all of the documents are different, in more ways than the domain of application and the target audiences. So (how) do they relate to one another? And how do they align? Figure 2.4 shows a simple conceptual diagram that illustrates the different dimensions and entry points that relate to the challenge of finding finance for NBS.

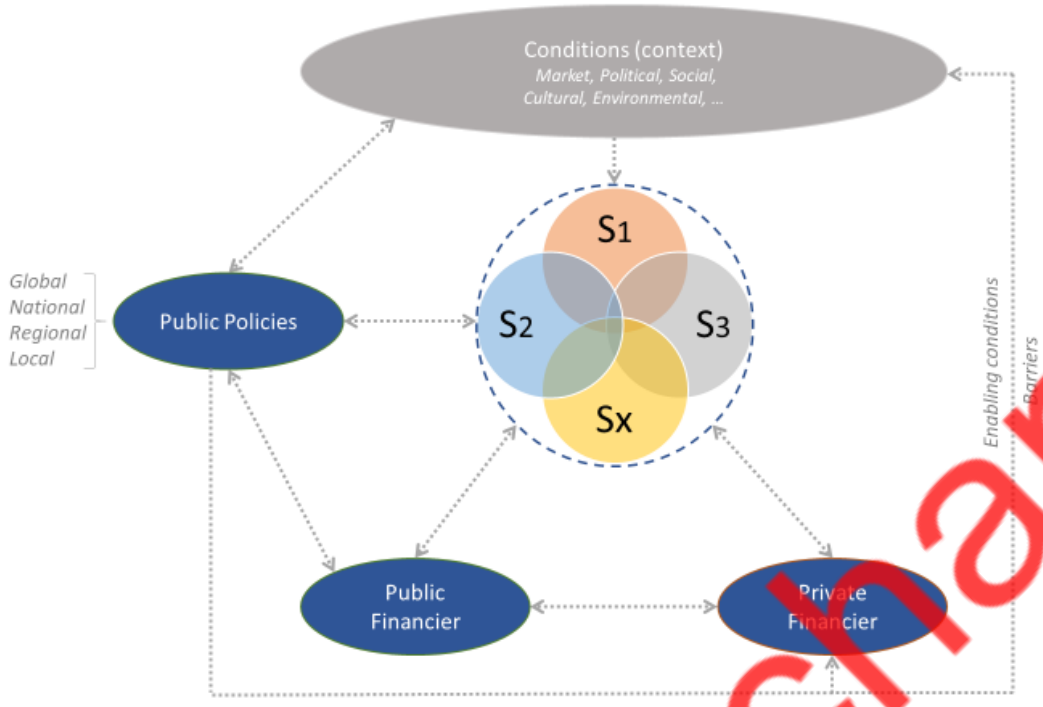

Figure 2.4 Conceptual Framework. *S represents stakeholders 1, 2, 3, ..., x. These may vary per project and over time.*

The centre of the diagram represents the **project setting**, in which (combinations of) different stakeholders are involved in the initiation of a NBS, ecosystem restoration activities, or another type of "green" (business) project. These can be for example the community, an NGO, a public actor, an entrepreneur, …etc. It is possible that there is just a single stakeholder involved or that there is a collaboration between two or more stakeholders. The **initiative** and or/ **responsibility**, and the costs and the benefits, may lie with different stakeholders. This can vary from project to project and may also vary over time throughout the lifecycle of the project/intervention. There is no standard structure, making this the first point by which the documents vary between them.

Depending on the starting-point in this project setting - which stakeholder initiates, who is responsible, what is the initiative or project about, what is the spatial and temporal scale - there are many different routes and procedures for implementation. Think of a small entrepreneur wanting to start up an educational and touristic art centre inside a natural park which is managed by an NGO. Or another situation when a water authority is initiating the construction of nature-friendly shorelines. In both cases different **procedures** exist, such as public procurement, permit applications, environmental impact assessment, and these can vary per country and per region. Thus, the existing **public policies** influence the project setting.

The project setting also encompasses the **values** that are expected to be generated by the project, such as revenues, cost savings, carbon sequestering, protection of endangered species, etc. **Agreements** are made between the stakeholders concerning the distribution of the generated

values. These values are the basis for the so-called funding model, in other words, who ultimately pays for which part of the project and the values delivered.

It is possible that within the project setting the project can be implemented and that no finance from outside sources is needed. External (outside of the project setting) finance to provide the **upfront capital** is not always necessary. An entrepreneur can use own personal savings, or a public actor may make use of the domestic or earmarked budgets from existing policies (given the project aligns with that scope). However, most of the time a source of finance is required that can provide the necessary upfront capital. This source of **finance** can be from the public sector or from the private sector, or a combination of both. The nature of the project and the funding model of the project (who will ultimately pay for the project and what values are created) determine what sources of finance can be suitable.

Back to the question, how do all the guidelines relate? Some of the guidelines target the whole scope of the conceptual model whilst others zoom in on a specific part. This will be explained for a number of the reviewed documents. For example, document number 3 (Green-win) addresses the financing possibilities of a specific stakeholder, in this case an entrepreneur and discusses how the entrepreneur can analyse and develop their own business model in the context of the project, given the external conditions (such as market demand, political stability, etc) and presents the range of financing possibilities that can then be aligned with the nature and funding model of the project.

Document number 5 (UNDP) focusses on the context and the public policies. This document is all about understanding and removing the existing barriers for involvement of private sector finance. It is thus not so much focused on the individual project setting but about creating the conditions under which all project settings can access the appropriate finance and increase the amount of private finance. So, the “external conditions” that are presented as given conditions in the guidelines in one document (e.g. document number 3) are the conditions that are being targeted or addressed in the guidelines of another document (e.g. document number 5).

Table 2.3 Summarising table of the target audiences, main objectives, and document types

#	Abbreviation	Target Audience	Main objectives	Document type
1	FCC	Dutch companies, international financial institutions, governments and private investors.	Boost the implementation of coastal NbS through increased market understanding and project preparation	Review of the financing landscape for NbS and guidelines to develop a business model
2	FFWS	Proponents of Nature-based Solutions (NbS) in general and stakeholders involved in a water security planning process	Aims to set in motion a multisectoral and transdisciplinary process that bridges the strategic adaptive planning and investment planning To design an implementation arrangement with the highest potential to ensure sustainability in service delivery in the long term.	Stepped approach with templates and examples for designing an implementation and financing arrangement for NbS and hybrid project (portfolios)
3	EPI	The public sector: Government agencies, Policy makers, Bilateral and multilateral development finance institutions, Central banks, Regulators,Public sector funds, Development organisations	How to unlock and enable private capital to (co-)finance national and local adaptation priorities.	Deep dive into state of private sector involvement followed by a blueprint for action to increase private sector involvement
4	LBIN	Governments, NGOs, the private sector and others	Identify and compare the different existing and future options for financing conservation.	Framework that organises biodiversity financing mechanisms into categories and an overview of the different mechanisms
5	SFN	Decision-makers	Provides up-to-date information about public and private sector finance that is channelled to activities and assets that can be considered NbS and to present estimates of the future needs. Help decision-makers assess how on track the world is to meet international commitments	Presents data on the state of finance into NbS and presents case studies of opportunities for public and private investment
6	UFF	Academics and practitioners	Presents and discusses practical experience and results of applying methodology to different case	Sharing of experience and lessons learned.
7	NbS-BMC	NbS initiators in cities	Help the initiating stakeholders to better communicate, plan, identify partners and explore finance for NbS	Guidebook supporting the use of the NBS Business Model Canvas (tool).

8	IN	Entrepreneurs, conservation organisations or foundations, corporations, financial institution, fund managers, cities or municipality	Help the initiating stakeholders to become eligible for commercial sources of financing by identifying the values generated that lead to a sustainable financial structure.	Guide to identify business models and explanation of financial support options, with specific attention for the Natural Capital Financing Facility
9	GBM	Green entrepreneurs and researchers and organisations that support entrepreneurs starting a green business	Align interests of potential financiers with the entrepreneurs and their green business models.	Guiding framework and basic descriptions of different types of financiers and their interest
10	Lit-rev	Academics and practitioners	Identify promising arrangements to overcome the barriers	literature based overview of investment barriers (public and private) into coastal adaptation and theoretical approach to
11	CC	Conservation organisations, investors willing to allocate capital in a way that yields positive environmental and social impacts alongside of financial returns (responsible investing)	To accelerate conservation activities by increasing the level of investment activities in the conservation space. To share experiences and lessons learnt. To guide the identification of the most appropriate investment structures, advisors and service providers	Practical framework for evaluating opportunities, showcasing of real world examples, discusses different roles organisations can play in mobilizing capital
12	CFin	Primarily targetted at mainstream investors. Also conservation project developers.	To identify product structures that have the potential to establish conservation finance in main- stream investment market	Analysis of characteristics of typical conservation / restoration projects and investor preferences and try to match these.
13	ESO	Conservation and (resource)development planners and practitioners	Assist in incorporating economic and development concerns into conservation management and to integrate biodiversity and ecosystem service opportunities into development planning.	Stepped approach with templates and examples to help in identifying, selecting and planning economic instruments to conserve ecosystems
14	FS	Program and project developers in developing countries working on wetland conservation and restoration.	Distinguishes between and identifies projects and national or subnational programs to help find those funds or financial mechanisms that best suit the type of activities intended	Generic guidance to identify different funds and finance mechanisms for wetland conservation and restoration projects, specifically focusing on the benefits related to carbon.
15	CCF	Public development practitioner (national and sub-national level) and experts involved in assisting governments in catalysing finance	To enable countries to assess the level and nature of assistance they will require to catalyse climate capital based on their unique set of national, regional and local circumstances. And to assist low-income countries to create conditions that enable public and private investment flows to address environmental and development challenges	Guidebook that focuses on a review of policy and financing instruments and mechanisms that can be combined to contribute to climate mitigation and adaptation objectives

2.3 Results: Building blocks

Based on the review of the different frameworks and guidelines a number of fundamental building blocks have been identified. These building blocks can be seen as a synthesis of the common elements mentioned and discussed in the different guidelines. Only the documents that had a chapter or component describing process guidelines or a stepwise approach are considered here (meaning three documents are excluded from the sample). Note that the names given to the building blocks are not identical to the naming of all of the steps within the reviewed documents. Terms and concepts are not used in a similar manner by all of the authors. Hence, naming the building blocks below was done based either on a high degree of consistency or overlap in the terminology used in the reviewed documents, or a name was selected which mostly reflects (according to us) the essence of the building block.

These building blocks will be used for the analysis and development of the financial strategies for the RESTCOAST pilot projects and can be seen as a road map. With this objective in mind, the building blocks are formulated from “project entry level” in which the contextual conditions (either enabling conditions or barriers) are primarily considered as exogenous. Note that these building blocks capture the elements, steps, and activities needed to enable the development of a financing strategy for the NbS project. One may recognize that some of the (sequencing of) the building blocks are similar to the processes used in Integrated Water Resource Management (IWRM) or Integrated Coastal zone Management (ICZM).

The following sub paragraphs discuss each building block briefly, followed by an overview table illustrating in which of the documents they have been addressed (extensively). The objective is not a full detailed description of each building block but to present the identified synergies between the reviewed documents and to outline the generic process. The building blocks could be mis-interpreted as being part of a linear process. This is not the case. There is an orderly logic, but, iterations and revisiting different building blocks (elements) is an essential part of the process. Furthermore, iterations can contain extra modelling activities or feasibility studies. These are not placed as separate building blocks, but the information collected should contribute towards the building blocks mentioned.

Table 2.4 Generic building blocks for developing a financing strategy

Building Block		Fin-coast-1	FFWS 2	EPI 3	LBIN 4	UFF 6	NbS-BMC 7	IN 8	GBM 9	Cap-con 11	ESO 13	Fresh 14	CCF 15
Strategic (societal) objective(s)	Challenges and problems (and data required)	X	X	X						X	X	X	
	Goals/Vision	X	X	X			X						
	Cross sectoral		X	X	X		X				X		
Situational analysis / analysis of (enabling) conditions	Stakeholder Identification and engagement		X			X	X	X	X	X	X		
	Social and cultural context		X			X	X				X		
	Environmental / Ecologcial context	X	X	X	X	X			X		X	X	
	Institutional (incl politcal and legal) context	X	X	X	X	X		X		X	X	X	X
	Economic context and market conditions		X	X			X		X	X	X		
	Financial landscape / context		X	X	X		X	X		X	X	X	X
Solution space *possible interventions*	Technical interventions	X	X		X					X		X	X
	Policy interventions		X	X	X					X	X		X
	(portfolio of) Measures	X	X		X	X		X		X		X	X
	Allignement and synergies			X	X	X				X	X	X	X
Funding model *who will pay ultimately pay?*	Identification of (ecosystem) goods and services	X	X	X		X	X	X	X		X	X	
	Identify output characteristics		X		X					X		X	
	Trade-offs and hierarchy		X		X		X		X	X			
	Identify and quantify (distribution of) costs and benefits	X	X	X	X	X	X	X	X	X	X		
	Business as usual	X	X			X		X		X	X	X	
	The 3T's		X		X		X			X	X		X
	Funding gap	X	X	X					X	X			
Financing model *who will provide the required (up-front) money and how?*	Type(s) of finance and prioritization	X		X	X	X	X	X	X	X	X	X	X
	Alligning instruments and conditions			X	X	X		X	X	X	X	X	
	Application and documentation				X	X	X		X	X	X		
	Catalyzing (blending) potential	X	X	X	X	X							X
	Risk assessment and mitigation	X	X	X	X		X		X	X			
Governance arrangements	(public) procurement, agreements and structures		X	X			X			X			X
	Intermediairies, and support facilities			X				X	X	X	X		
	Monitoring, Evaluation, reporting		X	X	X		X			X	X		
	other (non) financial inputs		X				X						
	Documentation, applications and procedures							X			X	X	
Working Principles	Collaborative approach	X	X	X	X	X				X	X		
	Lifecycle approach	X	X			X	X	X		X	X		X
	Systems approach		X	X									X
	Interdisciplinary approach		X	X	X	X					X		
	Robustness (scenario-based)			X						X			
	Adaptivity	X	X			X					X		

2.3.1. Strategic (Societal) objective(s)

This building block is about developing a generic, common understanding within the NbS project team of the **aims** of the project. What **issue(s)** or threat(s) need(s) to be being tackled or what is the opportunity considered? This will be refined along the way, when a deeper understanding of the ecological, technical and social-economic system has been developed, but a starting point is required to initiate the process. A generic aim can be as broad as "protection of biodiversity" or "decrease flood risk" which can later be further detailed in more specific objectives such as a specific type of species under threat, a certain ecosystem, or, a specific flood prone zone. Socio-economic objectives, such as livelihood objectives can be part of this generic aim and different (related) problems can be identified. If possible given the level of available knowledge a separation between short and long term challenges and aims is useful. This building block is also important to create an initial understanding of the required expertise to proceed in the situational analysis.

2.3.2. Situational analysis

This building block is about analysing and understanding the project context. A number of different "contexts" have been identified. Analysing the stakeholder context is about understanding the playing field and the players. Who are the (key) stakeholders, their attitudes, potential conflicts, and existing structure in relation to the issue(s) or opportunities of the project.

The **social and cultural context** analysis addresses the cultural characteristics of the population (such as ethnicity, language, religion), education levels and systems, community involvement, attitudes towards conservation, perceptions of the environment, and potentially specific knowledge about the local (use of) natural resources.

Analysing the **environmental context** has the purpose of understanding the conditions of the area of interest, such as land-use changes, habitat and (threatened) species types, hydrological and geological conditions, hotspots or sensitive areas, and air and water quality. Also, understanding the forces putting the system under pressure, such as pollution or urbanisation. Also important to understand the current conservation activities and measures already in place.

Next is analysing the **institutional context** (including political and legal) leading to an understanding of the distributions of responsibilities and authorities, what are the national and local policy objectives influencing the challenge addressed, how are land tenures and resource and property rights distributed (formally and informally) how is environmental protection governed, and according to which regulatory frameworks?

The **economic context** addresses amongst others the state of the infrastructure and related development plans, sources of income and main economic activities in the area, wealth, income and employment across the population in the area.

Based on the review, a **financial context analysis** is an important addition to this list. In some cases this is addressed as part of one of the other "contexts, but as the focus is on developing a financial strategy, it is mentioned here as a separate item. This analysis includes for example, whether there are important public and private investments ongoing or planned, if there are payment schemes (such as PES), tax reductions, subsidies, or markets (carbon credits) already set up, and also whether there are existing policies or schemes (perversely) affecting the desired outcomes.

2.3.3. Solution space

Define and assess possible measures and/or business opportunities that can tackle the challenges (or opportunities) to be addressed. These can include technical approaches (both ecological and traditional engineering approaches) and policy approaches such as market incentives and regulatory instruments. An important element that is being addressed in several guidelines is the realignment of policies and interventions to contribute to the common objective. This includes addressing and repurposing existing measures or subsidies that are putting the natural asset at risk. Furthermore, identifying "win-win" situations such as job creation objectives with restoration activities is often mentioned.

2.3.4. The funding model - *who ultimately pays?*

This building block is about identifying who will ultimately pay for the measures or interventions. Several documents address this without using the term "funding model". It is about understanding the values and the costs, and how these can be (re) distributed. This means on the one side an understanding of the types and magnitudes of **benefits** and/or negative effects of the intervention over the lifecycle, and the distribution of these among the different stakeholders. In most cases this will involve looking into the goods and (ecosystem) services provided. This also asks for a comparison between the current situation (**business as usual**) and the situation with the suggested interventions. The other side of the question is to generate an understanding of the expected life cycle **costs** that need to be covered. From there, it can be assessed how the costs of intervention compare to the (financial) benefits of interventions and whether there is a funding gap or not. It is also important to acknowledge and assess the **uncertainties** and risks involved in the project and the potential interventions, specifically in relation to the service provision for which ultimately someone is expected to pay.

The generic categories for funding (who ultimately pays) are the "**3T's**": taxes (earmarked or generic), tariffs (or user fees), and transfers. This reasoning can be applied to public initiatives (where the goods and services are mostly public) but also to business opportunities where users/consumers are charged for the produced goods and services. In developing the funding model, the concepts of "the **economic typology** of goods and services" (public goods, private goods, club goods, and common resources) introduced in the FFWS (document # 2) and "the **economic principles**" (steward earns, beneficiary pays, polluter pays) introduced in ESO (Document # 13) are

important foundations for this building block. The results from the different components of the situational analysis are important input for investigating and determining the funding model and as such can be considered as barriers or enabling conditions for different strategies.

2.3.5. The financing model - *who provides the upfront capital needed?*

This building block addresses the question of who will provide the up-front money needed to construct or implement the project and how (using what instrument) will the money be provided. The options available for financing and the activities in this building block depend on what the funding model looks like.

If the funding model is mostly based on taxes, which is common when the main services and goods derived from the project are "public goods" then often finance is provided from public or concessional sources. If the consumers of the services and goods can be charged (user fees) then commercial finance can potentially become available. Besides from the economic typology, the expected project output is also an important factor to consider. Thus the expected returns and outcomes of the project (**risk-return profile)** determine for a large part what financing sources could be tapped into. Some financing sources provide money for a specific purpose through a specific mechanism. A distinction can be made between performance based "return" and non-performance based "return" where return relates to what is expected by the financier in return for the money provided.

Thus, different financing sources have different characteristics. This building block is about understanding if the characteristics of the project (as the two examples mentioned above) are or can be aligned with the characteristics (or requirements) of the different sources of finance. Furthermore, the different sources of finance also have their distinct application procedures.

2.3.6. Governance arrangements

Depending on the outcomes of the previous building blocks and the project characteristics this building block addresses the choices to be made in how the infrastructure and the goods and services it delivers can best be managed (given the contextual conditions). The options to consider can be placed on a continuum with full public ownership and management (state intervention) on one end of the spectrum and full market/private ownership and management on the other end of the spectrum. In between are for example public private partnership and special purpose vehicles, (public) procurement and lease agreements. When considering the entire value chain arrangements with for example intermediaries, distribution facilities, and technical support facilities also play a role in this building block.

2.3.7. Working principles

This last building block is more related to the process and the attitudes of the people involved than the content of the activities. Throughout the different documents specific types of attitudes, guiding principles, which are essential elements in the process for developing a financing strategy. From the review we have captured 6 working principles.

- Collaborative approach: Involving stakeholders & effective communication
- Lifecycle approach: Addressing the building blocks considering the entire lifecycle of the project/measure
- Systems approach: Consider not only one system or only one sector, but break the silos for more impact and a stronger strategic and economic case
- Interdisciplinary approach: Integrating a range of knowledge and expertise
- Robustness: Decision making under uncertainty and working with scenarios
- Adaptivity: Taking a flexible, adaptive approach

Chapter 3. NBS Business Model Framework

Fausto Favero [1,2,*] *and Jochen Hinkel* [1,2]

[1] *Faculty of Resource Economics, Humboldt University, Hannoversche Str. 27 D-10115 Berlin, Germany;*

[2] *Global Climate Forum e.V., Neue Promenade 6 10178 Berlin, Germany*

[*] *Correspondence: Fausto.Favero@globalclimateforum.org*

In this section we set down the cornerstone of our NBS Upscaling and Outscaling Framework (UOF) by proceeding with the development of the analytical project-level framework, the NBS Business Model Framework (BMF) (Figure 3.1). The purpose of the BMF is to provide tools to consistently describe NBS projects for coastal adaptation and to identify financing and funding arrangements suitable for their implementation and upscaling. The remaining components of the UOF will be developed later on in future project deliverables.

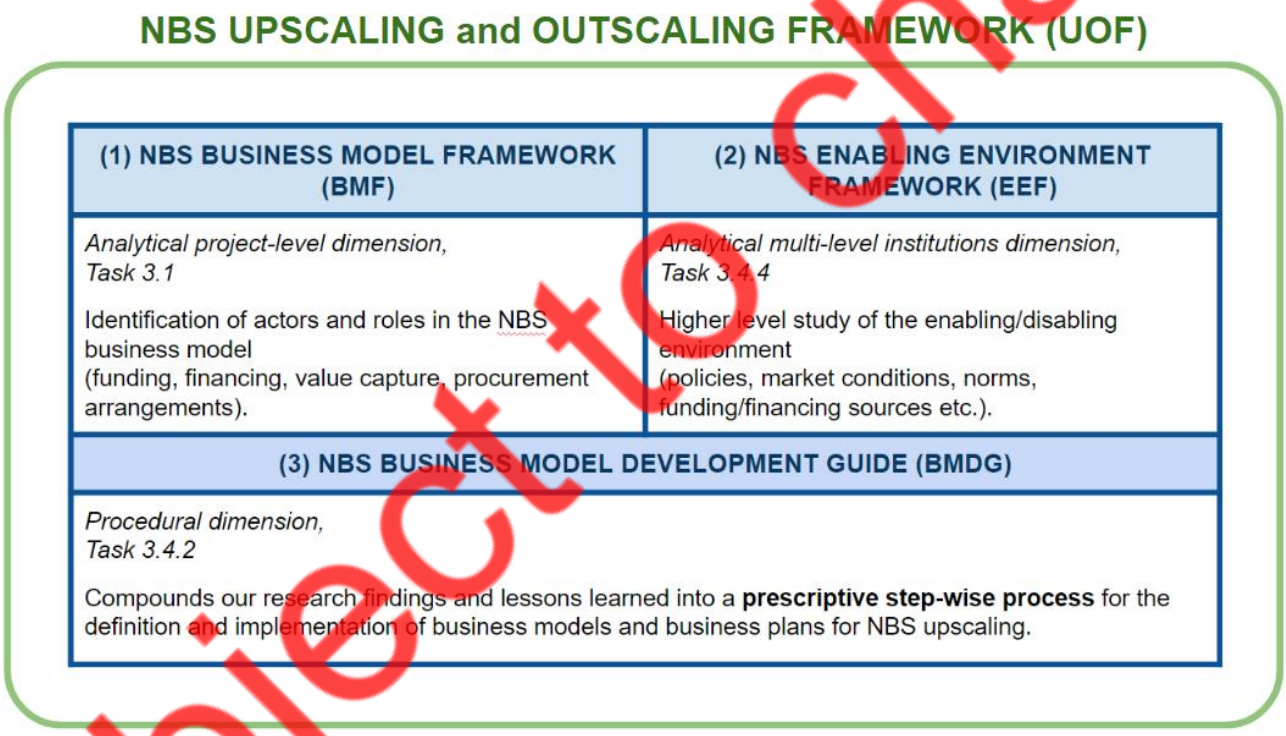

Figure 3.1. Structure of the NBS Upscaling and Outscaling Framework and description of its three dimensions.

A crucial issue that we will address is the inconsistency in terminology used on funding and financing NBS business models across communities and sectors. The work on financing lies on the intersection of different domains - e.g. resilience, adaptation, mitigation, entrepreneurship, biodiversity conservation -, different disciplines - e.g. engineering, ecology, economics, governance -, and different sectors - public sector, private sector, NGO's -. In developing financial strategies for coastal restoration and nature-based solutions one "stew" of definitions and perceptions and terms are being combined. We will address this problem in this section through the definition and explanation

of a number of fundamental concepts, and the construction of a set of typologies for NBS business model structures.

3.1. Concepts for NBS business models

3.1.1. Nature-based solutions

The concept of NBS has been recognised as a benchmark in environmental science and nature conservation in relatively recent times, but the basic idea of managing natural features for the integrated management of society's needs was already well established within the scientific literature for decades. Ecosystem restoration approaches (De Groot et al., 2013), ecosystem-based adaptation (Vignola et al., 2013), the concept of natural capital (Costanza and Daly, 1992; Jansson, 1994), payments for ecosystem services (Gómez-Baggethun and Muradian, 2015) and green infrastructure (Connop et al., 2016) are, to different degrees, autonomous categories that have been conceptualised and that fall under the more comprehensive umbrella concept of NBS (Dorst et al., 2019; Nesshöver et al., 2017).

The IUCN defines NBS as: “actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits'' (Cohen-Shacham et al., 2016, p. 2). The definition of NBS is broad and it allows the inclusion of different perspectives and meanings, extending its applicability to a variety of scales and contexts (Dorst et al., 2019). The protection and restoration of degraded ecosystems, hybrid measures that combine natural and artificial features, and hard structures that rehabilitate natural processes are examples of different interventions that can be brought under the category of NBS.

Societal challenges mentioned by the definition are also understood extensively, including climate change adaptation and mitigation, ecosystem degradation and biodiversity loss, human health, urbanisation, social and economic development, food and watersecurity and disaster risk reduction(Brears, 2022; IUCN, 2020). Because of the marked emphasis on synergetic solutions across environmental, social and economic policy agendas, strong alignments can be found with the Sustainable Development Goals of the United Nations’ Agenda 2030 (Andrikopoulou et al., 2021) as well as with the “three-pillar'' sustainability approach (Purvis et al., 2019). The solutions in these fields should be provided jointly by any NBS, with multiple benefits and functions delivered to various stakeholder groups (Kooijman et al., 2021).

While these stances prescribe the adoption of systematic and integrative thinking - which is typically advised for the governance of natural resources and ecosystems (IPCC, 2022) -, it also renders NBS as inherently complex measures, due to the potential emergence of interdependencies among involved actors and of trade-off among functions (Seddon et al., 2020a). The inherent complexity of NBS is compounded by the lack of substantial data of previous successes and failures, with consequent uncertainties towards the effectiveness and reliability over time.

While the combination of fundamental complexity and uncertainty results in lags in practical implementation, in recent years NBS could achieve transversal conceptual support from a variety of large international organisations and NGOs, as well as private sector representatives (Melanidis and Hagerman, 2022). This is explained by the fact that the broad, win-win oriented conceptualization of NBS is an example of strategic ambiguity (Eisenberg, 1984). Ambiguous and broad terms are flexible and adaptable to different narratives and identities, thus facilitating the achievement of political consensus and alignigment of commitments across institutional and disciplinary boundaries. Strategic ambiguity is a common device in those policy situations where multiple - and potentially conflicting - objectives must be balanced out, particularly in pioneering projects where, in order to achieve innovation, unconventional coalitions are formed (Abson et al., 2014; Schröter et al., 2014). At the same time, the conceptual ambiguity of NBS has also been criticised as a product of existing power asymmetries which would facilitate and reproduce co-option and greenwashing practices (Kotsila et al., 2021; Melanidis and Hagerman, 2022). These concerns stem from the fact that an inadequate assessment of the complexity and interconnectedness of natural systems could potentially result in adverse impacts on natural processes and social groups (Lindenmayer et al., 2012). In particular when private entrepreneurship around NBS is expanded or being promoted, social justice risks could materialise due to dynamics of commodification of nature and the prioritisation of those functions that are able to generate revenue streams (Dorst et al., 2019). Based on the IUCN NBS principles (Cohen-Shacham et al., 2016) and the NBS literature, some considerations can be made to minimise the risk of maladaptation and unequal distribution of NBS benefits. Indeed the most recent literature on NBS conceptualisation recognizes the need to critically analyse the approach and emphasises the necessity to draw boundaries and to establish environmental and social safeguards with regards to NBS finance and governance (Pörtner et al., 2021; Seddon et al., 2021).

Due to the interconnectedness of natural systems (Hagedorn, 2008), the implementation of NBS should take into consideration the surrounding natural and built environment, as well as the socio-institutional context they are embedded in. For this reason, the NBS literature underlines how any governance arrangement for these solutions should be highly local-based (Dorst et al., 2019), and that great emphasis should be given to the active participation of local stakeholders and communities (Pauleit et al., 2017). Institutional arrangements for the implementation of NBS - including financing and funding arrangements, revenue generation arrangements, procurement arrangements - should match with the biophysical, social and economic problems that they are meant to address. In other words, the deployment of NBS should acknowledge problems of institutional fit (Young, 2002). Moreover, the financing of NBS in some cases could correspond to the extension of monetization and markets in areas - in particular, the natural environment - where behaviours and activities have been traditionally governed by non-market values (Gómez-Baggethun and Muradian, 2015). Market valuation can only consider those values that are instrumental to human economic and social activities, while natural intrinsic values get marginalised or replaced through the notion that it is possible to compensate this loss with market alternatives

of equivalent exchange value (Jax et al., 2013). Moral hazards related to the implementation of NBS offsets are an example of this dysfunction (Anderson et al., 2019; Seddon et al., 2021). The selective conservation of species that are culturally known and charismatic (Peterson et al., 2010), and the moral hazards related to the implementation of NBS offsets are examples of this dysfunction (Anderson et al., 2019; Seddon et al., 2021).

When an NBS project involves a redefinition of property rights, right-based considerations for equitable access to land and resources become particularly relevant. The privatisation or fencing of previously-communal areas could be in conflict with customary rights and norms of rural and indigenous communities, which often rely on natural resources for their livelihoods (Gómez-Baggethun et al., 2013; Ibarra et al., 2011).

3.1.2. Contracts

Contracts are crucial instruments to translate the conceptual structure of a business model - its purpose, objectives and strategies to achieve them - into the actual processes and transactions that concretise it. Contract theory provides useful insights on the reason actors engage in certain - long-term - contractual arrangements, and how these are shaped depending on the parties' needs, interests and constraints.

Contracts can be essentially understood as reference points for the parties' future relationship, establishing various rights and obligations which are useful to support long-term investment (Hart and Moore, 2008). Financial contracting, in particular, describes the structure of agreements between investors and those in need of finance.

When an entrepreneur needs to raise capital to finance its project, a decision of the type of financial arrangement must be made. As we will see in section 3.2, equity and debt instruments entail different rights and obligations for the contracting parties. Acquiring finances by issuing equities will dilute the stake of the manager, as they will no longer own the entirety of the project. By issuing debt, on the other hand, the manager will retain full ownership over the project, but the borrowed capital will have to be repaid with interests.

Myers and Majluf (1984) developed a model that highlights the role of asymmetric information in equity/debt financing decisions. When a manager has exclusive information on the profitability of the project, they will be inclined to resort to debt and avoid dilution, as shares would be sold at a price that is short of their true value. Jensen and Meckling (1976) further argued that the dilution of ownership brought by equities encourages managers to take inefficient decisions. Perks and benefits that are attractive to managers but do not generate profit become more tempting as their costs are collectively borne by shareholders, despite the adverse impact on overall project value. At the same time, high levels of debt become increasingly risky, as the chance of not being able to repay these expands.

The different stances of managers and investors that emerge from their relationship give raise to agency problems, which highlight the potential for a conflict of interest between an agent, in this case a project manager, and a principal, the investor, who is affected by the actions of the former. In classic principal-agent approaches, the actions of the agent are assumed to be non-observable, yet the principal can look at certain signals - for example in the form of outputs or profits - which can be used as proxy measures for the efforts of the agent. While the work of Myers and Majluf (1984) and Jensen and Meckling (1976) focused on financing structures, the mainstream approach for a solution to agency problems is to put the agent in an optimal scheme of incentives, i.e. tying the agent's compensation to the level of - measurable - performance reached (Holmstrom, 1979).

Tension arises in incentive contracts whenever the agent has multiple tasks to perform, or its single task is characterised by several dimensions. This is known as a multitasking problem (Holmstrom and Milgrom, 1991), and it is especially relevant whenever the measurability of the different tasks varies, and/or trade-offs exist. Holmstrom and Milgrom (1991) suggest that contingent rewards will be tied to the most measurable objective, which will thus be prioritised at the expense - i.e. lower efforts by the agent - of any other conflicting task. Geczy et al. (2021) find empirical confirmation of Holmstrom and Milgrom's (1991) multitasking theory in impact financing contracts, where funds were predominantly found to tie managers' compensation to financial outcomes only.

Solutions to this problem could also be brought through innovative governance structures, as the studies of Geczy et al. (2021) and Gilson et al. (2010) suggest that, when hard-to-measure objectives are present, or when tasks are more difficult to be regulated *ex ante*, the relevance and influence of formal and informal governance structures is greater.

More recent theories on financial contracting (Aghion and Bolton, 1992; Hart, 1995) recognize that not all conflicts of interest can be resolved by means of ex ante contractual structuring. Future, relevant events cannot always be foreseen and addressed in contracts, thus making all financial contracts necessarily incomplete. This is ever so relevant for contracts regulating responsibilities, risk distribution and roles for long periods of time. To some degree, incompleteness can also be an intentional feature. While very strict regulation of terms for future outcomes may minimise the risk of conflict and disagreement, excessive rigidity might hinder adaptability to new circumstances (Hart and Moore, 2008). The inherent incompleteness of contracts requires the setting up of decision-making processes and renegotiations for the management of unplanned contingencies (Hart, 2001). From this perspective, the way decision rights and control are allocated becomes extremely relevant, and a crucial factor to consider when undertaking the financing relationship in the first place (Hart, 1995).

Decision rights can be allocated by choosing specific financial structures. Direct equities for example grant control power to the investors, while the issuing of preferred equities will favour the manager's discretion. Governance structures such as partnerships and trust raise co-decision arrangements where decisions are reached collectively. Debt instruments and convertibles are

suitable for the implementation of contingent control allocations, for example when decision rights are transferred on the realisation of performance signals; nevertheless debt financing implies that, in case of default, control rights are transferred to creditors (Aghion and Bolton, 1992).

Kaplan and Stromberg (2003) study the dynamics of control right allocation by looking at the features of a set of venture capital contracts. The sector was chosen as project participants are few and have close relationships, thus representing a good approximation of the single investor-single entrepreneur found in theoretical models. In venture capital financing, cash flow rights, voting rights, decision rights are all allocated separately and are contingent on observable financial or non-financial outputs. In particular, if performances are poor and fall below a threshold, investors will gain full control; if the opposite is true, decisional power and additional cash-flow rights are transferred to the entrepreneurs. Moreover, investors have overall less control towards the final development stages of the project.

When applied to the context of a NBS project, contract theory provides some useful insights. If we take agency problems, for instance, we can recognize how these could potentially arise within the contractual relationships between the investor - the principal - and the project manager - the agent -, but also between the project manager - the principal - and the third-party firms - the agents - when one or multiple phases of the project are delivered through public procurement.

When we look at the defining elements of multitasking contracts, it is easy to draw parallels to the structure of a NBS project. Project managers implementing a NBS are typically responsible for the achievement of various objectives, including cost-effectiveness and satisfying levels of those different co-benefits that the NBS is meant to deliver. Should the business model require it, additional tasks would point to the achievement of sufficient revenues to reward financing parties.

Multitasking contract theory thus suggests that project outcomes that are difficult to measure, for instance the biodiversity conservation or improvement of local livelihoods, could lose out to more quantifiable objectives such as construction cost reduction. An important step to ensure the delivery of each one of the proposed co-benefits is therefore the development of clear and reliable indicators - or proxy measures -, to guarantee a faithful quantification of the NBS performances. Alternative, or complementary, solutions could be explored by means of institutional governance, as Geczy et al. (2021) and Gilson et al. (2010) would argue. Under this approach, the exploration of innovative arrangements for decision-making processes and control rights allocation might reveal interesting and innovative avenues.

3.1.3. Financing and funding

While funding and financing are often used interchangeably, the two terms refer to different processes, both of which are crucial components of the NBS business model and the selection of the actual measures to be implemented.

Financing is the provision of financial capital to meet upfront costs of a project by an investor who is interested in making productive use of their capital, thus securing future monetary returns - interests, dividends etc. Financing is often necessary to implement NBS and infrastructure projects, because the initiators do not have sufficient capital to cover the high upfront cost for project development themselves and hence are looking for external sources of financing.

While financing provides money to start the implementation of the project, this does not imply that the project costs have been paid. Indeed, financing sources - i.e. the financiers - need to be repaid in full at a later point in time, including the payment of interests to cover the cost of borrowed capital.

On the other hand, **funding** is paying for the project. The NBS can be funded upfront or, when part of the capital is provided through a financing arrangement, *ex post*, thanks to the establishment of revenue streams that will allow the repayment of financiers. While funders - as opposed to financiers - are not entitled to any repayment of the capital they provide, the contractual agreement underlying a funding transaction might establish certain requirements - reporting obligations, performance targets, specific uses of the funds provided etc. -. The main motivation for an actor to provide funds is to purchase something. In the case of a government or a philanthropist foundation shouldering the upfront costs of a NBS project, this might be its outcome in terms of social welfare and ESG impacts, while local stakeholders might pay to have access to or to benefit from the NBS - thus generating revenue streams to fund the project *ex post*.

Governments are an important source of funding. Since government budgets are funded through taxes, tariffs and transfers - "The 3Ts" -, one could argue that a project funded by the government is ultimately funded by taxpayers, charged users or the transfers' issuers, depending on the arrangements in place. For practical reasons, in these - rather common - situations, we will identify the government as the funder of the project, and taxpayers/charged users/transfers' issuers as the funders of the government budget.

In essence, financing is how the upfront costs to start the NBS project are met if not sufficient funds are available for paying them upfront, and funding is about paying for these, either upfront or throughout the project's lifecycle.

Having a clear understanding of the difference between the two concepts is crucial to grasp where the problem of NBS finance lies. Unlocking financing is closely tied to securing funding: Without a clear proposal of how future revenue streams will be established to fund the pay for the project costs (e.g. later stages such as maintenance and operations), convincing financiers to provide the capital needed to implement the project will be a difficult task.

3.1.4. NBS business model and business plan

The central concept of WP3 is the one of a **NBS business model**, which describes all roles and contractual arrangements between all actors involved in an NBS project in qualitative terms. A business model describes the rationale of how an organisation creates, delivers, and captures value (economic, social, cultural, or other forms of value) (Osterwalder & Pigneur, 2010)

A NBS Business plan, also known as business case, is a document for the application of a business model to a specific NBS project instance including quantitative details on cash flows - costs, revenues, returns, funding, finance - and non-monetary rewards - social welfare, natural capital -, associated risks and risk mitigation measures, analysis of relevant markets and legal structures, information on the management personnel. The purpose of a business case is to provide a clear and compelling argument for why the NBS project should be undertaken, and to help decision makers understand the potential implications of investing in the venture or project.

A business plan becomes viable or bankable if it is attractive to all parties involved. What attractiveness means can be formulated from the ideal typical pure public and pure private perspectives as follows:

- Public investors - or pure impact investors such as nature foundations or philanthropists - have the fiduciary duty to promote those projects that deliver the highest social welfare. Hence there is a need to demonstrate that NBS have sufficiently high net-benefits - discounted benefits minus costs -, because otherwise public investments should go into alternative measures - e.g. grey measures - or even alternative projects that would deliver a higher contribution to social welfare. This public perspective is particularly important, because currently the vast majority of NBS projects across Europe are funded publicly. The great opportunity of NBS thereby lies in the multitude of benefits and co-benefits these solutions offer. The issue, thereby, is that economic analysis of NBS - e.g. cost-benefit analysis - often falls short in considering all significant benefits and co-benefits that NBS bring and hence underestimate their total economic value.
- Private investors, on the contrary, are seeking returns on investments in terms of actual cash flows. Hence, there is the need to demonstrate how the economic values of NBS can be "captured" and turned into revenue streams that can provide sufficiently high and secure returns for investors. The private investment perspective is important for scaling up NBS beyond what the limited public funds can accomplish. NBS that deliver high total economic values that cannot be turned into revenue streams are still important from an economic social welfare perspective, but not for attracting private investments that require a financial return on investment.

In reality these two perspectives are intertwined in many ways. For example, public investors are often also interested in obtaining a financial return on investments, because public money is limited

and returns can be used to finance additional projects. Similarly, private investors may also be interested in generating social welfare impacts - i.e., impact investment -, either for corporate social responsibility reasons or to comply with emerging financial regulation such as forthcoming in the next years under the Sustainable Finance Workstream of the European Commission - e.g. Taxonomy Regulation -.

Recognizing the diversity of actors involved and the intertwinedness of both public and private perspectives on NBS, REST-COAST WP3 advances a transdisciplinary and systemic approach in which economists, finance and governance scholars, NBS practitioners, investors, SMEs, environmental NGOs and local governments work together on a range of levers for overcoming economic and financial barriers and unleashing the potential for upscaling the implementation of NBS.

The next sections will present the framework for NBS Business Models (BMF) - i.e. the first dimension of the UOF -, which consists of a typology and description of NBS contractual and institutional arrangements for funding, financing, procurement and value capture. The purpose of the BMF is to enable detailed descriptions of NBS business models at a project level. More specifically, this includes:

- All actors involved in NbS - e.g. local government -;
- the roles they play - e.g. local government acts as funder or initiator or both -;
- their interests;
- the transactions between these;
- the contractual/institutional arrangements that govern the transactions;
- how costs, rewards, risks, and operational responsibilities are distributed between all actors involved.

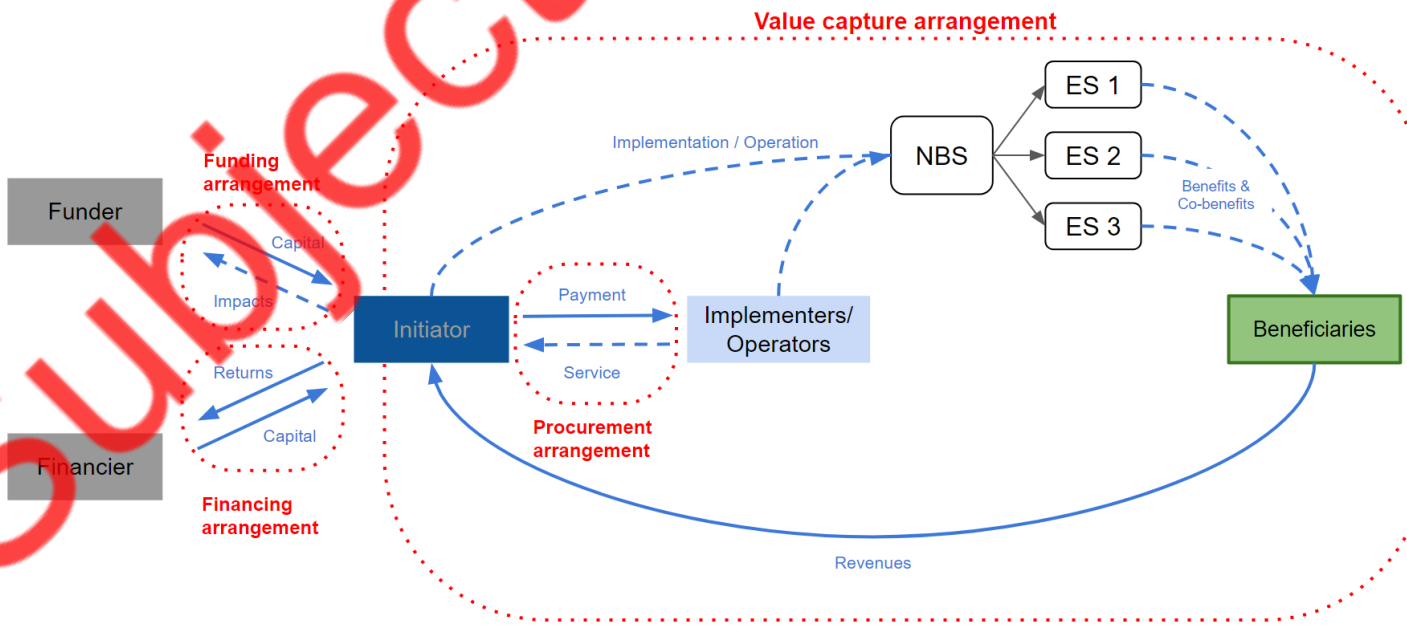

Figure 3.2: Roles of actors involved in NbS projects, associated transactions and contracts.

As shown in figure 3.2, the fundamental components of a NBS project business model are the funding and financing arrangements, the procurement arrangement and the value capture arrangement.

Funding means paying for the NBS in expectation of non-monetary rewards such as enhancement of natural capital and social welfare. This can be done through project-external funders providing financial capital - funds, grants, donations - such as governments, but also philanthropist, (nature) foundations, the public - i.e. via crowdfunding - or commercial companies. Funding may also be generated within the project by **value capture arrangements**, which transform the (monetary and non-monetary) values delivered by NBS into revenue streams. Typical ways of capturing NBS values include the sale of products from NBS - e.g., payment for ecosystem services -, sale of carbon credits, biodiversity credits, permits, eco-labels, etc. In addition, public actors may also capture the value through tariffs and taxes paid by NBS beneficiaries - e.g., levies paid by homeowners that are flood secured by ecosystem restoration -. What we call value capture mechanism here is also called NBS business model in the literature.

Financing refers to a contracted transaction where an investor provides financial capital with the expectation to be repaid with financial returns - e.g. interest, dividend -. A prerequisite for financing are sufficient revenue streams, otherwise investments can not be paid back. Even if sufficient revenues can be generated from the NBS, finance is often necessary in order to pay for the upfront implementation cost of NBS, because revenue streams can only occur after implementation. Investors can be both public and private including commercial investors providing capital at market rates as well as impact investors providing capital at lower rates - e.g. concessional finance of development banks -. Financial instruments are the type of contracts employed for delivering finance. This includes a diverse range of instruments such as loans, equity, climate and resilience bonds, etc.

Procurement arrangements - also referred to as provisioning arrangement - refers to the governance structure by which the NBS project is provided - or procured -. It describes all the contractual relations, roles and responsibilities of parties involved in project delivery. For example, the project may be procured either as an integrated contract, covering all stages of the project implementation - i.e. from planning to operation & maintenance -, or more traditionally as separate contracts for different stages. Innovative procurement modes also include setting up new legal entities - i.e. special purpose vehicles - for project delivery.

3.2. Typology for financing and funding arrangements

The complexity of contractual arrangements points to the necessity of drawing theoretical structures where knowledge can be systematised. The classification in typologies is a theoretical method that provides homogenous abstract models, or ideal types, which represent consistent configurations that are described in terms of multiple dimensions (Doty and Glick, 1994). Ideal types

are the result of simplification and exaggeration, and are not meant for a detailed portrayal of reality. They provide models so that deviation from the typology can be observed and justified (Weber, 1949).

In this section, we provide a typology for financing and funding instruments; in sections 3.3 and 3.4 we will complement this with typologies of revenue generation instruments and public procurement arrangements, respectively. The intent is to establish clear nomenclatures and descriptions that can be then used for the mapping and reference of NBS projects for coastal adaptation.

Financing arrangements, or financing instruments, are legal agreements that establish a financial asset of one party and a financial liability/equity of the counterpart (Camilleri and Camilleri, 2017). By channelling efficient flows of capital, they allow actors to finance their businesses, and investors to generate income out of their current assets. Within the NBS Business Model, these arrangements are fundamental to meet the costs that arise within the project (Figure 3.3). The typology provided in this section consists of a reference frame for the categorization of financing and funding instruments. Funding instruments, as opposed to financing ones, do not generate financial returns for the investor, which is instead motivated by the impact generated by supported activities. Notice, however, how the different features that ground these typical arrangements can be arranged in a vast range of possible combinations, and that consequently hybrid and intermediated forms of these categories are common practice.

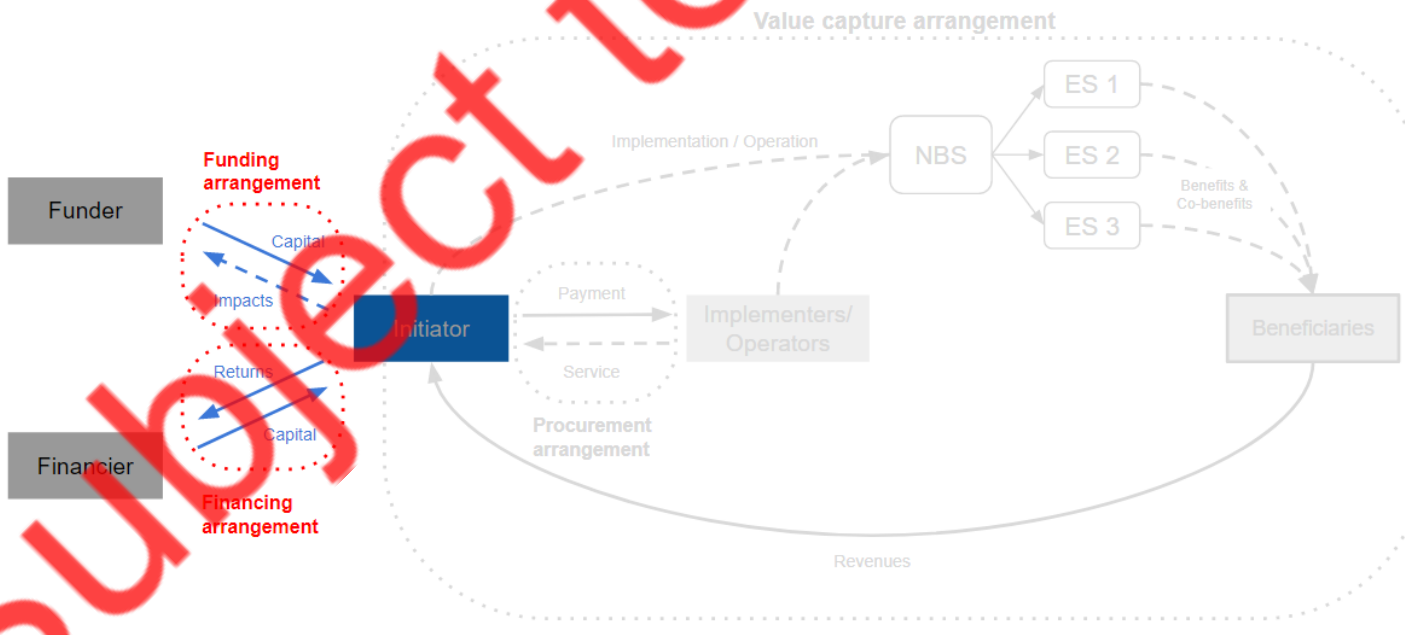

Figure 3.3 Highlight of funding and financing arrangements within the BMF.

The first distinction that we can make to sort financing and funding instruments is one between commercial finance and concessional finance.

Commercial finance refers to the financing under market conditions. Investors allocate part of their capital to finance a project or a business entity, with the aim of generating income at a future date. This process entails a certain degree of risk - e.g. the financed project does not materialise -, which corresponds inversely to the prospects of appreciation generated by the investment.

Concessional finance on the other hand is not driven by the expectation of profit alone. Concessional investors provide capital at below market terms, for example with lower interest rates or longer maturities. The quintessential instance of concessional finance is funding, which does not require any repayment of the capital provided by the funders. Concessional investors and funders intervene to realise development-relevant projects that have difficulties in accessing sufficient capital on markets, for instance due to the presence of high risks or low returns.

3.2.1. Commercial Finance

Starting with the typology for instruments of commercial finance, we can first of all distinguish equity instruments from debt instruments. **Equity instruments** consist of an injection of permanent capital that corresponds to the sharing of the business' risks and rewards with additional actors. **Debt instruments** refer to the borrowing of capital, with an obligation of repayment with interests at future date (Druce et al., 2016). A third class of instrument is that of **hybrid, or mezzanine, instruments**, which displays typical characteristics of both equity and debt. Investors purchasing debt instruments generally expect lower returns on their investment - as opposed to an equity investment -, but enjoy overall lower risks (Bisaro and Hinkel, 2018).

A major factor for risk-reduction is the fact that debt instruments have a higher seniority with respect to equities, that is to say that it ranks higher in the order of repayment, which is especially relevant in the event of a default or other forms of financial hardship. The choice of the type of instrument to be employed for the financing of a project depends on various contextual factors. These include those related to the project itself, including its size, risks and costs, the amount and predictability of generated revenue streams, the development stage that must be financed, but also the characteristics and preferences of the actors involved in the financing arrangement, such as the investor's constraints and the creditworthiness of the project sponsor (Druce et al., 2016; Weber and Alfen, 2010).

Equities are the class of instruments with the highest associated risks - being subordinated to all the other instruments - and relatively low level of liquidity, and a corresponding high level of return potential. Equity investors realise profit either through dividend payments or by selling their shares. Equities can be direct - i.e. unlisted equities, equity co-investment - or indirect - i.e. listed equities, stocks -. In general terms, we can define a financing instrument as:

a. Direct financing instrument when investors are approached directly to set up transactions that are based on a private contractual agreement and that cannot be freely traded or transferred to third parties.

b. Indirect financial arrangements when investors operate through a regulated environment, i.e. the capital markets. These instruments are therefore highly standardised and regulated, and can be traded with ease (Druce et al., 2016).

Indirect instruments are thus characterised by higher liquidity, as well as a higher degree of accounting transparency, due to their alignment with the standards of regulated markets (Bisaro and Hinkel, 2018).

- Direct equity shares

  One of the advantages of direct equity shares is that they do not raise obligations for repayment, as investors gain capital from their direct claim on a portion of the business revenues. This means that the risk of performance is prolonged until they resort to sale, and investors will receive capital gain (or loss) after the creditors are paid out. The attractiveness of direct equity financing is that this option does not come with considerable cash flow requirements, and external investors might even bring in valuable expertise to the business management (EIB, 2020). On the other hand, the autonomy of the investee in decision making will decrease, as external investors will also gain voting rights over the direction of the business operations.

  Direct equity investments is a risk-absorbing type of investment, well suited to finance the initial stages of a project, when construction risks are not yet settled and high growth strategies are viable. It is common to employ direct equities as a source of venture capital, with the provision of early-stage capital to start-ups, i.e. new and innovative companies or projects that seek validation for the scalability of a business model (Druce et al., 2016). Despite its promising features, equity financing is still a novel instrument in the climate finance landscape, and most investors would rather not engage with the high financial risks connected to it (Habbel et al., 2021).

- Stocks (Indirect equity shares)

  Indirect equity shares, or stocks, just like direct equity shares, grant investors ownership interests, although in a minority position with scarce power of influence over the management (OECD, 2015). Stocks are issued by large companies/corporations, and are traded on regulated exchanges - e.g. stock markets -, thus being subject to their standards and regulations (Bisaro and Hinkel, 2018). Stocks are only accessible to big corporations with a sufficient credit rating (Druce et al., 2016).

Debt instruments allow the investee to borrow capital, to be repaid in full at a specified date in full with interests. Different sources can provide debt, including private lenders, institutional investors, multilateral organisations and governments. The type of lender can influence the nature and characteristics of the debt sourced (Delmon, 2010). Although debt is usually a fixed income instrument, interest rates can also be variable, thus changing throughout the term of the

contractual agreement according to predefined interbank rates (EIB, 2020). As opposed to equity financing, debt does require the existence and proving of sufficient revenue streams for the timely repayment of principal and interests. In addition, a security or collateral may be required by the investor. Nevertheless, the predictability of repayments and the maintenance of ownership and control over the direction of the business might make debt an attractive option.

- Loans - Direct debt -, syndicated loans, micro-loans.

  Direct debts, or loans, are typically provided to borrowers by commercial banks or other financial institutions. The direct contractual relationship underlying loans allows the contractors to tailor the terms of the agreement to best suit their respective investing/business needs (OECD, 2015). Loans are commonly supplied by banking institutions both in the form of balance sheet finance and through a project finance entity (Druce et al., 2016). The arrangements for capital flows based on project finance refers exclusively to one specific project. Thus, lending relies only on cash flow generated within the project itself, and liabilities are limited accordingly, with few possibilities of recourse to the sponsors of the project (OECD, 2015). This limitation is usually materialised through the establishment of a new, ad-hoc company known as a Special Purpose Vehicle (SPV) (Kleimeier and Megginson, 2000). By contrast, balance sheet financing directly involves the sponsoring companies, which are approached by investors as portfolios of various projects and activities with various degrees of performances and risks. Companies are thus liable for the debt, allowing access to their assets in case of default (OECD, 2015).

  Multiple lenders (i.e. a syndicate) can aggregate to jointly issue a single loan, which will thus be called a syndicated loan. Syndicated loans are an effective way for lenders to dilute and share the risk of the borrower's default, while at the same time allowing the borrower to attain an amount of finance for capital-intensive projects that a single lender would not be willing to provide (Habbel et al., 2021). By contrast, when borrowers require small amount of start-up capital and find it difficult to obtain a standard loan from a commercial bank, microfinance institutions can offer micro-loans, with higher interest rates but with no requirements such as a formal credit rating or prohibitive reporting requirements (Druce et al., 2016).

- Bonds (Indirect debt)

  Generally issued for larger transactions and longer time-frames, bonds are the indirect counterpart of loans (Weber and Alfen, 2010). As such, the underlying mechanism of capital borrowing works in a similar way, with the difference that bonds are standardised and highly tradeable. While loans imply a creditworthiness check by the creditor, bonds are rated by credit rating agencies (Bisaro and Hinkel, 2018), and are only issued by organisations with sufficient credit rates and capabilities, such as (sub-)sovereign entities, large corporations, large-scale infrastructure projects and development banks (König et al., 2020). Rates of

interests are also generally lower than those attached to commercial finance loans, and fewer conditions limit the financial freedom of the issuer.

Government bonds, municipal bonds and sub-sovereign bonds, i.e. bonds issued by national governments, regional/local governments, and government agencies or development banks, respectively, are among the lowest risk financial instruments, as they are explicitly backed by the sovereign entity (Bisaro and Hinkel, 2018). Given the alignment between the service outcome and source of finance, government bonds are one of the most relevant vehicles for public good and infrastructure investments, including coastal adaptation (OECD, 2015).

Similarly to loans, bonds can also be based on both balance sheet finance and project finance. Corporate bonds are standardised debt instruments that finance the balance sheets of entire corporations. As bonds normally have a longer seniority than loans, they provide corporations that can access public bond markets a reliable and long-term source of finance (OECD, 2015). Whereas the credit-worthiness for corporate bonds is calculated on the base of the overall profile of the issuing corporate entity, project bonds bear credit risks of a single project and are thus less secure investments. Project bonds are most appropriate to finance the later stages of a project, when construction risks have expired and the beginning of actual operations secure positive cash flows (ibid.).

- Green bonds, thematic bonds.

Additional sub-categories exist for the classification of those bonds that require to use the proceeds that they generate for specific purposes. In general, these thematic bonds aim to address socio ecological challenges by channelling capital into under-resourced development projects - e.g. SDG Bonds addressing sustainable development or Blue bonds for ocean conservation - (König et al., 2020). Among thematic bonds, green bonds are of particular importance for climate-change related investments. The market for green bonds is in rapid expansion, and today these instruments represent the cornerstone of the EU policy strategy for climate neutrality (European Commission, 2020).

With green bonds, while the basic financing structure remains the same as that of traditional bonds, the raised capital must finance projects that produce environmental benefits. In order to make sure that the issuer's pledge meets the investor's expectation, projects financed through a green bond are required to include periodical reporting on the use of the proceeds and to produce clear and measurable impacts (König et al., 2020). These requirements are being increasingly aligned to international standards such as those set by the Climate Bonds Initiative (Climate Bonds Initiative, 2019). Green bonds are fitting instruments for investors such as pension funds and insurances looking for long-term and relatively low-risk sustainability investments (Colgan, 2017), yet the capacity to initiate and aggregate a sufficient amount of green projects under a single financial product of relevant size is currently a major challenge for the expansion of the green bond market and its connection to smaller scale

sustainability initiatives (Chiang, 2017). Other prominent evolving issues in the green bond market include the possibility for the introduction of price premiums, which would equal to lower interest rates based on environmental/sustainability gains, and the further development of standards in areas where performance measurements are particularly complex (Colgan, 2017).

Certain subsets of green bonds such as resilience bonds - investing in risk mitigation -, blue bonds - investing in ocean and coastal sustainability projects - and climate bonds - investing in climate change mitigation and adaptation - are emerging as recognized and accepted asset classes, yet their respective markets are still nascent (BNCFF, 2019).

- Environmental Impact Bonds, outcome-based finance

While bonds are normally fixed income instruments, the investors' returns from Environmental Impact Bonds will depend on generated outcomes. On top of the standard repayment of the bond's principal and interest, additional payments are unlocked once the achievement of a certain pre-agreed and measured outcome have been met (König et al., 2020). These second-tier payments may be shared between investors - the risk-taking actors - and those in charge of realising the project and delivering the outcomes, so as to incentivise the latter to improve its performance (EDF, 2018). Outcome-based finance instruments are usually used by investors that are particularly interested in the non-financial impact of their contribution, such as impact investors, donor agencies and philanthropic foundations (Habbel et al., 2021).

Commercial finance instruments can also belong to a third class which fits the gap between equity and debt. Hybrid financing instruments, also known as mezzanine, present characteristics of both categories. Mezzanine instruments are most appropriate when it is not possible, or it is too costly, to issue additional debt, and equity holders would rather avoid issuing new shares which would cause an excessive dilution of ownership (Weber and Alfen, 2010). The unique risk/return profile of mezzanine can also be an attracting factor for certain investors. Pension funds, insurance and other institutional investors, for instance, are increasingly looking at hybrid finance as a strategic niche of investment (OECD, 2015).

- Subordinated debt, preferred shares, convertible debt

The most common form of hybrid finance is subordinated debt, that is a debt instrument that ranks low on the seniority scale. In other words, the issuer of a subordinated debt accepts to take a junior debt position thus bearing the risk for first losses (Habbel et al., 2021). Preferred shares - applicable to both stocks and direct equities - are another common example of hybrid instruments. Holders of preferred shares have a priority over standard share holders when dividends are paid out - they are still subordinated to all other debt classes -, but at the same time they do not carry voting rights, which means that issuing preferred equity shares does not dilute ownership (OECD, 2015). Mezzanine finance can also take the form of convertible

debt, which is essentially a type of junior debt that compensates for its relatively lower rate of interest with the option, for the investor, to convert the bond/loan into shareholding. The conversion to an equity position can be done at the date of maturity, at any other pre-agreed date or when certain performance targets are achieved (König et al., 2020).

3.2.2. Concessional finance

As previously mentioned, concessional finance differs from commercial finance in that it does not aim exclusively at generating profit out of the investment, as they value and strive for its non-financial impacts. What this means, in practice, is that concessional investors are able to take on outsized risks and provide capital at better terms than those offered by the market (Gregory et al., 2021). Sources of concessional finance can be either public - such as national governments and development banks - or private/philanthropic (EIB, 2020).

Loans are a common means to deliver concessional finance, with the application of better-than-market conditions such as lower/zero interest rates, lower priority of repayment or longer maturity. Equities can also be structured as concessional, for example when the investor agrees to receive less shares than what the investment is actually worth (Gregory et al., 2021).

When concessional finance is delivered with no requirements for repayment at all - no interests and no principal -, we refer to these as funding instruments rather than financing instruments.

- Grants, performance-based grants, subsidies

  Grants provide capital with no expectation of repayment. Grants are commonly disbursed from funds that are dedicated to specific policy objectives - coastal adaptation could be an example - or established for specific instances - e.g. to provide a response following a natural disaster event - (Banhalmi-Zakar et al., 2016), which means that are to be used for specific purposes. Furthermore, grants are accessible only via competition with other candidate projects, implying that financial resources and efforts must be placed to build a strong application and, when requested, to provide periodic reports once the grant is obtained. Performance-based grants are a subcategory of grants, which conditions the transfer of capital on the achievement of agreed-upon results, usually through measurable and verifiable social or environmental impacts (Habbel et al., 2021).

  Subsidies are a different category of funding instrument that consist in direct payments or tax rebates that governments provide over an extended period of time in order to reduce costs for operation or management. The purpose of subsidies is the stimulation of investments in those projects or markets that would otherwise be too risky for private financial commitments.

- Crowdfunding

Crowdfunding is an emerging form of funding which involves large networks of small and distributed donors - but also small investors - pledging small amounts of funds through a digital platform (Banhalmi-Zakar et al., 2016). Crowdfunding is a rather novel financing practice, and in recent years its market has been rapidly growing. Due to emerging regulatory frameworks, crowdfunding is expected to eventually overtake venture capital in financial markets in the upcoming decade.

Although crowdfunded initiatives are mostly small-scale, the emergence of niches for green crowdfunding on dedicated platforms might suggest a more substantial role in supporting climate change adaptation in the near future (Nigam et al., 2018).

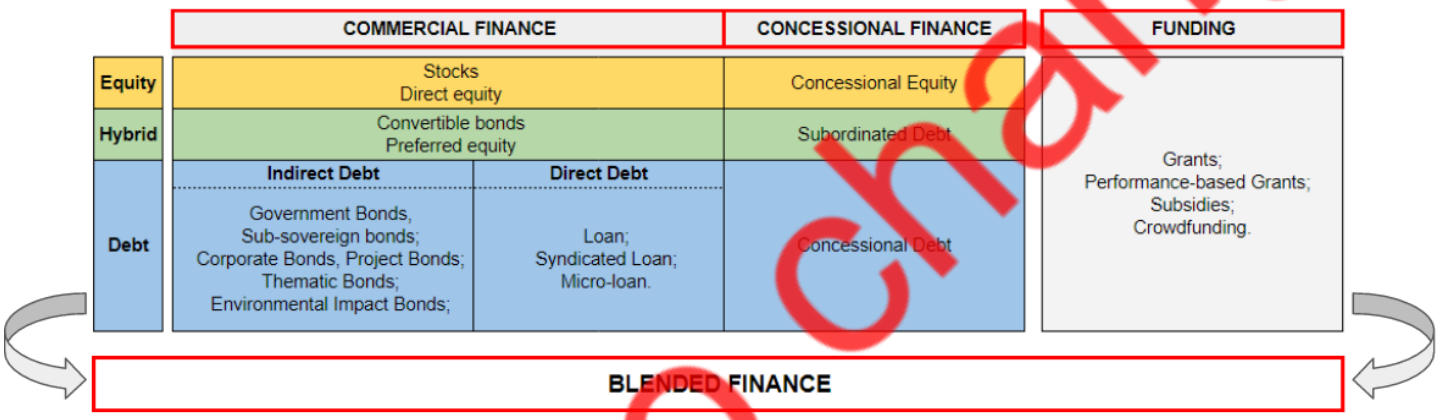

Figure 3.4 Overview of financing and funding instruments

Concessional finance is sometimes deployed strategically with the objective to improve the risk-return profile for investments in a project, thus making it more attractive for commercial finance. The practice of combining concessional and commercial finance in such a way is known as blended finance. Although many different definitions for this concept have been developed, most of these agree that the mobilisation of additional finance and the use of these for non-financial - development, social or environmental - positive impact are the two core elements of blended finance (OECD, 2018). The degree of, or presence of, concessionality is not always considered as a requirement, although this is surely a typical feature: most blended finance arrangements are based on concessional debt or equity, followed by funds for technical assistance, guarantees or risk insurance, and less often they utilise grants (Havemann et al., 2020).

Arrangements for blended finance are typically considered when investment risks are particularly high and an involvement of private investors would otherwise be unrealistic. This is often the case for development finance or pioneering projects, where uncertainty and costs are high, and/or new technology is used (Gregory et al., 2021). Blended finance can also be relevant for the early phases of a project when the majority of risks are not yet settled (EIB, 2020).

NBS projects and other conservation oriented initiatives are overly dependent on public funding and can benefit from the catalytic effect produced by blended finance (Brathwaite et al., 2022; Rode et al., 2019). Despite the effect of commercial finance mobilisation, the use of blended finance does

not guarantee better performances. Havemann et al. (2020) notice how in any case, investment structures must regard the specificities of the project and its institutional and environmental settings, acknowledging for instance the motivation and incentives of the various stakeholders involved.

3.3. Typology of value capture arrangements

As NBS are designed to deliver multiple co-benefits - adaptation to climate change, halting biodiversity loss, prevention of natural disasters, provision of food and raw materials, opportunities for education and recreation, among others -, in the context of a NBS projects different individuals and groups can be identified as beneficiaries of the particular functions enabled by the implemented measures. The most immediate form of co-benefit is monetary, for example when the restoration of an ecosystem supports the growth of revenues of near-by accommodation facilities by attracting tourists, or when future costs related to the impact of floods are avoided. NBS co-benefits can also be non-monetary, as in biodiversity, reputational gains, wellbeing improvements, collection of scientific knowledge and data. Notice, however, how different stakeholders could value the same NBS co-benefit, or more generally, the same NBS function, in different ways. To some, under certain conditions, the implementation of a NBS could represent a hindrance, or result in additional costs.

After having identified and assessed the benefit created by the project, initiators can capture and monetize part of the value generated by an investment through a process known as value capture (Mayor et al., 2021). The concept of “value capture” has been developed by the public finance and public investment literature, particularly in the field of transport infrastructure (Abelson, 2018; Suzuki et al., 2015). It is a core element of any business model, as it often allows to justify an investment, recovering part or all of its costs - thus alleviating impacts on government balance sheets - and, especially when financiers are involved, to assess the business viability and its potential to generate profits (Figure 3.5). Value capture arrangements can potentially be put in place and structured in such a way as to redistribute costs and benefits associated with an NBS project, thus contributing to the removal of barriers.

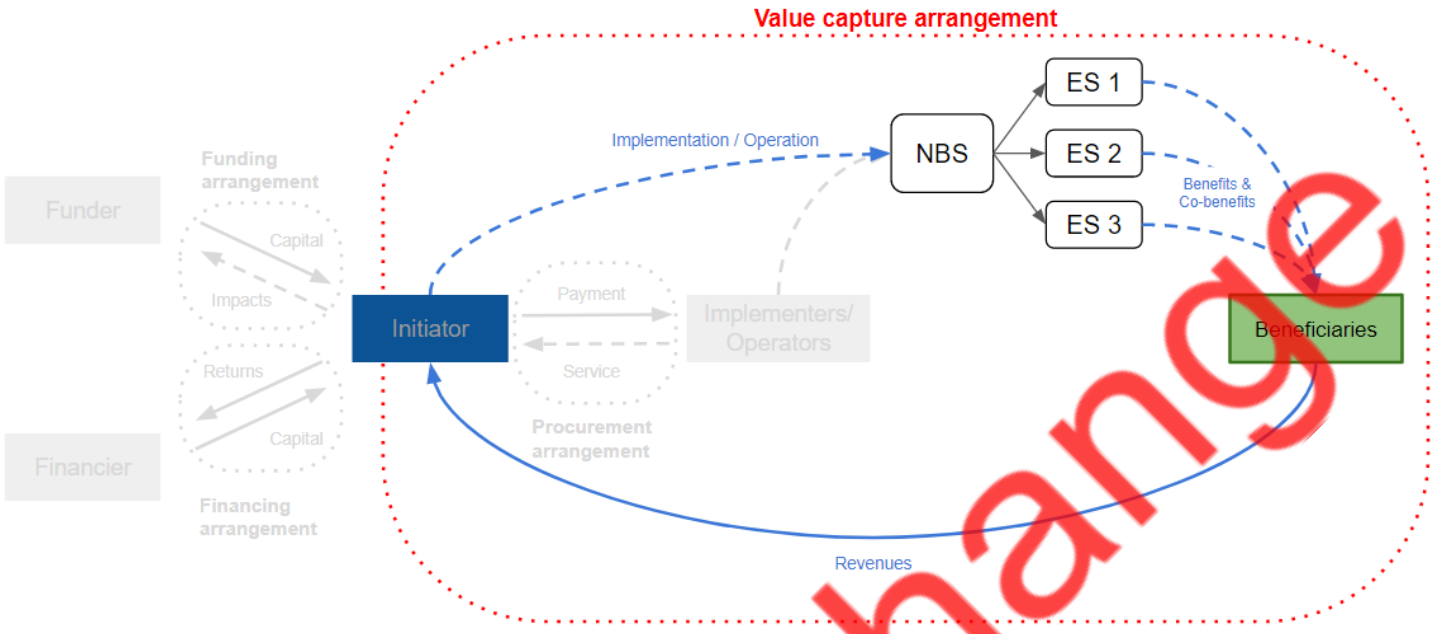

Figure 3.5 Highlight of Value Capture Arrangement within the BMF.

A range of possible instruments are available to determine who is going to pay for a project and how. Costs can be allocated to various groups: public agencies - i.e. tax payers -, development companies, locally circumscribed residents/households, or individual consumers.

In order to achieve political support and social acceptance, the choice for the most suitable instrument for revenue generation can be weighted following criteria of efficiency, equity and fairness (Woodruff et al., 2020). Efficiency essentially requires achieving the desired outputs - products and services - with the least amount of costs in terms of resources used (Abelson, 2018). Fairness refers to the degree to which those shouldering the costs of the project correspond to those benefiting from its output, while the equity criterion suggests that the financing contributions should be weighted on the ability to pay.

When trying to identify potential revenue sources and how to tap them, it is important to acknowledge that certain types of economic goods cannot be sold efficiently in a market. This is due to the fact that some good's physical characteristics are problematic for the organisation of economic relationships, and ultimately lead to the emergence of market failures (Altamirano et al., 2021). Following Ostrom and Ostrom (1977) taxonomy, economic goods can be classified according to their level of excludability and subtractability. These qualities are a matter of degree in real economic goods and services, as pure examples are very rare and their classification is highly contested (Coase, 1974).

The character of excludability is essential for products and services to be sold on the market. When exclusion is possible for a good, it means that individuals cannot consume it or derive benefit from it unless the commercial terms set by the supplier, e.g. the payment of a price, are met. For instance,

the improvement of air quality generated by a NBS can be considered as a non-excludable good, as in general terms none can be denied to benefit from it.

The attribute of subtractability, also known as finiteness or rivalry of consumption, refers to the extent to which the consumption of a good by some precludes the consumption by others. If subtractability is high, as in the case of fishes that are fished from a pond, the limited amount of supply means the consumption by some decreases the remaining amount available for others. Subtractability can also apply in those cases where it is quality, rather than quantity, to decrease with each marginal consumption.

By crossing the two dimensions, four ideal-types of economic goods are identified, these are (1) public goods, (2) common pool resources, (3) club goods, and (4) private goods (Ostrom and Ostrom, 1977).

	SUBTRACTABILITY HIGH	SUBTRACTABILITY LOW
EXCLUSION FEASIBLE	PRIVATE GOODS	CLUB GOODS
EXCLUSION DIFFICULT	COMMON POOL RESOURCES	PUBLIC GOODS

Table 3.1: Types of economic goods

Due to their characteristics, it is difficult to sell public goods on the market, and thus their production and maintenance is usually paid through broad-based fiscal instruments, which are a prerogative of public actors.

Common pool resources (CPRs), due to the difficulty of exclusion, are not allocated efficiently by the market either. As opposed to public goods, CPRs are essentially an aggregation of a finite number of resource units. In such conditions, incentives for their production and preservation are low, which results in a tendency towards overconsumption and resource depletion (Adams and McCormick, 1987).

Private actors can only set up revenue generation instruments when the good's characteristics allow some degree of excludability. In particular, private goods, whose non-payers can be excluded easily, are usually provided by the private sector through market transactions. Club goods can also be allocated efficiently by private actors by setting up user or membership fees.

The above classification matrix should be considered as a mere starting point for the actual classification of goods and services in real economy situations. Excludability and subtractability are not - entirely - inherent qualities of goods and services, and therefore their classification is contingent on context-specific factors. The level of available technology and institutional capacity - including human and financial capital - and the number of simultaneous users are examples of exogenous factors that might shift the position of a certain good across the matrix.

As NBS deliver a range of services and products by leveraging interconnected natural processes, some of these are often found to be in a trade-off relationship. In other words, under certain circumstances some of the intended co-benefits would not be attainable at the same time/ to the same degree. In a project based on reforestation, for example, the maximisation of the ecosystem's capacity to produce timber can be associated with a contraction of other ecosystem services such as biodiversity and cultural activities (Maier et al., 2021). Trade-offs might also emerge among generated values and costs. As the matrix for economic goods analises products and services as objects of consumption, the point of view is set on individuals and groups that value these and benefit from their consumption. For a comprehensive assessment of the value generated by a NBS, and the design of a mechanism for value capture, disbenefits and costs associated with the delivery of services and products also need to be accounted for.

3.3.1. Direct value capture

A strategy for revenue generation can be based on direct value capture or indirect value capture. When an infrastructure investment increases the value of the surrounding assets - land and properties -, owners can capture this new value directly by selling or leasing these appreciated assets, in a process known as Land Value Capture (LVC) (Kok et al., 2021). Public actors have the additional option to charge a one-off payment to developers for the acquisition of development rights. Land sale can be used in conjunction with endowments, whereby a trust would be established with the responsibility to manage the generated revenues, for example for the regular maintenance of the new infrastructure (Mell, 2016).

For large scale infrastructure and development projects on areas of public-private share ownership, strategies of land readjustment or land pooling are also possible. Land readjustment is a process for infrastructure co-financing that involves contributions from both public and private land-owners, based on a redistribution of property rights (van der Krabben and Needham, 2008). Land owners pool together their respective property rights, thus enabling the project developer to improve and reconfigure a larger spatial area in coherence with the features of the public investment. While some assets are reserved to public property, the rest is redistributed proportionally to the original individual contributions (Suzuki et al., 2015). It is important to remark that an appreciable level of awareness of local actors over the added value brought by the development project, as well as solid government capacity, are preconditions for the successful application of any value capture strategy based on land development (Bisaro Hinkel 2018).

When the NBS generates excludable services or products, it is possible to capture directly the generated value through market transactions. In the case of club goods, it is possible to charge users with fees (Kok et al., 2021). Fees are also applicable to the extraction of common-pool resources, to the extent to which it is possible to somehow limit over-abstraction. Should that not be the case, flat-rate fees are also an option (Altamirano et al., 2021). When the NBS produces provisioning ecosystem services (Alcamo et al., 2003), i.e. they consist of excludable goods, value can be captured through their selling on the market, for instance by selling timber, fibre and other materials at market value.

A peculiar category of excludable goods that can be produced in restoration projects and sold on the market is that of environmental credits. Environmental credits are a class of asset that act as a unit of accounting for the value of an ecosystem service. Carbon credits (Matzek et al., 2015), biodiversity credits (Holloway, 2004), wetland credits (Koh et al., 2019) and water quality credits (Lentz et al., 2014) are examples of this class of assets. When regulation allows for it, a single project can implement the so-called credit stacking (Li et al., 2022), i.e. the generation of various types of credits through the same restoration activity, provided of course that multiple co-benefits can be identified. In order to create and sell environmental credits, one needs to clearly define the benefit generated through the restoration of an ecosystem, accurately quantify it, and value it in monetary terms.

Notice how the value attributed to a quantified benefit may vary between actors, and for some the mere identification of the benefit might be sufficient. As market-based instruments (MIB) (Gómez-Baggethun and Muradian, 2015), environmental credits only exist where there is a corresponding demand. Regulation regarding the compensation for environmental damages can create and increase the demand for this type of assets (Koh et al., 2019).

3.3.2. Indirect value capture

In order to ensure reliable revenue streams throughout the lifetime of a NBS project, it is often necessary to identify and involve additional beneficiaries, even when these have been affected only indirectly by the public investment (Mayor et al., 2021). As previously mentioned, public actors have at their disposal various fiscal instruments that can effectively collect revenues even from users of non-excludable goods.

The main fiscal instrument in the hands of governments are taxes. Taxes have the advantage of generating permanent and secure flows of finance, and can also be structured to target beneficiary groups. Abelson (2018) argues that, when applied to unearned economic benefits, taxes can be considered as efficient tools as they essentially do not result in a redistribution of resources. On the other hand, linking payors to beneficiaries is not always a simple exercise. In case of ambiguity, achieving political support for additional taxes will be a challenge. Another problem is that part of the value created by a public investment is often captured by taxes that are not earmarked to the project budget or to the public budget for restoration, and revenues end up flowing to the general

budget, at the same or at higher government level (Suzuki et al., 2015; UNEP, 2021). Broad-based land and/or property taxes are an example of such an issue. Since they are proportional to the total value of each taxed asset, any increase of value resulting from the public investment will be - partially - intercepted.

When the public investment consists in mostly public goods, earmarking is not feasible and the application to a large tax base puts coastal adaptation in competition with other expenditure items. When beneficiaries are clearly identifiable, for example in the case of coastal protection measures that reduce flooding risks only for residents in the immediate proximity, structures for differential taxation can be applied to land and property taxes, in what is known as a district level tax or special assessment district (Suzuki et al., 2015). A specific geographical area is delimited to identify and tax those that benefit disproportionately from a public investment, either as a one-off payment or on a periodic basis. The precision of the assessment of the increase of value is the main challenge in this type of configuration. When a district level tax is earmarked to repay debt that was raised to finance the project, it is referred to as Tax Increment Financing (TIF). In order to persuade investors of the reliability of future revenue streams generated from the taxation of appreciated assets, TIF usually requires development strategies that are markedly aimed at marketable value-enhancement (Levy and Herst, 2018; Root et al., 2015). TIF, and district level taxation in general, are effective mechanisms to connect payors with beneficiaries, and to disclose the destination of the collected revenues (Suzuki et al., 2015). One should nevertheless be mindful of the risk of concentration of public investment in areas where residents have more resources and are thus more willing to pay for extra taxes and fees (ibid.). Moreover, land and property value taxes rely on the respective markets' development, and projected incremental revenues could be curbed by market turbulence or stagnation (Levy and Herst, 2018). Market fluctuations should be accounted for with multiple rounds of value assessment and flexible rates in order to decouple the financing of land development from land asset bubbles and speculative dynamics (Medda, 2012).

In addition to appreciated land or property value, taxes can also target the value of increased, or simply maintained, economic activity generated by a public investment. In many coastal areas, tourism represents a major industry providing an important avenue for funding public investment (Kok et al., 2021). Tourism-related taxes such as value-added taxes (VAT), income taxes and occupancy taxes are especially important, and in recent years have been increasingly earmarked to support local infrastructures and environmental protection policies (OECD, 2014). Despite this, shouldering additional costs on tourists could push them towards cheaper, nearby locations. In fact, in order to sustain the competitiveness of the tourist sector, EU countries tend to minimise their tax burden, for instance by setting tourism-related VAT rates lower than those for other types of goods (European Commission, 2022a).

3.4. Typology of public procurement arrangements

Public procurement is the process that allows public authorities to acquire goods, works or services from companies, and that therefore regulates the involvement of the private sector in the delivery of public services and infrastructures (European Commission, 2022b). Public procurement is based on contractual relationships, where responsibilities, risks and rewards are distributed among the involved parties. The EU law sets harmonised rules for public procurement, which apply for tenders whose monetary value exceeds a given threshold (European Commission, 2022c). Smaller tenders are regulated by national laws, which must nevertheless guarantee the application of the general EU principles of transparency, open competition, non-discrimination and effective procedural management (European Parliament and the Council of EU, 2014).

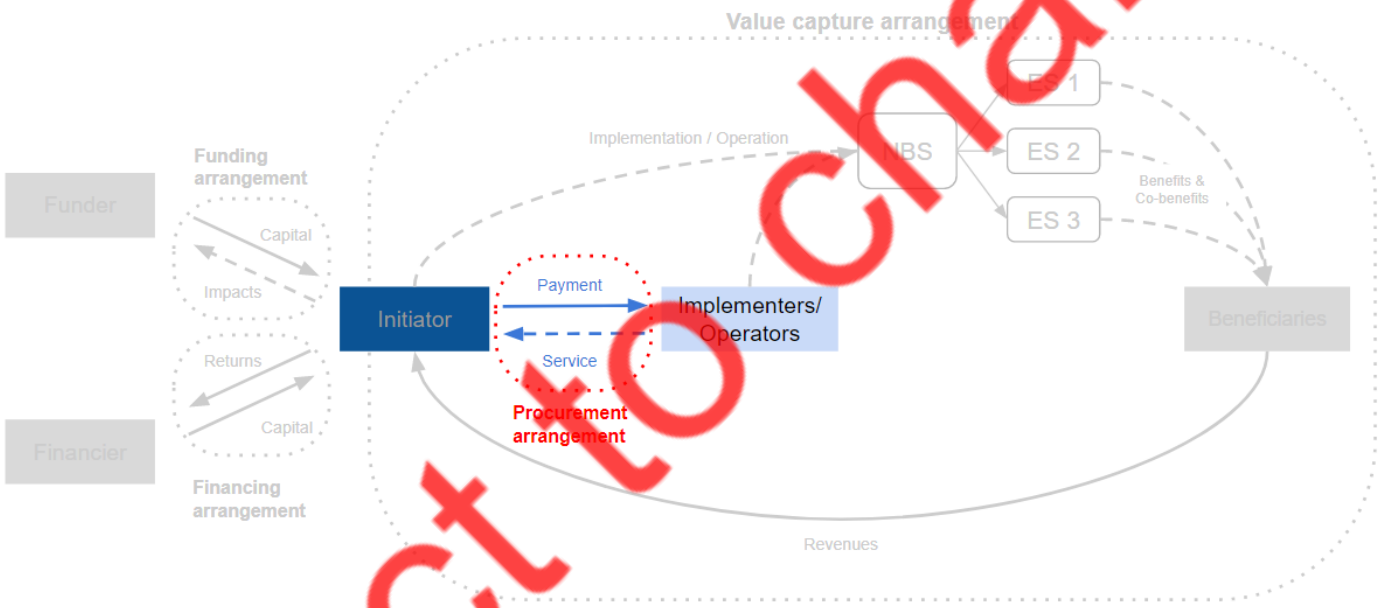

Figure 3.6 Highlight of Procurement Arrangement within the BMF.

Within the NBS Business Model, the initiator establishes procurement arrangements to carry out the activities needed to materialise the envisioned NBS (Figure 3.6), including its design, planning, construction, operation and maintenance (World Bank Group, 2017). These phases are all characterised by specific types of risks and functions, and can be separately procured by the project initiator.

The level of integration in the procurement of these different phases is a first, reliable dimension for the construction of a typology of public procurement arrangements (Miller, 2000). On one end of this scale we find segmented procurement structures, for which each stage of the project is procured separately with multiple, self-contained contracts. On the other end of the spectrum, combined structures integrate several phases in a single, more complex, contractual arrangement. It follows that, while in the first instance the government will presumably interact with multiple

interlocutors, in case of a fully integrated procurement strategy this - direct - engagement will be reduced to a single entity.

Pietroforte and Miller (2002) identify, as an additional dimension for a procurement typology, the funding responsibilities, which can be assumed by the public authority - direct funding - or shifted to the private contractor - indirect funding -. By crossing the axis of funding responsibility with the "integration level" dimension, the authors draw a quadrant framework for procurement strategies, which we have replicated in figure 3.7.

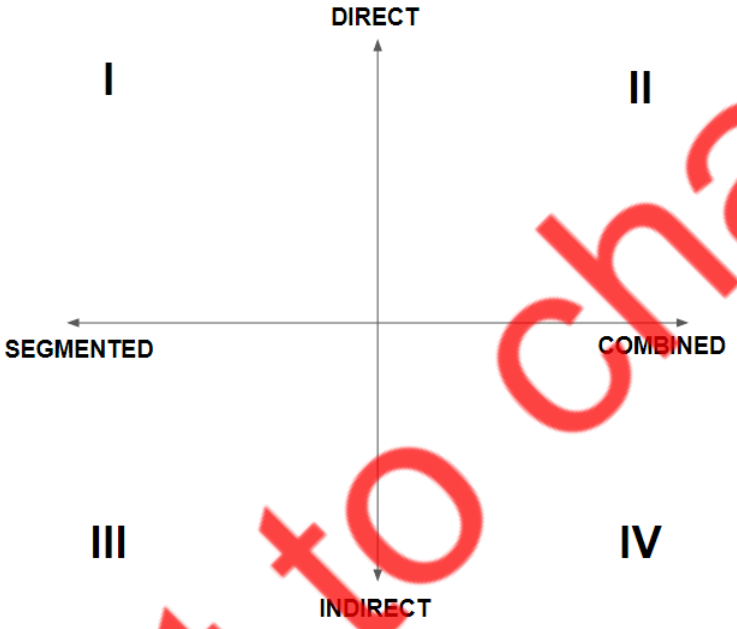

Figure 3.7 Quadrant framework for public procurement strategies

While predominantly private procurement of infrastructure is still a rare occurrence (Välilä, 2020), a growing number of public administrations is considering new forms of procurement where responsibilities for the construction and operation of assets are shifted to the private sector (Hoppe et al., 2013). If we take the quadrant framework as a reference, traditional public procurement strategies would be found in the first quadrant. Under this model, companies don't have a broader interest in the project beyond the respective assigned functions. The government underwrites all risks, from financing to operating performances, and bears the responsibility for the provision of the service connected to the asset (Välilä, 2020). This kind of approach relies on the fact that governments are well-placed to sustain long-term risks inherent to service provisioning, due to the possibility to recoup cost overruns through fiscal instruments.

Longer temporal scales of public service infrastructure projects must nevertheless cope with the necessary tension that arise against rather short term electoral cycles (ibid.). During the last few decades, limited public budgetary resources coupled with important increases in expenditure needs for infrastructures imposed the necessity to look for more efficient procurement approaches (Pietroforte and Miller, 2002). What has resulted from this tension was an intensification of the shift

of responsibilities to private actors, and the extension of their involvement to the whole project life-cycle scope. This tendency is captured by the concept of Public-Private Partnership (PPP), an approach to public procurement that is alternative to the traditional model, and that has long been promoted by multilateral development and economic organisations - the European Commission, the OECD, the World Bank, Asian Development Bank, the International Finance Corporation, ASEAN - (Greve, 2015). By now, PPPs have been applied successfully for decades in both advanced economies (Douglass and Sykes, 2013) and developing countries, although the latter may face additional challenges related to the solidity of their legal and financial institutions (Henckel and McKibbin, 2010).

The public procurement literature does not give a precise and comprehensive definition to PPP (Hodge et al., 2010), yet its key elements are clearly identified. PPPs are based on the "bundling of contracts", i.e. the integration of the various project phases into a single procurement contract (Carpintero and Petersen, 2015). These contracts are long-term - roughly between 20-30 years - and they transfer a considerable amount of risks and responsibilities to the private party, including a major contribution in terms of capital investment (Grimsey and Lewis, 2007). The long term horizon is meant to create incentives for the private party to consider life-cycle costs, (World Bank Group, 2017), for example by investing more for the construction of the asset in order to avoid incurring in additional costs at later stage during operations. In the quadrant framework, PPPs would thus be placed in the fourth quadrant, as financing responsibilities are borne by the private actors and the procurement of the project phases is combined in a single contract. The fact that the various project activities are delegated to a single private contractor does not mean that they will necessarily be provided by the same company. In most cases, once the procurement is awarded to a consortium, the latter will establish secondary contracts with external planning, construction and operator companies (Grimsey and Lewis, 2007).

The whole-life approach manages to balance these costs with whole-life benefits, thus resulting in increased efficiency of service delivery. PPPs also entail regular revenues for the private party over the duration of the contract, either in the form of direct payments form the public sector party (i.e. availability-based approach) , or through the establishment of fees for the users of the facility (Guasch, 2018). Most PPP projects are delivered through a dedicated SPV, a legal entity used in project finance, which encompasses all assets and liabilities related to the project. In some other cases, activities are executed by a jointly owned public-private company, in what is known as an institutional public-private partnership (Carpintero and Petersen, 2015).

While the bundling of procurement contracts in a single PPP arrangement can reduce the overall amount of transaction costs required to manage the relationship between public and private parties (Pietroforte and Miller, 2002), PPPs are complex contractual arrangements that are set up through particularly costly pre-contractual transactions (De Schepper et al., 2015).

While PPPs are often framed as win-win solutions and sometimes met with excessive optimism (Altamirano et al., 2021), designing and monitoring long-term, composite contracts is by all means a challenging task. Depending on the institutional, socio-political and fiscal context (Välilä, 2020), as well as the effects of the cost-saving investments on service quality (Hoppe et al., 2013), the choice for the most appropriate procurement method might fall on more conventional approaches.

Besides the two dimensions that form the quadrant framework - financing responsibilities and degree of integration -, public procurement arrangements can also be classified according to the model for revenue generation, the ownership of the assets, and which of the phases of the project are bundled in the PPP contract. Below we list the categories that are most commonly mentioned in the literature.

- Design & Build (DB), Design-Bid-Build (DBB)

  DB contracts are the most common type of traditional public procurement arrangement. They are not considered PPP as they consist of short-term contracts, through which companies are hired to design and build an asset following a set of requirements provided by the commissioning public authority. Upon the completion of the construction works, the government agent will be in charge of operating and maintaining the facility. DBB contracts are structurally similar to DB ones, but public actors design the project themselves, then call a bid for its construction. DB and DBB contracts thus alleviate governments from construction risks without the need to set up complex PPP arrangements, but they do not provide incentives to the private party to consider the long-term performance of the facility (Yescombe, 2010). For this reason, they are best suited for relatively simple and small-scale projects (World Bank Group, 2017).

- Operation & Maintenance (O&M), Affermage and Franchise.

  O&M contracts procure the in-service management of a pre-existing/already-realised infrastructure. They can be considered PPP only when the contract is based on performances, it is long-term and requires considerable capital investment from the private party (World Bank Group, 2017). If the contract establishes an user-pay model for revenue generation, and part of the revenues are transferred to the government, for the recovering of the construction/rehabilitation costs, the arrangement can be called an Affermage or Franchise (Yescombe, 2010).

- Design-Build-Operate (DBO)

  DBO is an extension of a DB contract which combines the procurement for the design, construction, operation and maintenance of a facility. Financing remains direct, i.e. a responsibility of the public party. The main advantages of a DBO contract is that the cost of capital will be lower, and the level of complexity of the contractual arrangement will generally remain low (Yescombe, 2010).

- Design-Build-Finance-Operate (DBFO)

Also known as DBFOM - the function maintenance is implicit -, DBFO is a form of PPP where the design, construction, operation & maintenance functions are transferred to the private party with a single bundled contract. The contractor company is also responsible to finance all the related costs, and will fully benefit from the operation of the infrastructure and the related revenue streams. The revenue streams that sustain the financing of the project can originate either from a single purchaser (usually a public entity), or be based on tariffs charged to a large number of off-takes, i.e. the users of the service provided (Delmon, 2010). The latter option is generally less attractive, as it entails more complex due diligence processes to account for the multiple variables for the analysis of credit risk and demand profiles. Under a DBFO arrangement, the public authority maintains legal ownership over the asset (Yescombe, 2010). Overall, the level of risk assumed by the private sector is high.

- Build-Operate-Transfer (BOT), Build-Transfer-Operate (BTO), Build-Own-Operate (BOO)

This category of PPPs are essentially DBFO-like contracts in which the private party eventually acquires ownership over the assets (World Bank Group, 2017). In BOT contracts, the private party has ownership rights for the duration of the contract. Once the contract term ends, ownership is transferred to the public authority. With BTO, this transfer happens when the construction of the asset is completed. In BOOs contract, the transfer of ownership does not happen at all, and the private party can benefit from full legal ownership rights throughout the contract duration and beyond.

Table 6.2 Distribution of responsibilities across the main types of procurement contracts (adapted from Yescombe 2010, p. 12)

Public Project ←							→ Private Project
	Conventional procurement			PPP ←			→
Contract type	**DBB**	**DB**	**Franchise/affermage, O&M**	**DBO**	**DBFO**	**BTO, BOT**	**BOO**
Design	Public	Private	Public	Private	Private	Private	Private
Build	Public	Public	Public	Private	Private	Private	Private
Operation	Public	Public	Private	Private	Private	Private	Private
Ownership	Public	Public	Public	Public	Public	Temporarily private	Private
Payor	Public	Public	Users	Public	Public or users	Public or users	Public or users
Payee	n/a	n/a	Private	Private	Private	Private	Private

Public procurement is only one of several delivery options available for a NBS investment. There are other governance structures, or governance modes (Altamirano et al., 2021), to support the fundamental transactions necessary to form a business model.

- First of all, as transpires from the above discussion on public procurement, public actors may decide to deliver a public service autonomously, thus relying on its own in-house staff and resources. It may also decide to outsource the activities to a state-owned enterprise, instead of a private one. Public-public partnerships are also a common find, consisting of a publicly-owned SPV who finances and delivers a facility, operates it and collects fees from the users. This setup does not introduce private-sector finances and may not be the most effective way to negotiate with subcontractors (Yescombe, 2010).
- NBS projects may result from a private sector stewardship investment (Altamirano et al., 2021). This type of governance mode is typically relevant when the investment is related to common pool resources. Private actors whose businesses depend on the availability of water resources and related ecosystem services organise multi-stakeholder processes and implement solutions in order to preserve these services. The feasibility of private stewardship depends on the institutional environment. Without effective governance structures and shared norms, transaction and monitoring costs to set up the process and avoid free riders would be prohibitive.

- Collective investments consist of a pooling of resources from many investors into an investment fund that invests these in a portfolio of assets (Altamirano et al., 2021). The objective is to rely on professional investment management, to achieve economies of scale and to reduce risks through diversification. An example of an investment fund that has relevance for coastal adaptation NBS is water funds. Water funds specifically contribute by mandate to water security and the improvement of water resources governance.
- Environmental markets are market-based transactions for ecosystem products and services, which create incentives for the preservation of the ecosystems that produce them. It is a prevailing governance mode for private goods.

Chapter 4 Market conditions and values

Fausto Favero [1,2,], Jochen Hinkel [1,2] and Michael Sedlmeier [1]*

[1] Faculty of Resource Economics, Humboldt University, Hannoversche Str. 27 D-10115 Berlin, Germany;

[2] Global Climate Forum e.V., Neue Promenade 6 10178 Berlin, Germany

[*] Correspondence: Fausto.Favero@globalclimateforum.org

4.1. Sustainability in investment strategies

As previously mentioned, NBS and the restoration of coastal ecosystems are planned in such a way to provide multiple benefits, including mitigation and adaptation to climate change, improving the resilience and ecological status of ecosystems, supporting the economy and livelihoods of local communities. As such, they are closely related to the concept of sustainability. Sustainability, in economics, is understood as the avoidance of depletion of natural resources, in such a way as to maintain their availability to future generations as well as the overall ecological balance. This definition is often expanded to also include social and economic resources. NBS can be characterised and proposed as sustainable investments through a range of environmental indicators (e.g. carbon sequestration, water quality, biodiversity), social indicators (e.g. participation of local communities, new employment opportunities, public health and wellbeing), economic indicators (e.g. cost-effectiveness, return on investment, projected revenues), and governance indicators (e.g. stakeholder engagement, transparency). Multiple sources confirm the growth of the market for sustainable investments and demonstrate the growing demand and supply for investment products that incorporate environmental, social and governance (ESG) data into their investment decisions (Forum Nachhaltige Geldanlagen e. V., 2022; Micilotta, 2018). Nevertheless it should be mentioned that according to the Dasgupta Review, it is difficult to estimate the concrete size of assets related to ESG due to a lack of consistent definitions. They find that global estimates range from US$3 trillion to US$31 trillion (HM Treasury, 2021).

4.1.1 Financial and non-financial returns

Sustainable investors aim for achieving viable financial returns while incurring appropriate levels of risks. The industry association Eurosif states that next to benefitting society, the main aim of sustainable investments is “to better capture long term returns for investors.” (Sakuma-Keck, 2021, p. 11). Also various scholars find that pecuniary factors are important drivers for sustainable investments (Gutsche et al., 2020; Riedl and Smeets, 2017; Weber, 2014).

There are various studies analysing the relationship between financial and ESG performance. Friede et al. (2015) succeeded in aggregating findings from more than 2000 empirical studies, covering all relevant review studies on sustainability and financial performance published until the end of 2014 and concluded that 90% of the studies find a non-negative relationship between ESG factors and financial performance and that the majority (47,9% in vote-count studies and 62,6% in meta-

analyses) of the studies even yield positive findings. The findings support that by incorporating sustainability considerations in investment decision making, sustainable investors are able to achieve sufficient financial returns and may even achieve additional financial returns compared to conventional investors. Or in the words of Friede et al, the "the business case for ESG investing is empirically very well founded" (Friede et al., 2015, p. 210).

There is multiple academic research demonstrating that also non pecuniary factors are drivers of sustainable investments and that consequently the utility function of investors is shaped by both, financial as well as non-financial return (Bollen, 2007; Gutsche et al., 2020; Nishino et al., 2014).

Scholars expect that this non-financial return is driven by a positive emotional effect that can be achieved through investments in line with moral values and pro social preferences (Gutsche et al., 2020; Hafenstein and Bassen, 2016; Riedl and Smeets, 2017). Hafenstein and Bassen summarise academic literature and find that there are sustainable investors "who do not want to generate profit by investing in companies that behave unethically or immorally" other sustainable investors on the other hand derive their positive feelings from "supporting a `good` thing, acting in a socially responsible manner or contributing to social change" (Hafenstein and Bassen, 2016, pp. 2–3). Empirical studies confirm that individual psychological factors and social values - e.g. solidarity, perception of long-term profitability, environmental values and political preferences , sense of appropriateness - play a role in financial decision-making (DeBondt et al., 2010), particularly in the context of sustainable investments (Riedl and Smeets, 2017). Notice how there may be trade-offs between different types of financial and non-financial benefits, and the willingness to forego financial returns in exchange of more incisive environmental and social impact varies between investors and types of investors - individual investors, philanthropists, institutional investors, financial institutions -. Delsen and Lehr (2019) argue that in post-industrial societies, where socio-economic growth has developed for a long period of time, individuals attribute increasing importance to post-material values, i.e. the fulfilment of non-material needs, which then results in stronger preferences for green investments.

4.1.2 Classification and impact

Academic scholars report great heterogeneity not only within the strategic dimension of sustainable investments, but also when it comes to general classifications of sustainable investments (Busch et al., 2021; Sandberg et al., 2009). Figure 4.1 showcases the different sustainable investment strategies that are applied and used by Eurosif to categorise the market (Micilotta, 2018).

ESG integration	The systematic and explicit inclusion by investment managers of environmental, social and governance factors into financial analysis.
Corporate engagement & shareholder action	Employing shareholder power to influence corporate behaviour, including through direct corporate engagement (i.e., communicating with senior management and/or boards of companies), filing or co-filing shareholder proposals, and proxy voting that is guided by comprehensive ESG guidelines.
Norms-based screening	Screening of investments against minimum standards of business or issuer practice based on international norms such as those issued by the UN, ILO, OECD and NGOs (e.g. Transparency International).
Negative/exclusionary screening	The exclusion from a fund or portfolio of certain sectors, companies, countries or other issuers based on activities considered not investable. Exclusion criteria (based on norms and values) can refer, for example, to product categories (e.g., weapons, tobacco), company practices (e.g., animal testing, violation of human rights, corruption) or controversies.
Best-in-class/positive screening	Investment in sectors, companies or projects selected for positive ESG performance relative to industry peers, and that achieve a rating above a defined threshold.
Sustainability themed/thematic investing	Investing in themes or assets specifically contributing to sustainable solutions - environmental and social - (e.g., sustainable agriculture, green buildings, lower carbon tilted portfolio, gender equity, diversity).
Impact investing and community investing	**Impact investing** Investing to achieve positive, social and environmental impacts - requires measuring and reporting against these impacts, demonstrating the intentionality of investor and underlying asset/investee, and demonstrating the investor contribution. **Community investing** Where capital is specifically directed to traditionally underserved individuals or communities, as well as financing that is provided to businesses with a clear social or environmental purpose. Some community investing is impact investing, but community investing is broader and considers other forms of investing and targeted lending activities.

Figure 4.1 Main approaches to sustainable investment and their related definitions (GSIA, 2019).

Academic scholars as well as sustainable investors associations however increasingly mention the importance of the actual contribution of sustainable investments to a more sustainable economy, regardless of the used investment strategy (Busch et al., 2021; Kölbel et al., 2020; Sakuma-Keck, 2021).

Busch et al. note that this reorientation of sustainable investment to the actual impact of investments is a significant change, a shift in the sustainable finance landscape "from the business case of sustainability to the sustainability case of business." (Busch et al., 2021, p. 32).

Therefore, recently, Busch et al. (2022), in collaboration with Eurosif, published a white paper on the development of a new classification system for sustainable investments. They place the ambition of sustainable investment to actively support the transition towards a more just and sustainable economy at the centre of the sustainable investment classification. Such a transition-focused classification for sustainable investments and the consequent shift towards actual real world-impact of sustainable investments is emphasised to be fundamental to express the full potential of capital markets in supporting the transition to a net-zero emission economy (Busch et al., 2022; Sakuma-Keck, 2021). Scholars emphasise that when evaluating the impact of investors, i.e. their contribution to a more sustainable economy, it is important to distinguish between the investor's impact and the company's impact in the real economy (Busch et al., 2021; Kölbel et al., 2020).

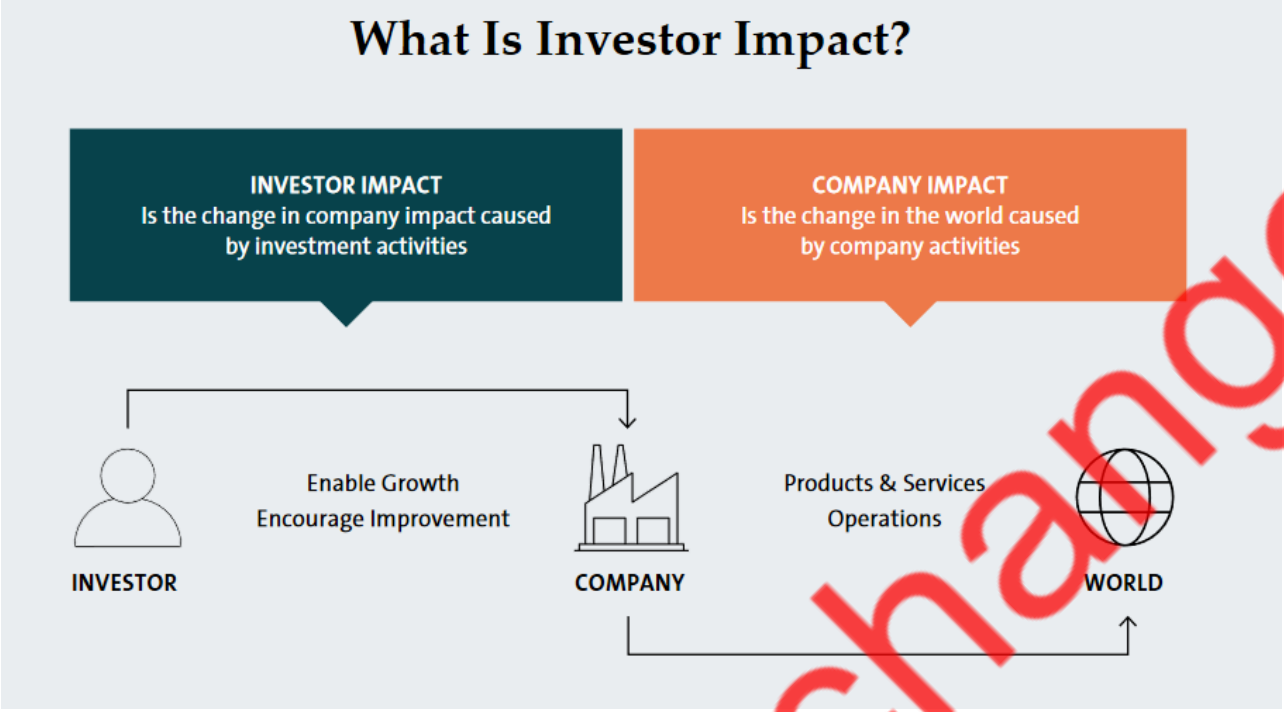

Figure 4.2 Distinction between the impacts of investors and companies (Heeb and Kölbel, 2020).

Figure 4.2 shows the distinction between the real economy, which actually interacts with the environment, and the financial sector, which influences entrepreneurial activity in the real economy. Accordingly, when talking about investor impact, we really need to determine what changes the investment activity has caused in the way the company interacts with the environment. Consequently, scholars emphasise the need for a transformative nature of sustainable investments in order to legitimately claim to achieve sustainability impacts.

The potential of NbS to contribute to achieving net-zero targets and SDGs, as well as their increasing perception as a means to diversify and transform businesses, is highlighted by several scholars (Kooijman et al., 2021; Seddon et al., 2020a, 2020b). What remains to be seen is whether the recent growth in investor interest in sustainable and green financial products is matched by - or could lead to - a comparable increase in financial flows towards NBS projects.

4.2 Review of the supply side of funding & finance in Europe

Global climate finance sources have been constantly increasing in recent years. The CPI's 2021 global landscape of climate finance illustrates how, despite recent rapid growth rates, the current supply for climate finance is far below the level required to meet the international climate objectives for 2030 and to avoid the worst consequences of climate change (CPI, 2021). Moreover, most of the finance mobilised for the fight against climate change is currently directed towards mitigation

projects, while the support for adaptation efforts is rather marginal (Figure 4.4).

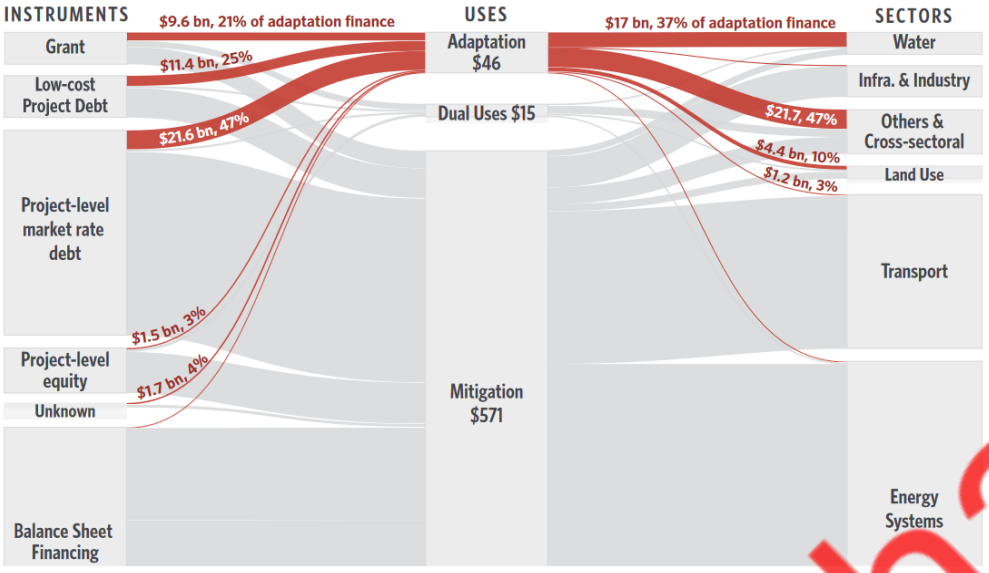

Figure 4.4 Adaptation finance by source and instrument (CPI 2021).

The financing of climate change adaptation is smaller - 7% of total climate finance -, grows slower - 53% increase between 2017 and 2019 -, and is more reliant on the public sector when compared to mitigation finance (Figure 4.5).

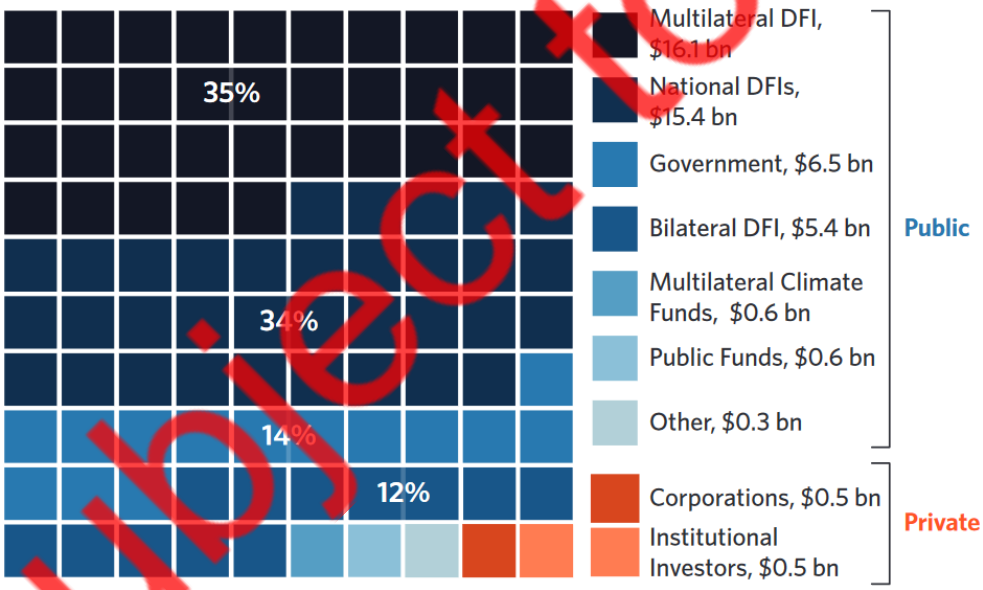

Figure 4.5 Sources for adaptation finance (CPI 2021).

The same can be said for the subcategory of NBS finance, which is almost exclusively supported by public funders (UNEP, 2021). Swann et al. (2021) estimates global international public funding for NBS adaptation to be as low as 0.6-1.4% of total climate finance flows - 1.5-3,4% of total public climate finance flows and 9% of adaptation finance -. The contributions of the private sector to adaptation NBS are mostly in the form of investments for the sustainability of the supply chains and

for environmental offsets, less often they consist in philanthropic and impact investment initiatives (UNEP, 2021). These figures are approximative as current datasets on NBS and adaptation investments are not sufficiently granular to precisely assess current levels of investment (Swann et al., 2021). Adaptation measures are often embedded in larger interventions or integrated into wider development scopes (Ward and Caldwell, 2016), and therefore often labelled under other related categories (Tall et al., 2021). The tracking of private investments in NBS faces additional barriers, as transparency in accounting is limited by voluntary reporting schemes, confidentiality-based constraints and lack of impact metrics (CPI, 2021; Tall et al., 2021).

As recent financial commitments and efforts by the public sector only amounted to insufficient rates of growth in adaptation finance, unlocking the participation of the private sector in this sense would be a firm step towards closing the finance gap. According to the World Bank Group (2021) a precondition for this to happen is the establishment of supporting frameworks of policies and incentives. Adaptation bonds and other labelled financial instruments are already being issued by corporations - in particular in the real-estate and forestry/paper industries - (Tuhkanen, 2020).

4.2.1 Supply of finance from supranational funds and multilateral development banks

The European Structural and Investment Funds (ESIF) are the main investment instrument of the EU and provide several opportunities for the funding of NBS projects. The European Regional Development Fund (ERDF) - which includes Interreg for transnational projects - and the Cohesion Fund (CF) are particularly suitable, as a considerable portion of their total investments are earmarked for the development of sustainability-, climate- and resilience-focused projects. Projects are eligible for ESIF funds only when they meet a set of criteria and they are in line with the hosting member state's operational programme investment priorities. Moreover, these grants require co-funding, which means that projects cannot be funded entirely by the EU funds. The ESIF also includes the European Agricultural Fund for Rural Development (EAFRD) and the Just Transition Fund (JTF), which respectively support investments in rural development - including sustainable management of natural resources and climate action - and in the green transition of member states.

The EU also provides grants for NBS projects through the co-funding Program for the Environment and Climate Action (LIFE) and, for those with a research or innovative component, the Horizon Europe programme.

Multilateral development banks (MDB) are supranational institutions that provide development aid and cooperation, including those for climate and restoration projects, through impact development debt and equities, grants and other financial instruments. They often support economic and social progress in developing countries, but development and cohesion within Europe is also targeted.

The largest MDB in Europe is the European Investment Bank, an autonomous body within the EU institutional framework which finances investments for climate action and environment, essential infrastructure, communications in Europe and in developing countries. The EIB is one of the most

important public-sector institutions lending in the PPP sector, and its InvestEU - previously known as Natural Capital Financing Facility - program supports a variety of biodiversity and nature-based adaptation projects (EIB, 2022). Another major MDB operating in Europe is the European Bank for Reconstruction and Development (EBRD), which aims to become a majority green bank by 2025. In a recent statement signed at COP26 in Glasgow, the EBRD and the EIB pledged to "step up nature financing and efforts to mobilise or leverage private finance for investments in nature" and "to support countries to secure high ambition for implementing nature-based solutions" (World Bank Group et al., 2021, p. 5). Grants funded through the European Economic Area (EEA) by Iceland, Liechtenstein and Norway are also available for environment, energy, climate change and low carbon economy projects in eastern European countries, while several financial instruments supporting climate action and environmental sustainability across Europe are issued by the EIF with a focus on innovation and entrepreneurship. NBS projects can also be financed through global funds for climate adaptation such as the Green Climate Fund and the Global Environment Facility.

4.2.2. Supply of finance from the private sector

The interest of companies for sustainable investment is surging as major private sector players are more and more interested in developing and implementing sustainable business models. Despite the emergence of such trends and the clear prospect of growth opportunities for sustainable businesses ahead of the global transition to a net zero economy, the involvement of corporate investors in adaptation finance is still an emerging phenomenon.

With regards to NBS investment in particular, this is even more so the case, for reasons that have been already discussed. Nevertheless, broad private-sectors initiatives supporting environmental protection and investments in natural capital are increasingly common (e.g. Business for Nature, AgWater Challenge, Act4nature). This is reflected in actual corporate NBS investments, which consists mainly in investments for sustainable supply chain and offsets, to a lesser degree in impact investments (UNEP, 2021). Funding reforestation and other carbon-offsetting projects are among the most prevalent ESG measures of high carbon emitting companies in sectors such as aviation and oil/gas production. Water utilities frequently issue green and other sustainability-linked bonds to reduce risk and improve their supply chain cost-benefit profile, including through freshwater NBS (GPC, 2021). Companies with high water footprints - food and beverage, power generation, mining etc. - are exposed to water scarcity risks and have offset the impact of their water consumption through restoration of natural river flows and hydrologic connectedness. Real estate and forestry - including paper - companies can also be considered as potential suppliers of finance for NBS, as most of corporate adaptation-related green bonds are issued within these sectors (Tuhkanen, 2020).

Institutional investors such as pension funds, insurance companies and investment firms are increasingly aligning their portfolios towards net zero targets and, due to their long-term, real-asset-oriented investment strategies, recognize growing opportunities in large-scale NBS projects with

long-term lifecycles. Although philanthropic foundations have only dedicated marginal attention to climate objectives in comparison to other social challenges, in recent years their funding has increased consistently (Roeyer et al., 2021). Despite the primacy of funding for climate mitigation, hands-on conservation approaches to biodiversity and ecosystem conservation are also widely supported by the foundations' environmental programs (EFC, 2021).

New means to deliver finance to NBS projects are brought by numerous European crowdfunding platforms specialised in sustainability- and climate-related investments. Although currently the focus is on small scale projects in the renewable energy sector, the growth of the crowdfunding market, coupled with past successful implementations of this type of instrument for civic engagement in NBS funding (Sedlitzky and Franz, 2019) , suggest a future growth in relevance of this type for NBS projects (Nigam et al., 2018). Among the most active EU-based green crowdfunding platforms we find Greencrowd (Netherlands), Bettervest (Germany), Oneplanetcrowd (Netherlands), Lendosphere (France), ZonnepanelenDelen (Netherlands), Durzaam Investeren (Netherlands), Lumo (France), GreenXmoney (Germany), Abundance (UK) and Rockets Green (Austria).

Chapter 5. Current financial arrangements in the RESTCOAST pilots

Fausto Favero [1,2,] Jochen Hinkel [1,2] Lieke M. Hüsken [3,4,] and Heleen S.I. Vreugdenhil [3,4]*

[1] Faculty of Resource Economics, Humboldt University, Hannoversche Str. 27 D-10115 Berlin, Germany;

[2] Global Climate Forum e.V., Neue Promenade 6 10178 Berlin, Germany

[3] Faculty of Technology Policy and Management, Delft University of Technology, Jaffalaan 5, 2628 BX Delft, The Netherlands;

[4] Deltares, Boussinesqweg 1, 2629 HV Delft, The Netherlands

[*] Correspondence: Fausto.Favero@globalclimateforum.org

The rest-coast project will enhance ESS through coastal ecosystem restoration in 9 pilots that represent the main EU regional seas (Baltic, Black, North, Atlantic and Mediterranean).

Besides their geographical location, the pilots differ in terms of scale, type of restoration activity and targeted ESS, stage of development (initial planning, construction, maintenance etc.), the structure (single project or several projects within a single restoration program), the involved jurisdictions. This section describes the funding, financing and procurement arrangements present in the various REST-COAST pilots using the framework defined in the last section. Note that the type of information currently available varies per pilot and that the descriptions below represent an initial inventory of the financing structures in place.

5.1. Wadden Sea (The Netherlands)

Wadden sea is a portion of the North Sea that spans across the Dutch and German northern coasts. Its surface is mostly composed of protected areas due to the diverse hydrological, morphological and ecological characteristics. Current data show that, due to the combined effects of salt and gas extraction and peat oxidation, the area is experiencing surface subsidence, and it is therefore more exposed to projected sea level rise and extreme weather events.

The aim of the pilot is to remove sediments from the estuaries and to use these to make local coastal areas more adaptive to climate in several respects: reduction of turbidity, restoration of natural processes, habitat development. Synergies with local livelihoods are sought after whenever possible. The interventions will be spread on different sites, and the resulting data will be used for the development of a studying map for the evaluation of scaling potential of the various deployed measures.

Several (pilot) projects are occurring or have been completed in the estuary. Figure 5.1 shows several different locations where different restoration activities are occurring at different scales, addressing different challenges. For each (pilot) project, funding and financing happens within the project setting (project finance). The project costs are covered by the different collaborating and

participating partners. Several of the projects receive subsidies from public funds, funds in which both public and private parties contribute and European funds.

The program costs - consisting mostly of activities related to coordination and management - are covered by the Province of Groningen, the Ministry of Infrastructure and Water, the Ministry of Agriculture, Nature and Food Quality, and the Department of Waterways and Public Works. Some of the challenges related to finance experienced in this case are the lack of structural funding and finance for projects (the program is committed for several years but project financing is very incidental) and the earmarking of public funds (only meant for a single purpose or objective while NbS serves many objectives).

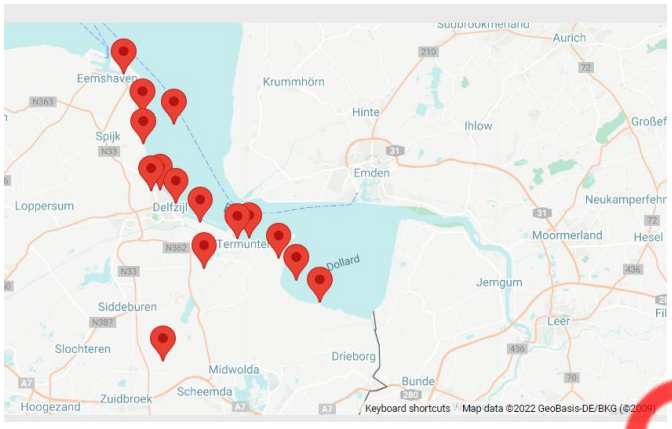

Figure 5.1 Project locations within the Umbrella Program Eemsdollard 2050 (Source: Eemsdollard2050)

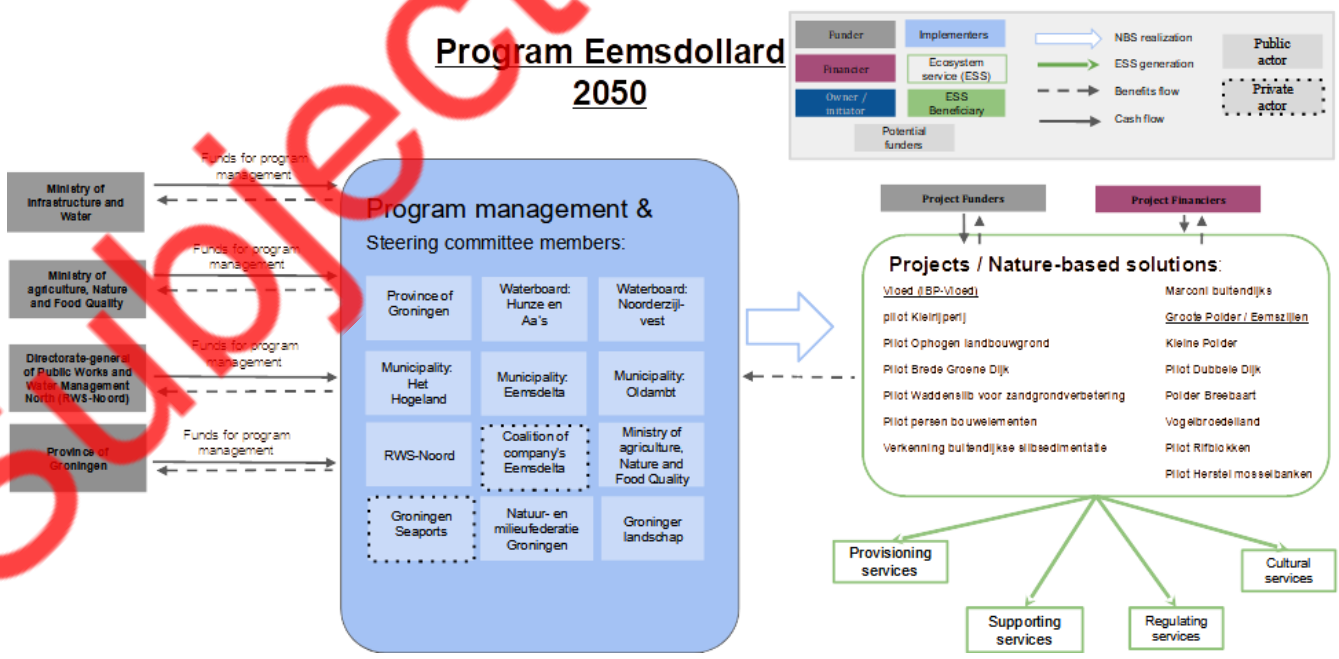

Figure 5.2 Overview of the financing structure of the Eemsdollard2050 Program

5.2. Catalan coast/Ebro delta (Spain)

The Ebro delta is located in the north-western Spanish coast, in the region of Catalonia. The main land morphological features of this coastal stretch are the existence of the Ebro river valley and its delta. The Ebro delta is a heavily unbalanced system due to sediment flux disruption, with the highest erosion rates in Catalonia. The system needs sediments to cope with future coastal hazards. It is a very dynamic system, as sediments are continuously sorted alongshore and across shore by wave energy. The target for coastal restoration is to reduce rates of erosion and flooding events through dune restoration and coastal room provisioning. Due to coastal dynamics and future stressors, restoration will have a shorter life-time and will require rather frequent maintenance actions.

Currently two sites are being jointly evaluated by the project managers and the local government. The first option would be the northern side of the delta, where the "Playas de la Delta del Ebro" is located. In this area coastal erosion is particularly aggressive; the government has so far dealt with this issue by nourishing the beach with sediments collected from the nearby split. The alternative approach proposed by the pilot project would follow an accommodation strategy, i.e. re-naturalizing rice fields and freeing up additional space to the coast, enabling the restoration of dunes and wetlands.

An alternative approach proposed for the pilot would be the installation of underground pipes and the removal of upstream artificial barriers of the river Ebro, which would re-establish the natural flow of sediments and ultimately improve the ecological status and functions of the delta's backshore wetlands.

The restoration activities are co-founded by the European Union - Horizon 2020 and LIFE programs - and National Research Projects.

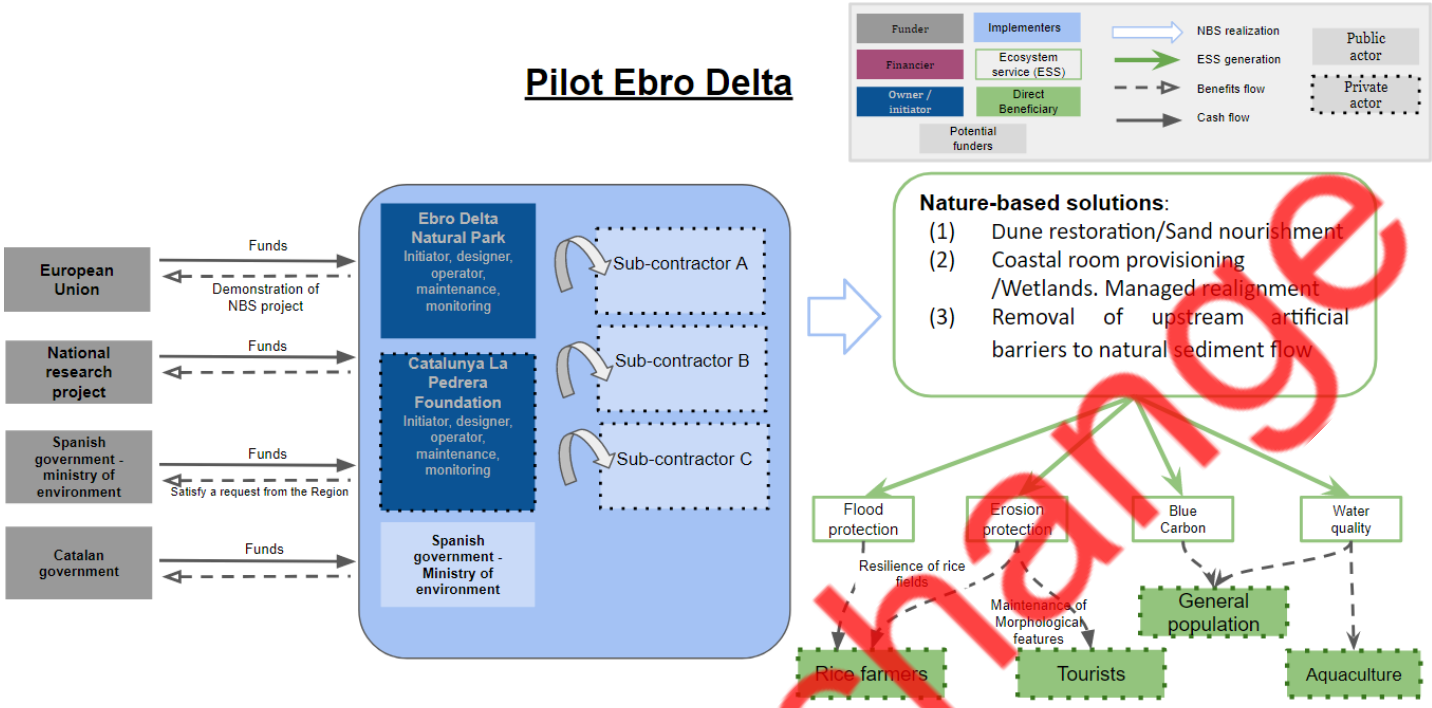

Figure 5.3 Overview of the Ebro Delta Pilot

5.3. Venice (Italy)

The Venice lagoon is located in the northeast coast of Italy, and with its 540 km2 is the largest lagoon of the Mediterranean basin. This transitional area includes the greatest Important Bird Area (IBA) in Italy for extension and number of species, a Special Protection Area (SPA), four sites of community importance (SCI) and a World Heritage site. Despite the recognition of the lagoon's unique value, the area is currently experiencing growing asymmetries in the balance of sediment and the degradation of its unique habitats.

Starting from 1992, a series of interventions have been implemented to recreate typical morphological structures, in particular artificial salt marshes and mudflats, and safeguard the edges of existing ones from the risk of erosion.

The pilot project will review past restoration interventions and draw best practices, with the overall objective of creating suitability maps for future restoration upscaling. Moreover, maintenance works will be carried out in order to preserve the already existing artificial salt marshes in the central lagoon as well as the ecosystem services they generate. Monitoring activities will gather additional data for future interventions. The restoration and protection of the lagoon ecosystems is expected to increase the biodiversity of birds and other species in the area. In addition, it would benefit local communities with the provision of various recreational activities, support fishing and increase revenues of the tourism sector.

The project is managed by Provveditorato Opere Pubbliche (Provv. OO. PP.), with the support of CORILA, CMCC, SELC and the University Ca' Foscari Venezia. Similarly to previous restoration

projects in the area, it is co-funded by grants provided by the EU - Horizon Europe funding program - and the national government. The local government has issued in 2018 an action plan for climate. The plan includes commitment for the development of mitigation actions that are compatible with the project at hand, and could therefore suggest a future financial involvement of the local government in the lagoon's restoration activities. The Port Authority of the Northern Adriatic Sea is another possible future partner, as it financed similar activities in the past. The authority has furthermore expressed its interest in supporting the project through the recycling and management of sediments.

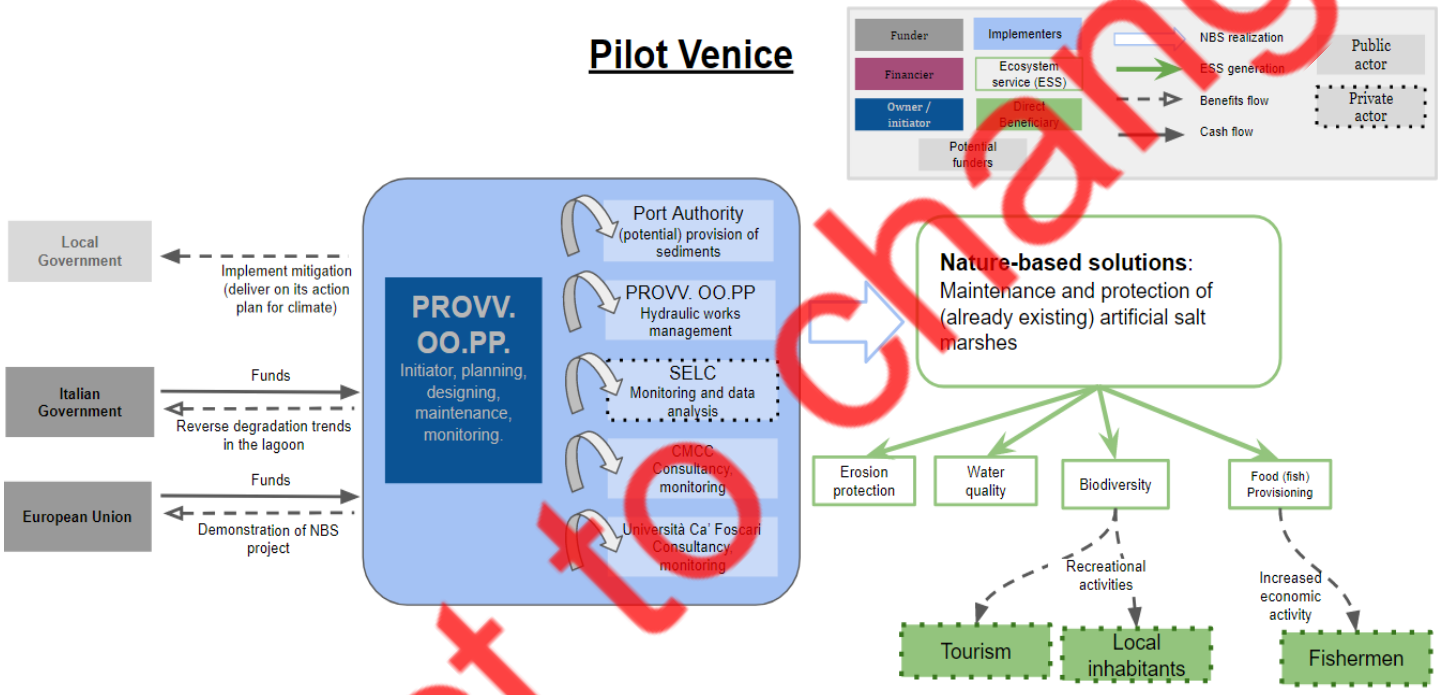

Figure 5.4 Overview of the Venice Pilot

5.4. Vistula Lagoon (Poland)

The Vistula lagoon is located on the Baltic Sea and it is a transboundary basin shared between Poland and Russia. The inlet that connects the lagoon to the open sea is located in Russian territory. This confirmation complicates the access to the lagoon for vessels bound for the Polish harbour of Elblag, as this is contingent on the release of authorizations that require extensive bureaucratic time and can be withdrawn at any time. The harmonisation of policies for maritime transport and environmental management is unlikely due to deteriorated diplomatic relations between Russia and EU countries.

To solve this issue and boost the economy of Elblag, the central government of Poland decided to open a channel to gain independent access to the sea. As the lagoon is part of the Natura 2000 network of sites for breeding and resting for rare and threatened species, compensation for the environmental impact generated by the operation is needed. The restoration project thus consists in the creation of an artificial island through the accommodation of muddy sediments obtained from

the construction and maintenance of the navigation channel. The island will not be open to visitors and will constitute a safe-haven for bird species, especially for migratory birds. In addition to biodiversity, the project will monitor the performance of other additional ecosystem services such as carbon sequestration.

The construction activities are carried out by NDI Group, a construction company, while operations and maintenance after project completion will be a responsibility of the Maritime Office of Gdynia, a governmental agency. EKO-Konsult and Polish Society for the Protection of Birds could be involved in case of need for consultancy services. The project is entirely funded by the Polish Government. The Maritime Office of Gdynia could be financially involved once the project is completed. The increased potential and stabilisation of biodiversity is expected to - indirectly - benefit the maritime office of Gdynia. The spontaneous creation of spawning grounds around the island will result in higher potential for the fish yields of fishermen, as well as in an increase of licences sold and equipment rents.

Another polish lagoon, the Szczecin lagoon, has been identified as a fitting site for potential upscaling of the project. Three additional islands could be built in case of successful outcomes obtained in the Vistula lagoon.

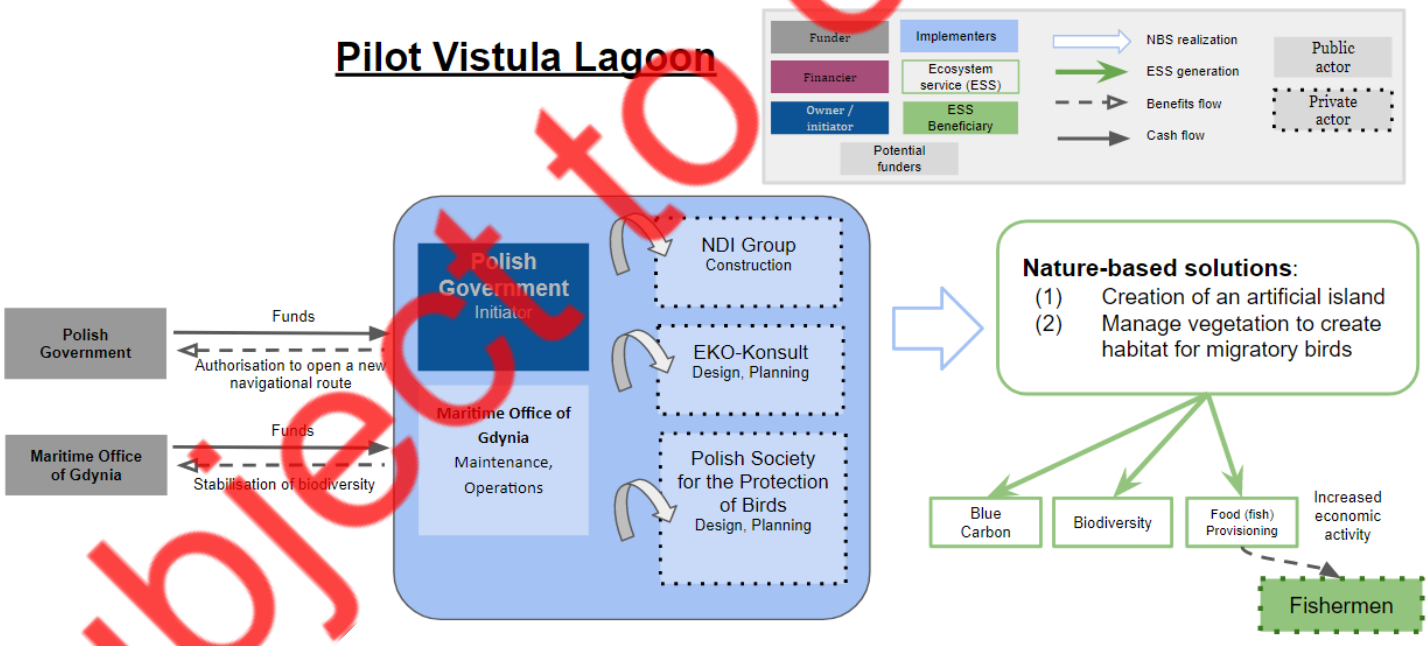

Figure 5.5 Overview of the Vistula Lagoon Pilot

5.5. Foros Bay (Bulgaria)

Foros bay is the most sheltered area against waves of the Bulgarian Black sea. These geographic conditions enable sea grasses and other wave sensitive aquatic species to flourish.

While the biodiversity value of the bay is of clear high socio-ecological importance, the highly-populated city of Burgas exerts several anthropogenic pressures on the system, jeopardising habitat

diversity and increasing the risk of flooding and coastal erosion. There are several coastal (estuarine) lakes of varying size and saltiness located around the pilot site, some of which are designated as protected areas.

The pilot project will build on previous restoration efforts by re-establish the hydrologic connection of the Foros bay with the Vaya lake and the surrounding wetlands, and by armouring the southern canal's bank. Restoration of habitats and regular maintenance of wetland ecosystems will also be carried out. These activities will reduce flooding risks and improve the balance of salinity in the basins.

The project was initiated by the regional subdivision of the Ministry of Environment and Water, while planning and construction have been contracted out to construction companies.

As with previous restoration interventions in the area, one of the key challenges will be to secure a regular flow of finances. The project currently relies mostly on the funding by the European Union under its structural and investment funds and cohesion fund.

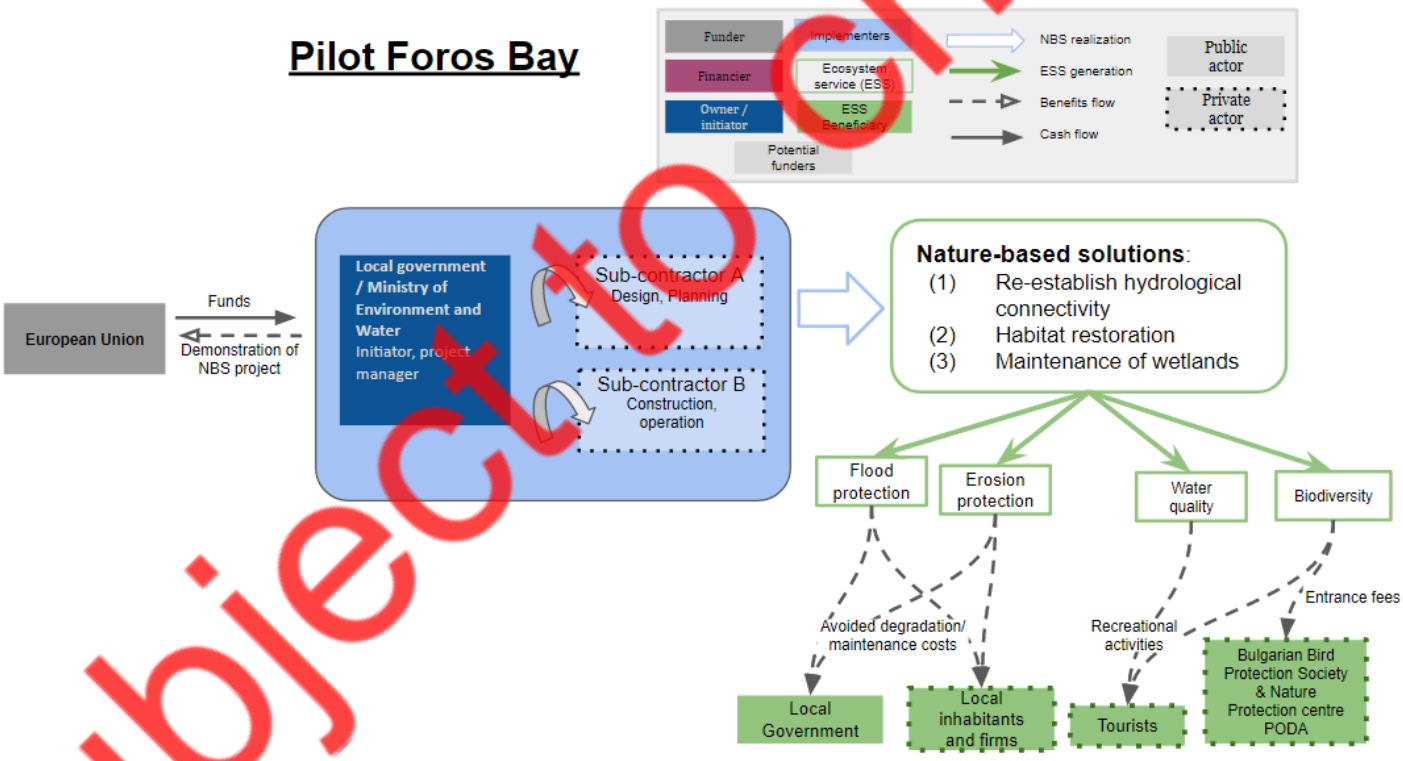

Figure 5.6 Overview of the Foros Bay Pilot

5.6. Rhone Delta (France)

The delta of the river Rhone is located in the southern coast of France. The site for the pilot project used to be owned by a salt company, whose activities required a high level of control on water levels and salinity. In 2008 the salt company decided to sell more than 6500 ha of land on the site to the

French government, which is now aiming at the reestablishment of the original environmental conditions of the delta.

The restoration interventions, coordinated by the coastal protection agency (owner of the pilot site) and co-managed by the Camargue Regional Natural Park, the SNPN NGO and the Tour du Valat research institute, started in 2012 and are still under development. The overall objective is to restore the connection of the central lagoons of the Rhone delta with the surrounding watersheds and the sea.

The management strategy focuses on the implementation of adaptive management to sea level rise, the restoration of the natural, gravity-led hydrology - as opposed to the previous use of pumping stations -, the restoration of the Mediterranean coastal ecosystem and the associated species, and the integration of socio-economic issues. The restoration of the hydrologic connectivity and of the natural coastal ecosystem will be achieved passively, through the elimination of artificial barriers by non-maintenance, and will take into account multiple ecological and economic issues in the short, medium and long term. The project adopted a conventional model for procurement: planning activities are carried out by the project's co-managers, while building and part of the monitoring tasks are delivered by various sub-contracted companies.

The project is co-founded by the European Union and the French State and agencies under the LIFE+ MCSALT program. Ultimately, these funds are paid through the national budget - broad-based taxes -; the introduction of a local tax to cover an expected future increase of maintenance costs is advocated by project's co-managers and will be considered in future developments.

The project is also supported financially by private sector representatives. Both the Coca-Cola foundation and Total foundation funded part of the restoration activities. While the former did so as it was required to off-set its high water footprint under French law, the latter's participation was voluntary, as part of its ESG strategy. Française des Jeux, a French gambling company, also funded some of the restoration activities as required by French authorities in order to get the authorization to use flamingos - an autochthonous and iconic bird species in the Rhone delta - as the main theme for a new scratchcard game. The involvement of these private funders was possible thanks to the solid partnership and patronage network developed by Tour de Valat.

Since the start of the project, a small ecotourism activity has developed, and angling for European Sea Bass has increased in the southern side of the pilot site. Further recreational activities could develop following current efforts in promoting cycling and hiking activities and the organisation of car parking and public access to the beach.

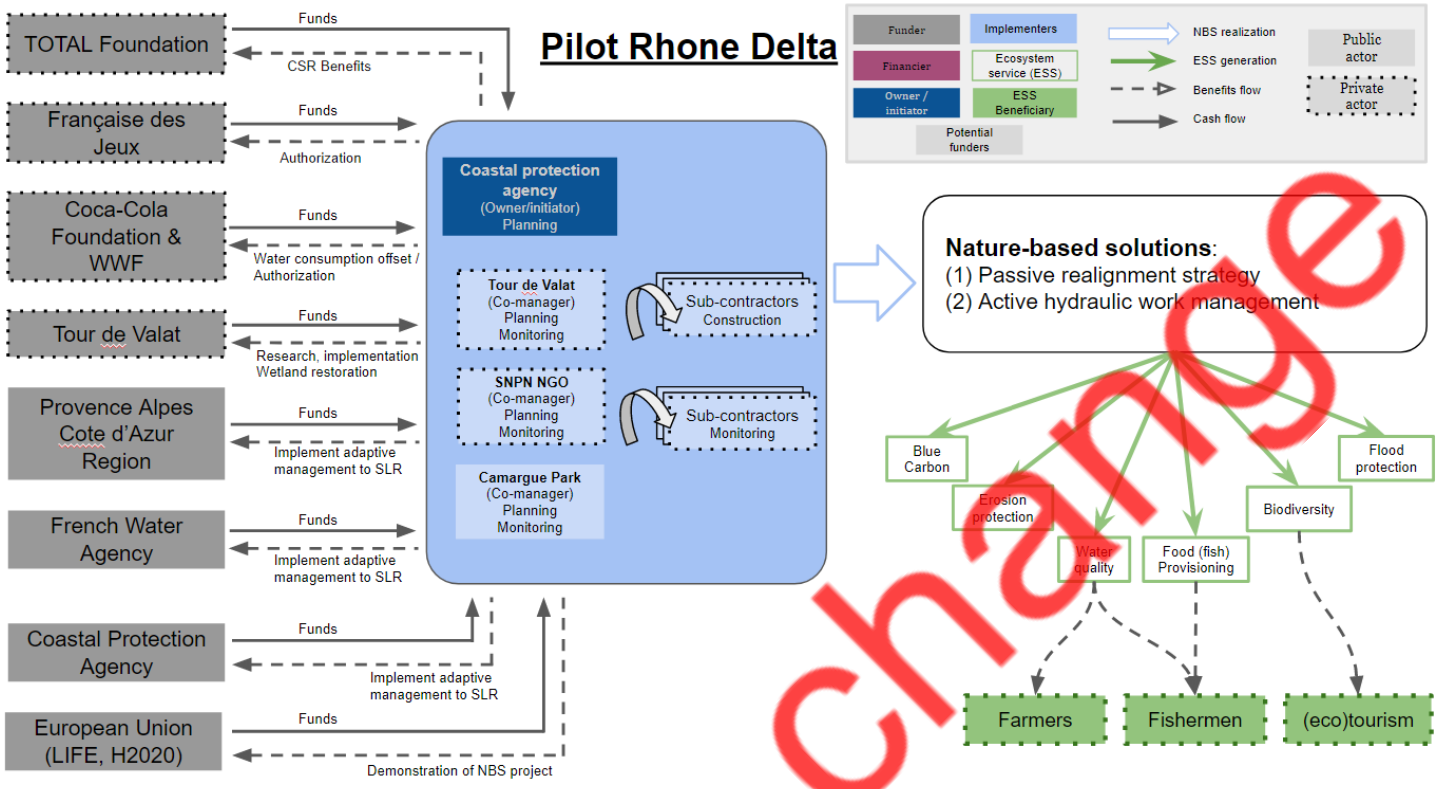

Figure 5.7 Overview of the Rhone Delta Pilot

5.7. Sicily (Italy)

The restoration activities for the pilot project in Sicily (Italy) are scattered across several lagoons in the south-east of the island. The need for restoration emerged due to the very intensive agricultural activities in the region, which generate pressures on the local environment through high water withdrawal rates. Ecological status is further jeopardised by the growing population and by increasing economic activity in the tourism sector. As a result of these anthropogenic pressures, the hydraulic connectivity between lagoons is compromised and several local species and habitats are endangered.

Several activities have been initiated in recent years, with the overall objective of contrasting habitat degradation, safeguarding endangered species and improving the ecological status of the area. Specific actions include anti-poaching measures, the removal of alien and invasive species, land use regulation, wildfire prevention, habitat fencing and waste dump removal. The project also seeks to set up incentive schemes to promote biological and eco-sustainable agriculture and sustainable land use change. Similarly to previous similar interventions, activities are co-funded by grants provided by the European Union - Horizon 2020 and LIFE funding program - and the regional government of Sicily.

In the "Longarini and Cuba" lagoons, activities are founded and managed by Stiftung Pro Artenvielfalt, a private German foundation that purchases local real estates and land to increase the extension of the protected area.

Monitoring techniques are implemented to track environmental performances and the changing status of the lagoon. While currently the focus is mainly on indicators for the fauna and flora, a plan for a more comprehensive monitoring system is underway.

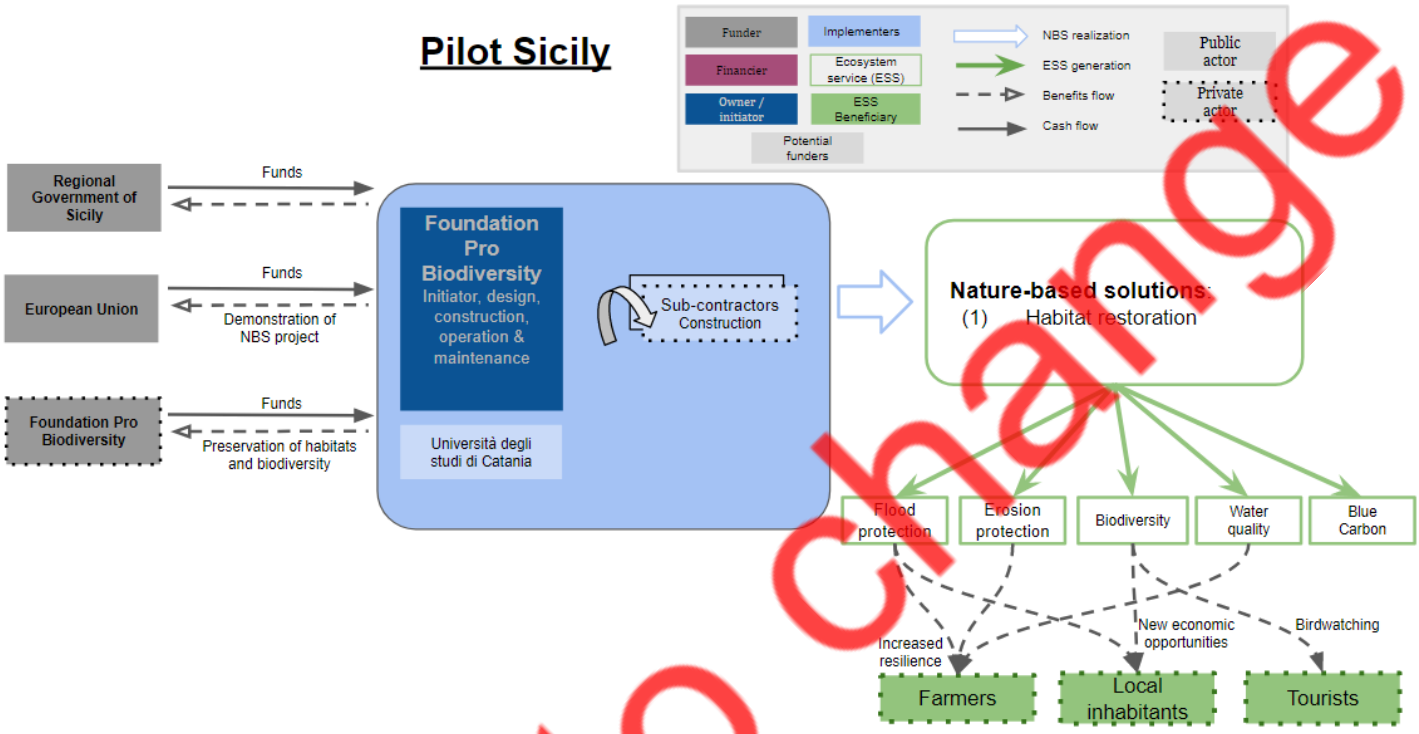

Figure 5.8 Overview of the Sicily Pilot

5.8. Arcachon (France)

The Arcachon bay is a large lagoon located in the south-west of France. The bay is suffering a severe regression of its large population of Zostera seagrass, which between 1989 and 2012 has decreased by almost 50%. These high regression rates are due to the existence of negative feedbacks which result in the continuous acceleration of the process. The objective of the pilot project is thus the restoration of the local seagrass ecosystem. To achieve this goal, the first stage of the project will focus on a small-scale calibration of its approach. Interventions will mostly focus on improving the environmental context, which should support the spontaneous recovery of seagrass. Once small-scale targets are met, the approach will be replicated on a larger scale. Performances in terms of biodiversity and ecosystem services associated with the restoration of the Zostera seagrass ecosystem will be monitored throughout the second phase. The project is co-funded by the European Union (Horizon 2020 funding programme) and the French Biodiversity Office. The restoration activities are expected to generate revenues for professional fishermen, the owners of oyster farms, and the local government.

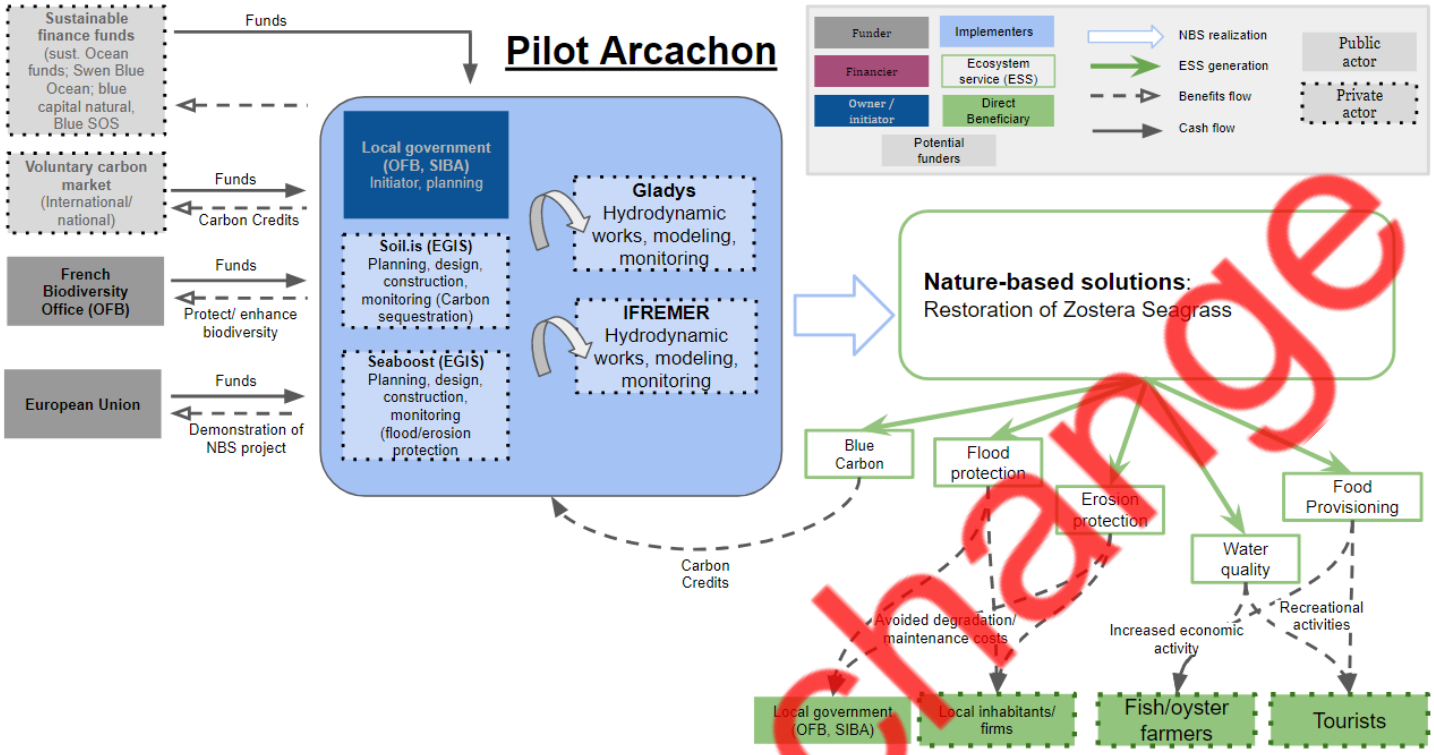

Figure 5.9 Overview of the Arcachon Pilot

5.9. Nahal Dalia (Israel)

Since the 1980s, the biodiversity and ecosystem processes in Nahal Dalia (Israel) have been degrading. The main cause of environmental degradation are the alterations in the water regime and the interruption of river to sea connectivity due to the establishment of a stream dam. Effluent discharges in the natural reserve by local fisheries contributed to water pollution, thus worsening an already dire situation.

The proposed NBS currently consists of four complementary interventions:

1. Dam removal and restoration of water flows;
2. Geomorphologic restoration;
3. Fishpond effluents treatment and reduced water abstraction;
4. Macrophytes and sea grass rejuvenation.

The intent behind these four measures is to deliver multiple ecosystem services. The provision of fresh water supply, supported by improved water quality through natural regulation of nutrient cycling and water purification, is expected to be particularly beneficial to farmers - for irrigation purposes - and the owners of local fisheries. In addition, the general improvement of environmental conditions and biodiversity is expected to attract visitors and local residents with recreational and cultural outdoor activities.

The project is managed by the Israel Natural Parks Authority (INPA), whose mandate is to preserve natural reserves in the country, with a specific focus on wetlands. INPA will deliver the NBS through

a traditional procurement structure, setting up separate contracts with specialised companies for the planning, construction, and maintenance phases of the project.

Financial resources have been secured from different sources. In addition to those provided by the European Commission through the Rest-Coast Project, funds are provided in the form of grants by the Carmel Drainage and Streams Authority and the open-areas fund of the Israel Land Authority. The Carmel Drainage and Streams Authority is a local public body in charge of the rehabilitation of streams and flood control, and it is particularly interested in the NBS potential for flood risk mitigation. The Israel Land Authority manages most of the land in Israel, providing services for the transfer of residential and land rights, the rezoning of land, permits for building additions, and leases of land for agricultural businesses. Funds are also provided by the kibbutz Ma'ayan Tzvi, a local business association that owns several farming lands and fisheries on the project's site. Ma'ayan Tzvi can be - partially - considered as an investor, as it has reasonable expectations for the project to generate monetary returns. More specifically, the kibbutz would benefit from the projected increase of economic activity caused by the improvement of the fisheries and the increased touristic value of the site. In addition, the mitigation of flood risks would also lead to a reduction of damages to the kibbutz' assets in the long-term. Dag-on, another neighbouring kibbutz, as well as the Hof HaCarmel municipality, would also enjoy similar benefits, but at present they are not involved in the financing of the project.

Opportunities for potential future funds have been identified. The local desalination plant Ma'agan Michael appears to be a potential funder of the proposed NBS, as its operations do not meet national sustainability standards and directly impact the ecosystems of the Dalia streams. A corporate social responsibility action for the compensation of local resource depletion is therefore foreseeable. Intel corporation was also identified as a potential funder as it recently pledged to reduce its emissions to a net-zero. A prerequisite for its financial involvement would thus be the acquisition of certificates for the production of blue carbon credits, which would also allow the collection of additional funds from international carbon credit markets.

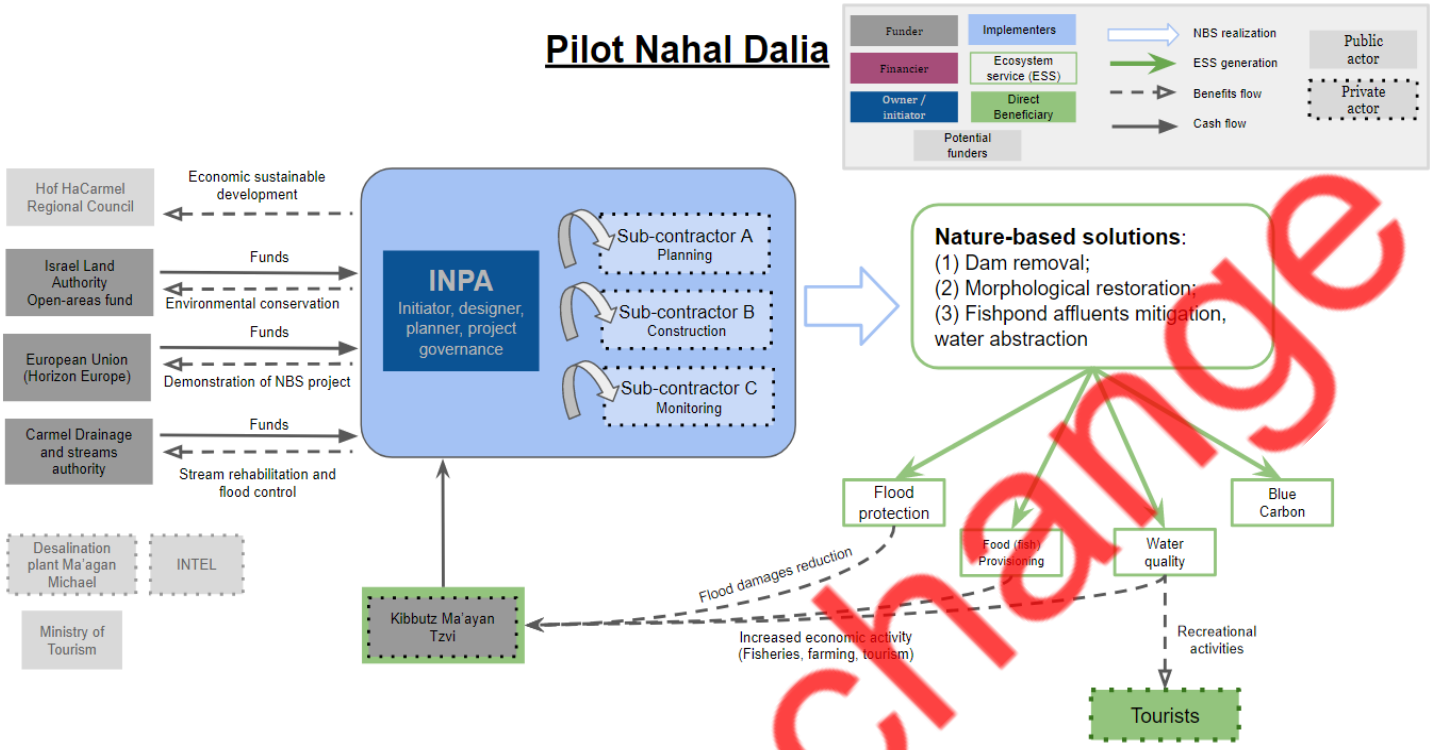

Figure 5.10 Overview of the Nahal Dalia Pilot

5.10. Conclusions

Table 5.1 Overview of arrangements in the Rest-Coast Pilots

	Funding		**Financing**	**Procurement**	**Targeted ESS**	**Value captured**
	Public	**Private**				
Arcachon	EU/French biodiversity office co-funding	-	-	N/A	Flood protection	
					Erosion protection	
					Water quality	
					Food Provisioning	
Ebro delta	EU/national government co-funding	-	-	N/A	Flood Protection	TBD
					Erosion Protection	TBD
					Blue Carbon	
					Water Quality	

Foros Bay	EU/national government co-funding	-	-	N/A	Flood Protection	TBD
					Erosion Protection	TBD
					Water Quality	
					Biodiversity	TBD
Nahal Dalia	EU/local drainage authority, national land authority co-funding	Kibbutz Ma'ayan Tzvi	-	Conventional public procurement	Flood Protection	
					Food Provisioning	
					Water Quality	
					Blue Carbon	
					Biodiversity	
Rhone Delta	EU/National government co-funding.	Coca-cola, Total, Française des Jeux	-	Conventional public procurement	Blue Carbon	
					Erosion Protection	
					Water Quality	
					Food Provisioning	
					Biodiversity	
					Flood Protection	
Sicily	EU/Regional government co-funding.	Stiftung pro Artenvielfalt	-	Conventional procurement	Flood protection	
					Erosion protection	
					Biodiversity	
					Water Quality	
					Blue carbon	
Vistula	National government	-	-	Conventional	Blue carbon	

Lagoon				public procurement	Biodiversity	
					Food provisioning	
Venice	EU/national-local government co-funding	-	-	Conventional public procurement	Erosion protection	
					Water quality	
					Biodiversity	
					Food provisioning	
Wadden Sea	EU/National-local government	Indirect contribution to public funds	-	N/A	Flood protection	
					Erosion protection	
					Biodiversity	
					Water Quality	

The purpose of Work Package 3 (WP3) of the Rest-Coast project is to overcome economic and financial barriers to the upscaling of Nature-based Solutions (NBS) for coastal adaptation through the identification and implementation of innovative and sustainable financial arrangements. The ultimate contribution of our work will be delivered in the form of a comprehensive framework for NBS upscaling that will acknowledge and analyse both project level and institutional/policy level, and that will include a step-by-step guiding brief for NBS project sponsors to implement and improve their financial frameworks and business models.

This document provided solid foundations for this assignment by means of an analytical project-level framework for NBS Business Models, the BMF. This framework identifies and describes the main components of an NBS Business Model - i.e. funding arrangement, financing arrangement, Procurement arrangement, value-capture arrangement -, as well as typologies for the referencing and mapping of real cases of application. The development of the framework was preceded by a detailed analysis of existing frameworks for nature-based coastal adaptation and related sectors, to ensure that our contribution meets the standards of the latest publications on the subject, and to maintain the coherence of terminology and conceptualisations with previous works.

The research that we have carried out to develop the BMF also provided a number of early elements and insights on possible innovations for NBS business models. This information will help us streamlining our next project deliverable, which will be dedicated to the identification of case studies for innovative NBS business models.

We have also had a first look at the arrangements in place and the settings for each of the Rest-Coast project's pilots (Table 8.1). By analysing these through the structures identified in our BMF, we found a number of noteworthy elements. First of all, the various pilots are currently at different stages of their development. What this means is that the role of WP3 could change from pilot to pilot, facilitating the early incorporation of innovative business model elements where restoration activities are still being designed and planned, and assisting on up- and out-scaling where restoration is ongoing.

We have ascertained that, in line with the sectoral patterns described in literature, our pilots over rely on fundings from the public sector. At present we have not identified any financing arrangements, and overall the involvement of private funders is rather marginal. In line with these circumstances, we have also found that, although the generated value and the public and private beneficiaries have been for the most part identified - in qualitative terms -, value capture is negligible or, in most cases, absent. Although we haven't yet inquired over the specific terms of the contractual arrangements in place, we expect most of the works and services to be obtained through conventional models of public procurement.

The early discussions we had with the pilots' managers revealed that the analysis and governance of NBS project finance is a new practice for many in this field, mirroring the inexperience of the financial sector in NBS investments described by scientific literature (Toxopeus and Polzin, 2021). Considering this, we have reason to believe in the existence of a considerable margin of improvement for NBS finance, which can be targeted through the implementation of innovative business model arrangements and scientific research.

Clear concepts and business model structures - described in the present deliverable - and step-wise guidance - to be delivered later on in the project - are fundamental tools to bridge the needs of ecosystem restoration practitioners to those of potential investors. A common language and the adoption of a business model mindset hold great potential to unlock innovation for future implementation, upscaling and outscaling of NBS. Our next deliverable will review relevant case studies with the objective of identifying innovative business models applied or applicable to nature-based coastal adaptation, as well as the relative barriers and enabling factors. This exercise will provide us with precious information that we will try to transfer and adapt to the pilots of the Rest-Coast project.

Glossary

Blended finance: Strategic use of concessional finance means that improves the risk-return profile for investments in a project, and consequently attracts additional commercial finance.

Bond: Standardised and tradable debt security under which the issuer owes the holder a debt.

(NBS) Business Model: Plan that describes all roles and contractual arrangements between all actors involved in a (NBS) project in qualitative terms.

(NBS) Business Plan: Plan that applies a business model to a specific (NBS) project, including quantitative information (e.g. detailed cash flows, non-monetary outputs, risks, risk-mitigating measures etc.).

Club good: Type of economic good characterised by excludability and non-subtractability. As a consequence, these goods are available to everyone but scarce, and therefore susceptible to overexploitation.

Co-benefit: Positive benefits that derive from NBS projects.

Commercial finance: Provision of finance at market rates.

Common Pool Resource (CPR): Type of economic good characterised by subtractability and non-excludability.

Concessional finance: Provision of finance at below market rates, typically provided by large financial institutions such as (multilateral) development banks, funds, national governments.

Contract: Agreement between two or more parties that establishes mutual obligations that are enforceable by law.

Crowdfunding: Funding of a project by pooling (small) donations from a large number of people, typically through a digital platform.

Debt: Amount of money borrowed by a debtor from a creditor. The debtor commits to repay the debt, usually with interests, after an agreed period of time.

District Level Tax: Taxation structure to fund a project, which identifies and tax those that disproportionately benefit from a public investment, either as a one-off payment or on a periodic basis.

Ecosystem Restoration: Process of facilitating the recovery of an ecosystem that has been degraded or destroyed.

Equity: Type of investment that consists in the purchase of a share of a company, which provides claims on future income streams and voting rights to the investor.

Excludability: Degree to which a good, service or resource can be limited to only payors. A High level of excludability allows the prevention of free consumption of a good.

Fee: A payment made in exchange for a service.

Financier: A legal person that provides finance for a project to make a productive use of its own financial capital.

Financing: Provision of financial capital that is needed to meet a project's upfront costs.

Funder: A legal person that provides funding for a project, mainly because of an interest in realising specific impacts through the project implementation.

Funding: Payment of costs that arise from a project. A project can be funded upfront or, when part of the capital is provided through a financing arrangement, *ex post*, thanks to the establishment of revenue streams that will allow the repayment of financiers.

Grant: Funding instrument that provides capital to a project to facilitate an objective of interest to the issuer.

Green Bond: Standardised and tradable debt security whose proceeds are designated to finance the conservation of natural resources, the transition to a carbon-free economy and other environmentally sustainable projects.

Land readjustment: Process for infrastructure co-financing that involves financial contributions from both public and private land-owners and a redistribution of property rights.

Land Value Capture: Selling or leasing of land whose value had increased as a result of a project's implementation, as a way to monetize the value created by the project itself.

Loan: Debt security typically provided to borrowers by commercial banks or other financial institutions based on a direct contractual relationship, which makes it a non-standardised and non-tradable instrument.

Mezzanine: Hybrid of debt and equity financing instruments that present characteristics of both classes.

Nature-based Solution: Use of natural features and processes to address societal challenges in a sustainable and resilient way.

Outcome-based Finance: Provision of finance that entails different scenarios for the repayment of the investors, depending on the project's generated outcomes.

Outscaling: Replicate an approach that has been tested and demonstrated in a pilot project, with the ultimate objective of broadening the impact of an intervention.

Philanthropic investment: Financing or funding initiative by the private sector for the promotion of welfare and other public goods.

Private Investor: Person or company that invests its own capital into a project, with the goal of achieving returns on the investment in the future.

Private Good: Type of economic good characterised by excludability and subtractability. As a consequence, private goods need to be purchased to be consumed.

Procurement: Purchasing of works and services needed for the implementation of a project.

Public-Private Partnership (PPP): Long-term contractual arrangement between a government and private companies for the purpose of implementing a project or a service that is conventionally provided by the public sector (e.g. infrastructures, public services etc.).

Public Good: Type of economic good characterised by non-excludability and non-subtractability. As a consequence, public goods are available to all members of a society and are paid for collectively by taxpayers.

Public Investor: Public entity that invests a portion of its budget into a project, with the goal of achieving social welfare or other objectives of public interest.

Share: Unit of equity ownership in a company. They provide a means for the equal distribution of the company's residual profit (dividends).

Special Assessment District: See "District Level Tax".

Subtractability: The degree to which the consumption of a good by one consumer prevents or reduces the ability of consumption by other consumers.

Tax: Compulsory contribution to state revenues imposed by a governmental organisation.

Tax Increment Financing (TIF): Type of public financing that uses anticipated new tax revenues generated by a project to stimulate private investments.

Upscaling: Expand an approach that has been tested and demonstrated in a pilot project to a larger scale, with the ultimate objective of broadening the impact of an intervention.

Value capture: Process that allows the recovery of project costs through the monetisation of part of the generated value.

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Appendix 1

Short summary and visual of each reviewed document

1. Financing nature-based solutions for Coastal protection – *A practical review of blended finance approaches with carbon credits from blue carbon sources*
"Voluntary and compliance emission trading frameworks have opened the market for blue carbon projects through the approval of the first blue carbon conservation methodology in 2020. This creates a new opportunity to scale up finance for coastal protection projects that conserve and restore blue carbon ecosystems through the sale of carbon credits."
This document positions nature-based solutions as beneficial solutions (starting point of the document) due to their social, environmental and economic benefits. Next the authors state that lack of finance is currently one barrier limiting the implementation of NbS. Carbon emission trading schemes are seen as an opportunity to increase and diversify financial flows towards NbS. The document reviews the financing landscape for NbS, including the risks associated with setting up NbS projects and the identification of investors (through blended finance). The document also provides practical guidelines for developing a business model for NbS. From the market study the authors identify a number of barriers that could hinder the implementation, and also access to finance, namely a common understanding of the concept, necessity and co-benefits, and an underdeveloped market for ecosystem services. Furthermore they identify an number of blended finance specific barriers, namely the project scale, the risk profiles, lack of standardized metrics, difficult legal frameworks, political instability, procurement challenges, and lack of evidence base. The authors also suggest ways to deal with these barriers. The guidelines present four steps to develop the financial structure of a NbS project. The first step is the technical design, which includes the identification of the problem to be solved by NbS, the goals, the success factors and potential interventions). The second step is the context analysis and the social cost benefit analysis (SCBA) including the study of the ecological, socio-economic, and governance context of the NbS and to conduct the SCBA to assess the feasibility of the NbS. The third step is called the Financing strategy, in which the financing mechanisms are prioritized based on the previous step and combinations of different financing sources are considered. The fourth step is the risk assessment and mitigation, where risk assessment relates specifically to the risks in the financial a strategy. Alongside these four steps as an adaptive management and stakeholder engagement approach is recommended throughout the entire process.

Four steps in designing the financial structure of a NbS project and potential guides and toolkits to support the development of a NbS project

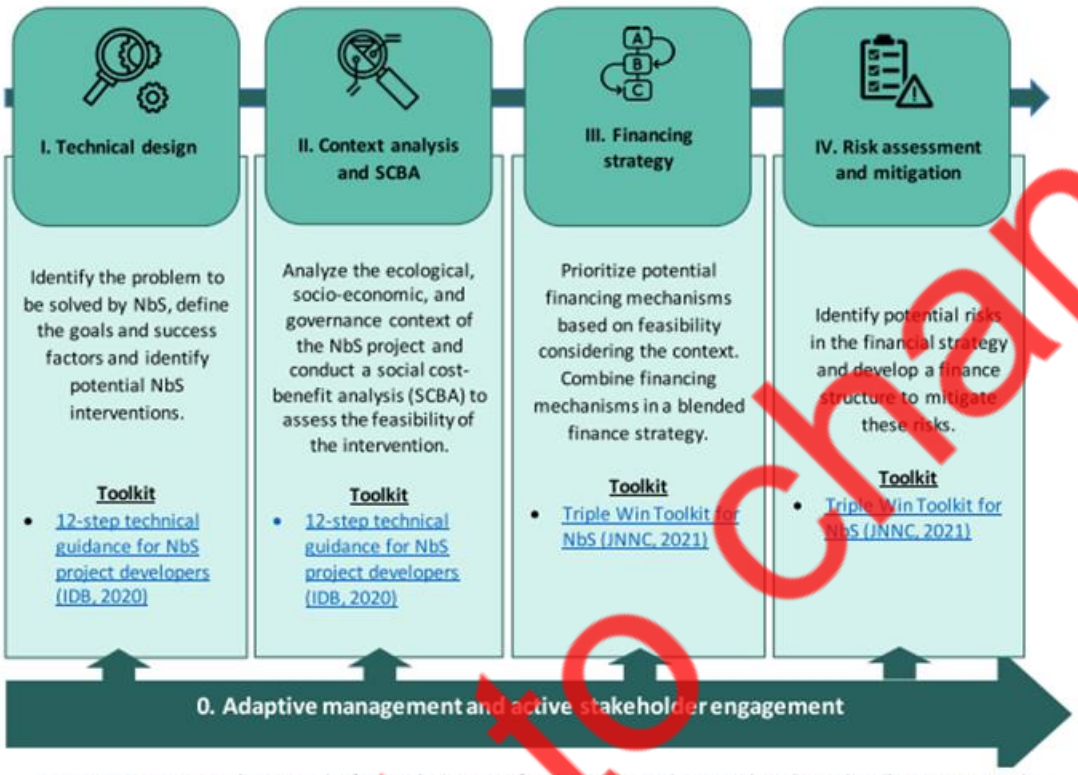


Figure 10 Four steps in designing the financial structure of a NbS project and potential guides and toolkits to support the development of a NbS project

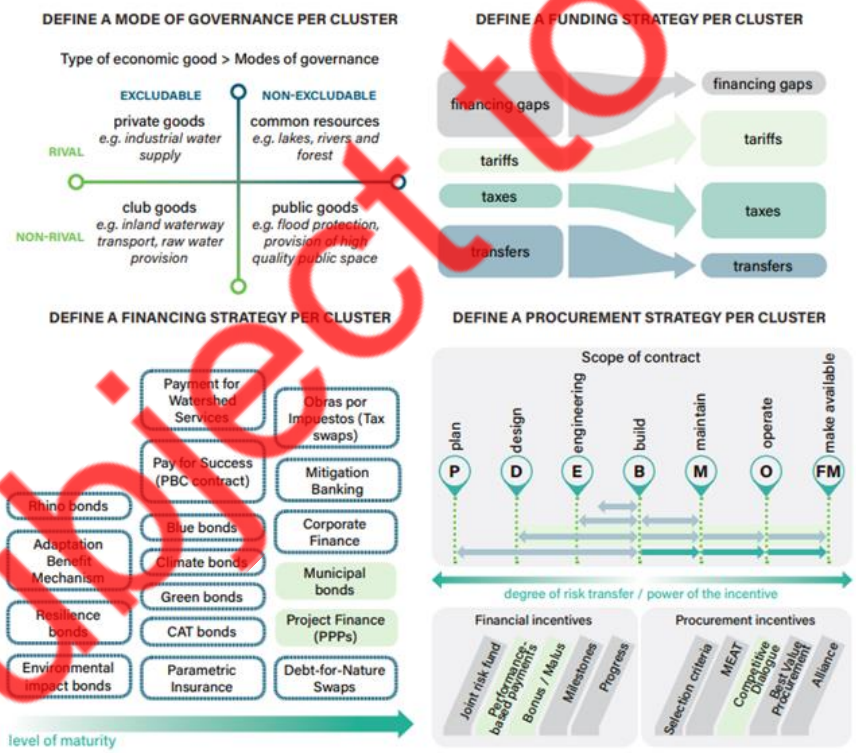
2. Handbook for the Implementation of Nature -based Solutions for Water Security. - *Guidelines for designing an implementation and financing arrangement*

"NBS emerge as important pillars of new models of economic growth that enable a win-win between economy and environment while helping us mitigate water risks. Unfortunately, the implementation of NbS at scale remains limited. In most cases, NbS are still being implemented as pilot projects of limited size and following parallel processes from mainstream procurement practices. This is what we call the implementation gap."

This framework presents an approach targeting to bridge this implementation gap by connecting the project delivery community (in the field of water resource management and watershed conservation) to the finance community. The level and type of data collected and presented by initiators and developers of NbS currently does not match with the information that is required by investors, specifically regarding project risks, costs, and expected benefits. To connect these worlds, a transdisciplinary and multisectoral collaborative approach is required, including early and active participation of private sector stakeholders. The audience targeted in the document are proponents of NBS.

The framework is based on several guiding questions to enable the development of the five business cases (fig) and subsequently a tailor-made implementation arrangement which includes the choice in mode of governance, the funding model, the financing strategy and the procurement strategy (fig). The authors pay specific attention to a number of elements that seem essential for NbS, namely i) assessing the entire lifecycle of the project/infrastructure, ii) assessing the levels of services provided and required (including the typology of these services and their different values for different stakeholders), iii) exploring possibilities to combine green (nbs) with grey (traditional) infrastructure, iv) making use of performance based contracts that allow for stacking of multiple benefits and v) the institutional setting providing enabling conditions or barriers. The framework is rooted in System analysis, collaborative modelling techniques and New Institutional Economics.

The design of an implementation arrangement involves four decisions:



3. Enabling private investment in climate adaptation & resilience – *Current status, barriers to investment and Blueprint for Action*

"… although public finance for adaptation has increased, it will not suffice. Private sector investment is critical to closing the adaptation finance gap. Much remains to be learned, however, about how to unlock and enable private capital to help finance national and local adaptation priorities."

This report firstly dives into the current state of private sector investment into climate adaptation and resilience by addressing both the magnitude of private sector investment as well as the barriers for (increased) private sector investment. The authors report that, concerning the role of the private sector, there is growing knowledge about how to increase its own climate resilience (recognizing the risks of climate change and making supply chains more resilient) and there is a growing market of selling goods and services to support adaptation and resilience. However, far less is known about the role of the private sector in meeting broader adaptation financing needs.
Next the authors lay out a "blueprint for action" ( ) to help the public sector and their development partners with practical steps and tools for shaping policies, market signals, incentives, and metrics. The blueprint is based on the assumption that successful adaptation investment springs from a solid national adaptation plan or strategy. The blueprint (Figure 2.2) should help overcome the main barriers for private sector investment into climate adaptation. These are i) lack of country-level climate related data to guide investment decision making ii) limited clarity on government capital investment goals and/or where private investment is needed and iii) low perceived and/or actual returns on investments due to inability to capture environmental and social benefits. Different entry points for action are suggested varying in upstream (policy dialogue) midstream (project identification) and downstream (transaction preparation).

The main target audience is the public sector including government agencies, policy makers, bilateral and multilateral development finance institutions, central banks, regulators, public sector funds, and development organizations. The authors suggest the report may also be of interest to the private sector including impact investors, pension funds, and firms already engaged or interested in financing adaptation and resilience as these are potential partners.

Blueprint for Action – Five steps to enable private sector engagement in Climate Adaptation

4. The Little Book of investing in Nature – A simple guide to financing life on earth
"Biodiversity finance is about leveraging and effectively managing economic incentives, policies, and capital to achieve the long-term well-being of nature and our society" (UNDP 2018). The goal of biodiversity finance is to create economic incentives within both public and private financial sources to preserve the world's biodiversity and stock of natural capital and subsequently guarantee a sustainable flow of ecosystem services for the future."

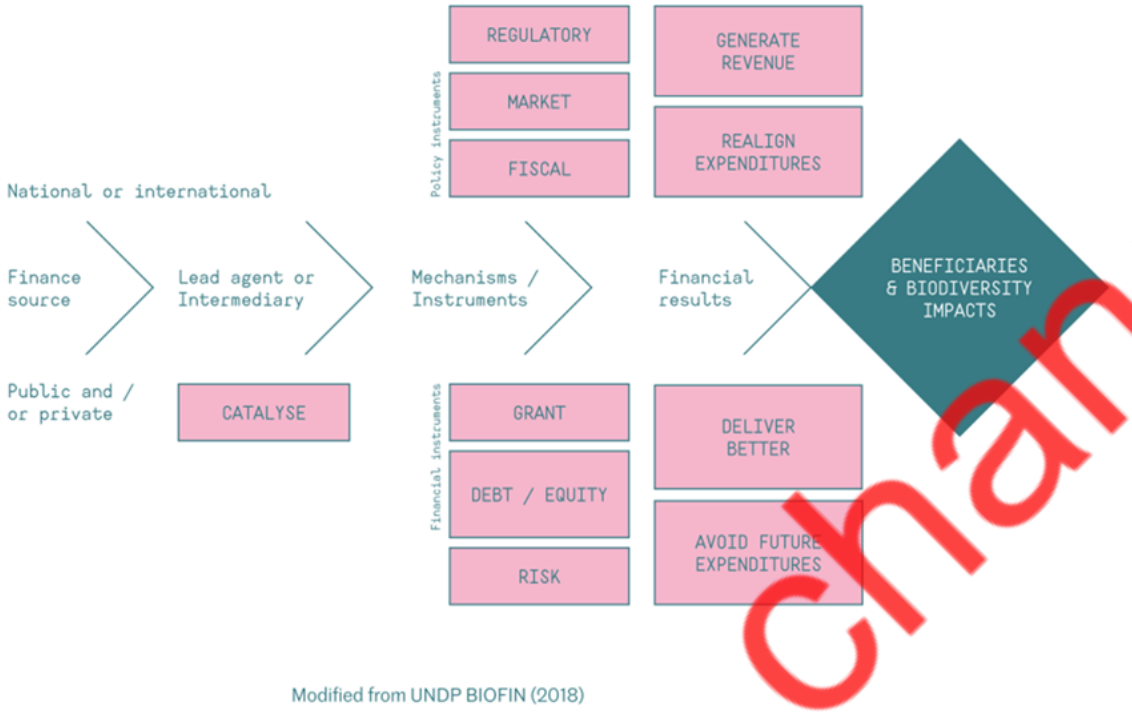
In this document, the authors introduce a framework that organizes biodiversity financing mechanisms into 5 categories, namely i) revenue generation - identify the mechanisms that generate revenue for biodiversity conservation; ii) better delivery - deliver results for biodiversity through improved efficiency, greater alignment of incentives and better resource management iii) Expenditure realignment - reduce investments that have a negative impact on biodiversity and redirect these flows; iv) avoidance of future expenditures - prevent future costs through strategic investment today; and v) catalyze - enhance measures or enabling conditions that can result in new or scaled-up biodiversity finance. The authors expect a comprehensive financing plan to consist of options form more than one category.

To build up to the framework the authors firstly discuss the terminology surrounding biodiversity, and dive into the current scale, types and needs of biodiversity finance and the overall progress on the Aichi biodiversity targets. Biodiversity conservation finance has been dominated by the public sector, covering over 80% of the available financial resources for conservation efforts. Given the size of the global biodiversity funding gap (which the authors extensively explore) this will not be sufficient and governments, producers and consumers are being called to (collaborative) action to create a more sustainable relationship with nature. Businesses and financial institutions have a large part to play; on the one side they are dependent on biodiversity and ecosystem services for their own business models. On the other side they are also a huge driver of the negative trends seen, due to their operations and investments.

The aim of the document is to help governments, NGOs, the private sector and others identify and compare existing and future options for financing conservation in a clear and consistent way and with that navigate through the landscape.

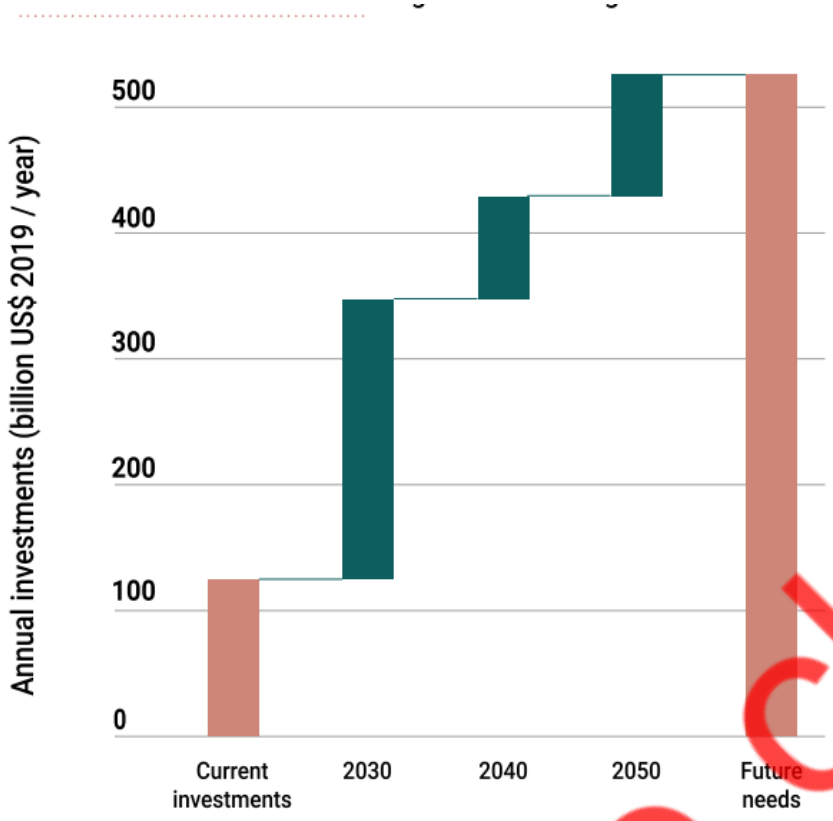
Schematic Diagram of biodiversity finance solutions

Figure 4. Schematic diagram of biodiversity finance solutions



Modified from UNDP BIOFIN (2018)

5. State of Finance for Nature – Trippling investments in nature-based solutions by 2030
"Among the structural barriers and systemic rigidities that hamper this transition, finance is fundamental. Mainstream financial products and underlying assets accelerate natural resource depletion and magnify environmental degradation"
This document reports on the types of capital flowing into NbS-relevant sectors and illustrates how these current figures relate to what is needed to meet objectives of international agreements (biodiversity, climate change, and land degradation targets). The authors show that investments in NbS should triple by 2030 and increase four-fold by 2050. Furthermore, in doing so, the authors identify a number of key challenges, such as the lack of consistent and standardised data and reporting that should be addressed and would allow for much better compatibility and thus more informed decision making. The role of the public sector is critical, where they should be creating opportunities and setting enabling conditions for investment in nature.
Future investment needs charting an accelerating rate over time



Note: These figures are taken from the Model of Agricultural Production and its Impacts on the Environment (MAgPIE v4.1), which was used to estimate investment need for forest-based NbS (which includes reforestation and afforestation cost estimates), and taken from separately estimated figures for silvopasture (planting trees on agricultural land), mangrove restoration and peatland conservation and restoration.
Source: Vivid Economics.

6. Why 'blended finance' could help transitions to sustainable landscapes: Lessons from the Unlocking Forest Finance project
"The UFF experience shows that unlocking finance to conserve tropical forests and stimulating a transition towards sustainable land use at landscape scale requires combining at least three different perspectives: a landscape (here: regional) transition perspective, a farm-level perspective, and the perspective of financial investors. Designing financial mechanisms requires a detailed understanding of each perspective as well as their interactions."

Between 2013 and 2018 the Unlocking Forest Finance (UFF) project has worked on developing finance mechanisms for a transition to sustainable landscapes in three regions of the Amazon. This publication describes the project, the approach, the cases, and the findings. Specifically the paper addresses how and why the project team deviated from their initial approach and extracts lessons and recommendations from this.

These changes in approach were driven by, amongst others, the complexity of the modelling and required data (e.g. integrating ecosystem service modelling into the cash-flow analysis, the required data granularity, and isolating expected effects of different investment activities) the interactions between different impact scales (e.g. farm level vs landscape level), and stakeholder preferences being different than initially assumed (e.g. an implicit assumption was that investors were willing to accept lower interest rates in return for social and environmental impact, and investors were interested to participate in selecting measures that are of their interest).
The paper is published in Ecosystem Services, "an international, interdisciplinary journal that deals with the science, policy and practice of Ecosystem Services …".

Analytical approach of UFF. Left: originally planned and Right: how it was implemented

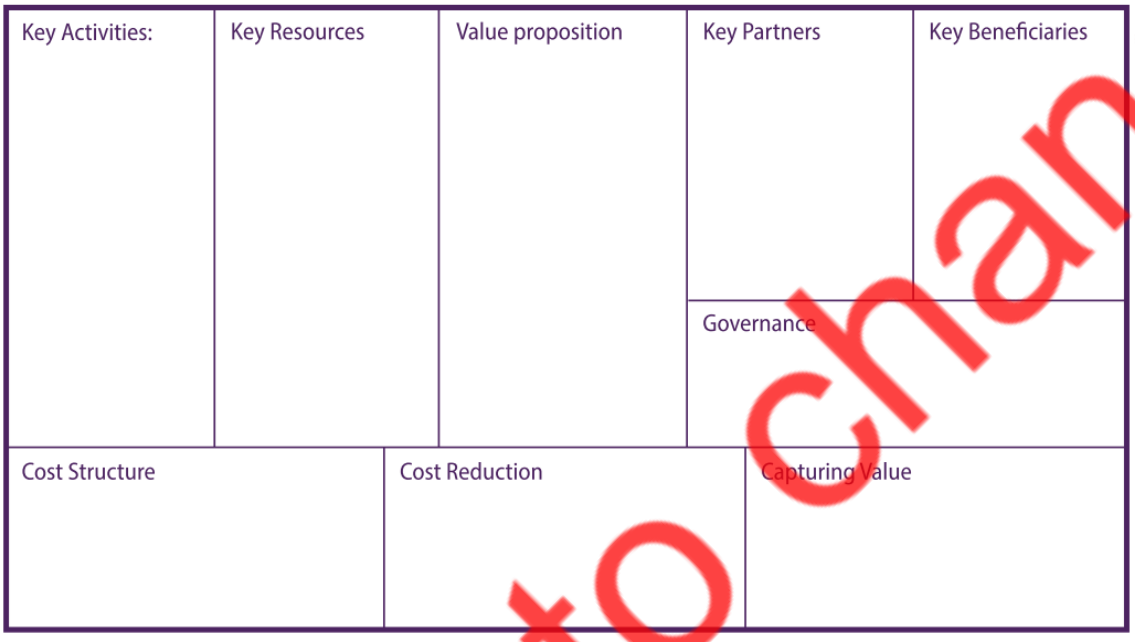
7. Nature-Based Solutions Business Model Canvas Guidebook

"A business model is quite simply the story of your NBS project. 'Business model' is a common term used by enterprises worldwide to explain how the different elements of an enterprise work together to deliver value to a customer and how enterprises make money from this value proposition"

This document is a guidebook that supports initiators (in cities) to use the NBS business model canvas which can help in communication, identifying partners, looking for sources of finance, and to plan the NbS initiative. The NbS business model canvas has been adapted from the regular business model canvas in several ways, namely
i) Value also reflects environmental and social, next to economic value;
ii) Customer segments has been changed to key beneficiaries to include more explicitly direct

and indirect users;
iii; Key partners and key beneficiaries are positioned at the same level as they often overlap
iv) Governance is added because it is often complex and needs to be considered early on;
v) Cost reduction is added as it reflects specific characteristics of nbs enabling a variety of types of cost reductions.

The NbS business model canvas



8. Investing in Nature: Financing conservation and Nature-based solutions

"Even if you haven't previously considered taking up a loan from a bank or going to an external investor for equity (e.g. if you have only worked with grants so far), you may find that with the right amount of preparation and risk-mitigation you could become eligible for commercial sources of financing."

This document is a step by step guide to design an optimal financial structure for conservation projects and **nature-based solutions (NBS)**. The authors explicitly distinguish between projects where nature is at the core of the business (e.g. ecotourism) and where it is not (e.g. a property developer wanting to build green walls). Both types can benefit from following the presented steps and are seen as eligible for **commercial** (or **blended**) sources of finance.

The 7 steps in this guide are intended to firstly enable the identification of cost-saving and revenue-generating opportunities that could be provided by the project or business and with that develop a sustainable financial structure. Secondly, the guide also taps into ways to access different types of financial support, the pro's and con's of different sources, and the role of the European Investment Bank's dedicated Natural Capital Financing Facility. The guide attempts to bridge the assumed gap between on one side businesses that are looking for finance to scale-up projects that benefit natural capital and biodiversity and on the other side banks and other investors who struggle to develop **a pipeline of investable projects** that enhance natural capital and biodiversity.

The guide is written to target a range of different stakeholders: entrepreneurs looking to tap into NBS; conservation organisations or foundations looking for a more commercial **business model** to become less dependent on **concessional finance**; corporations searching for ways to offset negative environmental impact of their operations; **financial institutions** that want to contribute to conservation and nature-based solutions; **fund managers** raising capital for conservation or biodiversity projects in Europe; cities or municipalities wanting to increase their positive impact on the environment and become more resilient to climate change.

The seven step guide to financing conservation and nature-based solutions projects

9. A short guide to developing green business models

"Green Business Model describes how an enterprise, alongside or through its primary business activity, creates, delivers and captures environmental, economic and social value or benefit."

This document provides guidance in the process of elaborating a business plan to be presented to potential partners and investors. More specifically, it zooms in on "green businesses" defined by the authors as "*Green Business Model describes how an enterprise, alongside or through its primary business activity, creates, delivers and captures environmental, economic and social value or benefit.*"

The authors present an adjusted Business Model Canvas by adding an additional element (namely "Green Impact") as a guiding framework. The document was developed based on the premise that green entrepreneurs are currently not able to access the appropriate finance. The guidance document intends to aligning the interests of potential financiers (in terms of risk profile, business maturity, expected impact, and investment quantities) with the entrepreneurs and their green business models (Figure 2.3).

The target audience is green entrepreneurs and researchers as well as organisations that support entrepreneurs starting a green business

Sources of finance organised according to level of maturity

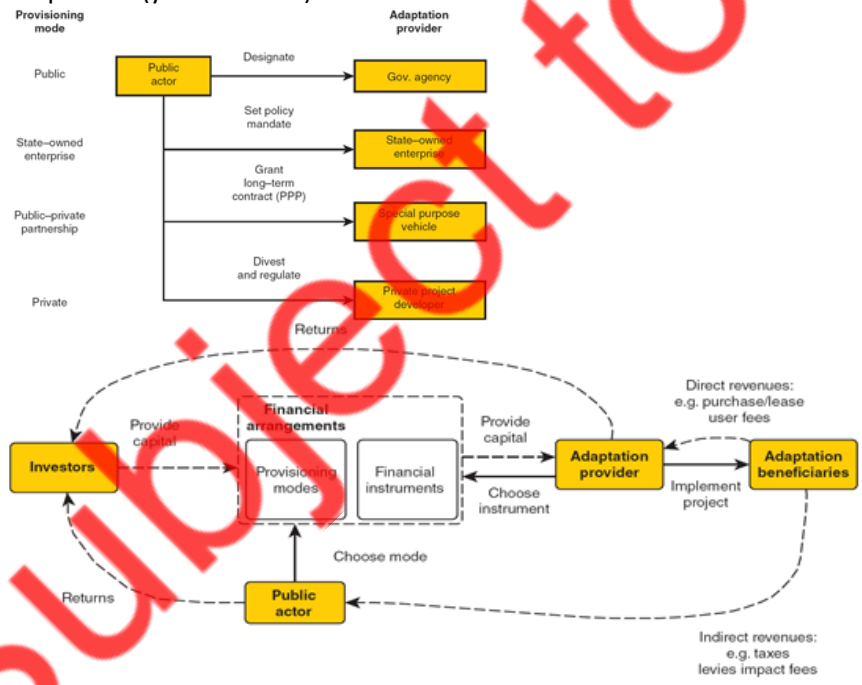
10. Mobilising private finance for coastal adaptation: A literature review

"This article has analysed which financial arrangements are promising, both from a theoretical and empirical perspective, to align public actor and private investor interests in coastal adaptation projects in order to overcome prevailing barriers ..."

This publication concerns a literature and case study review of financial arrangements for coastal adaptation projects. In doing so the document addresses the questions what promotes private investment and how can public and private interests be aligned? The authors consider adaptation projects as collectively providing flood risk reduction, with long time horizons, high upfront investment costs and benefits that are non-excludable. The review looks firstly into barriers to financing coastal adaptation projects for both public and private actors. They identify factors related to the political economy of coastal adaptation projects for public actors (such as public criticism about high project preparation costs and low public risk perception) and for private actors country risks (uncertainty in institutional environment) and the risk of being liable for large-scale damages.

Following, the authors explore the relationships between the different stakeholders involved (investors, public actors, adaptation providers and adaptation beneficiary) in coastal adaptation projects and present a typology of different provisioning modes and a range of financing instruments that could be used under different provisioning modes and that could align the public and private investors interests. The authors assume that revenue generation (direct or indirect) is a necessary characteristic to attract private capital. They find amongst others that private provisioning occurs when returns are high, and that PPP's attract dredging and/or construction companies when the operational costs are high.

Left: Coastal adaptation provisioning modes. The public actor chooses a provisioning mode and adaptation provider. Right: Financing arrangements in terms of responsibilities (drawn-through arrows) and possible financial flows (dashed arrows) between key actors involved in coastal adaptation (yellow boxes)

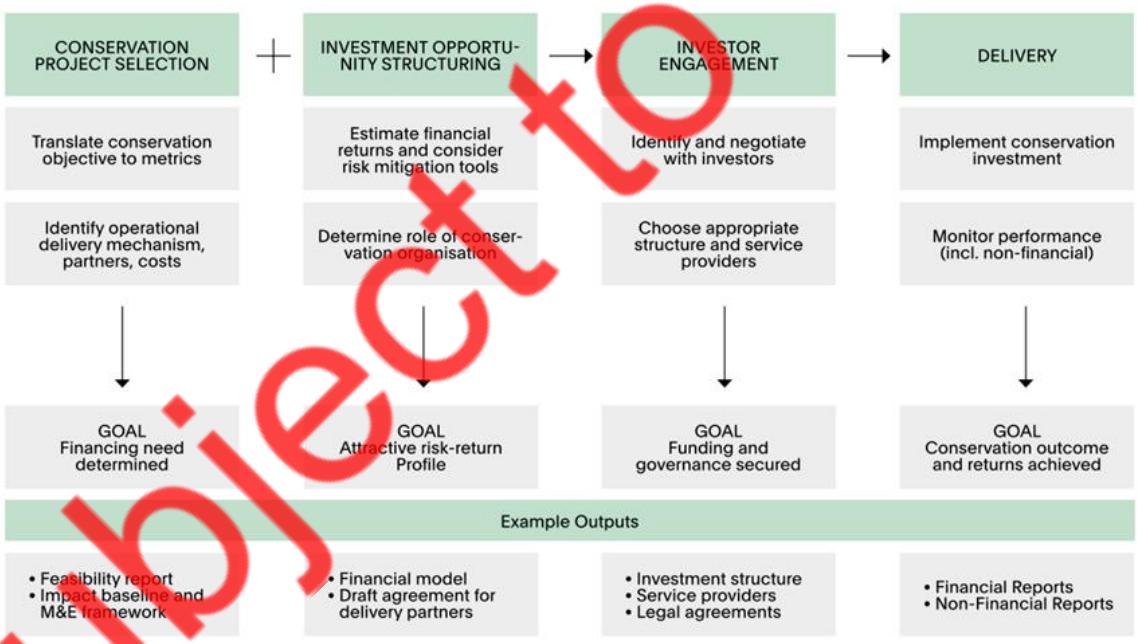


11. Capitalising conservation - How conservation organisations can engage with investors to mobilise capital

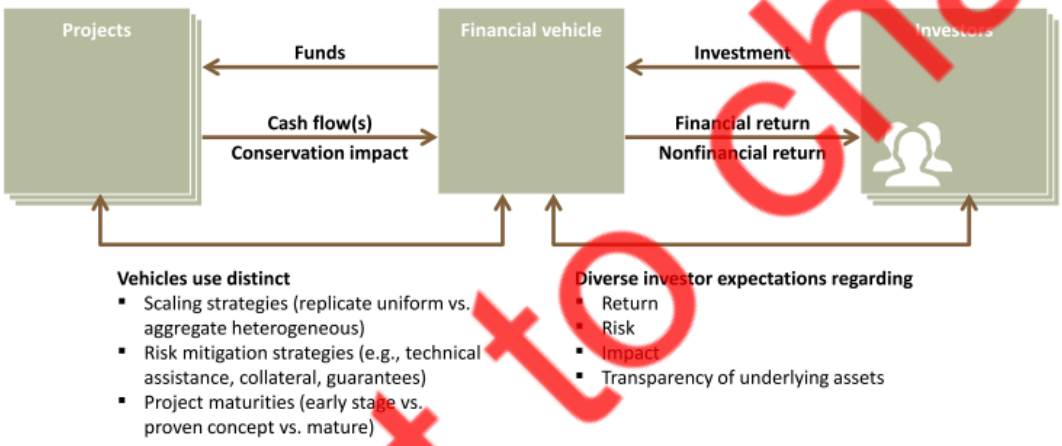
"Although certain investment structures may receive significant media attention, it is essential that a financing instrument is chosen to best suit specific underlying conditions. The local environment, stakeholders, the required time horizon, as well as investors' needs, must be considered in structuring investments that are sustainable and scalable. Scalability remains a key challenge that will require new approaches, for example at landscape or jurisdictional levels, and track record."

Implementing conservation activities requires financial resources, and conservation organisations are exploring ways to attract the private sector to participate/contribute. This document reports on the experiences and practices so far. It provides a practical framework that helps conceptualizing investment opportunities. It can be used to evaluate opportunities and to showcase examples of conservation finance. Furthermore the document identifies different stakeholders and their (potential) responsibilities and roles within this field to mobilize effective delivery of conservation investments.
The authors identify both the financial and the non-financial outcomes of conservation investments to be essential and need to be communicated transparently.

Framework to structure investment opportunities based on conservation projects



12. Conservation Finance – From Niche to Mainstream: The Building of an Institutional Asset Class

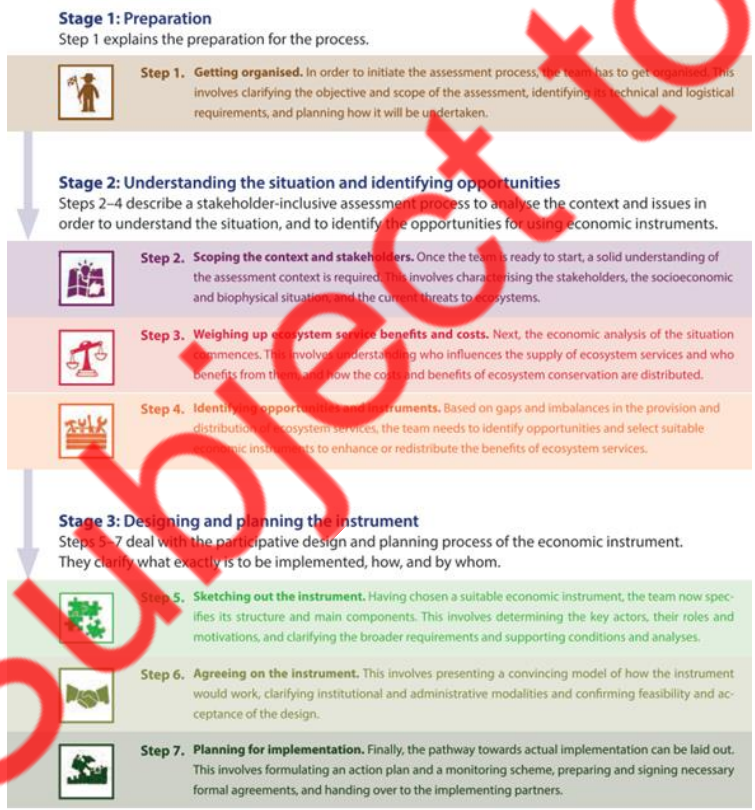
"*This report is primarily targeted at mainstream investors who are interested in learning more about investment structures that provide a market-rate return and a positive conservation impact. The report should also help conservation project developers better understand the possible funding options provided to them by the private investment sector. It is targeted at those who are willing to take the plunge into the "financialization" of conservation finance projects in order to try to tap into those deeper capital pools. "*
This report identifies financial product structures that satisfy both conservation project needs/characteristics as well as investor needs/characteristics. The report focuses on investment mechanisms that activate at least one type of cashflow generated by the sustainable management of the ecosystem. Furthermore the document discusses the need to create a "conservation finance asset class" by matching conservation finance project strategies with the right vehicles and funds.
Demand and supply side of conservation finance 

13. Acting on Ecosystem Service Opportunities - Guidelines for identifying, selecting and planning economic instruments to conserve ecosystems and enhance local livelihoods
"Many conservation practitioners hope that economic valuation studies will help them make the case for nature conservation and initiate positive change. But in most circumstances, the benefits and costs of changes accrue to different parties in very different ways, so that the revelation of ecosystem service values does not in itself change the behaviour of individuals, corporations or communities."

The document presents a step by step framework to help conservation and development planners and practitioners (the target audience) to identify economic instruments that can promote pro-conservation behaviour in a specific setting. As can be seen in Figure 2.4, it does so in seven steps over three project stages (preparation, situational analysis, and planning for implementation). The document is practice oriented providing several templates, tips and examples for going through the different steps.
Practical efforts to implement economic instruments in nature projects face considerable risks of failing, either because the measures chosen are not adopted by the stakeholders or because they do not have the expected positive effect. The framework therefore starts with the screening for opportunities rather broadly, in particular not initially restricting only considering the instrument payments for ecosystem services (PES). PES receives a lot of focus, but PES does not cover the range of economic instruments, and is not always the most appropriate approach.

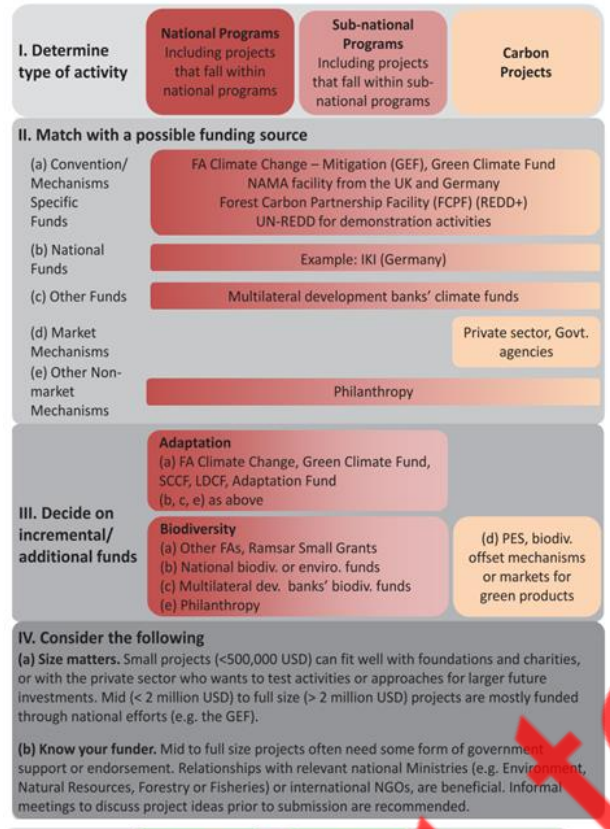
The concept of 'ecosystem service opportunities' (which is broader than PES) builds on, and brings together, general economic principles and an ecosystem services perspective. The four economic principles utilized are 'Steward Earns' (which ES providers could be rewarded for their efforts?), 'Beneficiary Pays' (which ES beneficiaries could contribute to the provision of ecosystem services), 'Polluter Pays' (which ES degraders can be held liable for damage, so that they reduce or stop harmful activities or at least compensate for them?), and 'Innovation' (what are new ways for people to tap into business opportunities from ecosystem services and biodiversity?)

The seven step framework for identifying and planning economic instruments for conservation and for sustainable development



14. Keep it Fresh or Salty - An introductory guide to financing wetland carbon programs and projects
"*Wetland carbon activities can be initiated as independent projects or as components of larger national or sub-national programs to combat climate change. Although to some extent an artificial construct, the distinction this report makes between projects and national or sub-national programs should help the reader find those funds or financial mechanisms that best suit the type of activities he/she intends to initiate. Due to inevitable overlap between projects and programs, multiple funding options could be explored.*"
This document presents a guidance to identify different funds and finance mechanisms for wetland (include peatlands and coastal wetland systems such as mangroves, tidal saltmarshes and seagrass meadows) conservation and restoration projects, specifically focusing on the benefits related to carbon. The document is intended for program and project developers in developing countries working on wetland conservation and restoration. The authors argue specifically that mitigation activities that lead to Greenhouse Gases (GHG) reductions need to be able to measure the result they delivery (result-based mitigation activities). Whether or not the results are measurable (verifiable) will define for a large part what funding model and financing sources could be tapped into. This also applies for other services provided by the activities, other than GHG reductions. The authors firstly present a strategy for identifying carbon financing opportunities by understanding the type and scale of the intended activities in relation to the (sub)(inter) national context (fig). This is followed by the identification and clustering of other potential sources of finance (so non-carbon financing sources) which are elaborately discussed in the document.

Left: Elements to consider when starting to look for wetland carbon finance. right: overview of the main climate and biodiversity related finance mechanisms relevant for wetland carbon projects and programs



15. Catalyzing Climate Finance - A Guidebook on Policy and Financing Options to Support Green, Low-Emission and Climate-Resilient Development

"It would be misleading to think of investors as wealthy institutions or individuals sitting on large piles of money and looking for places to invest. Most of the wealth accumulated globally is deposited in pension and insurance funds and must cover the cost of expected future payouts. Because of these future liabilities, fund managers are generally obliged to invest in very low-risk assets. … the objective of climate-investment policies is to create conditions for attractive investment risk/reward profiles, adapted to different types of investors, either through reducing risks (stable policy context, guarantee instruments, etc.) or increasing rewards (premium prices, tax credits, etc.)"

This document is part of a series of manuals and toolkits to support climate change adaptation and mitigation. It focuses on the review of policy and financing options to catalyze capital toward green, low-emission and climate-resilient development. The main audience is the public development practitioner, both at national and sub-national levels, as well as domestic and international experts involved in assisting governments in catalyzing finance for climate investment and sustainable development.

The document takes a deep dive into different types of policies categorized into i) capacity and information based instruments (such as awareness campaigns) , ii) regulatory instruments (such as standards and mandatory labelling), and iii) market based instruments including fiscal incentives (such as carbon tax) , early market development instruments (such as R&D grants), equity- and debt-based instruments (such as agricultural insurance) and trading instruments (such as fishing quota's). The authors propose a policy analysis framework to determine an appropriate policy mix based on eight criteria reflecting both the views expressed by the business community (policies need to be loud, long, legal and light) and the taxpayer's perspective (environmental effectiveness, cost effectiveness, political feasibility including distributional effects, and institutional feasibility).

The document builds up to a four step methodology to assist developing countries to identify and implement an optimal mix of public policies and financing instruments to create enabling conditions for public and private investment to address pressing environmental problems.

Four-step methodology to catalyze climate finance toward green, low-emission, climate-resilient development in line with national priorities.