Ministry of Foreign Affairs

# Financing Nature-based solutions for coastal protection

## A practical review of blended finance approaches with carbon credits from blue carbon sources

*Commissioned by the Netherlands Enterprise Agency*

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IUCN National Committee of The Netherlands

WOLFS COMPANY

MARKET STUDY

# FINANCING NATURE-BASED SOLUTIONS FOR COASTAL PROTECTION

A practical review of blended finance approaches with carbon credits from blue carbon sources

A just world that values and conserves nature.

2022

Authors: Maxime Eiselin, Stijn Schep, Chris Duinmeijer, Joris van Pul

Commissioned by

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In alphabetical order:

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**Dorothée Herr**, IUCN

**Edit Kiss**, Mirvoa-Althelia

**Fokko van der Goot**, Ecoshape & Boskalis

**Gautier Amoussou**, Eco-Benin

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In alphabetical order:

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**World Bank Team**

# Executive summary

Climate change and unsustainable coastal developments threaten coastal communities worldwide. Traditional coastal protection measures alone are not sufficient to address the 21st century's needs. There is increasing consensus that we should collaborate with nature to address the threats that our coastlines face. By making use of nature-based solutions in coastal protection projects, where we restore and conserve coastal ecosystems, we can not only decrease flood risks and wave damage, but also support livelihoods of coastal communities and sequester carbon in coastal vegetation. Though these societal benefits of nature-based solutions speak for their widespread use, in practice their implementation is still limited.

One of the major hurdles for implementing nature-based solutions for coastal protection is the mobilization of financial resources to develop, maintain and monitor projects. Coastal protection is generally considered to be a public good and is traditionally funded by state actors. In the coming decades, there is a need to mobilize additional financial resources for coastal protection projects, particularly in low- and lower-middle income countries. Interest in nature-based solutions is increasing and a multitude of governments, Dutch dredging & engineering companies and international funding organizations have shown their commitment to utilize these solutions in coastal protection projects.

Voluntary and compliance carbon 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. The current blue carbon market is underdeveloped with a relatively low number of nature-based coastal protection projects operational, but it has the potential to grow substantially if project developers sell the carbon credits from their blue carbon conservation and restoration activities.

To boost the implemention of nature-based coastal protection projects, Team Internationale Organisaties (TIO) of RVO commissioned IUCN NL and Wolfs Company to undertake a market study on blended financing mechanisms with carbon credits to set up these type of projects. This market study reviews the financing landscape for nature-based solutions, the risks associated with setting up projects, and the relevant stakeholders that invest in projects with blended finance models. This market study also provides practical guidelines on how to develop a business model for nature-based coastal protection projects. We focus on projects that involve the restoration of blue carbon stocks in the coastal zone to enhance coastal protection. West-Africa, East-Africa, South-East Asia and South Asia are considered to be the most promising regions for the development of these type of projects.

Before starting a nature-based coastal protection project, we need to know if the enabling conditions are in place. An enabling condition that is often lacking is a common understanding between dredging & engineering companies, conservation organisations, and investors that are all involved in coastal resilience projects about the concept of a nature-based solution, the goals of such a project and the co-benefits that the solution provides. Furthermore, project development is hindered by underdeveloped markets for ecosystem services produced by nature-based solutions. Capitalizing on multiple ecosystem services, such as carbon sequestration, sustainable aquaculture and biodiversity finance, is often crucial to build a bankable business case. Monetizing co-benefits improves the competitive advantage compared to hard-infrastructure options and is crucial to attract private finance to scale up nature-based solutions for coastal protection.

The most important barriers for financing nature-based solutions projects with blended finance structures are the small project scales, high-risk profiles, limited standardization of nature-based approaches and metrics, complex legal frameworks, unreliable state actors, rigid public procurement frameworks, and the lack of evidence-based communication of the benefits that nature-based solutions generate compared to traditional grey solutions.

The solutions to these barriers include aggregating projects to increase scale, apply layered financing mechanisms and set up technical assistance facilitaties to build capacity for NbS implementation. It is crucial to build trust and commitment with state actors to incorporate nature-based solutions in public procurement processes. In addition, public policies and procurement policies need to be reformed to allow for private investments in coastal protection projects. To mainstream nature-based solutions, it is crucial to further standardize approaches, metrics and carbon credit verification methods. The implementation of pilot projects that explore innovative financial mechanisms, such as first-loss guarantees and offtake agreements to derisk projects, will further build the evidence base for effective implementation of nature-based solutions.

It is expected that that the demand for blue carbon credits will increase substantially in the coming years. An increasing price for these credits will provide opportunities to scale up the market for private financing of nature-based solutions for coastal protection. In this report, a hypothetical nature-based coastal protection project is developed, where we illustrate the steps that are needed to develop a bankable business case with carbon credits using a blended finance structure. The hypothetical case includes the technical design of the nature-based solution, analysis of the context and social costs and benefits, a finance strategy for the whole project lifecycle, and financial risks mitigation measures.

All state and non-state actors active in the market of nature-based coastal protection projects have a role to play to further develop attractive blended finance models. We recommend to create more awareness of the benefits of nature-based solutions by building a central knowledge platform of funding opportunities and establishing relationships and collaborations with relevant funding organizations and potential project partners. It is important to make grants available for feasility studies and to de-risk projects to attract private investors. By developing multiple revenue streams based on co-benefits of nature-based solutions, different type of investors can be involved. The effective implementation of nature-based solutions requires a shift in our approach towards coastal resilience, but will provide a wide range of benefits for local communities, biodiversity and the climate.

# Acronyms

| | |
|---|---|
| **CBD** | Convention on Biological Diversity |
| **CCB** | Climate, Community & Biodiversity, standard developed by Verra |
| **CCP** | Core Carbon Principles |
| **CEM** | Commission of Ecosystem Management, part of IUCN |
| **COP** | Conference of the Parties |
| **CSR** | Corporate Social Responsibility |
| **EU** | European Union |
| **GHG** | Greenhouse gas |
| **IDB** | Inter-American Development Bank |
| **IFI** | International Financial Institution |
| **IUCN** | International Union for Conservation of Nature |
| **IPLC** | Indigenous People and Local Communities |
| **MDB** | Multilateral Development Banks |
| **NbS** | Nature-based solutions |
| **NGO** | Non-Governmental Organization |
| **NDC** | Nationally Determined Contribution |
| **OFH** | Ocean Finance Handbook |
| **RVO** | Dutch Enterprise Agency |
| **SCBA** | Social Cost-Benefit Analysis |
| **SDGs** | Sustainable Development Goals |
| **TAF** | Technical Assistance Facility |
| **TIO** | Team International Organizations, department of the Dutch Enterprise Agency that support the Dutch private sector in international endeavors to develop new markets. |
| **TNFD** | Taskforce on Nature-related Financial Disclosures |
| **TSVM** | Taskforce on Scaling Voluntary Carbon Markets |
| **UNEP** | United Nations Environment Programme |
| **UNFCCC** | United Nations Framework Convention on Climate Change |
| **USD** | United States Dollar |
| **VCC** | Voluntary Carbon Credit |
| **VCM** | Voluntary Carbon Market |
| **VCS** | Verified Carbon Standard, developed by Verra |

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# 1. Introduction

## 1.1. Background

*Team Internationale Organisaties* (TIO) of RVO supports the Dutch private sector in international endeavors to develop new markets. The Dutch infrastructure and water sector has expressed to TIO that there is a desire to develop the international market for nature-based solutions (NbS) projects for coastal protection. The Dutch infrastructure and water sector is considered to have a competitive advantage on the global market because of the implementation of innovative nature-inclusive water management approaches in the Netherlands and in other parts of the world. A round table on NbS organized by RVO, identified the development of blended finance mechanisms as the highest priority to upscale NbS for coastal resilience. To boost the global demand for NbS, it is considered important to develop business models that leverage public funds for NbS with private investment. Private and institutional investors are also expressing their interest in financing NbS projects.

In order to develop robust business models for NbS, it is crucial to overcome barriers related to risk management, project scales, institutional awareness, as well as appropriate regulatory frameworks. This requires innovative financing approaches that combine public and private investments and make use of new market mechanisms, such as blue carbon credits. As these financing approaches are currently still underdeveloped, there is a need to review best-practices and identify barriers and solutions to finance NbS projects.

## 1.2. Research scope and objectives

To support Dutch companies, international financial institutions, governments and private investors to overcome these barriers, RVO TIO commissioned IUCN NL and Wolfs Company to review innovative public-private financing approaches for NbS in low- and lower-middle income countries, and to provide practical guidelines to develop bankable business models for these NbS projects.

The study focuses on NbS projects that involve the restoration of coastal ecosystems with blue carbon to support coastal protection, biodiversity and economic development in these areas. The coastal zones in East-Africa, West-Africa, South-East Asia and South-Asia are considered to be the most for the development of the Dutch market for NbS. Therefore, this study reviewed the financing landscape and stakeholders that are active in these geographical regions.

This market study has the following research objectives:

1. To create an overview of the existing financing landscape for NbS for coastal protection.
2. To provide practical guidelines for financial institutions, investors and local project managers to develop robust blended financing structures to implement, maintain and/or scale up NbS projects. The focus is on large scale projects that are of interest to institutional and private investors.

## 1.3. Structure of the report

To achieve the research objectives, existing literature is reviewed and key stakeholders in coastal NbS projects were interviewed. This report consists of chapters that describe various aspect that are required for the development of a solid business model for coastal NbS projects with carbon credits. Chapter 2 gives a description of the concept of NbS, its use in the context of coastal protection, and relevant stakeholders involved in these types of projects. Chapter 3 gives an overview of the financial landscape for NbS in the coastal context, describes financing mechanism that are used in NbS

projects, and barriers and solutions for the implementation of blended finance structures. Chapter 4 provides a hypothetical example of a business case with NbS in the coastal zone that is used to highlight the various aspects involved in the development and financing of such a project. Although little examples are available on the financing of coastal NbS projects with blue carbon credits, the hypothetical case study will refer to elements of various examples. Chapter 5 list recommendations for the key stakeholders of NbS projects to improve market development using blended finance with carbon credits from blue carbon.

# 2. Market overview: NbS in coastal ecosystems

## 2.1. What are nature-based solutions?

### 2.1.1. Definition of nature-based solutions

While society has been working with nature for centuries already, the concept of nature-based solutions (NbS) was first defined by IUCN in 2016 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".


*Figure 1 – A schematic description of NbS (IUCN, 2020a)*

In 2020, IUCN has launched the first-ever 'Global Standard for Nature-based Solutions'. This standard aims to equip users with a robust framework for designing and verifying NbS that yield the outcomes desired in tackling societal challenges, such as climate change, biodiversity loss and poverty / inequality (Figure 1).

### 2.1.2. Ecosystem-based approaches

NbS can be considered as an umbrella concept that covers five broad categories of ecosystem-related approaches: ecosystem protection approaches (area-based conservation approaches, including protected area management), issue-specific ecosystem-related approaches (e.g. ecosystem-based adaptation, climate adaptation services, ecosystem-based disaster risk reduction), infrastructure-related approaches (e.g. natural infrastructure, green infrastructure), ecosystem-based management approaches (e.g. integrated coastal zone management, integrated water resources management) and ecosystem restoration approaches (e.g. ecological restoration, ecological engineering, forest landscape approaches) (Cohen-Shacham et al., 2016).

There can be overlap between the various ecosystem-related approaches in a NbS project. For instance, a nature-based coastal protection project can be based on green infrastructure combined with integrated coastal zone management.

### 2.1.3. Criteria of NbS

IUCN and its Commission on Ecosystem Management (CEM) created a list of 8 criteria to clarify NbS. Many of the following principles are interlinked and in parts interdependent:

1. NbS effectively address societal challenges.
2. Design of NbS takes into account the economic, social and ecological systems across the larger landscape.
3. NbS result in a net gain to biodiversity and ecosystem integrity.
4. NbS are economically viable.
5. NbS are based on inclusive, transparent and empowering governance processes.
6. NbS equitably balance trade-offs between achievement of their primary goal(s) and the continued provision of multiple benefits.
7. NbS are managed adaptively, based on evidence.
8. NbS are sustainable and mainstreamed within an appropriate jurisdictional context are not standing alone, but part of the larger design including policies and other actions.

### 2.1.4. Potential of NbS for climate mitigation

NbS can make a critical contribution to both climate change mitigation and adaptation. Recent analysis published in Nature in 2021 shows that NbS – based on the protection, restoration and sustainable management of the world's ecosystems – can have a powerful role in reducing temperatures in the long term. It estimates that NbS could save 10 gigatonnes of $CO_2$e per year, which is more than the emissions from the entire global transportation sector (Girardin et al., 2021). Previous studies have estimated that NbS could contribute around 30% of the global mitigation required by 2030/2050 to achieve the 1.5/2°C temperature rise goal agreed to under the Paris Agreement (Griscom et al., 2017; Roe et al., 2019). Note that NbS are not meant to be applied as a substitute for ambitious overall greenhouse gas (GHG) emission reductions through phasing out of fossil fuels and decarbonize the world economy.

## 2.2. NbS in coastal zones

### 2.2.1. Ecological threats in coastal ecosystems

Over the last decades, degradation of the world's coastal ecosystems have accelerated. This is driven by high and increasing densities of human populations in coastal regions and unsustainable practices – such as coastal development leading to habitat conversion, hardening of coastlines, land

reclamation of land and alteration of fluvial processes – that cause irreversible environmental damage. In addition, the already rising sea level as a result of climate change and soil subsidence due to unsustainable agricultural practices is reducing the resilience of coastal ecosystems. Observed changes include coastal erosion, loss of coastal vegetated ecosystems (50% of salt marshes and at least 35% of mangroves) (Steven et al., 2020), loss of living coral (50%) (Hoegh-Guldberg et al., 2018) and shellfish reefs (85%) (Gulliver et al., 2020), and the shrinking of deltas due to upstream sand extraction. The ecosystem services provided by natural coastal systems are diminished as a result of habitat destruction and degradation. The decline in physical and ecological resilience activates the release of stored carbon and weakens the system's ability to sequester more.

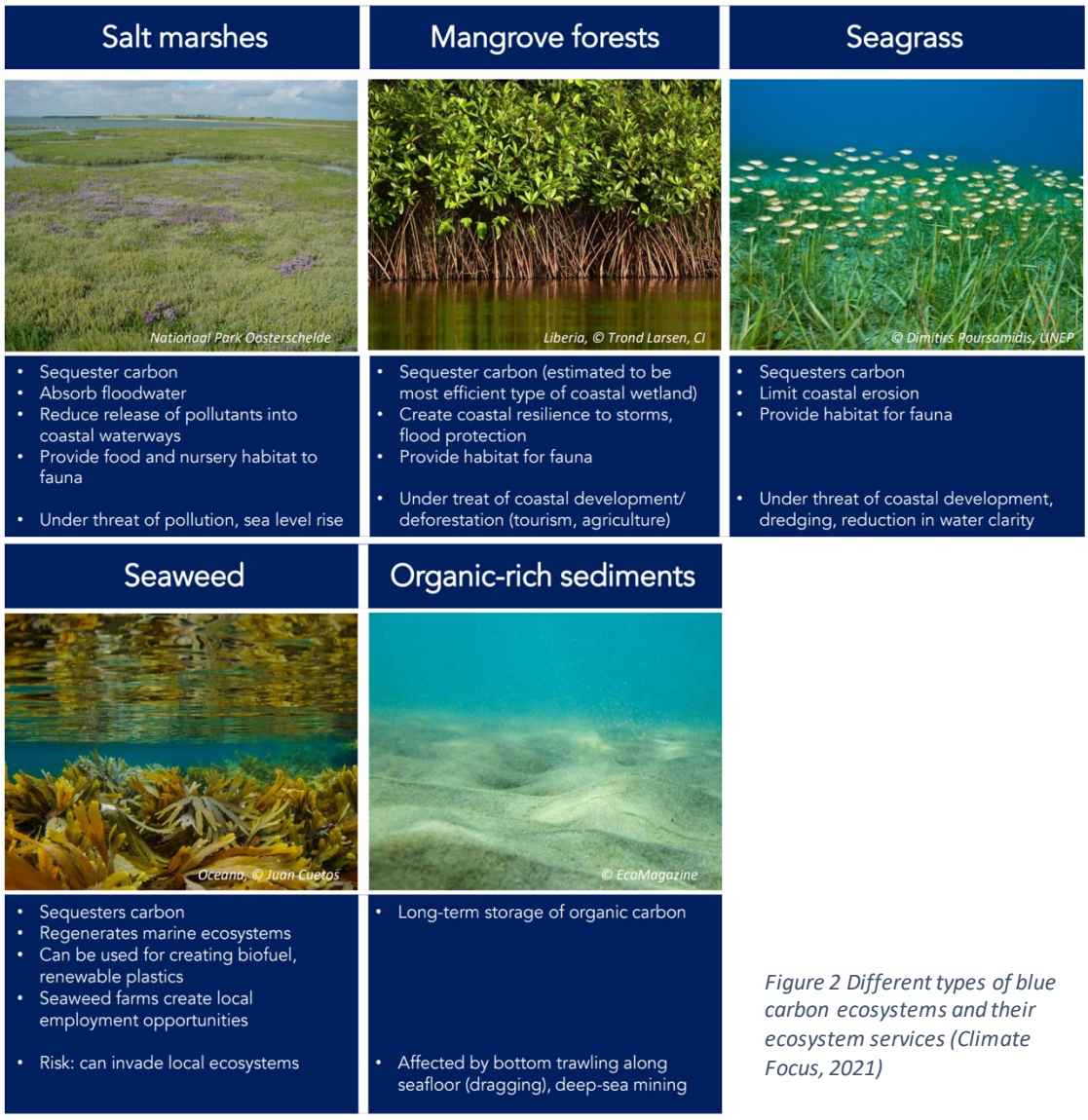


*Figure 2 Different types of blue carbon ecosystems and their ecosystem services (Climate Focus, 2021)*

### 2.2.2. Ecological opportunities in coastal ecosystems

Coastal ecosystems function as a barrier or transition zone between the sea and the land. Mangroves, seagrasses, salt marshes, kelp forests, coral reefs and shellfish reefs form a natural coastal protection against physical damage on land from floods, storms and sea-level rise. Ecosystems services from different types of coastal ecosystems are shown in Figure 2. For example, coastal wetlands and coral reefs provide coastal protection from storm surges and rising sea level,

while wetlands help reduce flooding. The dense root systems of mangrove forests break waves, causing a reduction in wave energy of up to 66% in the first 100m of forest (Mcivor et al., 2012), thereby protecting the coasts from severe impacts of storm floods. In 2017, mangroves prevented $1.5 billion in flood damages in Florida, protecting over half a million people during Hurricane Irma. Damages were 25% lower in those Florida counties where mangroves were present (Earth Security, 2020). Other examples of coastal NbS are the protection and restoration of dunes and beaches in forms of natural dune replenishment.

In addition to shoreline protection, coastal ecosystems also improve marine- and freshwater quality and support biodiversity as they act as nursery areas that provide refuge to young fish and other aquatic species. As such, healthy coastal ecosystems also provide benefits for many livelihoods through provision of food and attraction of tourists.

### 2.2.3. Green-grey infrastructure approaches

Depending on the local circumstances and desired coastal protection level, a combination of "green infrastructure" with traditional "grey infrastructure," such as dams, levees, reservoirs, treatment systems, and pipes can achieve cost-effective flood risk reduction benefits. In locations with a relatively low flood protection goal (e.g. 1/5 to 1/100 year event), NbS can have a lower lifecycle cost than grey infrastructure (Narayan, 2016). As more dynamics and variability is introduced in the coastal zone, green-grey solutions may provide lower-cost and more resilient coastal protection services than solely green solutions. Over time, and done properly, combining green and gray infrastructure also offers ecosystem services like climate mitigation (World Bank, 2019).

### 2.2.4. Coastal blue carbon

Coastal ecosystems can reduce greenhouse gas emissions from land- and sea-use change and maintain large carbon sinks if properly managed. 'Blue carbon' represents the carbon stored in biologically-driven carbon fluxes and storage in coastal and marine systems. Blue carbon in coastal ecosystems focuses on rooted vegetation in the coastal zone, such as tidal marshes, mangroves and seagrasses.

These ecosystems have high carbon burial rates on a per unit area basis and accumulate carbon in their roots, soils and sediments. For example, while covering less than 2% of the total ocean area, coastal areas sequester and store 48% of the total carbon sequestrated in the ocean. Mangroves may sequester four times more carbon than rainforest per unit area (The Blue Carbon Initiative, 2021). An overview of the rate of carbon uptake in various biotopes is shown in Table 1.

Coastal ecosystems with blue carbon sinks are found on every continent except Antarctica. These coastal ecosystems cover between 13.8 and 15.2 million hectares (Mha) of mangroves, 2.2 and 40 Mha of salt marshes, and 17.7 and 60 Mha of seagrasses. Combined, these ecosystems cover approximately 49 Mha (Figure 2) (The Blue Carbon Initiative, 2021). There is evidence to suggest that the ecological connections between blue carbon ecosystems and coral reefs can make blue carbon ecosystems more resilient and effective in sequestering and storing carbon (Guerra-Vargas et al., 2020).

*Table 1 Typical rates of carbon sequestration in various biotopes (Somarakis et al., 2019)*

| BIOTOPE | RANGE OF CARBON SEQUESTRATION (tC/ha/yr) |
|---|---|
| Wild grassland | 0.35 - 0.7 (Conant et al., 2001) |
| Seagrass | 1.0 – 1.8 (Murray et al., 2011) |
| Saltmarsh | 2.0 – 2.7 " |
| Mangroves in estuary | 2.0 – 3.0 " |
| Oceanic mangroves | 3.0 – 6.0 " |
| Tropical forest | 1.5 – 2.0 " |
| Boreal forest | 1.0 – 1.5 " |
| Urban forest | 2.9 (Mohareb & Kennedy, 2012) |

If degraded or lost, coastal blue carbon ecosystems are likely to release most of their carbon back to the atmosphere (IPCC, 2019). Coastal blue carbon ecosystems are disappearing at rates between 0.7 and 7% annually, releasing between 0.15 and 1.02 billion tons of carbon each year (Pendleton et al., 2012). To put this figure in perspective, the global aviation – which includes both passenger and freight – emitted 1.04 billion tonnes of carbon in 2018 (Our World in Data, 2020).

Mangroves are being lost at a rate of 2% per year. It is estimated that carbon emissions from mangrove deforestation account for up to 10% of emissions from deforestation globally, despite covering just 0.7% of land coverage. Tidal marshes are being lost at a rate of 1-2% per year. They have lost more than 50% of their historical global coverage. Seagrasses cover less than 0.2% of ocean floor, but store about 10% of the carbon buried in the oceans each year. Seagrasses are being lost at a rate of 1.5% per year and have lost approximately 30% of historical global coverage (The Blue Carbon Initiative, 2021).

The loss of blue carbon means that there is also an opportunity to restore the ecosystems that store blue carbon. Blue carbon habitats are some of the most effective carbon sequestration habitats, area for area, on the planet. New revenue sources can be capitalized with carbon credits.


*Figure 2 Global distribution of blue carbon ecosystems (The Blue Carbon Initiative)*

## 2.3. Stakeholders: benefits and challenges of NbS

### 2.3.1. Involved stakeholder groups

The development of NbS in coastal ecosystems involves distinct groups of stakeholders, whom all have their own interests in NbS. At the same time, these stakeholder groups can also experience barriers that can obstruct their involvement in the development and implementation of NbS. These interests and barriers both affect the feasibility of business cases for coastal protection through NbS. We held semi-structured interviews with key stakeholder groups to identify these interests and challenges. In this section we describe the most relevant stakeholder groups and their interests in NbS for coastal protection. Not all of the groups mentioned here are involved in financing NbS, but we also describe groups that benefit or interact with NbS in other ways. Here, we will describe the general role of these stakeholder groups, while chapter 3 will provide more detail on the specific organizations relevant to finance NbS projects in Africa and Asia.

*Table 2 Overview of stakholder groups involved with NbS in coastal protection*

| **Stakeholder type** | **General interest in NbS** |
|---|---|
| National and local state actors | Use of NbS in coastal protection can also contribute to environmental and biodiversity goals, where traditional grey infrastructure might not. |
| Development finance institutions | Interested in supporting sustainable development which includes the use of NbS. |
| Private sector actors | Can be interested in NbS projects for the purposes of impact investing or offsetting. |
| Local communities and local private sector | Depend on the local environment for their livelihoods and thus can benefit from NbS in their surroundings. |
| Engineering and dredging sector | Have the expertise and capacity to implement NbS in coastal protection context |
| Non-governmental organizations | Interested in the broad employment of NbS to support their interests in, for example, biodiversity conservation. |

### 2.3.2. National and local state actors

For national and local state actors and their associated ministries and departments, NbS can form attractive measures that could potentially address biodiversity loss, climate change and poverty at the same time. State actors are crucial in the development of business cases for NbS, as they are often the stakeholders that identify the need for, and consequently initiate projects where NbS can be involved. Coastal protection in particular depends strongly on state actors, as coastal protection is generally considered to be a public service and therefore a governmental responsibility. Additionally, cooperation of state actors is typically an essential part of setting up a NbS project from a legislative standpoint. This is particularly true for large-scale NbS projects, as these types of projects often depend on permits and cooperation by multiple governmental agencies that are responsible for parts of the area covered by a NbS. Good collaboration can be a challenging factor in the effective implementation of NbS projects, as both horizontal (among Ministries/departments) and vertical coherence can play a role.

During interviews with stakeholders, a number of important obstacles were mentioned that prevent state actors from implementing NbS in coastal protection. Perhaps the most crucial obstacle is the lack of knowledge on the functionality and benefits of NbS within (parts of) many governments. This can be further exacerbated by the fact that cooperation between government departments on NbS is often lacking. However, this does not necessarily reflect a lack of will on the part of these departments but might also be hindered by a lack of adequate legislation for the development, implementation and monitoring of NbS.

### 2.3.3. Development Finance Institutions

International Financial Institutions (IFIs) are bi- or multilateral entities that can provide low-interest loans with the broad aim of supporting sustainable development, particularly in less developed countries (See Annex 1 for list of relevant IFIs operating in Asia and Africa). They are established by two or more countries that subsequently provide funds that can be lend to countries and projects that fit within the goals of the founding countries. IFIs are at the forefront of knowledge development in the field of NbS finance. In addition to IFIs, there are a variety of national development banks and agencies. Development finance institutions often combine financial resources with technical knowledge for NbS in the context of disaster resilience and climate change mitigation and adaptation. They utilize a variety of mechanisms for financing NbS projects, often in combination with larger infrastructure investments. Additionally, they provide technical support in the project development phase, through which they can form a crucial actor in bridging the gap between public and private investment in NbS. The role of development finance institutions in the financing of NbS will be further explored in Chapter 3.

### 2.3.4. Private sector

Under private sector we understand several types of business entities that can provide financial capital for NbS projects (See Annex 1 for list of relevant private investors in the field of NbS). Following the UNEP's 'State of Finance for Nature' report, we classify these into four groups. These groups have different expectations regarding the financial returns for their support to NbS (Figure 4). Firstly, we have traditional investors that invest private capital into NbS projects with the expectation of a direct financial return. Secondly, we have commercial financial institutions that finance NbS projects through loans or play a role in insuring NbS projects. Thirdly, we have corporations and private investors that invest in NbS for Corporate Social Responsibility (CSR) or to offset their negative impact on greenhouse gasses and/or ecosystems. Finally, we have philanthropic

organizations, which fund (non-profit) organizations that manage NbS projects and expect no financial returns.

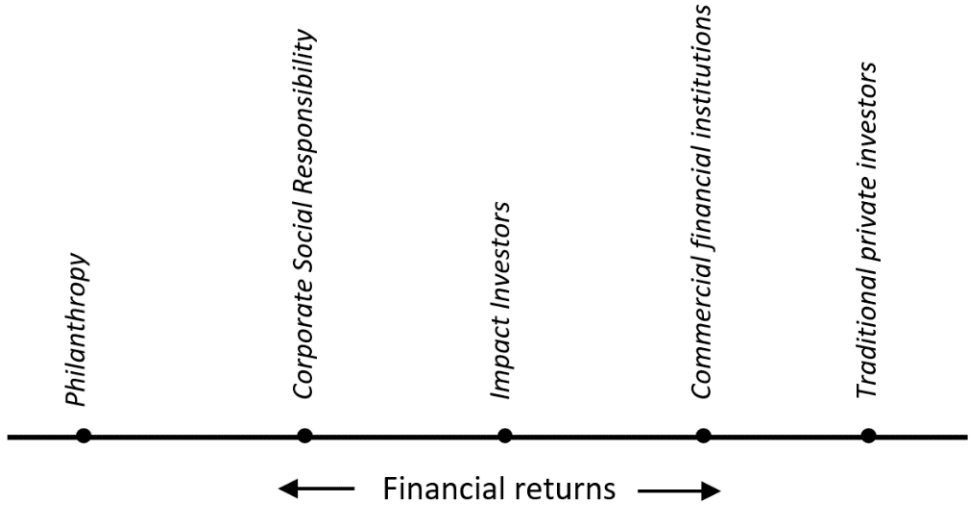


*Figure 4 Private finance groups ordered by their interests regarding financial return (differences between groups are not exact, but offer a generalized insight into their expectations)*

### 2.3.5. Local communities and local private sector

Local communities in the areas where NbS are implemented are direct beneficiaries through the ecosystem services that are generated. In the context of coastal protection projects where NbS are involved, the most obvious of these benefits is the protection of their property and livelihoods from damage by floods and storms. In addition, livelihoods are often improved through enhanced economic activities that depend on coastal ecosystems, such as fisheries, aquaculture, or tourism. This is not limited to individuals from these communities, but also includes local businesses that benefit from NbS implementation. Local communities are essential for the success of a NbS project due to the multitude of ways in which they can affect the NbS both positively (e.g. by protecting a mangrove forest) and negatively (e.g. by continuing with unsustainable fishing practices).

NbS can provide significant benefits for local communities, though this does not guarantee that local communities are interested in the implementation of NbS in their surroundings. First of all, local communities might not be aware of the benefits of NbS, which might hinder interest and enthusiasm for these types of solutions. Additionally, local communities are often not organized into entities that can represent their interests and as such also often lack access to finance for setting up NbS. These factors can lead to local communities being vulnerable to experiencing negative impacts of infrastructure projects. The IUCN has developed the 'Global Standards for Nature-based solutions' (IUCN, 2020b) to ensure that such negative effects do not occur in project design and implementation. Finally, it is important to mention that NbS can also negatively affect the livelihoods of local communities or specific community members. The implementation of NbS often require time and a change in land-use, which can be (temporarily) detrimental to sustaining local livelihoods.

The dredging and engineering sector can play a vital role in the development of NbS projects where grey and green infrastructure are combined. As the use of NbS in national development plans and climate finance pledges increases, so too does the incentive for dredging and engineering companies to expand their services to this field. Dutch dredging and engineering companies have the technical competency to execute large scale coastal infrastructure projects and to incorporate NbS in these projects.

### 2.3.6. Dredging and engineering sector

Dredging and engineering companies can be hindered by rigid procurement procedures and a lack of centralized information on funding. Based on interviews with Dutch dredging and engineering companies, a recurring theme was the rigidity of procurement procedures pertaining to funding for feasibility studies for NbS projects. NbS projects, particularly in the context of coastal protection, require robust feasibility studies to ensure that they will achieve their desired outcomes. Feasibility studies are often expensive undertakings that are not guaranteed to support the proposed NbS project. As such, project developers are unlikely to conduct such studies without outside funding. Additionally, project developers will be especially unlikely to undertake studies when they have no guarantee that they will get the contract for the development of the NbS.

In addition to rigid procurement procedures, it was also mentioned in interviews with the dredging and engineering companies that information on possible sources of public and private financing is often diffuse. This can lead to companies not being aware of relevant sources of finance for NbS projects. Furthermore, it means that a significant investment is needed for both finding and soliciting potential finance streams each time a NbS project is developed. There is also the uncertainty of operating in foreign countries where contracts are subject to local regulations. The contracts might not always be guaranteed to the extent that they would be in the home country of companies. Finally, competition with traditional grey infrastructure solutions, which can sometimes cost less than grey-green or green infrastructure, hinder the implementation of NbS.

### 2.3.7. Non-Governmental Organizations

Various Non-Governmental Organizations (NGOs) (see Annex 2 for a list of major NGOs involved in NbS) are active in the field of NbS where their primary function is that of convening, incubating, advocacy and developing a knowledge base. All big international nature conservation organizations operate programs in the field of NbS with local partners or have undertaken related activities. These organizations can form an important part of developing NbS projects, as they offer networks, knowledge and experience in the technical, ecological and social aspects of NbS and increasingly also on the financing aspects. They are key for broader uptake and integration of NbS to address societal challenges such as water- and food security and poverty alleviation. Additionally, there are also a number of NGOs that have (voluntary) quality standards and provide accreditation for NbS projects.

## 2.4. Markets for blue carbon

In this market study, we focus on blue carbon as the most concrete potential revenue stream from coastal ecosystem services. We look beyond markets that capitalize on avoided damage costs of vulnerable coastlines because coastal protection services is most often seen as a non-marketable public good.

Tracking global investments, investment needs and investment potential in blue carbon is notoriously complicated due to differences in reporting and definitions, and a general lack of data. To give an idea of the market, this section outlines insights based on available statistics and major trends driving carbon market developments.

### 2.4.1. Current market size

Blue carbon ecosystems are still an under-appreciated carbon asset in the voluntary carbon market. The reason for this is that only recently a standard methodology to assess blue carbon stocks has become available. Until 2015, mangrove projects were evaluated using terrestrial forest methods, undercounting storage in roots and soil. The first methodology for verified blue carbon credits was published in 2015 by Verra covering tidal wetland and seagrass restoration (Verra, 2015). Verra

expanded the methodology for coastal wetland conservation with mangroves, seagrasses and saltmarshes in 2020 (Verra, 2020). So far, Verra has issued a grand total of just under 970,000 credits to the voluntary carbon market, representing 970,000 metric tons of $CO_2$ equivalents, to blue carbon projects. As the science behind blue carbon expands, also new blue carbon stocks could be added, such as organic-rich sediments on the sea floor, kelp forests and seaweed farms. Blue carbon credits are likely to play an important role in the financing of NbS in the context coastal protection, though it is likely to take some more years for them to realize their full potential. In total there are five standards that dominate the market for blue carbon offsets (See Annex 3 for details on these five standards).

So far, only a few blue carbon projects are underway or in development. They focus on mangroves in Kenya, Senegal, Sumatra, India's Sunderbans, Colombia, and in marine protected areas in Madagascar and Kenya. Most aim to reduce emissions by thousands to hundreds of thousands of tons of $CO_2$ equivalents per year.

### 2.4.2. Upcoming investments in coastal infrastructure

Environmental degradation and growing flood protection needs lead to stronger demand for restoration of blue carbon ecosystems. The global trend of expanding and revitalization of ports also opens up potential for further investment along coast lines. For coastal protection alone, global investment needs for new infrastructure and maintenance of existing infrastructure are estimated at USD 10 billion per year, in the short term. By 2100, that is expected to be in the region of USD 103-215 billion per year (Nicholls et al., 2019). It is expected that a part of this finance will be directed to green or grey-green infrastructure in ecosystems with high blue carbon stocks.

### 2.4.3. Voluntary carbon markets

The Paris Agreement caused a surge of corporate pledges to achieve carbon neutrality, which increased the demand for carbon credits in the voluntary carbon markets. After 2016, the carbon market experienced a rebound in the transaction volume of Voluntary Carbon Market (VCM) credits, particularly from NbS and renewable energy activities. The VCM is on track to set an all-time record for market volume in 2021 (Figure 5). The transaction volume of carbon credits is expected to continue to rise in the next decade (Figure 6). This will make investing in protecting and/or restoring natural carbon assets on greater scales a more attractive business case.

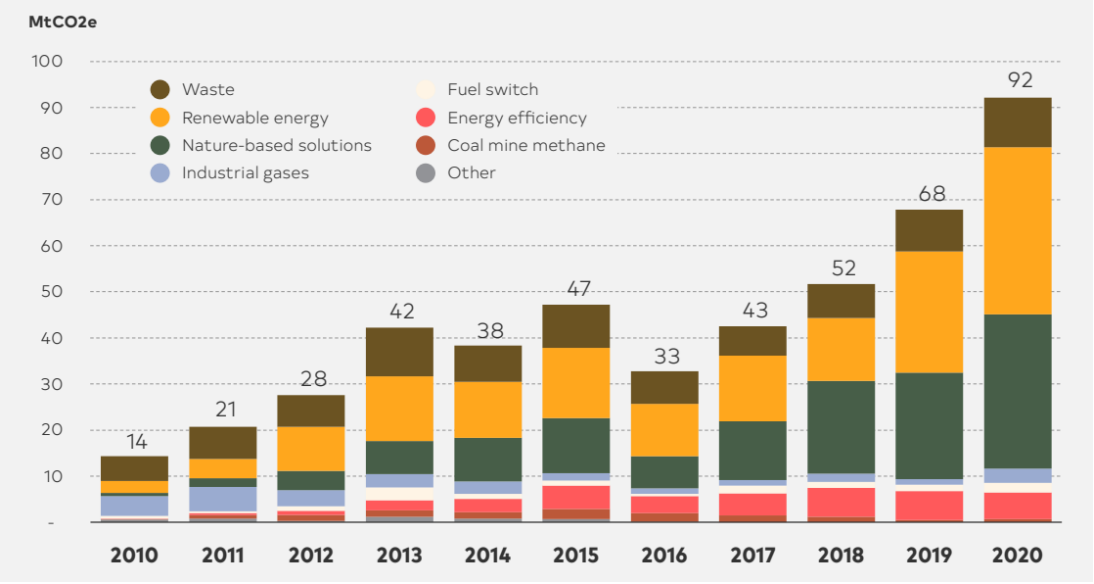


*Figure 5 Yearly volumes of retired voluntary carbon credits (VCS, GS, ACR, CAR) (Climate Focus, 2021)*

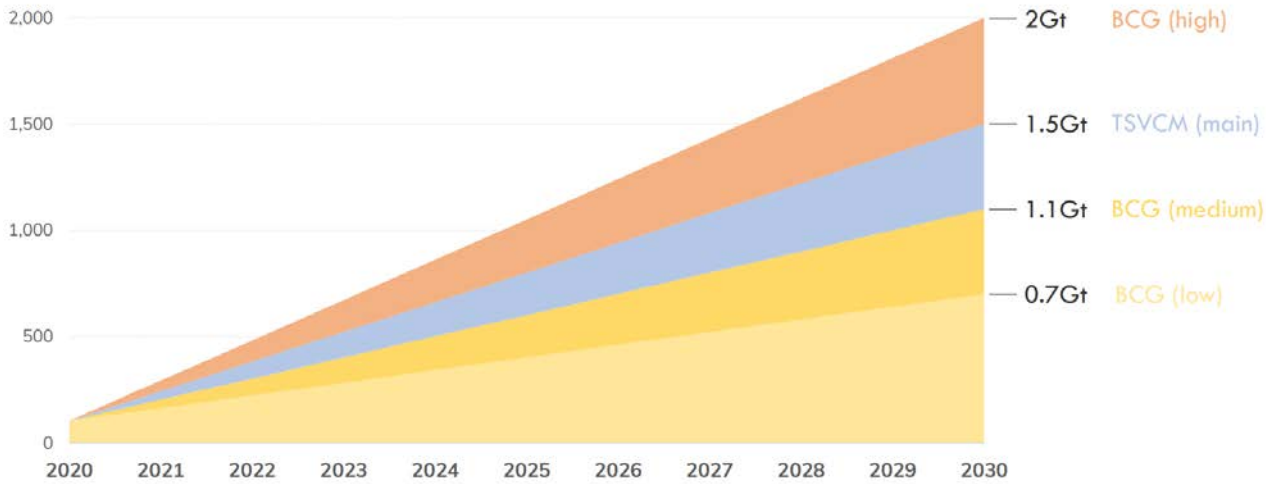


*Figure 6 Forecast scenarios of the transaction volume in MtCO2e in the total voluntary carbon market between 2020-2030 (adapted from Boston Consulting Group [BCG] and Taskforce on Scaling Voluntary Carbon Markets [TSVCM])*

At the same time, the demand for blue carbon credits is in an upward trend because it is a new, exciting carbon asset class. Especially companies in shipping and tourism sector have interest in conserving the sea/landscapes they have an impact on. Also for the offshore dredging and engineering sector it is interesting to invest in carbon projects based on blue carbon to offset impact. Mangrove restoration projects are among the best studied and most advanced type of blue carbon projects to date. It is estimated that USD 11.1 billion investment is needed over the next twenty-years to tackle the full restorable potential of over 700,000 hectares of mangroves across 25 coastal countries.

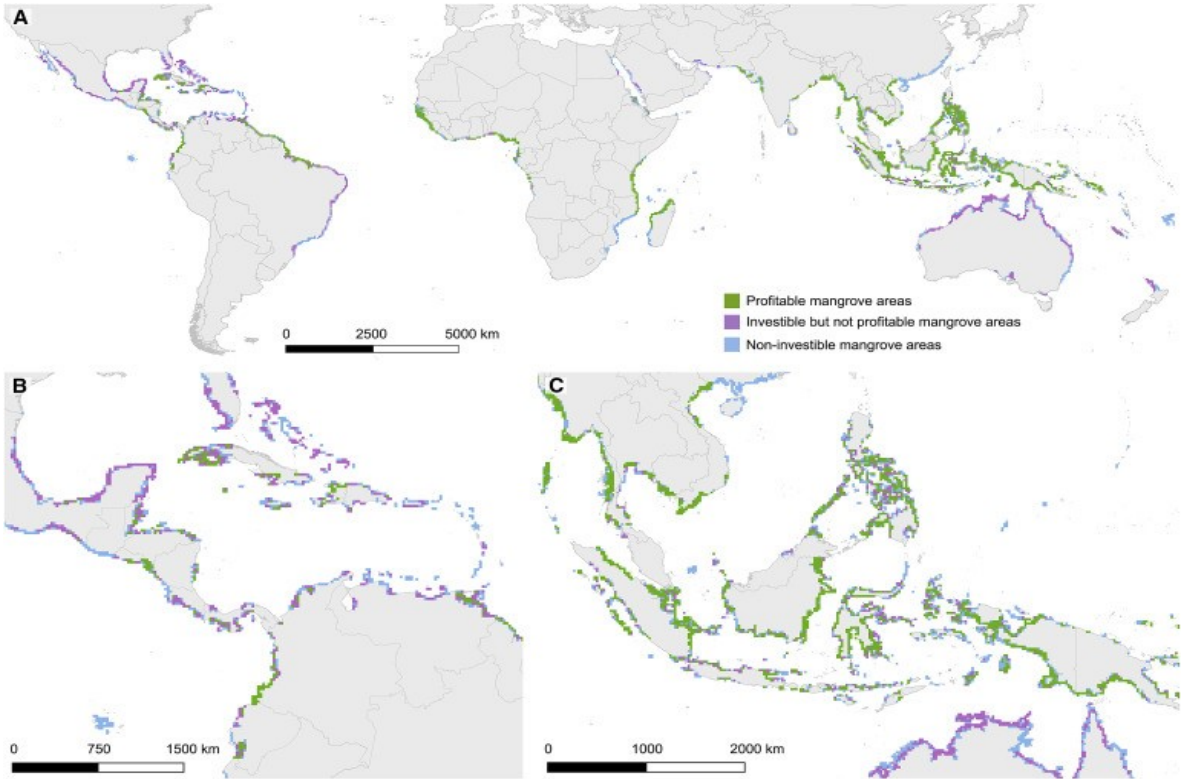


*Figure 7 Global potential and limits of mangrove blue carbon for climate change mitigation (Zeng et al., 2021)*

A recent assessment concluded that currently about 20 percent of the world's mangrove forests are ripe for blue carbon projects, and about half of that could be affordably protected and/or restored with inexpensive carbon credit prices of USD 5 per ton or more (Figure 7) (Zeng et al., 2021). Nature-based offset contracts have a typical price between USD 5-15 euro per ton $CO_2$ equivalents. If we consider the full potential of mangrove restoration, it could unlock 380 million $tCO_2$ of sequestration by 2040 (Earth Security, 2020).

With the current carbon prices in voluntary carbon markets, blue carbon investments are considered for a number of cases already. For instance, UNESCO noted in its blue carbon report that its 50 marine Heritage Sites, which together account for 15 percent of the planet's blue carbon assets, could finance at least part of their conservation work by claiming and selling carbon credits (UNESCO, 2021). Another example is a 700 hectares sea grass restoration project in South Bay (Virginia, USA) that is expected to have the potential to offset about 10 percent of that project's restoration costs of USD 800,000 with carbon credits (Oreska et al., 2020).

### 2.4.4. Mandatory carbon markets

If carbon trading from blue carbon projects are fully endorsed in mandatory carbon markets, such as the EU Emissions Trading Scheme, then this would help to scale up finance for blue carbon restoration and conservation activities. The mandatory carbon market is much larger in size and has generally higher carbon credit prices than the voluntary carbon market. Notably the COP26 in Glasgow made the mandatory market closer to recognizing blue carbon. The development of an international, mandatory carbon market depends on the willingness and ability of governments to export carbon credits overseas, set up a trading scheme, and make corresponding adjustments under their NDCs. The outcome of COP26 is to establish a rulebook to allow trading of credits between nations, as envisaged under article 6 of the Paris Agreement. The implementation of article 6 will likely boost the research and effort to promote blue carbon as a key carbon asset in the mandatory carbon market.

After the launch of the post-2020 CBD Global Biodiversity Framework, it is foreseen that NbS will gain additional political momentum. In the first draft of the biodiversity goals, NbS is framed as an effective response to tackle the triple crisis of biodiversity, climate change and poverty (IPBES-IPCC, 2021). This means that NbS will likely be adopted in the post-2020 CBD Global Biodiversity Framework as one of the policy responses to address this triple crisis. This will likely boost additional public investments in NbS projects that can be co-financed though selling carbon credits generated by public-private nature restoration and conservation activities.

### 2.4.5. Nationally Determined Contributions

NbS in blue carbon ecosystems are progressively included in policies to contribute to countries' solutions to mitigate climate change. A recent overview of NbS in coastal and marine ecosystems in countries' NDCs under the Paris Agreement showed that more than half of all submissions include coastal and marine NbS for either climate change mitigation, adaptation or both (Figure 8). There was a significant increase in the number of NDCs that mention wetlands, mangroves and marine ecosystems compared to previous version. 51 updated NDCs mentioned wetlands compared to 32 previous NDCs, 43 mentioned mangroves compared to 29 previous NDCs, and 60 mentioned marine ecosystems compared to 47 previously (WWF-UK, 2021). 25 NDCs aim to restore, conserve and protect blue carbon ecosystems with climate mitigation as their primary goal[1] (Lecerf et al., 2021). In

[1] 25 countries include protection, conservation and restoration of coastal blue carbon ecosystems as mitigation components of their new or updated NDCs: Australia, Brunei, Cape Verde, Cambodia, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Fiji, Honduras, Iceland, Kenya, Maldives, Nicaragua, Panama, Papua New Guinea, Saint Lucia, Senegal, Singapore, Sri Lanka, Sudan, Tonga, United Arab Emirates, United States, Vietnam.

addition to recognizing the importance of blue carbon ecosystems in carbon sequestration, a couple of countries have committed to more precise actions. To name a few examples:

- The United Arab Emirates is planning to plant 30 million mangrove seedlings by 2030 and to include at least 20% of marine blue carbon ecosystems within its national protected areas. It further wants to incorporate blue carbon stocks in national policies.
- Sudan has committed to protect and restore mangrove forests.
- Senegal aims to restore 4000 hectares of mangrove forest yearly.
- Costa Rica committed to restore 80% of mangroves located in the Gulf of Nicoya by 2030 and intends to manage and monitor restored coastal wetlands effectively.
- Papua New Guinea aims to include blue carbon ecosystems in the GHG inventory and UNFCCC reporting, while further emphasise mangroves and seagrasses in national climate policies.
- Kenya will conduct a blue carbon readiness assessment with the purpose of fully integrating blue carbon/ocean climate actions into NDCs.
- Sri Lanka targets restoration of at least 25 percent of wetland landscapes including coastal and marine habitats prioritized according to biodiversity value, ecosystem values and climate change vulnerability.

There is also ample scope for restoring and protecting salt marshes, especially in Australia, home to about a third of the planet's tidal marshes. For Indonesia, up to 20 percent of their national emissions come from mangroves. The business case for preserving mangroves at large scale becomes an attractive blue carbon opportunity compared to small scale aquaculture development in the coastal zone.

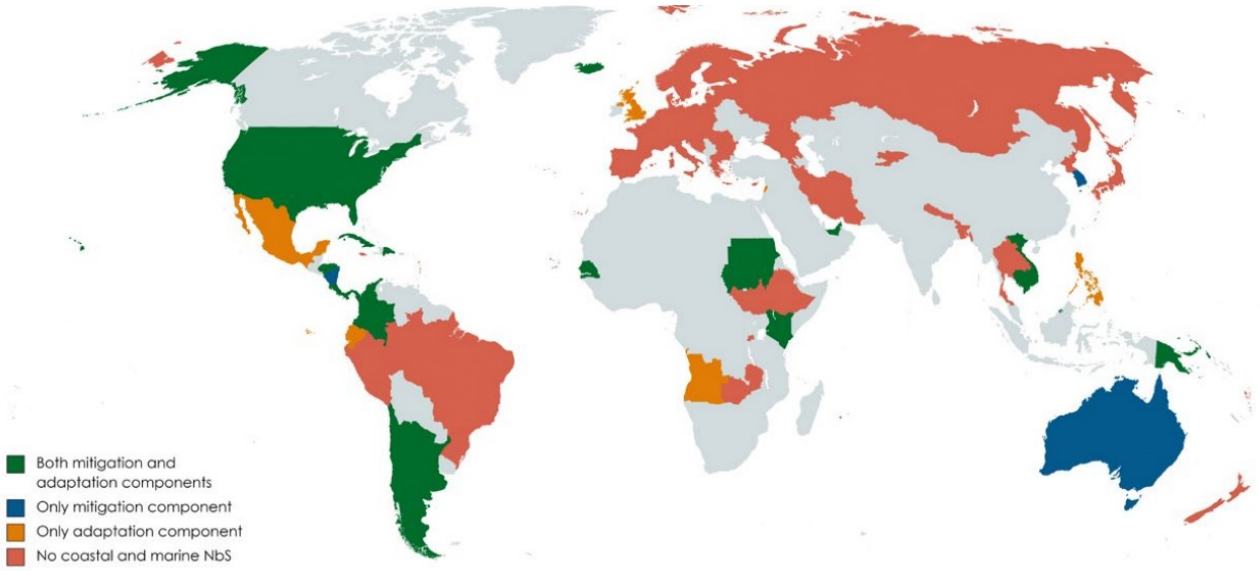


*Figure 8 Countries including coastal and marine NbS as mitigation and/or adaptation components in their new or updated NDCs (Lecerf et al., 2021)*

# 3. Finance mechanisms for NbS

## 3.1. Finance landscape

### 3.1.1. Finance mechanisms

There are a variety of financial mechanisms that have been used to finance NbS projects, ranging from project grants to carbon credit mechanisms. To boost the global demand for NbS, it is important to develop business models that leverage public funds for NbS through blended finance mechanisms that attract private investors. Multilateral institutions have also indicated that blended finance is a solution to convert "billions to trillions" to reach the Sustainable Development Goals (SDGs). In 2020, USD 133 billion/year was invested in NbS[2], of which 14% was comprised of private funds, equaling to USD 18 billion/year. To put this into perspective, in international climate finance 56% of total funds originate from private sources (UNEP, 2021a). In practice this means that funding for NbS projects in nearly all cases is wholly or partly dependent on public financing. This signifies the untapped source of private finance in this context. In nature-based coastal protection projects, this discrepancy is likely more pronounced, as coastal protection is virtually always a responsibility of the government and thus depends on public funding. Additionally, the objectives of funding can also differ markedly between and within public and private finance. Whereas public financing often also contains a landscape development objective, in private finance generally this will not be the case. Currently, opportunities for private finance of mangrove restoration projects is still limited, as project costs are often high compared to the revenue streams that can be generated based on carbon credits and other co-benefits.

Based on estimations developed by a joint study by several IFIs (AfDB and others, 2020), approximately USD 14 billion was available for climate change adaptation measures (which can also include NbS for coastal protection) through Multilateral Development Banks (MDBs) in the year 2019. Of this USD 14 billion, nearly half was reserved for low-income and middle-income countries in Sub-Saharan Africa (>USD 3.5 billion) and Southern Asia (>USD 3 billion). However, in terms of climate adaptation finance for coastal and riverine infrastructure by the MDBs, only 3 USD million was available for Sub-Saharan Africa, while for South Asia a total of USD 157 million was available (AfDB, 2020). These figures, though not necessarily reflecting the entirety of international public finance available for NbS in coastal protection, indicate that only a small part of international climate funding contributes to NbS in coastal protection in these regions (less than 0.5% for South Asia, and even less for Sub-Saharan Africa). Combined with the estimated annual investment needs for coastal protection, USD 10 billion per year globally and rising. These figures highlight the investment gap for coastal protection and the use of NbS in this context. As public financing so far has been unable to cover this gap, it is crucial to also attract private finance.

### 3.1.2. Mechanisms for public finance

Within public funding a variety of mechanisms beyond project grants have been developed to support NbS projects. Within public funds a distinction can be made between public funds distributed through IFIs (See Annex 1/Table 1 for details on relevant IFIs and programs) and public funds from national sources distributed through governmental agencies. In the context of low- and lower-middle income countries, the support of IFIs is often crucial due to the governmental budgets being limited and insufficient for large scale projects. Though various mechanisms exist, in

[2] Please not that these numbers are based on a broader definition of NbS, also including projects not related to coastal resilience.

international public funding grants still account for 85% of funding (Swann et al., 2021). The most important public financing sources are shown in Figure 9.

Additional innovative mechanisms that were mentioned in the interviews as potentially applicable to NbS included the 'first-loss guarantee' and 'off-take agreements'. The former concerns a mechanism where a third party (often an IFI) guarantees that a lender (e.g., a commercial bank) gets compensated if the borrower (e.g., local government) cannot fulfill its obligations under a contract. The latter concerns a mechanism where future benefits from a project are sold beforehand to serve as funding for setting up the project. These two mechanisms can help de-risk NbS projects and/or enhance profitability, and as such form a promising mechanism for coastal protection projects that require relatively large investments.


*Figure 9 Overview of funding mechanisms for NbS (source: IDB 2020). Note that mechanisms listed under public are also utilized by IFIs, namely grants, loans and bonds*

### 3.1.3. Mechanisms for private finance

The low percentage of private finance involved in NbS projects in contrast to the investment gap for these types of projects reflects the need for financing mechanisms that can attract private investments in NbS. However, this requires the identification and development of revenue streams from NbS projects that can generate returns that make investment attractive for private financiers (See Annex 1/Table 1 for details on relevant impact investment funds and other private financiers).

There is a variety of mechanisms that have been developed to generate revenue. Table 3 shows the distinction between the various mechanisms to create private revenue sources (see also Figure 9).

*Table 3 Mechanisms for private revenue or profit generation with description how they function*

| Mechanism | Description |
|---|---|
| **User charges** | Users of an ecosystem are charged a fee, (part of) which can be transferred to private financier of NbS |
| **Taxes** | Lower tax rates on services and payments utilized in NbS project |
| **Subsidies** | Private financier receives subsidies for investing in NbS |
| **Tax rebates** | Private financier of NbS receives a tax rebate |
| **Credit-trading systems** | Credits (e.g., carbon credits) are generated for protecting or restoring nature, and can then be sold on dedicated markets to generate revenue from NbS |
| **Biodiversity offsets** | Entities that are looking to compensate their own impact on biodiversity can invest in NbS that improve biodiversity elsewhere to offset their impact |
| **Carbon offsets** | Entities that are looking to compensate their carbon emissions can invest in NbS that function as carbon sinks to offset their impact |
| **Payment for ecosystem services** | Users of ecosystem services generated by a NbS pay the owner and/or manager of the ecosystem for the services they receive (e.g., fishermen pay for catching fish in mangrove forest) |

### 3.1.4. Blended finance

The development of revenue streams is one of the more difficult aspects to attract private investment in NbS projects. Revenue streams are often context-dependent and as such there is no straightforward methodology for developing these. Consequently, it requires a significant investment of resources to study the feasibility of revenue streams in a specific project, with no guarantee of success. Without the addition of public funding such feasibility studies are often unappealing to fund for private finance. To overcome this obstacle, increasing emphasis has been given in recent years to 'blended finance' mechanisms. In blended finance, public funds are used to attract and are combined with private finance to fund NbS projects. For example, public finance can be used to de-risk NbS projects by funding feasibility studies that can project the effects (e.g., coastal protection and water quality) and benefits (e.g., carbon credits generated) of a project and potentially make it more attract private finance. Funding for feasibility studies was mentioned multiple times in the stakeholder interviews as a barrier towards and is an area where blended finance can support NbS projects. Additionally, public funding can be used to de-risk projects through mechanisms such as the 'first-loss guarantee' described earlier which can support the initial operational phase of a project when benefits might not yet cover costs.

Blended finance forms a promising approach for attracting private finance in NbS projects but has not realized its full potential yet. Chapter 4 describes in greater detail blended finance mechanisms to finance NbS projects. For further reading it is recommended to study the case studies provided in the 'Bankable Nature Solutions' report developed by WWF (2020) as well as the 'Better Finance, Better World' report by the Blended Finance Taskforce (2018).

### 3.1.5. Finance mechanisms

Coastal protection is most often perceived as a public service that is implemented by state actors to ensure the safety of coastal communities and to protect economic interests in coastal areas. Usually, there is no direct financial incentive for private finance to invest in coastal protection, except in specific cases where commercial interests are directly threatened by flooding (i.e. where a large resort is threatened by flooding or erosion on the short term). NbS in coastal protection can provide

alternative avenues for attracting private finance compared to traditional 'grey' infrastructure, through the private finance sources described above. For example, a traditional concrete dike will provide no climate change mitigation benefits, while a dike with mangrove forest incorporated into the larger structure of coastal defenses can provide (under the right conditions) carbon credits. These credits can then be used to generate financial returns for the NbS aspect of the coastal defense.

## 3.2. Enabling conditions for private finance

Usually coastal protection projects does not generate direct economic benefits for investors by itself. In order for coastal protection projects with NbS to generate returns for private investors there generally will need to be co-benefits that provide revenue streams (e.g., through payment for ecosystem services such as carbon sequestration or increased fishing opportunities). In cases where the revenue streams are too limited to generate a return on investment, private financing will in theory be unfeasible. Thus, where private financing is desired, it is important to establish whe ther sufficient income from co-benefits can be generated by the project, or at least that part of the project for which private financing is needed.

Private financing of NbS requires a suitable business conditions, where certain pre-conditions need to exist that support successful private financing. The 'Ocean Finance Handbook' (OFH) (Friends of Ocean Action, 2020) defines three distinct areas where pre-requisites are necessary for private finance, namely: governance structures, investment climate, and know ledge & innovation. These three areas also closely resemble those proposed by the World Bank in the report 'Enabling Private Investment in Climate Adaptation and Resilience' on enabling private investment (Tall et al., 2021). The OFH provides an exhaustive description of the pre-requisites, which we have summarized in this section. For further reading it is recommended to study the OFH (Friends of Ocean Action, 2020), as well as the report developed for the World Bank (Tall et al., 2021). These reports provide detailed information on the crucial aspects of enabling conditions.

It is important to note that the suitable business conditions described in the section refers to governance conditions outside of the project, not to interproject governance. Though interproject governance is also a vital aspect for the bankability of a project, we have not expanded upon this aspect as this is more project and funder specific.

### 3.2.1. Governance structures

For NbS projects to be attractive to private investors it is vital that a governance structure exists that enables a well-functioning landscape for private finance. When developing NbS projects in coastal contexts, it is thus important to ascertain governance structures in the project country, and to determine whether they are supportive of the desired project. The OFH describes four enabling conditions that are required for effective governance structures.

- **Political willingness.** When policy makers are willing to utilize NbS in coastal protection and, then this can mobilize political capital for NbS. This willingness might be generated through lobbying for NbS by interest groups. Political willingness will help mainstream NbS thinking within government departments and thus contribute in various ways to enabling the development of NbS projects.
- **Policy incentives and disincentives.** For investment in NbS to be attractive to private finance it is important that policy frameworks are in place that incentivize the development of NbS projects and provide attractive conditions for investing in these projects. Incentives can include, for

instance, no taxes on investments in coastal protection projects; legislation allowing for the use of NbS in coastal protection. Disincentives should be put in place to discourage actors to do harm to a NbS project, such as fines for fishing techniques that negatively affect seagrass.

### 3.2.2. Investment conditions

To attract private investment in NbS projects it will be necessary to have suitable investment conditions that inspire confidence in potential investors and reduce the risks of investment. When developing NbS projects it is thus essential to consider the investment conditions in the target country as well as for the revenue streams that are expected to be developed within the project. The OFH describes four important conditions for a suitable investment climate.

- **Legal recourse avenues**. Countries that have clear avenues of legal recourse for investors are therefore more attractive than countries that lack such avenues. If private financing of a NbS is desired, it is important to check whether options for legal recourse are present in the country of implementation.
- **Insurances**. Another important enabling factor for private investment is the availability of insurance for projects in which they invest. The availability of insurance for NbS projects in coastal protection can ensure the stability of these projects. This stability will help attract investments as it provides protection for the returns of investors. At present, there are no standardized insurance projects for NbS yet, but on a project basis insurance projects have been developed (see case study 8 in IADC, 2018). In the future, the availability of insurance mechanisms fit to the desired project can help attract private finance.
- **Liquidity**. Liquidity concerns the ease with which an investment or the returns of an investment can be translated into monetary capital. According to the OFH liquidity requires 'the availability of multiple similar products and a healthy pool of potential buyers of these products'. In the context of coastal protection with NbS this would concern partly the markets for carbon credits. Having liquidity in the carbon market increases the appeal of investing in NbS projects with blue carbon.
- **Collaterals**. Collaterals are 'the assets which can be used as a guarantee for investors in the event of default' (OFH, 2020). Collaterals are thus an important aspect of NbS projects that strengthen investor confidence. Collaterals for NbS projects are often not directly discernible and might require innovative revenue mechanisms or be compensated for through strong insurance mechanisms.

### 3.2.3. Knowledge and innovation

For any successful interaction between investors and project developers it is vital that they speak the same language, or at least are able to understand each other's language. Once again, the OFH describes four different conditions:

- **Financial literacy for business planning.** Project developers seeking to attract private investment will need to have a thorough understanding of the concepts and frameworks upon which investors depend. Without this understanding and the ability to translate this understanding into the actions required to develop bankable mechanisms in NbS projects, private investors will be unlikely to be interested in such projects.
- **Literacy on NbS**. At the same time, it is also important to create a greater understanding among investors in NbS on the benefits and the way in which these projects function. Doing so might

alleviate risks felt by investors towards aspects of NbS projects where risks do not actually exist to the extent that investors might feel, or where no risk exist at all.

- **Multistakeholder collaboration**. Efforts should be taken to create better understanding between investors and project developers through increased collaboration, as well as with governmental agencies, NGOs and other relevant stakeholders. By ensuring that practical experience for such collaborations is developed, future NbS projects will have a better chance of being initiated and being successful.
- **Monitoring and evaluation.** Another vital enabler for successful NbS projects is proper data management, as this is vital for measuring the effectiveness of NbS projects and consequently to project financial flows. Without data management, investors will not be interested in NbS projects (or any other type of project for that matter) as there will be far too much uncertainty about performance and returns.

### 3.2.4. Reflections on the state of enabling conditions

Based on interviews with representatives of various stakeholder groups some observations can be made regarding the presence of the enabling conditions described in the previous section. Under all three areas there was a lack of one or more of the enabling conditions. Stakeholders indicated that adequate governance structures are often missing in low- and lower middle-income countries in Asia and Africa. Additionally, virtually all stakeholders noted that suitable investment conditions are hindered by un- and underdeveloped markets for ecosystem goods produced by NbS. An often-cited problem that a common language between the dredging & engineering and conservation sector on the one hand, and the financial sector on the other is missing. These challenges prevent an enabling landscape from materialising and thus hinder the implementation of NbS projects in coastal protection. The next section describe of the most important barriers for an enabling landscape for blended finance and provide potential solutions for these barriers.

# 4. Barriers and solutions for financing NbS

## 4.1. Barriers

This chapter highlights the most important barriers for financing NbS projects with the implementation of blended finance structures identified through the stakeholder interviews and literature study.

### 4.1.1. Barriers related to investment mechanisms

#### *4.1.1.a Bankability of NbS projects*

Certain NbS projects or concepts, including those in the context of blue carbon ecosystems, may require access to private financing (e.g. through debt or equity) in order to be scaled-up or implemented successfully. To secure financing from private investors, a NbS project will need to be perceived as sufficiently "bankable". Similar to other type of investments, the bankability of a NbS project will depend on factors such as the predictability of its cash-flow and its associated risk profile. These indicators inform investors on the potential returns of the investment, and the likeliness that the expected yields are realized. In the case of NbS projects, the following factors are often cited as barriers that prevent these projects from being perceived as bankable by private investors:

- **Small project scale.** NbS projects and their returns often do not reach the investment scale that institutional investors are looking for (Cooper, G. and Trémolet S., 2019). Small projects do not justify due diligence and transaction cost of the investor or may not even have potential to generate financial returns. Business models that rely on carbon credits (and soil carbon in particular) suffer from the costs of verifying the credits, making scale an essential criterion (WEF, 2021). Successfully certifying carbon emission reductions comes with various types of core costs and fees, such as for opening an account, document reviews, or issuance and registration fees, among others. These include either fixed costs, or costs that become marginally cheaper with a larger project size. Examples of such fees include those for Plan Vivo[3] and Verra VCS[4].
- **High risk profile.** Investors that provide debt or equity financing often consider NbS projects as too risky to receive their financial support. NbS can suffer from low or uncertain revenue streams, and typically have a time lag between initial investments and the generation of returns. For instance, the success of a mangrove restoration project depends on the survival rate of the mangrove seedlings, which is often difficult to predict. Non-financial investment outcomes, such as those related to improved biodiversity or community benefits, are not incorporated into the financial risk assessment, thereby making non-NbS investment (that may have un-desirable environmental outcomes) more attractive relative to NbS investments (Tobin-de la Puente and Mitchell, 2021; Grigg, Yacob and James, 2020).

#### *4.1.1.b Market for NbS projects*

- **Limited standardization.** There is a lack in clarity among both public and private entities as to what exactly constitutes a NbS project. This is most evident in the lack of adopted standard definitions, tools and metrics to track the costs and performance of these projects – that persist despite efforts being made by for instance the IUCN and World Bank on defining NbS (World Bank, 2021 and IUCN Global Standard for NbS). The resulting scarcity of publicly available and

[3] https://www.planvivo.org/costs-fees
[4] https://verra.org/wp-content/uploads/2020/04/Program-Fee-Schedule_v4.1.pdf

comparable project costs and performance data (in particular for projects with carbon credits from blue carbon sources) hinders structural investments in NbS project from both private and public entities, as well as the creation of replicable financial products/models (WEF, 2021; Thiele, von Unger and Mohan, 2021; Shames and Scherr, 2020).

- **Lack of attractive markets.** The complexity of data harvesting of the ecological, social and economic performance of historical projects involving blue carbon credits, proliferation of different measurement methods, and a fluctuating market price work as a deterrent for credit buyers – thereby artificially limiting demand (WEF, 2021). Projects are often under-valued because the co-benefits that they create (e.g., coastal protection or improved biodiversity) are not accounted for in the price of carbon credits (Swann et al., 2020). On top of these issues, credits are pay-for-performance, and require projects to operate for years before any revenue can be generated. As a result, there is a lack in up-front capital available to these projects, and a perceived lack of investment opportunities from the perspective of the private sector (WEF, 2021; Credit Suisse, 2021).

#### *4.1.1.c Capacity for project development*

- **Limited technical capacity.** Designing a functioning NbS is often hindered due to a lack in required capacity, technical expertise and financial literacy. There is often a lack of financial expertise on the side of the integrated landscape actors, and a lack of landscape expertise on the side of financial actors. Furthermore, low- and lower-middle income countries may lack the technical capacity to integrate NbS into their adaptation planning and sufficiently develop NbS project pipelines (Shames and Scherr, 2020). Capacity constraints can result in the absence of a clearly described model for revenue generation, mapped financing needs across the project lifecycle, a designed proof of concept or the engagement with the necessary stakeholders (WWF, 2020; Swan et al, 2020; McQuaid, 2019).

### 4.1.2. Barriers related to regulations

- **Slow translation of policies and plans from international to sub-national levels.** The CBD and UNFCCC conventions strongly promote NbS, but effective national policies and plans are still lagging behind. The absence of policies and plans that require public or private compliance with certain environmental standards (e.g., aimed at preventing mismanagement of resources, commodities and raw materials) can inhibit the incentive to develop NbS projects (Tobin-de la Puente and Mitchell, 2021). Another factor that can limit this incentive is the lack of suitable regulations – such as the incorporation of biodiversity or climate risks in investment decision-making, or public (dis)incentives (e.g., taxes, fines, subsidies) that promote NbS investments (Friends of Ocean action, 2020).
- **Complex legal frameworks.** Depending on the country, legal frameworks can be in place that limit the extent to which private investments in public or communally held assets are allowed. Because coastal NbS projects often revolve around such assets, this limitation can prevent their development (UNEP, 2021b). Furthermore, without a robust judicial system in place that can resolve legal grievances, a country is unlikely to receive foreign investments at scale. This is exacerbated in sectors where legal frameworks may not have been fully established or tailored yet to function effectively in a particular (NbS) context, such as those involving payment for climate mitigation services with blue carbon (Friends of Ocean Action, 2020). As such, there is no

guarantee that future legal issues that may threaten (an underlying mechanism of) a NbS can be effectively resolved.

### 4.1.3. Barriers related to public procurement

- **Public procurement processes.** NbS are not mainstreamed in the design and procurement stages of public infrastructure projects. Instead, public procurement processes often default "grey" infrastructure without systematically evaluating "green" NbS alternatives and the co-benefits that these generate (IDB, 2020). Additionally, procurement rules on blended finance structures and in particular the utilization of private finance in conjunction with public finance are not always clear.
- **Sectorized and inflexible politics.** Limited coordination between ministries and departments and between central and local government agencies hinders the structural uptake of NbS. Those government agencies that are responsible for infrastructure investment decisions (e.g., ministry for energy, planning or transportation) and those managing natural capital (e.g. ministry of environment) are divided and often lack a collaborative approach to evaluate NbS properly (Watkins et al, 2019).

### 4.1.4. Barriers related to gathering and communicating evidence

- **Complexity of gathering and communicating evidence of NbS benefits.** For a NbS to receive the required (financial) support, it is imperative that there is a theoretical basis that describes how it creates various types of benefits (e.g., economic, social, political or environmental). This theoretical basis is often absent because it demands time, specialized expertise, and money to conduct research and collect the right data. Furthermore, research and valuation outcomes can vary greatly depending on the method applied. And it can be difficult to structure in a compelling and convincing message that can be compared to alternative, more traditional business cases for grey infrastructure projects (Bassi et al, 2020).

## 4.2. Solutions

The following section will describe potential solutions to the barriers mentioned above, as suggested by stakeholders in the interviews and mentioned in the literature.

### 4.2.1. Solutions related to investment mechanics

#### *4.2.1.a Improving bankability*

- **Aggregate projects to increase scale**. Individual projects may not be able to meet the desired risk-return profile or ticket size of certain investors. Aggregating or "pooling" several projects can be a way to improve the likeliness to receive funding from investors. Doing so can generate significant efficiencies by reducing the costs for project development, credit registration and verification, yearly auditing, transactions, or community engagement, among others. Designated financial facilities (e.g., an impact investment fund) can aggregate differently sized projects into a single pooled fund, thereby decreasing the financial risk and lowering the transaction costs faced by investors, while increasing the overall ticket size of the investment (WWF, 2020; Blended Finance Taskforce, 2018).
- **Apply layered financing mechanisms**. NbS financing models can utilize tools designed to mitigate financial risks and ensure risk-adjusted returns, thereby increasing the bankability of a NbS project. Such tools include public private partnerships with blended finance arrangements that use (a combination of) grants, concessional loans, or other types of guarantees provided public

or philanthropic actors. Concessional loans provide below-market interest rates, along with longer a grace period, which can be used to attract private financing by having co-financing and thus lowering the investment risk. Moreover, for NbS that aim to generate goods (e.g. seeweed or fish) as part of their business model, offtake agreements can be a mechanism by which prospective buyers arrange to purchase (a portion of) these goods before they are produced (WWF, 2020). Having such an agreement in place will likely lower the perceived risk of investors, as well as promote local participation in the NbS. Lastly, in a first-loss guarantee a third party, such as a development bank, agrees to (partially) repay lenders in case the investment defaults – which considerably improves its risk-return profile (WWF, 2020; Hallstein and Iseman, 2021; Shames and Scherr, 2020).

- **Increase standardization of carbon credit verification methodologies.** By increasing standardization of carbon credit verification methodologies in a scientifically rigorous way, especially in blue carbon projects, transaction costs will decrease. Since bankability of carbon-financed projects is related to the retail price of the issued carbon credits, modelling carbon sequestration rates in an efficient but scientifically rigorous way is an inherent component of mitigating financial risks and would help lower perceived risk of investors.

#### *4.2.1.b Improving the market for NbS*

- **Adopt standard methods and metrics.** Creating clarity on the definitions of NbS, as well as on standard metrics and measurements to evaluate (and communicate) impact and financial performance will be a crucial step before either public or private NbS investments can be mainstreamed or replicable financial products can be created. In an effort to unify carbon units, the Taskforce on Scaling Voluntary Carbon Markets (TSVCM) proposes the adoption of a set of quality criteria called "Core Carbon Principles" (CCP), that provide a basis for verifying that carbon credits represent genuine emission reductions (WEF, 2021). Furthermore, since NbS that generate carbon credits can address both biodiversity and climate (adaptation) needs in tandem, there is a need to establish methodologies that properly value not only carbon storage but also the value of co-benefits. The "Climate, Community & Biodiversity" (CCB) standard by Verra is an example where such co-benefits are included and reflected in the standards' criteria, monitoring and ultimately the premium paid by offset buyers (Verra, 2021) (WEF, 2021; Tobin-de la Puente and Mitchell, 2021; Shames and Scherr, 2020).
- **Create innovative financing models for investors.** Along with the adoption of standard methods and metrics described above, creating a market and pipeline of NbS projects that attracts various types of investors will require further development of innovative financing mechanisms that can aggregate supply and bridge the time gap before NbS projects can generate returns. Subsidies and grant schemes, tax credits, blended finance, venture philanthropy, impact investing or other alternative financing models are needed to provide de-risking and securitization for early-stage NbS investments, thereby making them marketable. Moreover, project developers would benefit from a central point (e.g. a platform or network) where they can navigate these various financing options to find a match for their particular NbS project (WEF, 2021; Shames and Scherr, 2020).

#### *4.2.1.c Capacity building*

- **Set up technical assistance facilities.** On various levels, building technical capacity can help ensure that the NbS will meet investors' financial and impact objectives. This can be achieved by investing in training for both project officers as well as clients, or through technical assistance facilities (TAFs) that provide capacity solutions (i.e. training, grants and advice) to project

developers and key stakeholders of NbS. These TAF solutions can play a critical role to close the gap between investor and project developer, lower the overall investment risk, and ensure an increased number of higher quality projects – in turn improving the pipeline of investable projects. (Tobin-de la Puente and Mitchell, 2021; Watkins et al, 2019). At the same time, the importance of using traditional knowledge from Indigenous People and Local Communities (IPLC) in relation to coastal and marine NbS must not be underestimated, so their involvement in the project design phase is key.

### 4.2.2. Solutions related to regulations

- **Reform policies at (sub-)national levels.** Essential to drive future uptake of NbS development is the presence of strong and effective policy frameworks that stimulate both sustainability and investments. Key actions can include: valuing ecosystem services as part of national infrastructure, reforming harmful subsidies (e.g. related to fisheries, infrastructure or agriculture), changing legislative restrictions on investments in publicly held assets, creating a robust judicial system that can resolve grievances, and requiring the financial sector to incorporate and report on nature-related risks (Friends of Ocean Action, 2020). An international working group called The Taskforce on Nature-related Financial Disclosures (TNFD) is currently working on a framework that includes nature-related risks – which they expect to deliver by 2023 (Credit Suisse, 2021). Furthermore, the European Commission has introduced its "EU Taxonomy" that classifies environmentally sustainable economic activities. This is designed to scale sustainable investments of EU member states, potentially driving demand for NbS investment opportunities outside the EU (European Commission, 2021).

### 4.2.3. Solutions related to public procurement

- **Improve public procurement processes.** The number of developed NbS projects can be increased if NbS are mainstreamed into public procurement processes. To do this, NbS need to become integrated into national and sub-national planning processes and be placed on an equal playing field with their 'grey' alternatives. Collaboration between separate ministries is important to fully define and evaluate all relevant performance aspects of a NbS. To structurally evaluate NbS as a procurement option, relevant ministries will need sufficient capacity and technical know-how, and need to stimulate downstream actors (e.g. project developers) to offer their services and win contracts that are in line with green policies. Additionally, it is important that there are clear regulations on whether private financing of a NbS project is permitted in conjunction with public funding and how this should function. Consequently, for private sector actors, signaling in public spheres that they are willing and capable to offer such services may catalyze such procurement decisions (UNEP 2021; IDB 2020).

### 4.2.4. Solutions related to gathering and communicating evidence

- **Collect and analyze evidence of co-benefits of NbS.** Gathering information on the full environmental, socio-economic and cross-sectoral (co-)benefits of a NbS will enable the provision of theoretical evidence that a NbS is preferable compared to alternative, non-NbS investment options. Especially for NbS that do not provide reliable revenue streams, communicating the full range of benefits is necessary to find alternative ways to fund long-term operating costs. Valuation studies can be a fruitful pathway to create this type of theoretical evidence early on – and if the systemic value of the NbS is well-communicated this can secure the necessary support of public and private entities. As an example, The International Institute for Sustainable

Development (IISD) has created The SAVi assessment tool, which facilitates the structured gathering of NbS evidence (Bassi et al, 2020). Moreover, the Nature-based Solutions Initiative launched an online portal with best practice examples of NbS across the world at COP26[5] and peer-reviewed evidence on the performance of NbS projects[6] (IDB, 2020; Tobin-de la Puente and Mitchell, 2021). With regard to cost and performance data on carbon-financed projects two platforms are attempting to bring together data on such projects, namely BeZeroCarbon[7] and CarbonPlan[8].

- **Apply a landscape approach.** Policymakers, businesses and investors should consider the synergies and trade-offs in a landscape associated with NbS to provide sustainable benefits. This can be achieved by involving a wide range of ecosystems on land and in the sea in the design phase of a coastal NbS project. The scope of a NbS project needs to take into account the surrounding ecosystems in order to safeguard the right environmental conditions for blue carbon ecosystems to thrive. For instance, mangroves will only grow when pollution levels are low and when there is sufficient sediment flow from upstream rivers. NbS should also be implemented with the full engagement and consent of the key stakeholders, notably indigenous peoples and local communities in a way that respects their cultural and ecological rights. In this way, the NbS underpins societal benefits, fostering its long-term sustainability, and reduce investment risk.

[5] https://casestudies.naturebasedsolutionsinitiative.org/
[6] https://www.naturebasedsolutionsevidence.info
[7] www.bezerocarbon.org
[8] www.carbonplan.org

# 5. Developing the bankable business case for a coastal protection project with NbS

## 5.1. Introduction to a hypothetical case

### 5.1.1. Structure of the case study

The following sections describe four steps that can be considered when designing a bankable NbS business case[9]: (I) the initial design of the NbS intervention and project; (II) the context analysis and a social cost-benefit analysis (SCBA) to assess the feasibility of the NbS; (III) the design of the blended finance strategy of a NbS project; and (IV) the assessment of financial risks and identification of potential risk mitigation approaches. These four steps (Figure 10) are illustrated based on a fictive case of a coastal protection project in which mangrove restoration will be implemented as a NbS[10]. Furthermore, it should be noted that this chapter focusses on the financial design of a NbS project, and refers to other toolkits that can be used for the technical design and overall project management related to NbS project development.

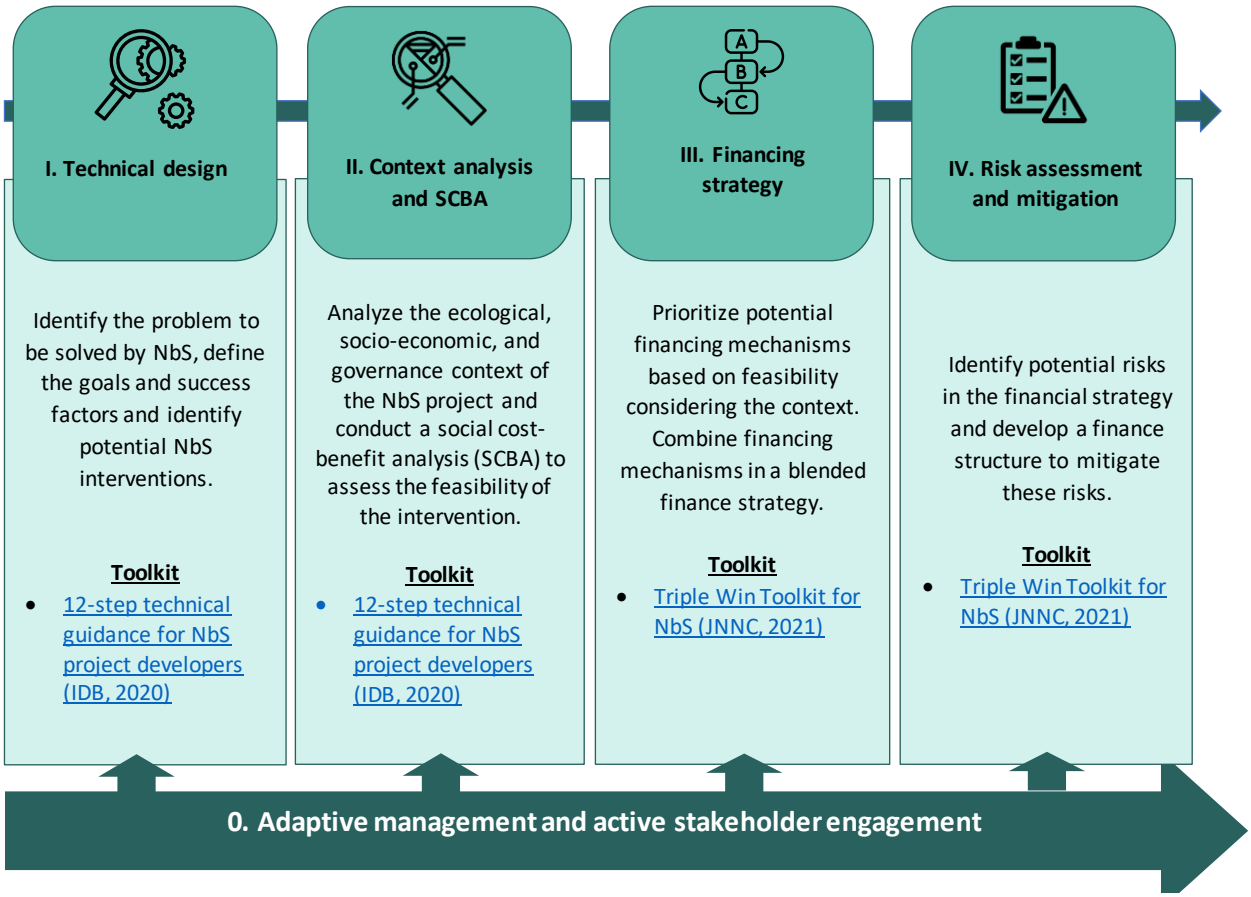


*Figure 10 Four steps in designing the financial structure of a NbS project and potential guides and toolkits to support the development of a NbS project*

[9] A bankable business case is defined as the reasoning for initiating a project with attractive returns.

[10] As no perfect real-life case was found to describe the four steps of developing a blended finance model for a coastal protection project with NbS, it was decided to develop a hypothetical case study. Where available, we refer to other case studies that illustrate specific aspects of a bankable business case for NbS.

### 5.1.2. A hypothetical case in today's world

A hypothetical case of a situation with a NbS intervention for coastal protection is shown in Figure 11. This hypothetical case relates to a protected area in the coastal zone with mangroves and marshes in a developing country. The protected area has a size of 2000 hectares and was originally created to provide intact habitat for rare species. The protected area is located near the outlet of a river delta that is bordered by human settlements and eco-lodges. In the past, flooding had not been a frequent problem as the mangrove forest and wetland had been able to absorb a large part of any storm surge (Figure 11; 1 – original). Over time, however, deforestation and degradation of the mangrove forest and wetland took place because of increased shrimp-aquaculture, agriculture activities and urban expansion. This left the expanding settlements more susceptible to flood risks. Increased levels of coastal erosion worsen the situation. The remaining mangrove forest, of which about 400 hectares are left in the protected area, now plays a critical role in absorbing wave energy (Figure 11; 2 – degraded). To strengthen the ability of the mangroves to reduce flood risk, the coastal community have the wish to restore the wider coastal ecosystem. The local village members and government officials made a first draft for a coastal restoration plan with green-grey infrastructure interventions, including 1200 ha active mangrove restoration, natural regeneration of inland forests and wetlands, and a permeable dam in the delta outlet, to improve coastal protection (Figure 11; 3 – restored). Now the local village members and government officials seek collaboration with Dutch dredging and engineering companies and international financiers to fine-tune the coastal restoration plan and to attract investments to implement the plan. In the following sections, the financial structure for this hypothetical NbS case is developed.

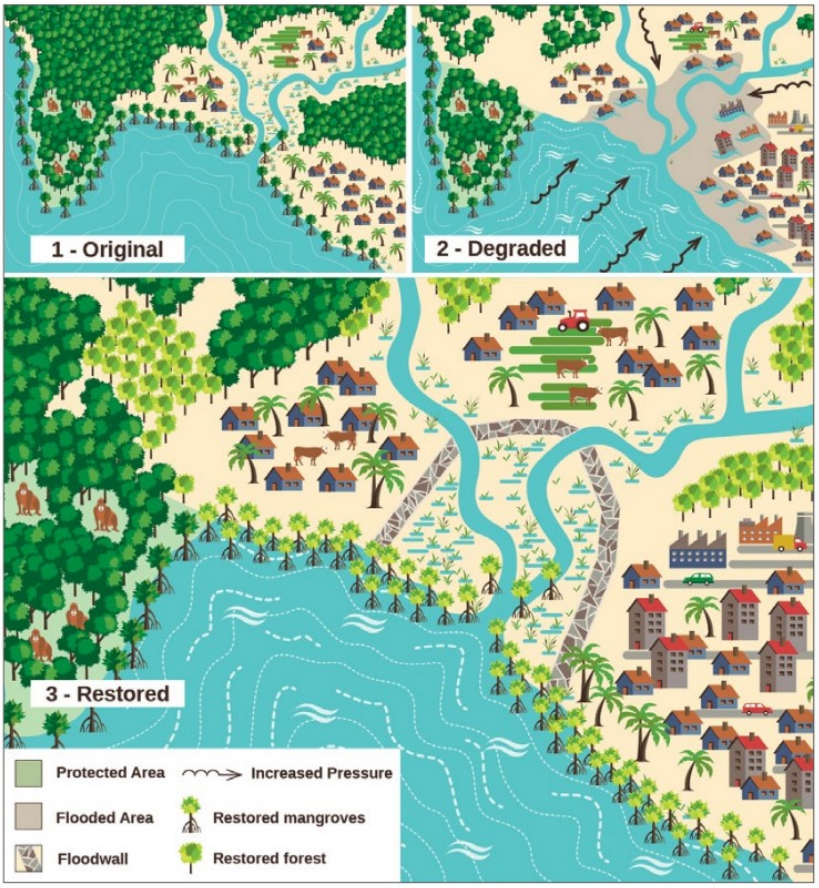


*Figure 11 Hypothetical scenario of NbS being used in conjunction with infrastructure development and protected area conservation (IUCN, 2016)*

## 5.2. Phase 0: Before we start

Before entering in the specific phases of financial project design, it is important to stress the crosscutting themes that need to be considered when designing and implementing NbS projects. The literature reviewed and interviews conducted in light of this market study illustrate two crosscutting aspects of NbS projects.

### 5.2.1. Stakeholder engagement

Firstly, the benefits and success rate of a NbS are highly dependent on the local socio-economic context. Continuous cooperation with engaged stakeholders throughout the project cycle is required. In our hypothetical example, the coastal ecosystem has been degraded over time through human use of timber and land.

In order to effectively address the restoration of the mangrove area, these drivers of degradation need to be addressed to ensure the long-term success of the NbS. This can be done by involving stakeholders, such as shrimp farmers and local community members, in the design and implementation of the NbS project in order to create the right incentives and conditions to ensure their buy-in. Often in NbS projects, NGOs play a crucial role to organize stakeholder engagement.

### 5.2.2. Adaptive management

Secondly, NbS approaches for coastal protection are relatively new and complex compared to grey infrastructure solutions. For example, the impacts of a concrete breakwater structure are well known, but for a NbS this is more difficult to determine. Therefore, NbS are subject to a higher degree of uncertainty. This requires an adaptive management approach and the ability to readjust the design, implementation and financing structure along the way.

Van der Lely et al. (2021) describe three sources of uncertainty in the context of NbS: the unpredictability of (1) the natural system (e.g. how often and with which magnitude will extreme weather events occur), (2) the technical system (e.g. how effective will the NbS protect the shoreline) and (3) the social system (e.g. how pressures on the mangrove ecosystem evolve over time). An adaptive planning approach, in which the project is regularly monitored, evaluated and where necessary updated, allows to effectively incorporate such uncertainties. These uncertainties have implications for the financial design of a NbS project, as investors or donors might only accept a limited level of risk. An adaptive planning approach, in which project design is regularly reviewed and where necessary updated, allows for the effective incorporation of such uncertainties. Step IV of this hypothetical case study will discuss financial mechanisms that can deal with uncertainty and financial risks.

**For further reading:**

- IDB (2020) provides an explanation on how to involve stakeholders during the development and implementation of a NbS project and how to organize an adaptive project management approach.
- Van der Lely et. (2021) provide concrete guidelines and recommendations to map uncertainties related to NbS and to incorporate these in an adaptive project management approach.
- Groenendijk et al. (2020, p37) provide an overview and applicability of different types of contracting arrangements

## 5.3. Phase 1 – Technical design of the NbS intervention

The technical design of a NbS project starts with the definition of the problem that needs to be addressed. In our hypothetical case, the problem is increased flood risk as a result of ecosystem degradation and coastal erosion. In addition, expansions of urban settlements towards the coast line have led to increased exposure of communities to flood events. This means that a successful NbS at least needs to contribute to:

- Reducing coastal erosion;
- Reducing the frequency and impacts of flooding events.

It is possible that stakeholders may require other success factors, such as cost-effectiveness, improved aquaculture conditions, or carbon sequestration.

This chapter will not go into the technical details of potential NbS solutions that can be implemented to increase coastal resilience[11], but according to the World Bank (2021), these approaches generally involve:

- Improving the hydrological conditions of the coastal area to restore tidal flows and create a suitable habitat for mangrove forests to be restored.
- Construction of permeable structures that capture the sediment necessary for mangroves and other species of coastal vegetation to grow.
- Restoration techniques of mangroves and coastal vegetation through active and/or passive restoration.

In our hypothetical example, the mangrove forest needs to be reconnected to the wider landscape to improve the entire watershed's functionality (Figure 11: 3 – restored). The main NbS intervention – namely, restoration of the watershed, including the protected area – can therefore be undertaken in combination with other NbS interventions (such as mangrove replanting and wetland restoration) and conventional measures (such as construction of a concrete flood barrier). Together these solutions not only mitigate flooding, but also support biodiversity and local livelihoods. This case illustrates two important points:

(i) NbS can complement or be complemented with other "grey" measures for coastal protection; and

(ii) NbS can involve the use of natural and protected areas that were originally established for a purpose other than that of the NbS.

The objectives and design of a NbS project has implications for the development of the financial structure of the project. Different goals of NbS will lead to different interventions on the ground and will benefit different stakeholders, which changes the value proposition of the NbS. As a result, different goals of a NbS are likely to attract different sources of funding.

If the primary goal of the intervention is coastal protection, then the project will primarily benefit the local communities that will be protected from flooding and will focus on ecosystem restoration in areas with high risk of flood damage. Such a project will often be initiated by a public authority that will be investing in the coastal protection solution. In Africa and Asia this investment is often done

[11] For an overview of innovative concepts, visit: https://www.ecoshape.org/en/concepts/

using a loan from a development bank. In this case, the potential NbS options can be evaluated and compared with other grey coastal defense options based on cost-effectiveness and the ability to increase coastal resilience. An example of a case where coastal protection is the primary objective, is the Demak project in Indonesia[12].

If the main purpose of the NbS, on the other hand, would be to contribute to climate mitigation, then the restoration project would focus on mangrove restoration in areas that have the best habitat conditions for mangrove growth. These areas are not necessarily the high-risk flooding areas in our previous example. This will probably affect different stakeholders compared to our hypothetical case, such as nature NGOs, eco-tourism operators and investors that are looking to develop carbon credits. These stakeholders are more likely to invest in the project.

This does not imply that different goals of a NbS cannot be combined in the design of a project. The point is that the goals of the NbS intervention determine which stakeholders will be affected and will therefore affect potential sources of funding.

Suggestions for further reading:

- A Catalogue of Nature-based Solutions for coastal resilience, the World Bank (2021) provides an overview of the approaches that can be applied to increase coastal resilience with NbS and provides a first indication of the potential benefits and costs related to such approaches.
- Steps 1-4 of the 12-step approach to increase infrastructure resilience with NbS (2020) provide further practical guidance to determine the goals and interventions of an effective NbS.

## 5.4. Phase 2 – Context analysis & social cost-benefit analysis

### 5.4.1. Context analysis

Once the goals of the NbS project have been identified, a more in-depth analysis of the context is required to create insight in the feasibility of the different financing mechanisms that have been discussed in chapter 3. The main components of the NbS context that can be identified in this step are presented in Figure 12. Ecological, socio-economic and governance aspects can be analyzed to determine the potential of different financial mechanisms. To establish a better understanding of the NbS context, the following questions can be asked:

1. What are the **environmental threats** that the NbS will address and what **ecosystems** will improve?

In our hypothetical case, economic activities that drive deforestation will be addressed and the coastal ecosystem will be restored.

2. What **ecosystem services** are provided by the natural area being restored (e.g. food, recreation, coastal protection, water retention, etc.)?

The NbS project in our example will have the following effects on ecosystem services:

- *Provisioning services:*
    - Shrimp farming production will increase, due to an improvement of water quality.
    - The mangroves have an enhanced function as a nursery for commercial fish species.
- *Regulating services:*

[12] https://www.ecoshape.org/en/pilots/building-with-nature-indonesia/partners/

- The main purpose of our NbS project is to improve coastal protection and reduce flood risk.
- Restoration of the mangrove forest contributes to carbon sequestration.

- *Cultural services:*
  - The restored mangroves will provide additional opportunity for recreational activities.
- *Supporting services:*
  - The habitat for (keystone) species will improve.

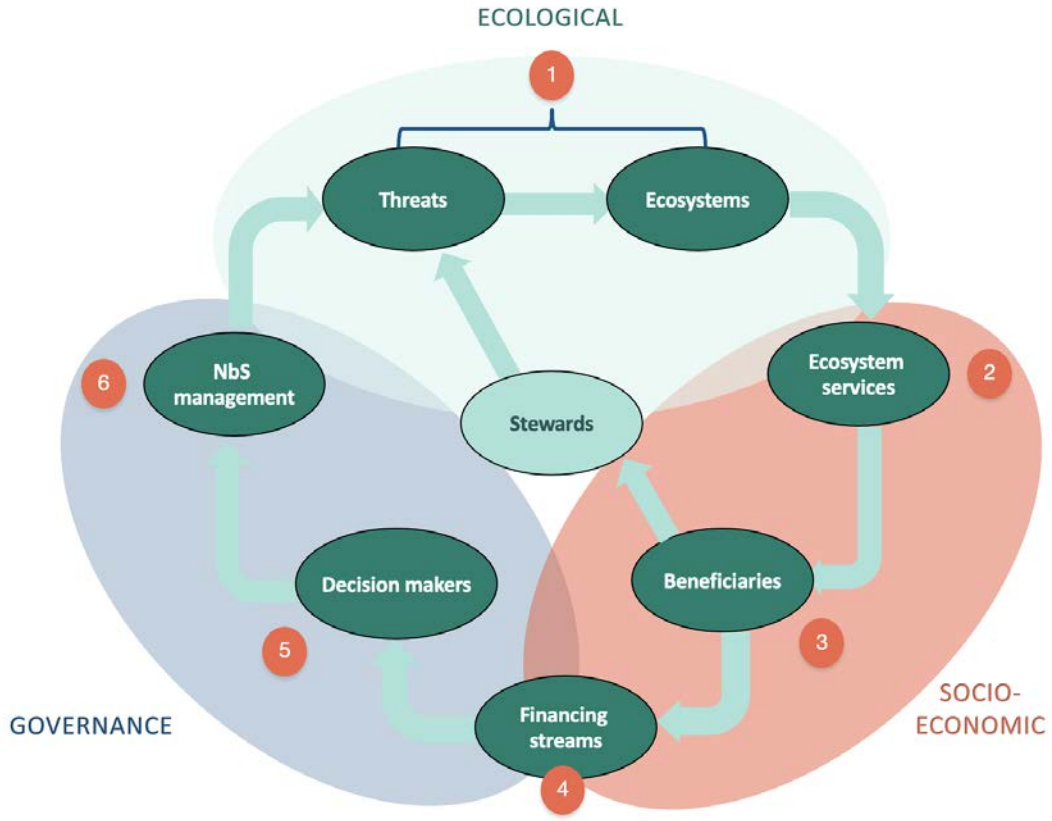


*Figure 12 Main components of the NbS context analysis (Eco2Fin framework; adapted from Luján, 2015)*

3. Who are the **beneficiaries** and **losers** of the change in ecosystem services?

Some beneficiaries may appear evident, like shrimp farmers in relation to food production or tourism operators in relation to recreation. The community members benefit from increased coastal protection, but will not be able to harvest fuel wood from the mangrove forest in the same quantities as before the implementation of the project. To deal with negative benefits for local stakeholders, it could be considered to incorporate compensation schemes or investments in alternative livelihoods in the NbS project scope. Beyond the NbS project site, the global community will benefit from increased biodiversity and climate mitigation.

4. What are the current and potential **finance streams** that can contribute to the NbS project?

Preparing a general overview of finance streams (i.e. financial resources flowing in the system) will be useful for the identification of finance mechanisms of each phase in the project. In our hypothetical case, funds are currently flowing from:

a. Developing agencies are providing ODA to the local community.
b. Shrimp farmers and local tourism operators are generating revenue.

c. An international NGO is supporting the management of the protected natural area.

Finance streams that could potentially be developed to fund the NbS include:
a. A loan by a development bank to the government to develop a coastal defense structure.
b. A new blue carbon project to sell carbon credits in a Voluntary Carbon Market (VCM).
c. An international company that wants to invest in biodiversity offsets.
d. Grants by international donors.
e. Taxes by the government within the coastal community that are used for coastal protection.

5. Who are the land-owners and other **decision-makers** that decide on the implementation of the NbS?

The governance context analysis looks into the decision makers that ultimately decide on the funding and permitting of the NbS project. To effectively implement a NbS project, it is important that the NbS aligns with national or local climate and development strategies. These decision makers may have influence on the rules and regulations that allow or limit the possibilities of the NbS project to generate its own funds. For example, who will be the owner of potential carbon credits that will be developed in the NbS project?

6. Who will be involved in the **management** of the NbS project?

The local NbS project managers are ultimately responsible for the day-to-day operations. They are the ones that will use the financial resources to address the threats to the mangroves and contribute to the mangrove restoration activities. Different schemes of NbS management exist and the specific management structure will be an important enabler for some financing mechanisms and can be critical to ensure the long-term success of the NbS. Involving shrimp farmers and/or local tourism operators as stewards in the NbS implementation, can enable user-fee mechanisms where part of the increased revenue of shrimp farming flows back to the long-term maintenance of the area. This also requires substantial capacity building of stewards. A community-based management approach might be required for certain types of VCM accreditation[13] or can be requested by certain types of investors.

### 5.4.2. Social cost-benefit analysis

Based on the context analysis, a social cost-benefit analysis (SCBA) can be conducted to assess the overall costs and benefits to society, but also identify the change in benefits for specific stakeholder groups as a result of the NbS project. IDB (2020, step 7) provides a detailed explanation on how to develop an SCBA. Furthermore, the World Bank (2021, page 204) provides an overview of cost examples in NbS projects that involve mangrove restoration.

For our hypothetical case, a simplified SCBA is provided in Table 4. The discounted cost of the NbS project are: the construction of the permeable dam (estimated at EUR 1 million); site preparation and planting of mangroves (EUR 3,4 million for 1.200 ha; based on a costs of EUR 3.000 per hectare)[14]; the maintenance cost of restored mangroves and the permeable dam (estimated at 5% of the initial investment per year); the accreditation costs for the Voluntary Carbon Credits (VCUs) and

[13] The Community, Climate and Biodiversity (CCB) accreditation by Verra, for example, requires a community-based management approach: https://verra.org/project/ccb-program/

[14] World Bank (2021) estimates the costs of mangrove restoration between USD 500-50.000 per hectare of mangrove. For this example, an estimate of EUR 3.000 per hectare is assumed.

regular monitoring and auditing (EUR 300.000). The change in economic benefits as a result of the project is provided in Table 4 as well.

*Table 4 Social costs and benefits in a business-as-usual scenario and the NbS scenario in the hypothetical example of coastal protection through mangrove restoration (discounted value over a 30-year timeframe in millions of euros; at 3% discount rate). For simplicity this hypothetical SCBA does not incorporate inflation rates for benefits and future costs, which should be considered in the development of an actual business case.*

| | **Business as usual** | **Concrete breakwater** | **Nature-based solution** |
|---|---|---|---|
| Permeable dam/breakwater construction | 0,0 | 8,0 | 1,0 |
| Mangrove planting (EUR 3000 / ha; 1200 ha) | 0,0 | 0,0 | 3,4 |
| Maintenance (5% of investment per year) | 0,0 | 0,0 | 3,8 |
| VCU accreditation and regular audits | 0,0 | 0,0 | 0,3 |
| **Total discounted costs** | **0,0** | **8,0** | **8,5** |
| Small-scale agriculture | 30,0 | 30,0 | 25,0 |
| Small-scale shrimp farming profits | 20 | 10,0 | 38,9 |
| Avoided flood damage | n/a | 27,0 | 25,0 |
| Carbon sequestration | 0,0 | 0,0 | 1,8 |
| Increased tourism revenue | *Unknown* | *Unknown* | *Unknown* |
| Increased biodiversity | *Unknown* | *Decrease* | *Increase* |
| **Total discounted benefits** | **50,0** | **67,0** | **90,7** |
| **Net present value** | **50,0** | **59,0** | **82,2** |

Next to the business as usual (BAU) and NbS scenarios, the option is evaluated to construct a concrete breakwater structure. Based on an analysis of costs, the breakwater structure is slightly cheaper compared to the NbS, provides adequate protection to the coastline, but underperforms in terms of other benefits (i.e. shrimp farming and carbon sequestration). In the NbS scenarios, the benefits for shrimp farming and carbon sequestration are expected to increase. Although there is insufficient monitoring data for biodiversity available at the project site, it is expected that there will be a positive effect on biodiversity through an improved habitat for species in the NbS scenario. The income for small-scale agricultural producers, however, is expected to decrease as some of the agricultural lands will be used for reforestation purposes. Based on the available data, it can be concluded that the net societal benefits of the NbS scenario are highest, which makes this the preferred scenario compared to the BAU and concrete breakwater scenarios.

Suggestions for further reading:

- Steps 5-7 of the 12-step approach to increase infrastructure resilience with NbS (2020) provide further practical guidance to conduct an economic analysis of a NbS project.
- Page 86-89 of the Triple Win Toolkit for NbS (JNNC, 2021) provide an overview coastal NbS cases that illustrate the economic feasibility.
- Page 24-35 of World Bank (2017) on estimating costs and benefits of NbS projects.

## 5.5. Phase 3 – Developing a finance strategy

### 5.5.1. Feasibility of potential finance mechanisms

The context analysis and SCBA provide the basis to develop a bankable business case and financial strategy for the NbS project. Based on the benefits investigated, the feasibility of potential revenue

streams can be evaluated. Chapter 3 introduced the finance mechanisms that can generally be applied in NbS projects and the enabling conditions. From Table 4 it can be concluded that the main quantifiable benefits in our example are avoided flooding, carbon sequestration and improved shrimp farming yields. Whether or not these benefits can be captured in the financial model of the NbS project depends on the enabling environment and the obstacles described in chapter 3.

#### *5.5.1.a Shrimp farming benefits*

In our example, small-scale shrimp farmers benefit from the NbS being implemented. It is estimated that the shrimp farming profits are around EUR 5.000 per hectare of shrimp ponds. In total, it is expected that the number of productive shrimp ponds will increase from 200 to 400 hectares, due to the improved mangrove landscape. The expected increase in shrimp farming profits, will therefore amount to EUR 18,7 million. It is agreed with the local shrimp farmers that 25% of these profits will flow back to the project fund: EUR 4,7 million over the 30-year project timeframe. Please note that shrimp farming is often an activity that leads to mangrove deforestation. To materialize these benefits, it is crucial that investments in sustainable aquaculture practices are made.

#### *5.5.1.b Carbon accreditation*

Carbon sequestration is the second co-benefit being generated in our example NbS project. Figure 13 provides a schematic overview of how a voluntary carbon market for blue carbon projects works. The estimated sequestration rates of a mangrove restoration project van be estimated in a feasibility study that can then be verified in a voluntary carbon market. For an overview of the current voluntary carbon markets, see annex 2. Although blue carbon credits are developed in multiple markets, the Verified Carbon Standard by Verra is currently the only standard that has developed tailored methodologies for mangrove restoration and protection projects. Most cases listed on their website combine restoration of mangroves and avoided deforestation in the carbon projects.

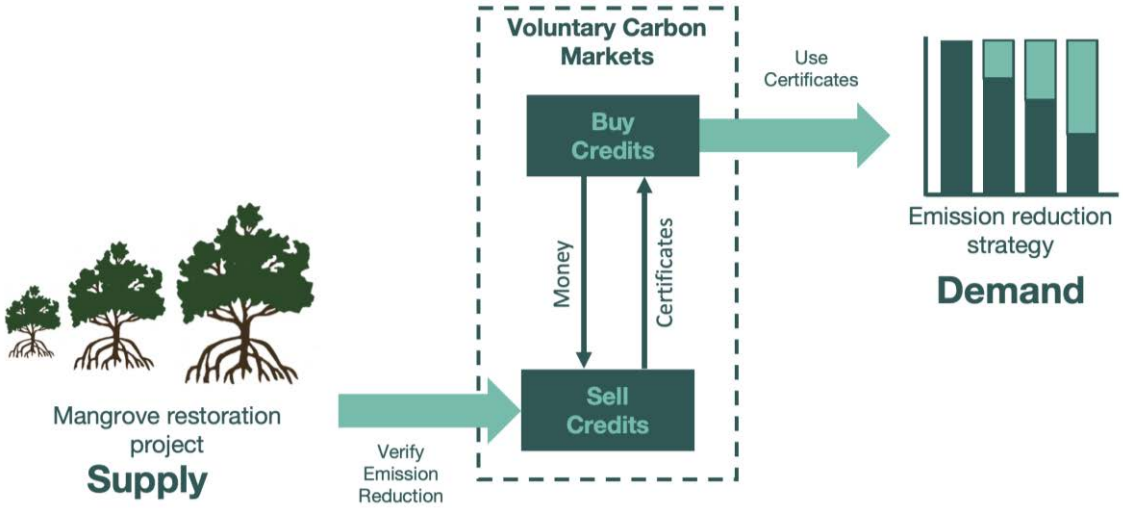


*Figure 13 Overview of a voluntary carbon market mechanism*

In order to develop credits in a VCM, initial investments are required for accreditation, as well as expenditures for regular auditing of the project. It is estimated that project costs of accreditation require an initial investment of EUR 80.000-100.000 and annual monitoring and auditing costs of around EUR 10.000. In addition, the estimated carbon sequestration rates of mangroves are between 2-8 tCO2/hectare/year. Because of the costs involved to monetize carbon benefits, this financial mechanism will only be profitable given a sufficient project scale. Due to an increased demand for

voluntary carbon credits over the last years, especially for blue carbon projects, prices have increased. As a result, carbon accreditation breaks even at a smaller project scale.

Figure 14 indicates from which project scale the discounted benefits of VCU sales start to outweigh the costs of VCU accreditation for different prices. Please note that the costs of mangrove restoration are not incorporated in this overview. For prices between USD 15 – 25 per $tCO_2$, the discounted sales of carbon credits per hectare are derived based on a 30-year period and a discount rate of 3% per year. The red line indicates the discounted costs for carbon accreditation and regular auditing in relation to the project scape. From the graph, it can be concluded that carbon accreditation will generate positive benefits from a project scale of 250 hectares in our example for a sequestration rate of 4 $tCO_2$/ha/year, and 125 hectares for a sequestration rate of 8 $tCO_2$/ha/year. Also note that these are conservative estimates, as the markets for blue carbon credits are expected to increase even more in the coming decades. For more information about the development in the voluntary carbon markets, please refer to chapter 2 in this report.

In the hypothetical mangrove restoration project, 1200 hectares are expected to be restored. With an estimated sequestration rate of 4 $tCO_2$/ha/year (Somarakis et al., 2019) and carbon price of EUR 20 per $tCO_2$, it is estimated that the discounted amount to EUR 1.8 million. The discounted costs of accreditation are estimated at EUR 300.000 for the initial accreditation and annual monitoring and auditing (Table 4).

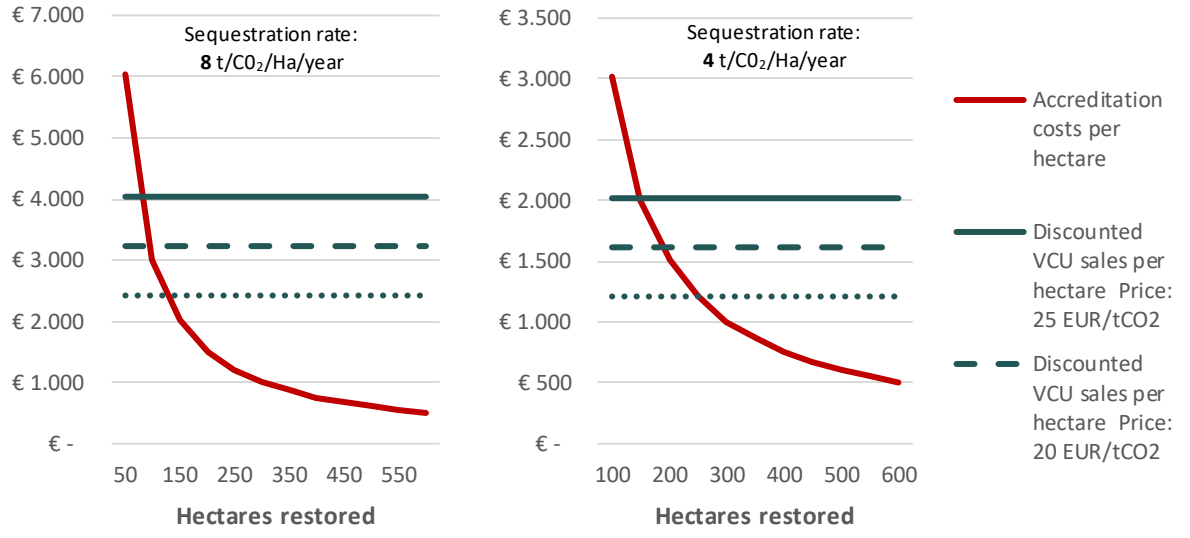


*Figure 14 Discounted benefits and costs of carbon accreditation per hectare of mangrove restored. For this example, the following parameters were used: costs of accreditation (EUR 100.000 [EUR 10.000 per year]; regular auditing & monitoring, and the revenue based on estimated sequestration rates of 4-8 $tCO_2$ eq. $ha^{-1}$ $year^{-1}$ for a 30-year period). A discount rate of 3% per year is applied. Costs and benefits are not indexed for inflation.*

### *5.5.1.c Financial feasibility*

Finally, the avoided damage through flood protection provides the incentive for disaster agencies and government infrastructure departments to contribute to the NbS with public funds. In our hypothetical example, the national government receives a EUR 3 million loan by a development bank to support the construction of the NbS with over the first four years of the project.

In our example, the co-benefits created for tourism and biodiversity cannot be translated into financial mechanisms. This does not mean that these benefits are not important to mobilize project funding. Communicating co-benefits can help to convince public investors and private investors that

are seeking to generate impact and can lead to higher prices of carbon credits from blue carbon projects.

The costs and direct financial revenue of the hypothetical mangrove restoration project are presented in Table 5. The combination of project revenue streams over the 30-year timeframe is expected to be EUR 9,5 million, while the expected costs amount to EUR 8,5 million, thereby leading in principle to a viable business case. In the next steps of this chapter, it is evaluated whether the financial benefits can be captured in a financial structure that adequately manages the project cash-flow in time and associated risks.

*Table 5 Direct project costs and revenue streams (in EUR millions)*

| | |
|---|---|
| **Discounted expenditures** | |
| Permeable dam/breakwater construction | 1,0 |
| Mangrove planting (EUR 3000 / ha; 1200 ha) | 3,4 |
| Maintenance (5% of investment per year) | 3,8 |
| VCU accreditation and regular audits | 0,3 |
| **Discounted costs** | **8,5** |
| | |
| Contribution national government | 3,0 |
| Small-scale shrimp farming profits | 4,7 |
| Sales of carbon credits | 1,8 |
| **Discounted revenue** | **9,5** |
| **Net discounted revenue** | **0,9** |

### 5.5.2. Developing a financial plan

As NbS for coastal protection often require substantial capital investments before economic activities start to generate revenue, a financial plan is required to manage cash flows (Ecoshape, 2020). Figure 15 provides a simplified overview of the required project funds throughout our mangrove restoration project and revenue streams in the project. The level of project funding changes throughout the project cycle:

#### *5.5.2.a Inception phase (0-2 years)*

The inception phase often requires substantial research to establish the technical design, conduct the context analysis and develop the governance structure of the NbS project. Based on the consultations conducted in light of this market study, it has become clear that this inception phase is often difficult to finance through private investment or existing public funds for coastal infrastructure development. The reason for this is that the future benefits and the business case are still relatively unclear at this point. As a result, many blue carbon coastal NbS projects still rely on grant funding provided by, for instance, multilateral funds, governments, NGOs or philanthropy. In our hypothetical example, the NbS project is funded through a grant of EUR 200.000 in the first year provided by an international fund for climate adaptation and the international NGO that also supports the management of the protected mangrove area provides technical expertise, and conducts the context analysis and SCBA (Figure 15).

#### 5.5.2.b *Implementation phase (2-5 years)*

The implementation phase concerns the restoration of mangrove forest and the construction of the permeable dam. In the implementation phase, once the outline of the NbS, the business case and the enabling environment have been developed, public and private funds can be more easily attracted to finance the implementation of the NbS solution. This can be, for example, through loans by IFIs, investments by government departments, or public or private loan or bond structures. In the hypothetical example, part of the costs is covered through the investment of the national government, which also initiates the NbS project (1 EUR million over 4 years). However, this budget does not cover all the restoration costs required. A mix of public and private investment is required to finance the initial investment in the NbS project. To fill the funding gap, an IFI provides a EUR 2,0 million low interest loan. A private investor provides a loan of EUR 0,7 million against commercial market rates. Both loans are paid back with the future proceeds of the shrimp farming profits and sales of the VCUs.

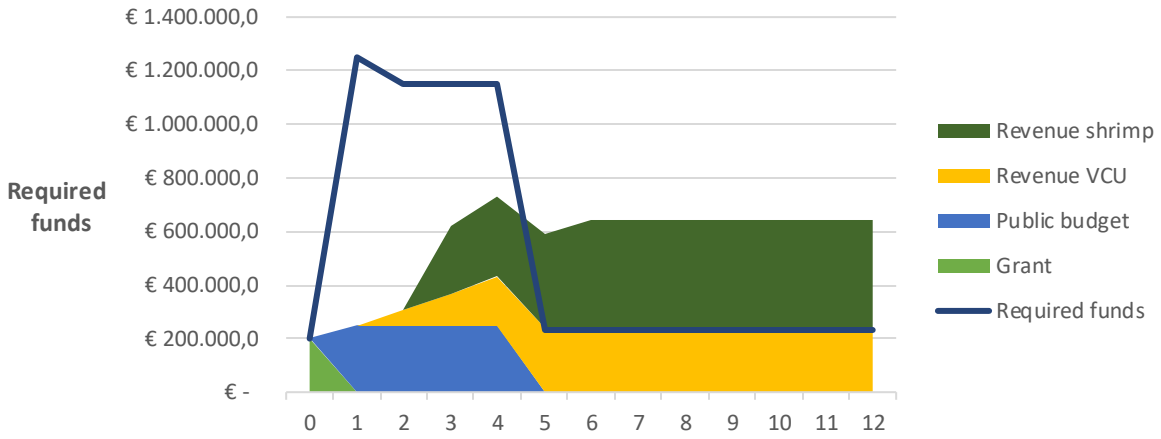


*Figure 15 Simplified example of the required funds over time (years) of the hypothetical NbS case study*

#### 5.5.2.c *Maintenance phase (5-30 years)*

After the NbS has been implemented, the NbS project enters the maintenance stage. It is in this stage that the NbS project can start to generate revenue through the sales of carbon credits or other revenue generating activities. In our hypothetical example, voluntary blue carbon credits are sold to generate revenue, and part of the shrimp farming profits flow back to the NbS project. The revenue streams are used for the maintenance in the NbS project, as well as to pay off the interest on the initial investments by the public and private investors.

## 5.6. Phase 4 – Mitigating financial risks through a blended finance structure

### 5.6.1. Finance structure

Often coastal NbS projects are managed by a dedicated project organization. This can be a dredging or engineering company, an NGO that implements the restoration activities, or an organization that is established specifically for the project. In our example a joint venture between a dredging company and nature NGO is contracted by the national government to implement the project. The project organization manages the funds and financial flows. The organization agrees on the loans with the development bank and the private investors. With the shrimp farmers, it is agreed that part of the profits flow back to the project fund. The project organization also manages the carbon

accreditation process and sales of the carbon credits. Figure 16 shows the blended finance model to de-risk the private investments in this hypothetical NbS project.

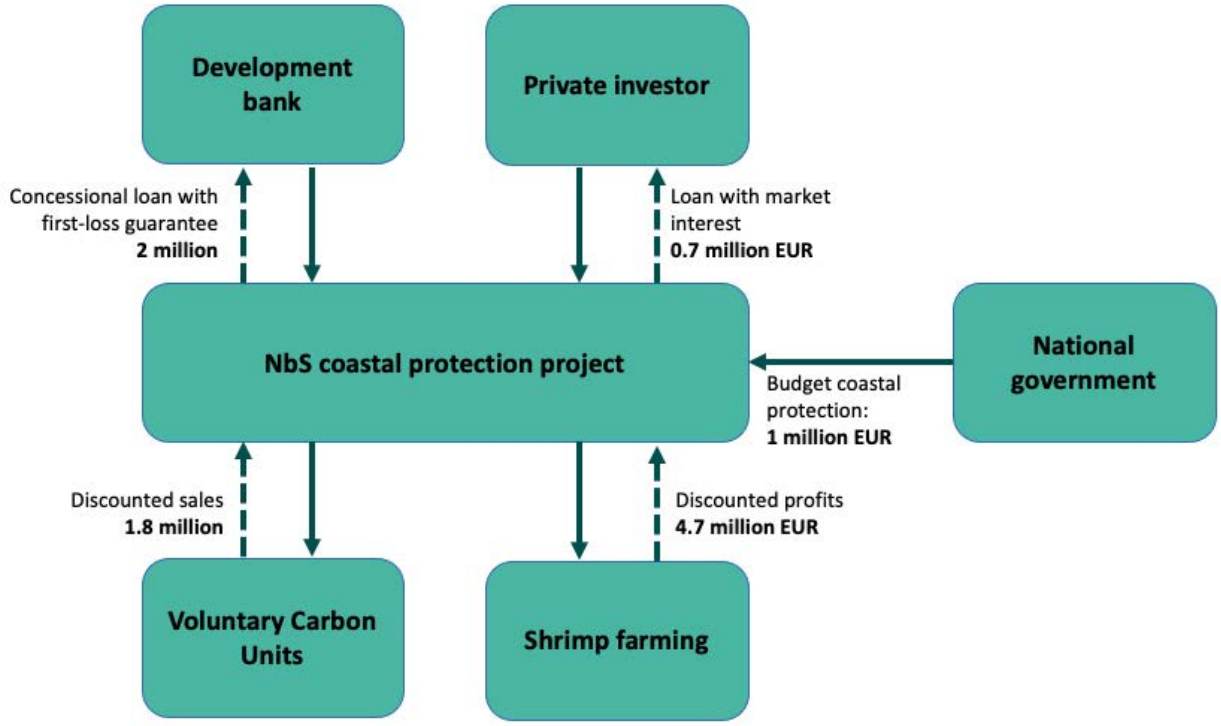


*Figure 16 Example of a blended finance model to de-risk private investments in the hypothetical NbS project (finance in EUR)*

### 5.6.2. Contracting

Different forms of contracting exist for coastal NbS projects in which engineering and/or dredging companies are involved. Groenendijk et al. (2020) describe four contracting approaches in which the level of involvement is different. The most basic contractual arrangement is the "*design and build*" arrangement, which is also the most common type of contracting for hard infrastructure projects. Additionally, the engineering company can also be involved in the maintenance of the NbS. *The design, build, finance, maintain and operate* arrangement is less common and according to the authors not always suitable for NbS projects. This approach often requires that the client allocates the contractor of the NbS project far reaching responsibilities, which governments often feel uncomfortable with.

The type of contracting is crucial for the possibilities to incorporate sources of project funding, as this can limit the opportunities to develop blended financing mechanisms. It is, therefore, important that the contracting structure aligns with the financial structure that is envisioned. In the contraction, agreements with regard to risk sharing between investors and implementing organizations can also be arranged.

### 5.6.3. Risk mitigation

Chapter 3 describes various ways in which public funds are applied to improve the risk profile of a NbS project to attract private finance. In our hypothetical example, a mix of public and private funds is used to finance the initial investment of the NbS project. Private investors, however, are reluctant to invest in our hypothetical project: although the project is expected to generate a positive financial result, there is a large uncertainty in the returns generated through the increased shrimp-farming

yields and the proceeds of the voluntary carbon credits. To mitigate the risks a financial model is developed where the development bank provides a concessional loan, in which it takes a first-loss position to reduce the financial risk for private investors (Figure 16). In reality, an infinite amount of blended finance structures is possible to de-risk investments or to close the viability gap for private investors.

Suggestions for further reading:

- Box 5.1 of the Ecoshape (2020) whitepaper on Paving the way for scaling up investment in nature-based solutions along coasts and rivers provides an overview of the general financial structures that apply to coastal protection finance.
- Page 123-134 of the Triple Win Toolkit for NbS (JNNC, 2021) provide an overview of financial models that can be applied for blended finance based on real world case studies.
- WWF (2020) provides a series of blueprints for the blended finance of bankable NbS projects and provides case studies on how these have been applied.

# 6. Recommendations to develop the market for NbS

This market study investigated the barriers and solutions towards developing bankable business cases for NbS projects for coastal protection with carbon credits from blue carbon sources. Certain barriers depended on factors on which the engineering and dredging sector itself does not have direct influence, such as the institutional readiness for blended finance and adaptive management in NbS approaches. Solutions in these cases can be supported through actions undertaken by state actors, development banks or other multilateral institutions. Based on the interviews and results of the market study, we have described a number of recommendations that could that could be addressed to contribute to the further development of the market for NbS projects in the coastal context.

## 6.1. Create awareness by demonstrating the benefits of NbS

In order to improve the uptake of NbS in public procurement, development finance and national policies, it is crucial to build awareness on the added value of NbS vis à vis grey solutions. This requires active communication on the risks involved and the co-benefits created. In addition, capacity building among potential clients of NbS is necessary to allow for the adaptive planning processes and blended financing structures required for the upscale of NbS. The development of a database with the project design, societal goals and financial structures ((e.g. risk profiles, ROI requirements) of NbS projects can contribute to the information sharing and increase the replicability of successful NbS approaches.

## 6.2. Build a central knowledge platform with funding entities

During the interviews, one important barrier for the development of business cases by the engineering sector was the diffuse nature of funding sources. There are a multitude of possible funding sources for NbS projects, both private and public, but finding these sources and meeting the application requirements can often be an extensive process. Such a process will often involve significant investments of time and resources, and as such can be unattractive for engineering companies. Thus, to make it more appealing for companies to develop business cases for NbS projects, it would be beneficial to have an accessible platform on funding sources. This platform should show the relevant funding organizations, funding priorities and funding application procedures. The availability of this information can reduce project development costs for NbS project managers and dredging & engineering companies.

## 6.3. Establish relationships with funding organizations and project partners

Coastal NbS projects always seem to be collaborative projects between dredging & engineering companies, financiers, NGOs, local people, local governments, and knowledge partners. Due to the multitude of actors involved in NbS projects, it is crucial to establish and maintain relationships to build trust and mutual understanding. For instance, well-developed relationships between potential funding organizations and engineering companies will provide easier collaboration to set up (blended) financing structures for NbS projects. RVO could play a role in facilitating a network with NbS actors to build and stimulate professional relationships with each other.

In the Netherlands, knowledge partners already work together in the EcoShape initiative, in which many pilot projects where implemented and knowledge products were developed. To facilitate the

forming of project teams, it can be worthwhile to expand the international network of potential implementing parties.

In addition, this market study has made it clear that NbS in coastal areas often require public funding due the fact that coastal protection is in many cases a public service. This implies that governments around the world need to be involved in the further development of NbS approaches through knowledge sharing. Establishing relationships between industries and Dutch and foreign state actors can facilitate this knowledge exchange. The market for NbS can also be stimulated if the NbS project matches with the priorities in the policies and plans of implementing countries, such as NDCs or the National Biodiversity Action Plans that will be made after COP15.

## 6.4. Improve access to grants for feasibility studies

A limiting factor for the development of NbS business cases is the procurement procedures that are often involved with applying for funding for feasibility studies and project implementation. During the stakeholder interviews with dredging and engineering companies, procurement procedures were mentioned multiple times as being too extensive and thus hindering the access to funding, for feasibility studies in particular. Additionally, there is a sentiment among the Dutch engineering and dredging companies that many countries prioritize their own dredging and engineering sector in procurement procedures, leading to a competitive disadvantage. Though this barrier is one that stretches beyond the scope of this report, it is an important limitation for the development of business cases by Dutch actors. Thus, it is recommended that future efforts explore avenues through which the risk of investments in initial feasibility studies can be minimized. For example, the Dutch government might be able to mobilize climate funding to Dutch NbS companies for feasibility studies in multi-stage procurement processes or make feasibility studies part of the project scope.

## 6.5. Develop additional revenue streams to attract more private investments

The financial analysis in the case study indicates that the development of carbon credits in mangrove restoration and protection projects becomes an attractive business model if demand and prices increase. With current prices between USD 5-15 per $tCO_2$ for blue carbon projects and expected sequestration rates of on average 2-8 $tCO_2$/ha/year, the expected revenues are insufficient to cover the full costs of mangrove restoration. As prices for blue carbon projects are expected to increase sharply in the coming decades, carbon credits can become a significant source of funding for coastal NbS projects. Nevertheless, it is unlikely that carbon credits will cover the full project costs in most coastal protection projects. This implies that other potential revenue streams must be explored. Options for such revenue streams can include the development of additional economic activities in NbS projects, such as tourism, aquaculture or sustainable woodlots. During the interviews, it was indicated that RVO could position itself to support the development of such financing mechanisms, by facilitating access to potential (impact) investors and providing guidance on the development of additional revenue streams in nature-based coastal protection projects.

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# Annex 1. Relevant funding stakeholders in Africa and Asia

The following table give a non-exhaustive overview of the most relevant entities for funding coastal NbS projects in Africa and Asia, both from the public as well as private sector.

| Organization | Relevance for coastal protection NbS | Relevant funding priority/interests | Regional focus |
|---|---|---|---|
| IFIs – Multilateral and regional | | | |
| The World Bank | Relevant programs include the West Africa Coastal Areas Management (WACA) Program and the Global Program on Nature-based Solutions for Climate Resilience. The World Bank aims to both support projection implementation as well as contributing to knowledge development. | Climate resilience; Coastal resilience; Disaster Risk and Water Resource Management | Worldwide |
| Asian Development Bank | Has the ADB Action Plan for Healthy Oceans and Sustainable Blue Economies which contains a coastal resilience component. Use of NbS expected to increase in the future, based on stakeholder interviews. | Coastal resilience | Asia |
| African Development Bank | Though the AfDB does not have a specific NbS program, it has mentioned NbS as an integrated aspect of many of its projects. Support sustainable development by mobilizing and allocating resources for investment in its regional member countries and providing policy advice and technical assistance. | Integrated Natural Resource Management | Africa |
| European Investment Bank | Between 2015-2020 the bank invested roughly 6.9 billion Euro in climate adaptation projects. This fell short of its own ambitions, and consequently the EIB aims to significantly increase its investment in this sector. | Climate change adaptation | Mostly EU but also Asia and ACP states |
| Green Climate Fund (GCF) | Focused on Co-Investments with private sector in Climate Change Mitigation and Adaptation, interested in result areas such as Agriculture, forestry and other land use as well as ecosystems and ecosystem services. Sample approved project "Improving the resilience of vulnerable coastal communities to climate change related impacts" (in Vietnam). GCF also does multi-country projects. Supports developing countries in reaching their NDC ambitions. | Climate change mitigation, Climate change adaption | Africa, Asia-Pacific, Eastern Europe, Latin America, Caribbean |
| Global Environment Facility (GEF) | Has conducted various NbS projects, where the focus is primarily on global environmental benefits. Social benefits are considered co-benefits. Has recently provided a grant for a project with the aim to increase investment in nature-based infrastructure. Also funds the 'Nature+ Accelerator Fund', a collaboration between IUCN, MIROVA and the Coalition of Private Investment in Conservation to attract private finance for conservation | Environmental problems, Climate change, International Environmental Agreements | Developing & transitioning countries |

| | | | |
|---|---|---|---|
| IFIs – Bilateral | | | |
| L'Agence Française de Développement (AfD) | Provides a wide range of financial tools for supporting climate change adaptation projects | Climate change adaptation | International |
| FMO- Dutch Entrepeneurial Development Bank | Provides low interest loans and private equity to support sustainable economic development in 85 countries | Sustainable economic development | International |
| Japan International Cooperation Agency (JICA) | Funding on among others environmental and climate change projects | | |
| Swedish International Development Cooperation Agency (SIDA) | Has a focus on climate change adaptation and works in Africa and Asia | Climate change adaptation | International |
| German Federal Ministry for Economic Cooperation and Development (BMZ) and German development bank (KfW) | Climate change adaptation is a focus of the KfW, where NbS are specifically considered as a means of adaptation. BMZ also support the use of NbS and aims to strengthen deployment of NbS in its portfolio. | Climate change adaptation | International |
| USAID | Wide array of topics that are relevant for coastal protection NbS | Green infrastructure | International |
| Investment Funds | | | |
| Livelihoods Funds | Coalition of various private sector actors that invest in projects that support rural communities in adapting to climate change. Has two carbon funds that are of particular interest. | Mangrove restoration | Asia, Africa, Latin America |
| Mirova – Althelia Funds (particularly, Sustainable Ocean Fund) | Has set up a Sustainable Ocean Fund with the support of Conservational International and with technical and scientific advice from the Environmental Defence Fund. This is an impact investment vehicle that will invest into marine and coastal enterprises that can deliver marine conservation, improved livelihoods and attractive economic returns. | Impact investment, Sustainable economic growth, Fishing and aquaculture | Latin America, Caribbean, Africa, Asia, Pacific |
| Nature Vest | Various projects related to nature conservation | Nature conservation | International |
| Ocean 14 Capital | Invests private capital in companies & technologies that sustain and improve marine health | Impact investment, Aquaculture | International |
| Global Fund for Coral Reefs | Investment vehicle for conserving and restoring coral reefs and to support the communities that depend on them | Coral reefs | International |
| Seychelle Bue bonds | Fund for coastal and marine ecosystems that provides guarantee and risk insurance with concessional finance | Blue carbon ecosystems | International |
| Seychelles debt-for-nature swap | Fund for coastal and marine ecosystems using concessional finance | Blue carbon ecosystems | International |

| | | | |
|---|---|---|---|
| Meloy Fund for Sustainable Community Fisheries | Technical assistance fund that provides concessional finance. | Sustainable community-based fisheries | International |
| AXA | AXA XL is the specialty risk division of AXA, known for solving the most complex risks. They offer traditional and innovative insurance solutions and services in over 200 countries andterritories. AXA XL is supporting TNC with the development of "Blue Carbon Resilience Credits." These would, for the first time, value the combined carbon sequestration and resilience benefits provided by coastal wetland ecosystems. | Blue carbon | International |
| South Pole | Manages carbon investments for private and public entities | Carbon investment | International |
| Climate Fund Managers | Manages the Climate Investor Two Fund, which is a blended finance facility delivering amongst others oceans infrastructure projects | Integrated Coastal Zone Management | Emerging markets |
| Dutch Fund for Climate and Development (DFCD) | Invests in climate-resilient water systems, water management and freshwater ecosystems, forestry, climate-smart agriculture, and restoration of ecosystems to protect the environment | Climate adaptation and mitigation | Emerging markets |

# Annex 2. Non-governmental organizations

This annex provides a non-exhaustive list of the most significant internationally operating NGOs with an interest in nature-based solutions (referred to by some organisations as Natural Climate Solutions) in coastal protection. These are listed in alphabetical order.

| Name | Description |
|---|---|
| BirdLife International (BirdLife) | Is actively implementing nature-based solutions in a selection of its projects |
| Conservation International (CI) | Interested in implementing nature-based solutions in local communities to address societal challenges |
| Environmental Defense Fund (EDF) | Considers Nature-based solutions as an important method to contribute to climate resilience |
| The International Federation of Red Cross and Red Crescent Societies (IFRC) | Promotes the use of nature-based solutions and has produced various knowledge products on the topic |
| International Union for Conservation of Nature (IUCN) | Nature-based solutions were first proposed by IUCN, and the organisations remains at the forefront of knowledge development on NbS |
| The Nature Conservancy (TNC) | Active in knowledge development on nature-based solutions, particularly pertaining to their role in mitigating climate change |
| Wildlife Conservation Society (WCS) | Employs Nature-based solutions in its projects and has worked with the IUCN on knowledge sharing |
| Wetlands International (WI) | Promotes the use of nature-based solutions and has produced various knowledge products on the topic |
| The World Wildlife Fund (WWF) | Considers nature-based solutions a vital tool for conservation and has produced a wide range of reports on NbS |

# Annex 3. Carbon standards

| Name | Description | Crediting organisation or founding mechanism | Blue carbon methodologies |
|---|---|---|---|
| Carbon standards | | | |
| Clean Development Mechanism | Allows for Kyoto Protocol signatories to implement emission reduction projects in their country that can earn saleable carbon credits. | Kyoto Protocol | Yes |
| Verified Carbon Standard | Voluntary carbon standard that can provide project developers with Verified Carbon Units that can be sold on the open market. Originally drafted by Restore America's Estuaries and Silvestrum Climate Associates | Verra | Yes |
| Gold Standard | Provides a voluntary standard for non-governmental emission reductions projects that can provide carbon credits for | The Gold Standard Foundation | Yes |
| Climate Action Reserve | Carbon standard mainly focussed on the American Market | Climate Action Reserve | No |
| American Carbon Registry | Carbon standard mainly focussed on the American market | Environmental Defense Fund | No |

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Prinses Beatrixlaan 2
PO Box 93144 | 2509 AC The Hague
T +31 (0) 88 042 42 42
Contact us
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