GUIDANCE ON THE USE OF NATURE-BASED SOLUTIONS FOR CLIMATE CHANGE ADAPTATION

IsDB
البنك الإسلامي للتنمية
Islamic Development Bank

ACKNOWLEDGEMENTS

The preparation of this report was led by the Climate Change Division and Economic Infrastructure Division at the Islamic Development Bank's Country Programs Complex (CPC) and UN Environment Programme.

The report was developed with contributions from Barney Dickson (Senior advisor on climate change adaptation, UN Environment Programme), Dr. Lili Ilieva (Independent researcher and writer), Dr. Daouda Ben Oumar Ndiaye (OIC Head of Climate Change Practice, Lead Climate Change Specialist, IsDB), and Mr. Olatunji Yusuf (Senior Climate Change Specialist, IsDB Climate Change Division). Dr. Ahmed Al Qabany (The World Bank, former Manager, IsDB Climate Change Division) also contributed to this report.

DISCLAIMER

Published by: Islamic Development Bank
Citation: Islamic Development Bank (2022).
Guidance on the use of Nature-based Solutions for climate change adaptation.

TABLE OF CONTENTS

3 **INTRODUCTION**

5 **PART A. BACKGROUND**

5 1. WHAT IS NBS FOR ADAPTATION?

9 2. BENEFITS AND CHALLENGES FOR INTEGRATING NBS FOR ADAPTATION IN CLIMATE RESILIENT INVESTMENTS

10 3. OVERVIEW OF KEY STEPS FOR THE INTEGRATION OF NBS IN CLIMATE RESILIENT INVESTRMENTS

13 **PART B. ADOPTING NBS FOR ADAPTATION TO BUILD RESILIENCE IN KEY SECTORS**

13 4. SETTING THE POLICY SCENE FOR NBS FOR ADAPTATION

15 5. NATURE-BASED SOLUTIONS FOR ADAPTATION IN THE AGRICULTURAL SECTOR

22 6. NATURE-BASED SOLUTIONS FOR ADAPTATION IN THE WATER SECTOR

30 7. NATURE-BASED SOLUTIONS FOR ADAPTATION IN THE TRANSPORT SECTOR

34 8. ISDB ROLE IN ENABLING THE SCALING- UP OF NBS FOR ADAPTATION

35 **CONCLUSIONS**

ACRONYMS

CAEP	Climate Action Enhancement Package
CBA	Cost-Benefit Analysis
IsDB	Islamic Development Bank
IUCN	International Union for Conservation of Nature
MDB	Multilateral Development Bank
NAP	National Adaptation Plan
NbS	Nature-based Solutions
NDC	Nationally Determined Contributions
TLFF	Tropical Landscape Finance Facility

LIST OF TABLES

Table 1. Examples of NbS for adaptation addressing key climate hazards relevant for the water, agriculture and infrastructure sectors 7

Table 2. Member countries of IsDB that consider NbS in prioritised sectors in their NDCs and adaptation plans 15

LIST OF FIGURES

Figure 1. Examples illustrating NbS for adaptation 6

Figure 2. Conceptual diagram involved in integrating NbS for adaptation into the project development cycle 11

Figure 3. Climate hazards and impacts for the agricultural sector 17

Figure 4. Climate change hazards and impacts in the agricultural sector and the potential of NbS to build resilience in the sector 18

Figure 5. Climate hazards and impacts in the water sector 23

Figure 6. Climate change hazards and impacts in the water sector and the potential of NbS to build resilience in the sector 25

Figure 7. Climate hazards and impacts in the transport sector 30

Figure 8. Climate change hazards and impacts in the transport sector and the potential of NbS to build resilience in the sector 31

INTRODUCTION

Climate change and extreme weather events have been identified among the five most likely global risks in the World Economic Forum's The global risks report 2020.[1] The current and projected impacts of climate change pose challenges in key economic sectors, thus hindering the sustainable development of countries. The Rio+20 Conference elevated Green Economy as one of the key features of a sustainable future. Nature-based Solutions (NbS) have demonstrated a high potential to provide cost-effective solutions for climate change adaptation by protecting, sustainably managing, and enhancing ecosystems and habitats in a way that reduces the vulnerability of livelihoods and economic assets. Additionally, NbS for adaptation have the potential to make infrastructure more resilient to climate change effects and add longer-term value to infrastructure assets. Thus, investments in NbS solutions have been identified as one of the main building blocks of a transition to a Green Economy. Although there is a general recognition and growing interest of the role of NbS for adaptation, NbS have not been widely deployed yet. It is estimated that as little as 1.5 per cent of all public international climate finance has gone to support nature-based solutions for adaptation in developing countries.[2]

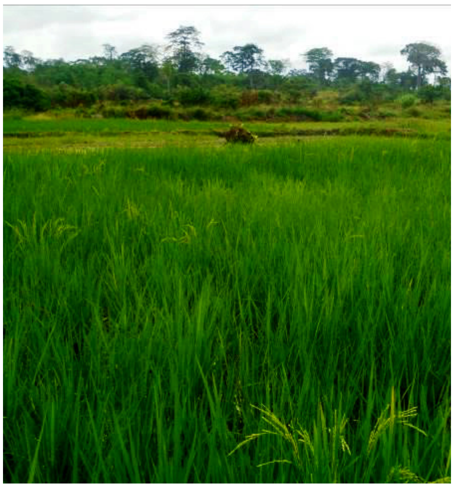
The State of Finance for Nature analysis published by the UN Environment Programme, the World Economic Forum (WEF) and the Economics of Land Degradation Initiative estimated that the world maust triple its investments in nature-based solutions by 2030 and quadruple them by 2050 in order to meet the climate change, biodiversity and land degradation targets of the three Rio Conventions. This means that the total investments necessary are USD 8.1 trillion by mid-century.

Ensuring that NbS are systematically incorporated into decision-making and investment projects will require enhanced partnerships, including strong involvement of the private sector. In this regard, the Islamic Development Bank (IsDB) has taken steps to better integrate NbS in its climate resilient investments. To achieve this, IsDB is developing this internal NbS guidance as part of larger commitments such as to the objectives of the Paris Agreement and the alignment of climate change finance according to the joint MDB statement, as well as the UN Decade on Ecosystem Restoration.

This guidance introduces NbS options within the disaster risk and climate adaptation components of investment programmes for agriculture water, cities and the transport sector.Its purpose is to raise awareness and guide IsDB member countries authorities, staff and project developers about the potential of NbS for adaptation and how to translate this opportunity into investments.It reviews practices and examples of how to integrate NbS for adaptation into project appraisal processes and investments within the portfolio of IsDB projects. The guidance consists in:

[1] WEF, 2020, The Global Risks Report 2020, World Economic Forum, Cologny/Geneva.
[2] Swann, S., L. Blandford, S. Cheng, J. Cook, A. Miller, and R. Barr. 2021. "Public International Funding of Nature-based Solutions for Adaptation: A Landscape Assessment." Working Paper. Washington, DC: World Resources Institute. Available online at https://doi.org/10.46830/ wriwp.20.00065.

CLIMATE CHANGE AND EXTREME WEATHER EVENTS HAVE BEEN IDENTIFIED AMONG THE FIVE MOST LIKELY GLOBAL RISKS IN THE WORLD ECONOMIC FORUM'S THE GLOBAL RISKS REPORT 2020



NBS FOR ADAPTATION HAVE THE POTENTIAL TO MAKE INFRASTRUCTURE MORE RESILIENT TO CLIMATE CHANGE EFFECTS AND ADD LONGER-TERM VALUE TO INFRASTRUCTURE ASSETS.

Part A: Introduces the concept of NbS for adaptation, highlights the benefits, while outlining the major challenges for the adoption and up-scaling. Additionally, it provides a brief overview of the key aspects and steps needed for the systematic integration of NbS for adaptation in resilience investment projects.

Part B: Describes the policy context of IsDB Member Countries, highlighting the integration of NbS in some of the NDCs. It focuses on the role of NbS in building resilience of three key sectors: agriculture; transport; and water (with a focus on urban water management). This report concludes by considering the enabling factors for catalyzing financing and scaling-up of NbS and the specific role of IsDB programming in supporting this ambition.

PART A. BACKGROUND

Part A provides a brief introduction to NbS for adaptation and highlights their co-benefits and the challenges of up-scaling. This part provides an overview of the key aspects and guidance for the integration of NbS in climate-resilient project investments.

1. WHAT IS NBS FOR ADAPTATION?

Nature-based solutions (NbS) are an 'umbrella concept' for established nature-based approaches to address societal challenges, including climate change. Such approaches include ecosystem-based adaptation (EbA), eco-disaster risk reduction (Eco-DRR) and Green Infrastructure (GI). Over the last decade, there has been a growing recognition that protected and well-managed ecosystems can be an efficient and effective alternative to grey infrastructure in achieving climate adaptation and building resilience.[3,4] Box 1 provides definitions of NbS.

NbS for adaptation refers to the use, protection, restoration and creation of ecosystems to reduce climate vulnerability and enhance the resilience of people and ecosystems to climate hazards such as riverine and coastal floods, droughts, soil erosion, landslides as well as shift in seasonal periods. Figure 1 shows the key actions describing NbS and relevant examples. For example, NbS can moderate the intensity of flood events by using and protecting vegetation to increasing the ability of the landscape to store water or by increasing the ability of channels to convey floodwaters. On a watershed level, forest and wetland restoration enhances the natural ability of ecosystems to retain water, slowing down and absorbing some of the storm runoff. In urban areas, the creation of green roofs, permeable pavements and green spaces help to absorb water, facilitate infiltration and minimize stormwater runoff. This, in turn, reduces or prevents sewer system overflows and flooding and relieves the load on existing flood management infrastructures.

Box 1. Nature-based Solutions (NbS): Definitions

IUCN defines Nature-based Solutions as 'Actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.' (IUCN, 2016, Resolution 69).

The European Commission defines Nature-based Solutions as 'Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Nature-based solutions must therefore benefit biodiversity and support the delivery of a range of ecosystem services.' (European Commission, 2015).

[3] Kapos, V. et al. 2019. The role of the natural environment in adaptation, background paper for the Global Commission on Adaptation.
[4] Chausson, A. et al. 2020. Mapping the effectiveness of nature-based solutions for climate change adaptation. Global Change Biology.

Figure 1. Examples illustrating NbS for adaptation

Using and protecting natural ecosystems

Example:
Use of vegetation cover to lessen the damage caused by heavy rain by slowing run-off, thus reducing soil erosion and the related pollution, reducing the impact of flash floads, and replenishing groundwater.

Restoring ecosystems

Example:
Restore riparian areas along riverbanks to slow run-off and capture sediment before it reaches the water course, thus limiting down-stream flood damage to property and livelihoods.

Creating new ecosystems

Example:
Create urban green spaces to increase urban canopy layer and plant coverage, thus reducing 'urban heat island effect' and increasing water availability.

NbS for adaptation can be used to complement, substitute, or safeguard traditional grey infrastructure while delivering enhanced resilience and co-benefits (e.g. supporting biodiversity, local livelihoods, etc.).[5] NbS for adaptation includes green infrastructure (also known as natural infrastructure), which aims to preserve, enhance, or restore natural systems, such as forests, floodplains, riparian areas, and coastal forests. When green infrastructure is combined with grey infrastructure it forms 'green-grey infrastructure' (also known as hybrid solutions) to produce more resilient and lower-cost services.[6] An example of such an approach is where natural coastal ecosystems – such as mangroves and salt marshes – are combined with grey infrastructure such as breakwaters to reduce the impacts from a coastal flood. Moreover, the conservation and restoration of natural coastal ecosystems can extend the lifespan of gray infrastructure and reduce maintenance costs. As a result, the adaptation solution can be more robust and cost-effective than if the solutions are implemented independently.

Multiple sectors can benefit from the integration of NbS for adaptation in their strategies and action plans. NbS have demonstrated effectiveness in addressing climate-related challenges in the agriculture, water, infrastructure, urban and coastal sectors for building climate resilience and enhancing the country's green economy. Table 1 maps examples or NbS and their role in addressing climate hazards for the above-mentioned sectors.

As NbS for adaptation continue to be an emerging approach, in requires research, guidance and standards to aid policy makers, project designers, implementers, funders and evaluators in the effective mainstreaming, design and implementation. In response to this need, key actors in fostering NbS have put forward a set of principles

[5] Browder, G. Ozment, S. Rehberger Bescos, I. et al. 2019. Integrating Green and Gray: Creating Next Generation Infrastructure. The World Bank. Available online: https://openknowledge.worldbank.org/handle/10986/31430
[6] Browder, G. et al. 2019. Footnote 5.

Table 1 maps examples of NbS and their role in addressing climate hazards for the above-mentioned sectors

Nature-based solutions for adaptation	Climate hazards				
	Floods	Droughts	Soil erosion	Coastal flooding	Landslides
Conservation agriculture (CA) to reduce soil erosion and mantain soil depth and water retention		Agriculture	Agriculture		
Cross-slope barriers to decrease velocity of water run-off and soil loss	Agriculture		Agriculture		
Agroforestry to control soil erosion, enhance water recharge, stabilise slopes and imporve soil fertility	Agriculture	Agriculture	Agriculture		Agriculture
Silvopasture to regenerate vegetation, increase forage quality and quantity, increase water availability, improve soil quality, and safeguard livestock, thus improving food and income security		Agriculture			
Reafforestation, afforestation and forest conservation to stabilise slopes and prevent landslides, mud flows and debir flows, thus limiting risks to life, property and livelihoods	Water, Infrastructure, Agriculture				Water, Infrastructure, Agriculture
Riparian buffers to slow run-off and capture sediment before it reaches the water course, thus limiting down-stream flood damage toproperty and livelihoods	Water, Infrastructure, Agriculture		Water, Infrastructure, Agriculture		
Wetland restoration/conservation to reduce flood damage, enable groundwater recharge and impove water availability	Water, Agriculture	Water, Agriculture			
Green roofs/Green areas to increase infiltration of rainwater run-off and reduce flood impacts	Water				
Rainwater harvesting to redirect the rainwater and stormwater run-off and storage for productive use	Water, Agriculture	Water, Agriculture			
Protecting/restoring mangroves, marshes and dunes to protect from storm surge and waves and sea lever rise				Water, Infrastructure, Agriculture	
Coastal slope stabilization with hybrid materials (e.g. revetments, groynes, gabions) and vegetation to protect infrastructure from coastal erosion by waves, currents and wind				Infrastructure	
Riverbank stabilization with hybrid materials (e.g. groynes and gabions) and vegetation to protect against floods and landslides	Infrastructure				Infrastructure

Water sector · Infrastructure sector · Agriculture sector

and standards to guide the processes involving NbS. The IUCN Global Standard for Nature-based Solutions,[7] launched in July 2020, seeks to enable Governments, companies and NGOs to consistently and effectively design, assess and scale-up NbS (see Box 2). Donors and financers can invest in NbS with the Global Standard as a benchmark minimizing risks and providing increased security. The World Bank has been a leading actor in promoting Principles for NbS for flood protection[8] as an alternative or a complementary to conventional engineering measures (see Box 3).

[7] IUCN, 2020. IUCN Global Standard for Nature-based Solutions. IUCN, Gland, Switzerland. Available online: https://portals.iucn.org/library/node/49070

[8] World Bank. 2017. Implementing nature-based flood protection: Principles and implementation guidance. Washington, DC: World Bank. Available online: https://documents1.worldbank.org/curated/en/739421509427698706/pdf/Implementing-nature-based-flood-protection-principles-and-implementation-guidance.pdf

THE CONSERVATION AND RESTORATION OF NATURAL COASTAL ECOSYSTEMS CAN EXTEND THE LIFESPAN OF GRAY INFRASTRUCTURE AND REDUCE MAINTENANCE COSTS.

Box 2. IUCN Global Standard for NbS

The IUCN Global Standard aims to ensure that the application of NbS is credible, and its uptake tracked and measured for adaptive management so that it can be replicated and upscaled in different contexts. The Standard consists of 8 Criteria and 28 Indicators. ***Criterion 1*** focuses on identifying the societal challenge to which the NbS is a response. ***Criterion 2*** guides the design of the solution responding to the scale of the issue. ***Criteria 3, 4*** and ***5*** correspond to the three pillars of sustainable development – environmentally sustainable, socially equitable and economically viable. ***Criterion 6*** addresses the balancing of trade-offs and choices that need to be made to achieve short and long-term gains, and how to ensure that there is a transparent, equitable and inclusive process to determine such trade-offs. ***Criterion 7*** responds to the need for adaptive management, which facilitates continuous learning about system-wide processes and adapting the NbS according to systemic changes. ***Criterion 8*** considers mainstreaming and sustainability of NbS.

Box 3. The World Bank Principles for NbS for flood protection

The World Bank adopts five principles to promote best practices and prevent common pitfalls in the use of nature-based solutions. The principles include:

Principle 1. System-scale perspective: Addressing NbS for climate change adaptation and disaster risk reduction should start with a system-wide analysis of the local socio-economic, environmental, and institutional conditions.

Principle 2. Risk and benefit assessment of full range of solutions: A thorough assessment of risks and benefits of the full range of possible measures should be conducted, covering risk reduction benefits as well as social and environmental effects.

Principle 3. Standardized performance evaluation: NbS need to be tested, designed, and evaluated using quantitative criteria.

Principle 4. Integration with ecosystem conservation and restoration: NbS should make use of existing ecosystems, native species, and comply with basic principles of ecological restoration and conservation.

Principle 5. Adaptive management: Nature-based solutions for flood risk management need adaptive management based on long-term monitoring. This ensures their sustainable performance.

2. BENEFITS AND CHALLENGES FOR INTEGRATING NBS FOR ADAPTATION IN CLIMATE RESILIENT INVESTMENTS

NbS provide promising cost-effective adaptation solutions and additional environmental and socio-economic benefits. Apart from the adaptation and disaster risk reduction benefits, NbS contributes to addressing other social and environmental challenges, creating co-benefits, which include:

- Protecting and enhancing biodiversity and reducing or reversing the trend in the loss and degradation of terrestrial and aquatic ecosystems and their services. NbS for adaptation also offer habitat improvement, carbon sequestration, soil stabilization and groundwater recharge.

- Enhancing economic development and/or sustainable livelihoods and reducing public health risks, which is particularly important for the green recovery strategies for COVID-19.[9]

- For rural areas and communities, NbS may reduce social inequalities affecting women, disadvantaged groups, the poor, and people living in slums/informal settlements. In general, the poorest people may have the most to gain from NbS. This is especially valid for improved water quantity and quality, especially where people lack access to improved water sources and are at risk of food insecurity.

- Restoring or protecting coastal wetlands can increase resilience against storms with co-benefits, including carbon sequestration, fish provision, job creation, or tourism.

The implementation and upscaling of NbS for adaptation is facing various challenges that inhibit the realisation of their benefits and co-benefits across scales. Some of the key challenges are:

- **The longer timeframe for experiencing benefits from NbS compared to grey infrastructure can lead to investors and policy-makers preferring grey infrastructure.** Policy makers and investors often evaluate projects over the lifetime of the financing cycle as opposed to the lifetime of the project.[10] Benefits from NbS can often be experienced over medium and long -term timescales. The lack of short-term benefits may discourage investors and policy makers who operate over short return periods.[11]

- **Quantifying and valuing the benefits and co-benefits of NbS and translating them into revenue streams is difficult.** Common economic appraisal tools and decision-making tools, such as Cost-Benefit Analysis (CBA), do not necessarily capture the real value or the myriad of benefits and co-benefits from NbS projects.[12] Where methods do exist for valuing co- benefits these are often not sufficiently developed to support investment decision-making.

[9] Capitals Coalition, 2021. COVID-19 Response and Recovery: Nature-Based Solutions for People, Planet and Prosperity. Available online: https://capitalscoalition.org/wp-content/uploads/2021/01/Global-Goal-for-Nature-Covid19-Response-Recovery-Joint-Policy-Recs_OCT23_FINAL-1.pdf
[10] OECD, 2020. Nature-based solutions for adapting to climate-related water risks. OECD Environment Policy Papers, No. 21.
[11] Cooper, R. & Matthews, J.H. 2020. Water Finance and Nature-based solutions. K4D Helpdesk Report 857. Brighton, UK: Institute of Development Studies.
[12] OECD, 2020. Footnote 12.

The benefits from NbS may also change over time and the value and/or performance of the investment may appreciate over time compared to traditional engineered solutions.[13]

- **Weak policy and legal support for NbS:** While many countries have policies and strategies addressing climate adaptation and disaster risk reduction, NbS is often poorly integrated into these, so policy support is often insufficient. Usually, political decision-makers are more interested in projects that generate short-term outcomes and often prioritize interventions with more immediate and tangible results and policies. In this respect, NbS typically needs a relatively long time to produce societal benefits.

- **Working in silos:** Siloed thinking is a critical barrier to the successful uptake and implementation of NbS across sectors and scale.[14] Ministries and departments associated with management and governance of ecosystems (e.g. environment) are separated from those responsible for planning, national budget and sectors (e.g. planning, transportation, energy, and agriculture). Different departments and institutions operate based on distinct visions, goals and legal structures, thus limiting the multifunctionality of NbS.

- **Limited options of suitable financial instruments and incentives**: There are limited options of financial incentives to encourage the implementation of NbS. This is a critical barrier when the public sector, the private sector and citizens need to collaborate in designing and implementing NbS.[15] The multiple benefits of NbS are often not clear for the different actors, who are thus uncertain about investing in such solutions. Besides, there is a lack of appropriate business models, limiting the adoption of and investment in these solutions by external financing institutions. Strengthening the 'business case' for NbS is therefore critical for successful public-private partnerships.

3. OVERVIEW OF KEY STEPS FOR THE INTEGRATION OF NBS CLIMATE RESILIENT INVESTMENTS

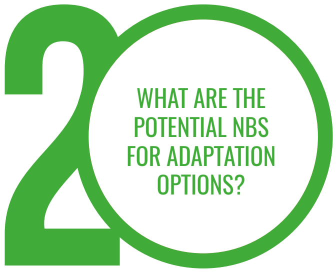
Ensuring that NbS for adaptation are systematically incorporated into decision-making and climate investments will require the consideration of a number of steps. The performance of natural systems is variable and can be expected to change over time and under changing climate conditions, contributing an element of uncertainty and complexity to NbS projects. Adaptive planning and management are recommended as it deals with decision-making over time and under uncertainty. Figure 2 presents a conceptual diagram of the seven steps involved in integrating NbS into the project development cycle based on existing guidelines and manuals.[16] This overview of the steps presents a generalized process, which is not strictly linear as there are many opportu nities for iteration and revision.

[13] Smith, D.M. et al. 2019. *Adaptation's thirst: Accelerating the convergence of water and climate action*. Background Paper prepared for the 2019 report of the Global Commission on Adaptation.
[14] Shahryar S. et al. 2020. Uptake and implementation of Nature-Based Solutions: An analysis of barriers using Interpretive Structural Modeling, Journal of Environmental Management, Volume 270, 2020.
[15] Shahryar S. et al. 2020. Footnote 16.
[16] (1) IADB, 2020. Increasing infrastructure resilience with Nature-based Solutions (NbS): A 12-step technical guidance document for project developers; (2) The World Bank, 2017. Implementing nature-based flood protection: Principles and implementation guidance.

Figure 2. Conceptual diagram involved in integrating NbS for adaptation into the project development cycle

Define the climate change problem

Identify the climate hazards, (e.g. drought, flooding, landslides, etc.), vulnerabilites and potential direct and indirect impacts on the sector.

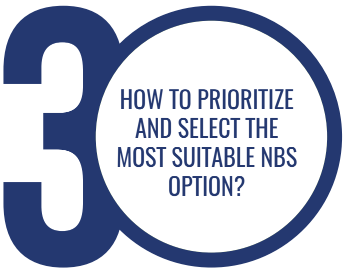


Identify potential NbS solutions

Identify the suite of potential NbS for adaptation that could reduce the vulnerability and impacts, meet the project goals, and evaluate options in the local context.

Define the financial structure of the project

Assess the potential and suitability of different funding and instruments for the implementation of the NbS.

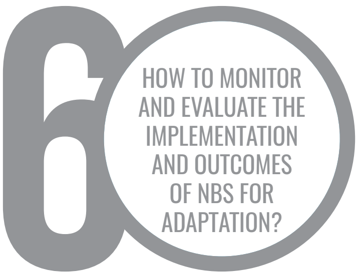


Apprise NbS for adaptation options

Prioritiza among the NbS option based on technical and financial criteria to select the most suitable NbS.

Design the NbS for adaptation

Define specific technical and operation aspects in the design of the selected NbS options to enhance multifunctionality.



Design the monitoring and evaluation (M&E) plan

Define the indicators, methodologies and procedures to follow for the monitoring and evaluation of the project.

THE PERFORMANCE OF NATURAL SYSTEMS IS VARIABLE AND CAN BE EXPECTED TO CHANGE OVER TIME AND UNDER CHANGING CLIMATE CONDITIONS, CONTRIBUTING AN ELEMENT OF UNCERTAINTY AND COMPLEXITY TO NBS PROJECTS.

Step 1. Define the climate change problem: A key prerequisite for the design of effective NbS for adaptation is identifying which climate hazards, impacts and key vulnerabilities are the NbS going to address. These can be identified by conducting a vulnerability and risk assessment and engaging stakeholders at local, sub-national and national levels.

Step 2. Identify potential NbS for adaptation options: The potential suite of solutions will vary depending on the climate change challenge identified in Step 1 and will include NbS as a substitute, safeguard or complement to grey infrastructure.

Step 3. Appraise NbS for adaptation options: A variety of approaches are available for evaluating and prioritizing NbS options for adaptation. One such approach uses multi-criteria analysis (MCA) to identify a short list of preferred NbS options based on specific criteria, followed by a more detailed, quantitative assessment including cost-benefit analysis (CBA). The CBA can be used to compare different NbS options or to compare with "grey" options. Articulating the multiple benefits of NbS in monetary terms is important in order to define and understand the business case and compare it to alternatives. Results from CBA are however not always clear cut; thus, it is important to consider the non-monetary elements of the compared options as well. Assessing the performance of different NbS options and how they compare to grey infrastructure, whether in qualitative or quantitative terms, always requires an understanding of future climate conditions.

Step 4. Define the financial structure of the project: As a first step to secure financing, project developers will need to demonstrate the bankability of the NbS option i.e. show the financial sustainability of the NbS over the lifecycle. This includes identifying sources of revenue over the project lifecycle, which may come, for example, from eco-tourism, regulated water supply, carbon offsets or payments for ecosystem services. Another aspect to consider are the capital requirements, capital investment, transactions, and O&M costs. Additionally, it will be necessary to analyze the ability of the project cash flows to cover future financial requirements under various funding mechanisms. This would also include examining the various financial instruments that could be applicable in the project context and opportunities to access financing can be through blended finance, Public-Private Partnerships, and green finance (Green Bonds/Sukuk, Green credit lines, dedicated climate finance, among others).

Step 5. Design the NbS for adaptation: The specific approach to design and implement NbS will vary greatly depending on the NbS. For example, designing and implementing a living roof will require different steps and expertise than transplanting coral, or restoring mangroves along a coastal road. However, in general, NbS design will be progressively iterated, from conceptual, preliminary and detailed stages, to take into account the results from stakeholder engagement, meet regulatory requirements, deliver against financial targets and ensure the project meets its performance indicators.

Step 6. Design the monitoring and evaluation (M&E) plan: M&E is important to provide evidence of progress and performance of NbS. Therefore, it is critical to identify and use indicators that can measure in a qualitative and/or quantitative way how NbS contribute to enhancing resilience.

PART B. ADOPTING NBS FOR ADAPTATION TO BUILD RESILIENCE IN KEY SECTORS

Part B begins with an overview of IsDB's ambition for contributing to climate adaptation. It provides a brief overview of the climate policy setting in the IsDB Member Countries highlighting the advances in the integration of NbS in the countries' NDCs. It then describes the major climate risks and the potential of NbS to build climate resilience in three key sectors: agriculture, water (with focus on urban water management) and transport.

4. SETTING THE POLICY SCENE FOR NBS FOR ADAPTATION

Mainstreaming NbS in institutional and national policy frameworks is essential to successful implementation and for catalyzing larger-scale NbS adoption. In the context of the Paris Agreement and the accelerating ambition of Nationally Determined Contributions (NDCs), NbS for adaptation play an important role in the efforts to achieving the adaptation targets across many countries, while improving livelihoods, reducing inequality and securing food and water.[17] In 2019, IsDB approved its Climate Change Policy, which builds on the Voluntary Principles for Mainstreaming Climate Action within Financial Institutions and the Multilateral Development Banks (MDBs) Common Principles for Climate Finance Tracking. In 2020, the Bank unveiled its Climate Change Action Plan (2020–2025). The 5-Year Climate Change Action Plan sets out an ambitious agenda and mandate for the IsDB to support its member states in achieving low-carbon and resilient economies including by integrating sustainable natural resources management and in line with the Paris Agreement and the MDBs Paris Alignment Framework. As part of the efforts to integrate considerations of climate change into its operations, the IsDB developed a series of climate change adaptation sector guidance notes. The notes aim to help sector-focused project teams to incorporate climate change considerations into project planning and design. The notes cover analysis of climate impacts and a set of adaptation solutions including NbS across three key sectors: (i) Agriculture and Rural Development;[18] (ii) Transport,[19] and (iii) Water.[20]

[17] Seddon, N., Sengupta, S., García-Espinosa, M., Hauler, I., Herr, D. and Rizvi, A.R. 2019. Nature-based Solutions in Nationally Determined Contributions: Synthesis and recommendations for enhancing climate ambition and action by 2020. Gland, Switzerland and Oxford, UK: IUCN and University of Oxford.
[18] IsDB, 2020. Agriculture and rural development climate change adaptation: Guidance note. Available online: https://www.isdb.org/sites/default/files/media/documents/2021-01/IsDB-Agriculture-Note.pdf
[19] IsDB, 2020. Transport sector climate change adaptation: Guidance note. Available online: https://www.isdb.org/sites/default/files/media/documents/2020-09/Transport per cent20Sector per cent20Climate per cent20Change per cent20IsDB per cent20Guidance per cent20note per cent20Note per cent20-Print per cent20version.pdf
[20] IsDB, 2020. Water sector climate change adaptation: Guidance note. Available online: https://www.isdb.org/sites/default/files/media/documents/2021-01/IsDB-Water-Note.pdf

Moving towards green, low carbon and climate resilient development trajectories will require that IsDB Member Countries develop strategies and investment plans at different levels including both at sectoral and national levels. Many of them have already developed ambitious NDCs and Adaptation Plans, while others are in the process of doing so.

National governments play a key role in fostering the use of NbS. Governments need to design an enabling environment considering institutional, regulatory, and financial conditions that facilitate the adoption and scaling-up of NbS by both public agencies and the private sector. According to IsDB's 2020-2025 Climate Action Plan, one key entry point of IsDB interventions in climate change activities in member countries will be the NDCs. Drawing from its own resources and others leveraged with its partners, the IsDB is supporting the improvement and operationalization of member countries' NDCs and relevant strategies and plans, specifically focusing on ways to utilize its financing and technical assistance tools to transform these strategies and plans into investments and actions. Moreover, IsDB is a delivery partner for the NDC Partnership Climate Action Enhancement Package (CAEP) and delivers targeted, fast-track support to countries to enhance the quality, increase the ambition, and implement NDCs.

The climate change policies and instruments (including NDCs, NAPs and NAMAs) adopted by the 57 Member Countries demonstrate the intention of governments to integrate NbS as a potential response to climate change and development challenges in prioritized areas such as the agricultural, forestry, water, coastal and disaster risk reduction sectors. Already, more than 25 per cent of the member countries have integrated NbS in their NDCs. Table 2 presents an overview of the IsDB member countries that include NbS considerations as adaptation actions in their vision and part of the NDCs and adaptation plans.

Box 4. How is IsDB integrating NbS in its investments?

The IsDB plays a catalytic role throughout all regions in advancing climate resilient investments in water, agriculture and transport sectors that drive green economic development and improve people's quality of life. This is done partly through IsDB's support to Nationally Determined Contributions (many of which now include references to NbS). IsDB has also designed sectoral operational and implementation strategies to ensure that the bank's investments integrate NbS to support sustainable and inclusive growth, and to deliver lasting, positive results for its member countries:

- Agriculture and Rural Development Policy and its Implementation Strategy (2020 – 2025)
- Urban Sector Policy and its Operational Strategy (2021-2025)
- Water and Sanitation Sector Policy and its Operational Strategy (2021-2025)

Table 2. Member countries of IsDB that consider NbS in prioritised sectors in their NDCs and adaptation plans. (Source: Nature-based Solutions Policy Platform)[21]

Country	NbS integrated in NDC adaptation measures and plans				
	Agriculture	Forestry	Water	Coastal areas	Disaster risk reduction
Kuwait	●		●		
Saudi Arabia				●	
Nigeria		●			
Algeria					●
Indonesia	●	●	●		
Bangladesh		●		●	●
Morocco	●	●	●		
Sudan	●	●			
Jordan	●				
Senegal	●				
Cameroon	●	●		●	
Burkina	●	●			
Faso					
Niger	●	●		●	
Suriname					

5. NATURE-BASED SOLUTIONS FOR ADAPTATION IN THE AGRICULTURAL SECTOR

5.1 CLIMATE IMPACTS ON THE AGRICULTURAL SECTOR

Agriculture provides livelihoods for more than 1 billion people and is critical for the economic development and food security of countries.[22] While agricultural systems are already under pressure due to rising demand, environmental degradation and water shortages, climate change will add additional stress. Climate change is already affecting agricultural systems in a multitude of ways. For example, it affects food availability through its increasingly adverse impacts on crop yields, fish stocks and animal health and productivity, especially in sub-Saharan Africa and South Asia. It limits *access to food* through negative impacts on rural incomes and livelihoods.

According to climate projections, there will be increases in the days above threshold temperatures and during key plant development times, increases in the length of dry seasons in already arid regions and unpredictable rainfall patterns. These changes will likely lead to a shift in agro-climatic zones and potential changes in distribution and abundance of

[21] Nature-based solutions policy platform: www.nbspolicyplatform.org
[22] IOL, 2021.

some plant pests. Projected rises in sea level are likely to result in in salt-water infiltration, which will affect crop production in coastal areas. In addition, hydrological and soil conditions will be impacted by decreases in groundwater recharge, surface flows, soil moisture and soil carbon.

Climate projections also indicate a likely increase in the frequency and intensity of severe weather-related events such as floods, cyclones, and hurricanes. Some regions are expected to face prolonged drought and water shortages, which will likely have devastating effects on agricultural production.[23] The widespread melting of glaciers and snow cover in major mountain ranges, particularly in Asia, will affect the volume and timing of water flows, ultimately reducing the availability of irrigation water downstream.[24] In summary, the potential climate impacts on the crop production and livestock include (See Figure 3):[25]

- Increased pest pressure and risk of plant diseases resulting in productivity decline or crop losses;
- Increased crop water demand and more rapid depletion of soil moisture;
- Increased heat stress may reduce productivity and increase risk of crop failure or decrease labor productivity/ health; decreased suitability of some crops for some regions
- Reduced soil quality and loss of arable land due to land degradation and wind erosion
- Damage to crops and damage to the irrigation or drainage infrastructure leading to field waterlogging; inability to cultivate land and delays in planting or harvesting
- Decreased quality and amount of feed supply, and the carrying capacity of pastures;
- Decreased animal productivity due to extreme temperature and water scarcity.

The rural poor, in particular smallholder farmers including female-headed farm households, are the most vulnerable to the impacts of climate change. Their vulnerability is owing to their high dependence on natural resources, limited resilience and protection against climate-related risks, and power imbalances over access to natural resources such as water and land, combined with a lack of resources to invest in adaptation and income diversification strategies. The exposure of farmers to climate impacts is determined by the location of their land. Farms located at high-risk areas for flooding such as floodplains, are more exposed to by floods. Severe droughts or floods can sharply reduce incomes and cause asset losses that erode future income earning capacity of these vulnerable groups. This puts the livelihoods and the food security and nutrition of both rural and urban communities at risk. In Central Asia and in Northern Africa about one-fifth of the population live in agricultural areas with high water shortages or scarcity. In sub-Saharan Africa, around 50 million people live in areas where severe drought has catastrophic impacts on cropland and pastureland.[26]

[23] P.R. Shukla, J. Skea, R. Slade, R. van Diemen, E. Haughey, J. Malley, M. Pathak, J. Portugal Pereira (eds.) Technical Summary, 2019. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M, Belkacemi, J. Malley, (eds.)]. In press.
[24] P.R. Shukla, Footnote 26.
[25] P.R. Shukla, Footnote 26.
[26] FAO, 2020. The state of food and agriculture 2020: Overcoming water challenges in agriculture. Rome.

Figure 3. Climate hazards and impacts for the agricultural sector

TEMPERATURE INCREASE	SEA-LEVEL RISE AND STORM RISE	INCREASE IN PRECIPITATION OR FREQUENCY OF EXTREME PRECIPITATION EVENTS	DECREASING PRECIPITATION AND DROUGHT
• Increased incidence of some pathogens and other pest • Shifts in agroclimatic zones; changes in crop phenology • Increased crop water demand • Decline in crop and animal productivity and increased risk of crop failure	• Increased salinity of water and soils in coastal areas • Reduced freshwater availability for irrigation • Decline in productivity or crop failure • Loss of arable land • Increased flood risk	• Increased pest pressure and risk of plant diseases • Productivity decline or crop losses • Increased runoff and soil erosion	• Soil moisture depletion; increased erosion, land degradation, and desertification • Decline in productivity or crop faiulure • Decreased quality and amount of feed supply, and the carrying capacity of pastures

5.2 THE POTENTIAL OF NBS IN ENHANCING THE RESILIENCE OF THE AGRICULTURAL SECTOR

NbS for adaptation can play a significant role in moderating climate hazards and building the resilience of the agriculture sector while sustaining livelihoods and long-term food security. In particular, NbS for adaptation in the agricultural sector aim to:

- **Enhance water availability during droughts** by increasing water infiltration and storage capacities of wetlands/soils and the recharge of aquifers – for example, through conservation agriculture, silvopasture, reforestation and wetland conservation.
- **Reduce the biophysical impacts of extreme weather events** (heavy rainfall, extremely high temperatures, strong winds, etc.) on crops, animals or farming system by stabilizing and protecting hill slopes, riverbanks and shorelines, thereby reducing soil erosion – for example, through cross-slope barriers and agroforestry.
- **Stabilize and protect hill slopes, riverbanks and shorelines,** thereby reducing erosion and moderating the risk of landslides – for example, through slope terracing.

NbS for adaptation in the agricultural sector can be adopted on-site (farm scale) and off-site (landscape scale). For example, experiences show that as a result of NbS such as conservation agriculture practices at farm level, there is observed improvement of yield and enhanced food security. Other examples of farm-level NbS include conservation agriculture and grass strips and micro-terraces. When the objective is to enhance ecosystem services such as the water regulating services, which are critical to sustain vulnerable agricultural systems, then NbS for adaptation will be more effective when implemented at landscape-level; for example, through reforestation of upstream areas. Other examples of landscape-scale NbS include avoided forest and grassland conversion, coastal protection and rehabilitation, agroforestry, wetland and peatland restoration, silvopasture systems. Figure 4 provides an overview of the role of NbS in moderating climate extreme events and reducing impacts on agricultural systems.

NBS FOR ADAPTATION CAN PLAY A SIGNIFICANT ROLE IN MODERATING CLIMATE HAZARDS AND BUILDING THE RESILIENCE OF THE AGRICULTURE SECTOR WHILE SUSTAINING LIVELIHOODS AND LONG-TERM FOOD SECURITY.

Figure 4. Climate change hazards and impacts in the agricultural sector and the potential of NbS to build resilience in the sector

CLIMATE CHANGE HAZARDS	CLIMATE IMPACTS	NATURE-BASED SOLUTIONS FOR ADAPTATION
TEMPERATURE INCREASE	• Increased incidence of some pathogens and other pest • Shifts in agroclimatic zones; changes in crop phenology • Increased crop water demand • Decline in crop and animal productivity and increased risk of crop failure	**1** Conservation agriculture **5** Slope terracing
SEA-LEVEL RISE AND STORM RISE	• Increased salinity of water and soils in coastal areas • Reduced freshwater availability for irrigation • Decline in productivity or crop failure • Loss of arable land • Increased flood risk	**7** Protecting/restoring mangroves, marshes and dunes (section6)
INCREASE IN PRECIPITATION OR FREQUENCY OF EXTREME PRECIPITATION EVENTS	• Increased pest pressure and risk of plant diseases • Productivity decline or crop losses • Increased runoff and soil erosion	**2** Cross slope barriers **3** Agroforestry **5** Slope terracing
DECREASING PRECIPITATION AND DROUGHT	• Soil moisture depletion; increased erosion, land degradation, and desertification • Decline in productivity or crop faiulure • Decreased quality and amount of feed supply, and the carrying capacity of pastures	**1** Conservation agriculture **3** Agroforestry **4** Silvopasture **6** Wetland restoration/conservation (section 5)

NbS options include:

1. Conservation agriculture (CA) is a widely known practice at farm-scale. This NbS includes a suite of practices such as cultivation of cover crops and shifts to reduced-tillage or zero- tillage practices, mulches, intercropping and rotation cropping. These practices are designed to enhance natural ecosystem processes that sustain agricultural productivity such as increased water infiltration and soil water retention capacity. Such processes are critical in arid and semi-arid areas with projected rainfall variability and likely increase in frequency and intensity of droughts. Mulches for example protect the soil surface from extreme temperatures and greatly reduce surface evaporation, which is particularly important in tropical and subtropical climates. Research shows that conservation agriculture saves 20–30 per cent of irrigation water because of lower evaporation losses from surface as surface is covered with residue.[27] In Zimbabwe, inter-cropping and rotational cropping resulted in an increase of up to 331 per cent in water infiltration.[28] CA has demonstrated to contribute to increasing of crop yields. In Kenya yields in maize, wheat, potato, and bean were 50-200 per cent higher in CA than in conventional systems.[29] Cover crops (grass or legumes in rotation between regular crops) can help alleviate drought stress by increasing water infiltration rates and soil moisture. They can also improve soil quality by increasing soil organic matter and reducing erosion. Cover crops help reduce the effects of extreme radiation, extreme rainfall and strong winds.[30]

2. Cross-slope barriers are farm-scale traditional measures on sloping lands in the form of earth or soil bunds, stone lines, and vegetative strips. These reduce runoff velocity and soil loss in the case of an extreme rainfall event, thereby contributing to soil, water and nutrient conservation. Terraces and vegetative strips are suitable in subhumid to humid areas for protection against soil erosion, whereas in semi-arid areas they are mainly used for water conservation purposes. In Ethiopia the adoption of terraces increase sorghum yield by between 127 per cent and 175 per cent depending on the slope.[31] In Kenya, the use of Napier grass contour hedges has been shown to be effective in reducing soil loss by forming barriers that slow runoff and capture sediments protecting soil aggregates from direct raindrops and improving soil structure.[32]

3. Agroforestry is an increasingly prominent example of an effective NbS for adaptation at landscape level.[33] The practice involves deliberate growing of woody perennials in association with food crops

[27] Kumar, S. et al 2016. Conservation Agriculture and Climate Change: An Overview. Book: Conservation Agriculture: An Approach to Combat Climate Change in Indian Himalaya.
[28] Thierfelder C, Cheesman S, Rusinamhodzi L., 2012. A comparative analysis of conservation agriculture systems: benefits and challenges of rotations and intercropping in Zimbabwe. Field Crops Res 137:237–250.
[29] Kaumbutho, P. and J. Kienzle (editors). 2007. Conservation agriculture as practiced in Kenya: two case studies. Nairobi. African Conservation Tillage Network, Nairobi; CIRAD, Paris; and FAO, Rome.
[30] Vignola, R. et al. 2015. Ecosystem-based adaptation for smallholder farmers: Definitions, opportunities and constraints. Agriculture, Ecosystems, Environment, Volume 211.
[31] Alemayehu M., F. Yohannes, and P. Dubale. 2006. Effect of Indigenous Stone Bunding (KAB) on Crop Yield at Mesobit-Gedeba, North Shoa, Ethiopia. Land Degrad. Develop. 17: 45–54 (2006).
[32] Angima SD, Stott DE, O'Neill MK et al. 2002. Use of calliandra-Napier grass contour hedges to control erosion in central Kenya. Agric Ecosyst Environ 91:15–23.
[33] World Agroforestry Centre. 2008. Agroforestry for food security and healthy ecosystems. World agroforestry centre annual report 2007-2008. Nairobi, Kenya. Available online at http://apps.worldagroforestry.org/downloads/Publications/PDFS/RP15815.pdf

(e.g. coffee plantations) and pastures. Agroforestry systems can maintain and enhance yields, maintain, or improve soil fertility, regulate soil moisture content, control erosion, enhance pollination, and supply food (e.g., fruits and nuts), fuelwood, fodder, medicines, and other products.[34] Agroforestry has shown to effectively improve soil moisture, increase water infiltration, and improve water storage capacity. In Uganda, the use of Sesbania and Alnus plants, increased soil water content by 9 – 18 per cent. Research in Ethiopia has shown that agroforestry has the potential to buffer maize yield losses for areas projected to have yield losses under climate change. It is estimated that 20 per cent agroforestry shade is able to reduce maize yield loss by 11 per cent(RCP8.5).[35]

4. Silvopasture is a subset of agroforestry, which integrates trees with pasture with the aim of increasing pasture quality and produce fodder while also protecting soils and vegetation. Silvopastoralism has proved to be more adaptive to drought, than pastures because foliage production from trees and shrubs is less affected by varying precipitation, temperature and other climatic variables thus enabling farmers to sustain livestock production even in extreme weather conditions.[36] Additionally, the use of woody fodder species in a silvopastoral system increases the fertility of grazing lands by providing suitable conditions for grasses and improving micro-sites for grass growth in the event of prolonged dry periods.[37]

5. Slope terracing can reduce slope steepness by dividing the slope into smaller, gently sloping sections resulting in reduced soil and water loss. Terracing may intercept rainfall and mitigate flood peak discharge efficiently, reducing both runoff and sediment loss, on average, by over 41.9 per cent and 52 per cent, respectively. In El Gouazine hill reservoir, central Tunisia, tilled contour bench terraces reduced runoff with up to 75 per cent.[38] Box 5 describes an IsDB resilient project investment in Chad, that seeks to increase food security by improving food production through promoting slope terracing as a hybrid technique that both protects against soil erosion and retains water in drought periods. A similar example of slope terracing in Indonesia, demonstrated the need for an integrated approach to address climate vulnerabilities at a farm and landscape level.

Even when NbS are being implemented at a farm-scale, it is important to plan for upscaling to landscape scale. An integrated and multi-scale approach to NbS has a high potential to provide multiple direct and indirect benefits, which contribute to building resilient livelihoods. An additional set of NbS for adaptation at landscape level that can contribute to securing water availability in the agriculture sector include reforestation and the conservation of forests, wetland restoration and rainwater harvesting. These NbS are further discussed in Section 6, on NbS for the water sector.

[34] Kuyah S, Öborn I, Jonsson M et al. 2016. Trees in agricultural landscapes enhance provision of ecosystem services in Sub-Saharan Africa. journal has since changed name to Ecosystems and People 12:255–273.
[35] Chemura A, Yalew AW and Gornott C., 2021. Quantifying Agroforestry Yield Buffering Potential Under Climate Change in the Smallholder Maize Farming Systems of Ethiopia. Front. Agron. 3:609536.
[36] Papanastasis, V. P., Yiakoulaki, M. D., Decandia, M., & Dini-Papanastasi, O. (2008). Integrating woody species into livestock feeding in the Mediterranean areas of Europe. Animal Feed Science and Technology, 140, 1–17
[37] Moreno, G., & Obrador, J. (2007). Effects of trees and understorey management on soil fertility and nutritional status of holm oaks in Spanish dehesas. Nutrient Cycling in Agroecosystems, 78, 253–264.
[38] Deng, C. et al. 2021. Advantages and disadvantages of terracing: A comprehensive review. International soil and water research. Vol 9:3.

The IsDB seeks to enhance the role of NbS in the agricultural sector via its Agriculture and Rural Development Policy and its Implementation Strategy 2020-2025, which aims to build productive, resilient and Climate-smart Agriculture. The Strategy promotes conservation agriculture that includes minimum or no-tillage of soils; forestry and agroforestry programs as well as crop residues management (e.g., conversion of rice straw to livestock feed instead of burning, a common practice currently among farmers).

Box 5. Case study: CHAD – BUILDING RESILIENCE TO RECURRING FOOD INSECURITY

Chad is among the most food insecure countries in Africa. Approximately 30 per cent (700,200 households) of the population is severely food insecure and more than 20 per cent are moderately food insecure. In 2012, 3.6 million people nationwide were affected by a food and nutrition crisis linked to poor harvests, poor distribution of rainfall and water deficit. This reduced the cultivated surface areas by 43 per cent and 18 per cent, respectively in the Sahelian and the Sudanese zone, compared to the previous year. This resulted in a reduction of 40 per cent and 28 per cent in cereal production and other crops respectively, thus severely impacting food security.

The IsDB project seeks to help 2.6 million people out of chronic food-insecurity and enable Chad's agriculture, livestock and fisheries sectors to better absorb the climate impacts, thereby contributing to building economic resilience of vulnerable farmers. The project promotes water harvesting through *Soil and Water Conservation Schemes*. The *Schemes* consist of a set of hybrid solutions combining grey infrastructure with NbS. They include the installation of ten water retention structures for rainwater control made of masonry walls that are 150-300m in length and 0.50m high, together with stone contour stones barriers covering the watershed of the wadis for terracing and land grading to reduce the erosion and enable the retention of run-off.

Box 6. Case study: INDONESIA – DEVELOPMENT OF INTEGRATED FARMING SYSTEMS IN UPLAND AREAS PROJECT

This project is implemented in seven provinces of Indonesia, namely Banten, West Java, Central Java, East Java, West Nusa Tenggara, North Sulawesi, and Gorontalo.

To improve resilience and water supply, the project will assist farmers to invest in water storage ponds, shallow wells, small weirs of around 14,000 ha. Additionally, soil and water conservation approaches to reduce the risk of erosion and landslides will enhance the resilience of the farmers and their lands. Activities include terracing and contouring, the use of soil bio-engineering stabilizers such as mulches and the strategic planting of agroforestry trees and shrubs including perennial horticultural crops.

Read more: www.isdb.org

6. NATURE-BASED SOLUTIONS FOR ADAPTATION IN THE WATER SECTOR

6.1 CLIMATE IMPACTS ON THE WATER SECTOR

Climate change makes the availability of water in many regions uncertain in the future. It is expected to affect precipitation, runoff and snow/ice melt, with effects on the hydrological system as well as on water quality, water temperature and groundwater recharge (see Figure 5). Climate change will also significantly impact sea level with potential impacts on the salinity of surface and groundwater in coastal areas. Surface water and groundwater resources are likely to substantially decrease in most dry subtropical regions.[39] Climate projections suggest an increase in the frequency and magnitude of meteorological and agricultural droughts in already arid and semi-arid areas by the end of the 21st century. Such changes will likely intensify competition for water among agriculture, urban settlements, industry, and energy production, thus potentially affecting regional water and food security.

Water insecurity is already a major constraint for sustainable development and poverty reduction.[40] At present, extreme water shortages or scarcity affect almost 1.2 billion people globally, and this number is projected to increase to 3.5 billion people by 2050.[41] The most affected people live in Southern Asia (520 million people) and Eastern and South-eastern Asia (460 million people).[42] On the other hand, by 2050, the number of people at risk of floods will increase from 1.2 billion to 1.6 billion. Evidence shows that a fifth of the world's water basins have recently been affected, with newly inundated land indicating flooding; or rapid declines in surface water area indicating drying up of lakes, reservoirs, wetlands, floodplains, and seasonal water bodies.[43]

Climate change will impact the water sector in diverse ways. A critical direct impact of climate change is the increased quantity and intensity in precipitation which may cause significant increases in runoff, resulting in flooding, especially in urban and peri-urban setting.[44] Similarly, a decrease in precipitation frequency will likely result in reduced surface water availability affecting agricultural production (as described in Section 5) and reduced access to freshwater for urban and peri-urban areas. Indirect impacts may relate to market disturbance as a result of the direct climate impacts. For example, heat waves could result in a short-term spike in water demand, thus putting pressure on the water supply system.

Climate change impacts for the water sector are expected to be significant both in rural and urban areas. It is estimated that of the total global population, 68 per cent will live in cities by 2050, up from 55 per cent in 2018.[45] As urban populations grow and climate change affects rainfall patterns, people are

[39] Jiménez Cisneros, B.E., T. Oki, N.W. Arnell, G. Benito, J.G. Cogley, P. Döll, T. Jiang, and S.S. Mwakalila, 2014: Freshwater resources. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.
[40] UNDP, 2014. Human Development Report. Sustaining Human Progress: Reducing Vulnerabilities and Building Resilience
[41] FAO, 2020. The State of Food and Agriculture 2020. Overcoming water challenges in agriculture. Rome.
[42] FAO, 2020. Footnote 43
[43] UN-Water, 2020: Summary Progress Update 2021 – SDG 6 – water and sanitation for all. Version: 1 March 2021. Geneva, Switzerland.
[44] FAO, 2020. Footnote 43.
[45] https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html

at growing risk of urban flooding. Rapid urbanization often results in informal urban and peri-urban in areas with high flood risk, such as floodplains and riverbanks, exposing the urban poor to a higher risk of floods. Average global flood losses in major coastal cities are expected to increase from $6 billion per year in 2005 to $52 billion per year by 2050.[46] While section 4 focused on water-related climate impacts in rural areas and the agricultural sector in particular, this section focuses on the water-related climate impacts in urban and peri-urban settlements. Such impacts include (See figure 5):[47]

- Heavy rainfall in low-drainage urban areas poses flood hazards and overwhelms water infrastructure systems, resulting in overflows that expose city residents to health risks.
- Saltwater intrusion into groundwater sources due to sea-level rise affects freshwater aquifers.
- More extended dry periods are likely to reduce groundwater recharge, lower minimum flows in rivers and affect water availability for agriculture, drinking water supply, manufacturing and energy production.

Figure 5. Climate hazards and impacts in the water sector

TEMPERATURE INCREASE

- Increased evaporation and glacial melting; decreased seasonal snowpack
- Increased water demand

SEA-LEVEL RISE AND STORM RISE

- Increased salinity of water and soils in coastal areas
- Increased risk of coastal flooding
- Sewage system overflows and exposes city residents to health risks

INCREASE IN PRECIPITATION OR FREQUENCY OF EXTREME PRECIPITATION EVENTS

- Increased run-off and soil erosion
- Larger sediment loads may result in more rapid sedimentation of storage reservoirs

DECREASING PRECIPITATION AND DROUGHT

- Reduced streamflow and inflows to reservoirs and aquifers

[46] Hallegatte, S. et.al. 2013. Future Flood Losses in Major Coastal Cities. Nature Climate Change 3(9):802-806.
[47] P.R. Shukla, Footnote 26.

6.2 THE POTENTIAL OF NBS IN ENHANCING THE RESILIENCE OF THE WATER SECTOR

NbS for adaptation in the water sector can be used in urban, peri-urban or rural areas. In rural areas NbS essentially focus on increasing the water availability for agricultural production and protection from floods and landslides, which were described in Section 4. In response to the current water-related climate impacts and climate projections, urban and peri-urban areas are rethinking their approaches to flood risk management and access to drinking water. Alongside continuing investment in traditional grey infrastructure (e.g. flood walls, barriers, lined drainage channels, underground pipes and detention tanks), many cities are transitioning from solely flood defence to greater water resilience by implementing NbS in the form of green infrastructure.

To address water-related climate impacts in an urban and peri-urban setting, NbS can be implemented in catchment areas or in the urban areas themselves. The catchments are where the source of water is located and stored and serve to regulate downstream flows (and groundwater recharge) and thus moderate the variations in water supply and address water scarcity during dry periods.[48] NbS in the urban and peri-urban areas aim to regulate the urban water flow during floods or droughts including by enhancing water infiltration and rainwater storage. NbS for adaptation in the water sector aim to:

- **Moderate extreme flood events:** NbS can be used to control riverine and coastal floods. Specifically:
  - **For riverine flood control,** NbS can increase the water retention capacity in watershed and urban areas and thus reduce downstream flooding, reduce flow velocity and create space for the river - for example, through riparian buffers, reconnecting rivers to floodplains and constructing wetlands.
  - **For coastal flood protection,** NbS can reduce shore erosion through natural breakwaters that can absorb the energy of the waves or prevent saltwater intrusion by storing stormwater and reducing inundation—for example, through protecting/restoring mangroves, coastal marshes and dunes.
  - **Urban stormwater runoff:** Reduce the risk of sewer overflow and contamination of water by facilitating infiltration and storage of stormwater, thereby minimizing excessive stormwater runoff—for example, through water harvesting and permeable pavements.
- **Regulate water supply during droughts:** NbS can sustain and increase water supplies by increasing the water infiltration and storage capacity of wetlands and soils and increasing the recharge of aquifers. For example, through reforestation, afforestation and forest conservation, wetlands conservation and restoration, the creation of wetlands and water harvesting.

Figure 6 provides an overview of the role of NbS for adaptation to moderate climate extreme events and reduce impacts to the water sector with focus on the urban settings.

[48] Matthews, J., Matthews, N., Simmons, E., & Vigerstol, K. 2019. Wellspring: Source Water Resilience and Climate Adaptation. Arlington, VA: The Nature Conservancy.

Figure 6. Climate change hazards and impacts in the water sector and the potential of NbS to build resilience in the sector

CLIMATE CHANGE HAZARDS	CLIMATE IMPACTS	NATURE-BASED SOLUTIONS FOR ADAPTATION
TEMPERATURE INCREASE	• Increased evaporation and glacial melting; decreased seasonal snowpack • Increased water demand	**12** Rainwater harvesting
SEA-LEVEL RISE AND STORM RISE	• Increased salinity of water and soils in coastal areas • Increased risk of coastal flooding • Sewage system overflows and exposes city residents to health risks	**14** Protecting/restoring mangroves, marshes and dunes * *NbS described in Section 6
INCREASE IN PRECIPITATION OR FREQUENCY OF EXTREME PRECIPITATION EVENTS	• Increased run-off and soil erosion • Larger sediment loads may result in more rapid sedimentation of storage reservoirs	**6** Wetland restoration/conservation **7** Refforestation, afforestation and forest conservation **8** Riparian buffers **9** Permeable surface **10** Green roofs **11** Green areas
DECREASING PRECIPITATION AND DROUGHT	• Reduced streamflow and inflows to reservoirs and aquifers	**6** Wetland restoration/conservation **7** Refforestation, afforestation and forest conservation **12** Rainwater harvesting

NbS options include:

6. Wetland restoration/conservation is the renewal of wetlands and their functions that have been drained or lost as a result of human activities. Wetlands have the capacity to store large amounts of water, and release it slowly, which is a vital feature in the natural regulation of water quantity during periods of droughts and floods. Wetlands can moderate the speed of flood waters, minimizing the potential flood damage downstream and increase resilience to storms, thereby avoiding potential damage to grey infrastructure and human lives. In periods of drought, they can function as "retention basins", providing water through slow release of the stored water.

7. Reafforestation, afforestation and forest conservation The first two involve the planting of trees on recently forested areas or areas where there has not been forests for a long time. Forest conservation involves maintaining forests on lands that would otherwise be converted to other land uses. Forest areas in the upper catchments can increase water retention and stabilize slopes, thus reducing the risks caused by storms. Trees increase infiltration, and the ability of soils in forest areas to store more water and release it through evaporation helps in regulating the water quantity during extreme weather events.[49] Forests can also reduce the likelihood (or frequency) of landslides, mudflows and avalanches, which can cause extensive damage to infrastructure and inhabited areas vulnerable to floods.[50] Box 7 describes the role of adopting a resilient catchment approach including afforestation and reforestation measures to secure water in Freetown in Sierra Leone.

8. Riparian buffers are vegetated areas adjacent to rivers, lakes and other waterways to stabilize banks and prevent erosion. During flood events, riparian vegetation slows down runoff by absorbing excess water, reduces peak flow and helps to mitigate potential flood damage downstream.

9. Permeable surface allows for water infiltration in contrast to the conventional pavement and drainage systems which use materials such as asphalt and concrete and are impervious surfaces, preventing infiltration and thus leading to floods following heavy rainfall. Permeable surfaces are made of materials that allow for the water to infiltrate, be filtered and recharge groundwater. For example, small-scale NbS have been found to reduce run-off by 30 to 65 per cent for porous pavements, up to 100 per cent for rain gardens or up to 56 per cent for infiltration trenches, thus reducing risk of flooding and overflow of sewage systems.[51] Box 8 with case study in Mozambique, demonstrates the use of natural drainage systems in the City of Beira to address urban coastal flooding.

10. Green roofs are roofs that are fully or partially covered with vegetation. They can contribute to regulating water quantity in cities by reducing storm runoff and thereby preventing floods from overburdening sewers. Green roofs can reduce the annual roof

[49] Doswald, N. Munroe, R., Roe, D., Guiliani, A., Castelli,I., Stephens, J., Moller, I, Spencer, T., Vira, B. & Reid, H. (2014), Effectiveness of ecosystem-based approaches for adaptation: review of the evidence-base, Climate and Development,
[50] Renaud, F.G., Sudmeier-Rieux, K. and Estrella, M.(eds) (2013), The role of ecosystems in disaster risk reduction. United Nations University Press, New York.
[51] Ruangpan, L., et al., 2020, 'Nature-based solutions for hydro- meteorological risk reduction: a state-of-the-art review of the research area', Natural Hazards and Earth System Sciences 20(1).

stormwater runoff by up to 50 to 60 per cent through retention of up to 90 per cent of runoff from smaller storms (up to 25mm), and at least 30 per cent for large storms.[52]

11. Green areas refer to areas of land that are partly or completely covered with grass, trees or other types of vegetation to help deal with stormwater runoff in the presence of large areas of impervious surfaces. The reduced stormwater runoff helps to mitigate flooding and sewer overflows by slowing down the runoff flow and improving the groundwater recharge through the enhanced water infiltration.

12. Rainwater harvesting helps with the redirection of rainwater and stormwater runoff, and provides storage for productive use (agriculture, drinking water and more). There is a wide variety of rainwater harvesting techniques, and the choice of a solution depends on the area available for catchment, as well as intended end use. In urban settings, water harvesting uses systems where rainwater is captured in areas external to the final water storage. Reservoirs in this case include natural soil surfaces, rooftops, roads and pavements. Water is stored in natural or artificial reservoirs, with little or no infiltration capacity. Box 9 describes methods for rainwater harvesting to secure water availability in Eastern Kenya.

A strategic objective of the IsDB's Urban Sector Policy and its Operational Strategy 2021-2025 is to enhance urban resiliency to climate and human induced disasters, while reducing cities' carbon footprint and safeguarding the environment (Strategic Objective 5). IsDB supports cities in the development and implementation of local climate action plans, city resilience plans and related local policies, emphasizing the need for NbS to build urban resilience. NbS options include the development or rehabilitation of public parks, recreational areas, community gardens for flood protection, coastal protection and improvement of urban water supply, among others.

[52] Foster, J., Foster, H., Lowe, A., and Winkelman, S. (2011). The Value of Green Infrastructure for Urban Climate Adaptation, The Center for Clean Air Policy, (February).

Box 7. Case study: SIERRA LEONE – NBS IN INTEGRATED INFRASTRUCTURE DEVELOPMENT

Freetown, the capital city of Sierra Leone, is facing an acute shortage of water supply as well as difficulties with rainwater drainage and solid and liquid waste management infrastructure. This situation is due to rapid population growth combined with weak city planning and delays in investment in social and economic infrastructures in the last two decades caused by the protracted civil conflict. Potable water is provided for an average of 3 days per week, covering less than 50 per cent of the population, and in certain areas potable water is rationed with almost no customers getting a 24-hour supply. Climate change is posing an additional risk to the water security for the population.

The IsDB's project "Freetown WASH and aquatic environment revamping project" focuses on the conservation of the Western Area Peninsular in order to secure the source of water for the city. Actions to achieve this include the identification and nurturing of appropriate species of trees (and other vegetation) to enable regeneration of the degraded areas. In parallel, measures have been designed to ensure that the communities living along the boundary of the protected area become the primary guardians of the watershed and promoted good practices in community forestry resources management.

Box 8. Case study: MOZAMBIQUE – GREEN SOLUTIONS FOR URBAN RESILIENCE TO FLOODS

Beira is considered to be the most exposed city in Mozambique to current and future climate risks. Rising sea level is gradually contributing to severe erosion along the coastline adjacent to the city centre. High groundwater tables, tropical cyclones and severe storms regularly cause severe flooding in the city. These have a particular impact on poorer households in the lowest-lying areas of the city. Encroachment of urban development into mangroves, existing green spaces and areas that help drain the city are exacerbating exposure to climate risks by reducing storm protection and downward infiltration of rainwater, thus increasing flooding. Through the World Bank's Cities and Climate Change Project - Pilot Program for Climate Resilience of Mozambique aims to strengthen the municipal capacity and implement green urban infrastructure such as natural drainage areas to manage flood risks. The stormwater drainage system has been rehabilitated, resulting in a 70 per cent reduction in the risk of urban flooding. Upgrades include the:

1. Rehabilitation/ construction of 11 km of natural drainage canals.
2. Installing flood control stations.
3. Constructing a large water retention basin.

Box 9. Case study: KENYA – ENHANCING WATER SECURITY USING ANCIENT METHOD FOR RAINWATER HARVESTING

Approximately 884,000 people that live in the semi-arid Makueni County in Eastern Kenya suffer from severe water and food insecurity. Subsistence farming is the prevailing form of agriculture (95 per cent) with more than 60 per cent of the population living in poverty. Poor access to water in rural areas forces people, especially women and children, to walk for several hours to collect water. Climate projections show that this situation will be aggravated in the next decade. The NbS interventions to address water scarcity include a sand dam revitalization and a cost-effective rainwater harvesting technique combined with terracing (1622 km) and agroforestry systems (958,000 trees planted). Sand dams have demonstrated the potential to supply water non-stop to 91 per cent of households. In parallel, agro-ecological techniques increased soil moisture and enabled small-scale irrigation to expand the growing season.

Read more: FAO

7. NATURE-BASED SOLUTIONS FOR ADAPTATION IN THE TRANSPORT SECTOR

7.1 CLIMATE IMPACTS ON THE TRANSPORT SECTOR

The transport sector plays a central role both in building countries' resilience and in disaster response. When floods, landslides and other hazards affect roads, they compromise access and safety for road users and people living in affected areas.[53]

Climate change is expected to cause local changes in average and extreme temperatures and changes in rainfall patterns, duration, and intensity. Current and future extreme events can reduce mobility and damage critical infrastructure. In coastal areas, storm surges and sea-level rise put critical infrastructure at risk. Additionally, increased wind strength can damage the transport infrastructure in multiple ways. These impacts may fall most heavily on vulnerable populations, particularly in areas where the availability of alternative routes or other transport options is limited. Climate impacts to the transport sector include (See Figure 7):[54]

- Landslides and mudflows onto roads result in road closures as well as human and social risks.
- Debris flows and rock falls reduce road safety, damage infrastructure, and cover roadways, which reduce both mobility and returns on investments.
- Floods can cause river channels to migrate, particularly in alluvial fans, damaging stream crossings.
- Increased salinity increases corrosion of materials, which can cause premature failure.
- Roadways are eroded by increased wave action.
- Increased flooding can result from overtopping of roadways by seawater, or saltwater intrusion into groundwater, leading to subsurface flooding.
- Increased wave action induces scouring and collapse of abutments and embankments.

Figure 7. Climate hazards and impacts in the transport sector

SEA-LEVEL RISE AND STORM RISE	INCREASE IN PRECIPITATION OR FREQUENCY OF EXTREME PRECIPITATION EVENTS	INCREASING FREQUENCY AND MAGNITUDE OF STORMS
• Increased salinity of water and soils in coastal areas • Increased risk of coastal flooding	• Increased run-off and soil erosion • Road damage and inability to access or safely use roads • Damage to bridge structures; increased scour and erosion of bridge foundations • Increased risk of land/mudslides, wich can damage roads and make them temporarily impassable	• Possible wind damage to roadway infrastructure; service disruption if winds leave trees or other debris on road • Increased water demand

[53] UNECE, 2020. Climate Change Impacts and Adaptation for Transport Networks and Nodes. Geneva.
[54] IsDB, 2020. Transport Sector Climate Change Adaptation. Guidance Note. Available at: https://www.isdb.org/sites/default/files/media/documents/2020-09/Transport per cent20Sector per cent20Climate per cent20Change per cent20IsDB per cent20Guidance per cent20note per cent20Note per cent20-Print per cent20version.pdf

7.2 THE POTENTIAL OF NBS IN ENHANCING THE RESILIENCE OF THE TRANSPORT SECTOR

NbS can play an important role in building resilience to climate change of infrastructure.[55] Combining NbS with grey infrastructure can decrease risks from climate hazards, improve long-term performance and decrease maintenance costs. In particular, NbS for adaptation in the transport sector aim to:

- **Protect from floods (riverine and coastal) and landslides:** NBS have a high potential to protect road infrastructure from hazards, in particular floods and landslides, and enhance road's long-term performance. NbS are very suitable for the protection of coastal road infrastructure. They can reduce the impacts from coastal storm surges by implementing beach nourishment and stabilization and restoration of dunes.

NbS for adaptation at landscape-level (described in sections 5 and 6), that extend well beyond the road infrastructure are important to moderate water flow of rivers and soil erosion and thus protect the roads. In particular, upslope reafforestation/afforestation, wetland restoration/conservation, protection of coastal vegetation and dunes, among others. Figure 8 provides an overview of the role of NbS for adaptation to protect the road infrastructure from climate extreme events such as floods and landslides.

Figure 8. Climate change hazards and impacts in the transport sector and the potential of NbS to build resilience in the sector

CLIMATE CHANGE HAZARDS	CLIMATE IMPACTS	NATURE-BASED SOLUTIONS FOR ADAPTATION
SEA-LEVEL RISE AND STORM RISE	• Increased salinity of water and soils in coastal areas • Increased risk of coastal flooding	**14** Protecting/restoring mangroves, marshes and dunes
INCREASE IN PRECIPITATION OR FREQUENCY OF EXTREME PRECIPITATION EVENTS	• Increased run-off and soil erosion • Road damage and inability to access or safely use roads • Damage to bridge structures; increased scour and erosion of bridge foundations • Increased risk of land/mudslides, wich can damage roads and make them temporarily impassable	**7** Reafforestation, afforestation and forest conservation* **8** Riparian buffers * **13** Stabilization of roadside slope *NbS described on section 5
INCREASING FREQUENCY AND MAGNITUDE OF STORMS	• Possible wind damage to roadway infrastructure; service disruption if winds leave trees or other debris on road • Increased water demand	**7** Reafforestation, afforestation and forest conservation* *NbS described on section 5

[55] IDB, 2019. Nature - Based Solutions: Increasing Private Sector Uptake for Climate - Resilience Infrastructure in Latin America and the Caribbean.

NbS options include:

13. Stabilization of roadside slopes with grassland and forests will manage the runoff and soil erosion thus protecting the road from the risk of a landslide. For example, native grasses restored along roadsides for erosion control and flood regulation as shown in Box 10 describing experience of eco-engineering techniques for road protection in Nepal.

14. Protecting/restoring mangroves, marshes and dunes: Coastal wetlands, such as mangroves and salt marshes, can stabilize coastlines by trapping sediment with their root systems, and with their dense vegetation reduce wave height and velocity. Salt marshes can reduce non-storm wave heights by an average of 72 per cent, and mangroves, by 31 per cent.[56] Average restoration costs for salt marshes and for mangroves can be two to five times cheaper to than to construct submerged breakwaters for wave heights of up to half a meter. Model suggests that a 10-yearold mangrove forest in a 500m wide belt could reduce tsunami hydrodynamic force by approximately 70 per cent for an incident wave of 3.0m inundation depth with a wave period of 40 minutes at the shoreline. When tsunami inundation depth exceeded 4.0m, the forest was mostly destroyed.[57]

Box 10. Case study: NEPAL – Eco-safe roads

Due to its mountainous features, many areas in Nepal have high rate of natural erosion and the transport and deposition of sediments is high, which combined with climate change effects results in landslides damaging the road network. The Ecosystems Protecting Infrastructure and Communities (EPIC) project led by IUCN, had the objective to establish demonstration sites for reducing landslide instabilities along roadsides using eco-engineering techniques including reforestation and slope stabilization. The experience has demonstrated successfully that eco-safe roads — an ecosystem-based approach to disaster risk reduction — are cost-effective and locally adapted, with great potential for reducing risk while increasing the resilience of communities living in landslide-prone areas.

Read more: IUCN

[56] Narayan S, Beck MW, Reguero BG, Losada IJ, van Wesenbeeck B, Pontee N, et al. 2016. The Effectiveness, Costs and Coastal Protection Benefits of Natural and Nature¬Based Defences. PLoS ONE 11(5).
[57] Yanagisawa, H., S. Koshimura, T. Miyagi, and F. Imamura. 2010. "Tsunami Damage Reduction Performance of a Mangrove Forest in Banda Aceh, Indonesia Inferred From Field Data and a Numerical Model." Journal of Geophysical Research: Oceans 115(C6), C06032.


© IsDB

8. ISDB ROLE IN ENABLING THE SCALING-UP OF NBS FOR ADAPTATION

Enhancing the implementation and scaling-up on NbS for adaptation requires a set of enabling conditions, including a financing mechanism to unlock additional finance for NbS and ensure its sustainability. MDBs have an important role to play in enabling the market for NbS by developing and deploying innovative instruments to finance NbS.

Innovative finance mechanisms include Green Bonds and Green Sukuk. These can mobilize resources from domestic and international capital markets for climate change adaptation, renewables, and other environment-friendly projects. They operate in the same way as conventional bonds but the proceeds can only be invested in projects that generate environmental benefits, which could include NbS. Examples include the USD 95 million sustainable “landscape” bond issued by the Tropical Landscape Finance Facility (TLFF) to finance a sustainable natural rubber plantation in Indonesia.[58]

The IsDB has developed in 2019 its Sustainable Finance Framework, which was created in line with the Green Bond Standards, Social Bond Standards and Sustainability Bond Guidelines published by the International Capital Market Association (ICMA). This Finance Framework enables the Bank to diversify its sources of funding, while enhancing IsDB’s sustainability profile as well as helping the Bank to continue to deliver environmentally sustainable growth in a socially responsible and transparent manner. The Framework, under which IsDB can issue Green (funds allocated to green projects only) or Sustainability Sukuk (funds allocated to green and social projects). See Box 11 for details on the green project categories.

Additionally, different ways in which IsDB seeks to actively engage in leveraging funds for NbS include:

- **Mobilize.** Developing and deploying innovative finance mechanisms, including the green sukuk, green-focus crowd-funding initiatives and philanthropy donor mobilization for green initiatives.
- **Broaden funding support.** Ensure instruments that address funding and financing gaps in NbS projects, including those that employ results-based financing approaches.
- **Partnering with local financial institutions**. Partner with local actors interested in expanding their green portfolios and help them develop and publicize NbS-related pilots, case studies, and products.
- **Support the access to climate finance.** Work with governments to combine climate finance with large conventional loans to create opportunities for effective demonstration of NbS. Seeking the integration of NbS into project pipelines for climate finance vehicles such as the Adaptation Fund, Global Environment Facility, the International Climate Initiative (IKI), and the Green Climate Fund.

[58] Tropical Landscape Finance Facility: https://www.tlffindonesia.org

Box 11. Green project categories under the Sustainable Finance Framework

Green project categories refer to environmentally sustainable management of natural living resources and land use. For example:

- Interventions on climate smart agriculture encouraging afforestation and agroforestry
- Reforestation and sustainable forest management activities that increase carbon stocks or reduce the impact of forestry activities
- Preservation or restoration of natural landscapes
- Soil remediation
- Integrated soil fertility management (inorganic and organic)
- Measures to enhance conditions and carrying capacity of existing grazing land to minimize the introduction of new lands into the grazing system (solely if net emission reductions can be demonstrated)

CONCLUSIONS

Using NbS for adaptation measures in development project investments presents a unique opportunity to increase the resilience of assets and services, while delivering important co-benefits that will support communities and the environment. To fully seize the opportunity presented by NbS, it is important to mainstream NbS uptake into the entire project cycle including in the programming, design and formulation, implementation and evaluation phases.

Using the growing momentum for the use of NbS as part of resilience-building strategies and disaster risk reduction, these guidelines offer a step-by-step approach for integrating NbS in overall project design and more specifically in the agriculture, water and transport sectors. This could further support IsDB member countries in including NbS considerations as part of their adaptation plans and strategies, NDCs and long-term climate resilient plans.

About the Islamic Development Bank Group

Rated AAA by the major rating agencies, the Islamic Development Bank is a multilateral development bank that has been working for over 45 years to improve the lives of the communities it serves by delivering impact at scale. The Bank brings together 57-Member Countries across four continents, touching the lives of 1 in 5 of the world population. Its mission is to equip people to drive their own economic and social potential. Headquartered in Jeddah, Kingdom of Saudi Arabia, IsDB has regional hubs and centers of excellence in 11 of its Member Countries. Over the years, the Bank has Bank (IsDB), the Islamic Development Bank Institute (IsDBI) tasked with research and training, the Islamic Corporation for the Insurance of Investment and Export Credit (ICIEC), the Islamic Corporation for the Development of the Private Sector (ICD), and the International Islamic Trade Finance Corporation (ITFC).

The Islamic Development Bank Group

8111 King Khald Street, Al Nuzlah Yamania Unit 1, Jeddah, 22332-2444,
Kingdom of Saudi Arabia

(+966-12) 636 1400

(+966-12) 637 8927

info@isdb.org

www.isdb.org

IsDB
البنك الإسلامي للتنمية
Islamic Development Bank

IsDB
البنك الإسلامي للتنمية
Islamic Development Bank