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Materials on Development Finance

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Nature-based Solutions – what cross-sectoral opportunities for development finance?

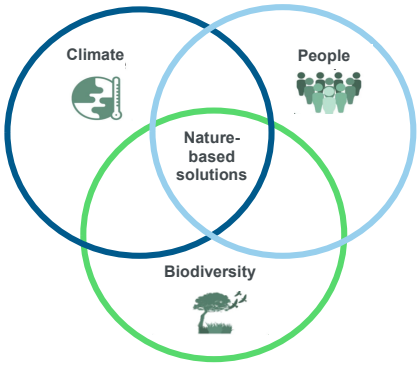
Introduction

Nature-based Solutions (NbS) represent a bundle of approaches to address societal challenges through the sustainable management and use of natural resources. NbS can effectively tackle issues such as climate change, water insecurity, soil degradation, pollution and biodiversity loss. These solutions leverage ecosystem services to provide benefits for both people and the environment. For development banks integrating NbS into investment strategies not only enhances the resilience of society, communities, and enterprises, but also promotes sustainable economic growth and contributes to global objectives including, for example, the Sustainable Development Goals (SDGs), the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC), the Global Biodiversity Framework (GBF) of the Convention on Biological Diversity (CBD) and the Land Degradation Neutrality goal of the United Nations Convention to Combat Desertification (UNCCD).

NbS have become a trend in recent years, characterised by various interpretations. This paper aims to highlight the key dimensions and opportunities of NbS within the context of KfW Development Bank financing.

What are Nature-based Solutions?

Nature-based Solutions are defined as actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits (UNEA resolution 2/2 2022 UNEA Resolution 2/2 2022, based on IUCN 2016). NbS are therefore vital for local livelihoods as well as the resilience of communities across the globe. NbS encompass a variety of practices, including but not limited to reforestation, wetland restoration, and the creation of green urban spaces, as further detailed in this publication.



KfW/Own representation

What are *not* Nature-based Solutions ?

Nature-based Solutions should not be confused with traditional engineering or purely technological solutions. Also, not every "green" solution qualifies as NbS, depending on its effects e. g. on biodiversity or ecosystems. Examples of what are *not* NbS include:

- **Emissions and Pollution Control Technologies:** Mechanical or chemical methods to reduce emissions and other types of pollution that do not leverage natural processes for cleaning air or water.
- **Carbon Capture and Storage:** Engineered solutions aimed at mechanically or chemically capturing CO_2 from emission sources like power and industrial plants and storing it underground in geological formation or utilising it in various products.
- **Hard "gray" infrastructure:**. Dams, levees, and concrete flood barriers, i.a. that do not incorporate natural elements or processes.
- **Monoculture Plantations:** Large-scale agricultural or silvicultural plantations that prioritise a single crop or tree species without regard for biodiversity or ecosystem health.
- **Environmental Social Governance (ESG) compensation measures:** ESG measures such as planting trees that compensate for the destruction of natural ecosystems in the course of a project, e.g. felling trees or draining a wetland for a road or a solar energy plant, are not considered NbS.

For a project to be considered an NbS, it should result in net positive outcomes for nature. NbS should aim to restore, protect, or sustainably manage natural systems in a way that enhances their functionality and benefits both the environment and society. Therefore, simply compensating for damage does not meet the criteria for NbS, unless it leads to overall improvements in ecological health and sustainability.

Solutions for what?

Nature-based Solutions provide effective solutions for a variety of pressing environmental and societal challenges, including:

Climate Change Mitigation: Climate change mitigation requires both reducing greenhouse gas emissions and enhancing carbon sinks through ecosystem conservation and restoration. NbS play a vital role by protecting and restoring ecosystems like forests, wetlands, peatlands, and oceans, which store vast amounts of CO2 and absorb around two-thirds of human emissions. Yet, land-based emissions alone already account for around 20-25% of global emissions. Destroying these ecosystems reduces their carbon storage capacity and risks releasing stored CO2, threatening global climate goals such as the Paris Agreement and Net-Zero targets. Since completely avoiding emissions is unrealistic, NbS are essential to offset residual emissions and support long-term sustainability. Moreover, preserving biodiversity through NbS strengthens ecosystem resilience, creating a positive cycle that benefits both climate mitigation and biodiversity conservation. Therefore, NbS are not just “nice to have” but indispensable for achieving effective climate mitigation (IPCC 2022, Global Carbon Budget 2024).

Climate Change Adaptation & Disaster Risk Reduction: NbS enhance resilience to climate impacts and natural disasters by protecting and restoring ecosystems that buffer against extreme weather events, such as floods, storms, droughts, and heatwaves. Intact ecosystems, due to their genetic diversity, also have a higher adaptability to climatic changes. Sustainable land management practices in agricultural landscapes increase resilience against climate impacts, including fire and soil erosion. NbS can also reduce the risk of natural disasters by restoring ecosystems that provide protective functions, such as mangroves for coastal protection or wetlands for flood regulation.

Water Security: Water security is a critical global problem, as billions of people face challenges in accessing safe and reliable water sources. NbS can improve water quality and availability through natural filtration and flood regulation by restoring natural water cycles, enhancing groundwater recharge, and managing stormwater through green infrastructure. In times of increasing water scarcity, NbS can help secure dwindling supplies of drinking water, as well as water for agricultural and industrial use.

Biodiversity and Habitat Loss: Already, three-quarters of natural land and two-thirds of marine ecosystems have been significantly degraded or destroyed. Healthy ecosystems are essential for the well-being of all life on Earth, including human life. Without a reversal of biodiversity and habitat loss, we will not achieve 80% of the SDGs. Most NbS include key activities in the conservation and restoration of habitats helping to protect endangered species and maintain ecosystem health and functionality.

Soil Degradation and Loss: Approximately one-third of the world's soils are degraded, with annual soil loss estimated at around 24 billion tons. Such soil loss can reduce agricultural productivity, increase sedimentation in waterways, and negatively affect ecosystems, also with adverse impacts for food security. NbS can prevent soil erosion, enhance soil fertility, and improve land productivity.

Food Security: After decades of decreasing food insecurity, world hunger and malnutrition are on the rise again. Sustainable agricultural practices using NbS can play a crucial role to enhance land productivity and food production as well as create more resilient food systems that can better withstand the pressures of climate change and population growth.
Urban Heat and Public Health: Urban heat is a growing issue marked by elevated temperatures in cities due to increased concrete surfaces, reduced vegetation, and human activities. This negatively impacts public health, quality of life, and energy consumption for cooling. Integrating green spaces and vegetation through NbS can mitigate the urban heat island effect, enhance air quality, and improve livability. Additionally, urban green spaces promote mental and physical health by offering recreational opportunities, reducing air pollution, and encouraging active lifestyles.

Poverty reduction: Land and ecosystem degradation cause economic losses by lowering agricultural productivity, raising disaster recovery costs, and reducing access to vital services like clean water and pollination. NbS can lessen these financial burdens, enhance community and ecosystem resilience, and support sustainable economic growth. Investing in ecosystem restoration and sustainable management can also yield significant economic benefits.
Social Equity: Social inequity, like limited land and resource rights, poses significant challenges to communities. NbS that use participatory approaches promote inclusion, ensuring that ecosystem benefits are shared broadly. This supports sustainable livelihoods and fosters local ownership. In this context, rewarding the provision of ecosystem services by marginalised communities that adopt sustainable practices and give up land uses with high environmental externalities, is part of a *Just Transition*, particularly in the land use sector.

Agroforestry in Central America restores degraded landscapes, protects biodiversity and provides livelihoods for localindigenous communities. KfW/Jonas Wresch

How do NbS look like in different sectors?

Biodiversity Conservation: NbS can focus on restoring habitats such as forests, wetlands, and grasslands through measures like tree planting, rewetting peatlands, and enhancing natural regeneration (e.g., seed dispersal). These restoration efforts support wildlife, improve ecosystem services like pollination, and boost climate resilience. Involving local communities in sustainable practices strengthens these outcomes and connects ecological health with social well-being. NbS are particularly impactful not only within protected areas and their buffer zones but also beyond, including agriculture and forest lands, water catchments, coastal and marine ecosystems, and urban settings.
Agriculture: Nature-based solutions in agriculture, often rooted in traditional and organic practices, are now recognised as effective ways to repair damage from unsustainable farming. Agroecological and conservation agriculture practices like agroforestry, cover cropping, low-tilling, and biofertilizers enhance productivity, improve soil health, prevent soil erosion, boost biodiversity, increase climate

resilience, and help create larger carbon sinks.

Water Sector: NbS and “green infrastructure” are increasingly popular in the water sector, as they can increase water availability and quality and help manage water-related disaster risks. NbS can enhance water availability in watersheds and supply systems by managing precipitation, soil moisture, and water storage. This improves the quantity, timing, and location of water for various uses. Ecosystem-friendly water storage methods include natural wetlands, reforestation, and efficient groundwater recharge. NbS can also improve water quality by protecting source water. Well managed forests, wetlands, and grasslands improve soil conditions and regulate water quality by reducing sediment, capturing pollutants, and recycling nutrients. In water infrastructure projects, NbS can reduce investments and also operation costs through erosion control that reduces sedimentation or complementary wastewater treatment steps such as constructed wetlands. For water-related risks such as floods and droughts, NbS include green infrastructure, such as mangroves in coastal areas and gallery forests along rivers, for flood protection and stormwater management, as well as water retention and storage through wetlands and floodplains.

Urban Development: Cities are growing around the world, making NbS all the more important in urban areas. There are many innovations in the fields of urban planning and architecture and Smart City Initiatives are now also incorporating NbS. Sustainable urban drainage systems promote natural drainage before runoff to reduce flood risk and increase infiltration. Urban green infrastructure, such as parks and green strips, tiny forests, rain gardens, green roofs, permeable pavements, and infiltration basements can further enhance urban climate resilience and livability. This improves air quality, reduces heat islands, creates stepping stone habitats for biodiversity and enhances community well-being and social coherence.

Mobility: NbS can reduce environmental mpacts and improve connectivity in mobility projects. In cities, integrating green spaces into public transport infrastructure lowers footprints, improves air quality, and encourages active, low-impact travel. Elements like tree-lined streets naturally cool and purify air. In rural areas, NbS enhance infrastructure resilience. For example, slope stabiliation reduces landslide risks and prolongs infrastructure life. Other applications include green roofs on depots, eco-friendly drainage irrigating nearby vegetation, wildlife bridges for safe crossings, and green railway or tram tracks, which help manage stormwater, cut noise pollution, and beautify transport routes.

Energy: Renewable energy infrastructure - such as solar, wind, and hydropower - can deliver joint benefits for decarbonisation and ecosystem resilience when combined with ecological restoration of degraded landscapes and closed mining areas. Agro-photovoltaic systems and floating solar installations enable renewable generation to coexist with agricultural productivity and aquatic ecosystem rehabilitation, optimising land and water use efficiency. Furthermore, natural resources can be harnessed to develop renewable energy solutions such as bioenergy from agricultural residues and organic waste. Policy instruments can incentivize such multifunctional energy landscapes by linking clean energy deployment with ecosystem service valuation and biodiversity restoration targets.

How are Nature-based Solutions linked to the OECD DAC Biodiversity Marker (BTR)?

NbS are linked with the OECD DAC Biodiversity Marker which identifies projects with the objectives of the Convention on Biological Diversity (**BTR** in the BMZ Reporting System). The Biodiversity marker is crucial for tracking financial flows towards biodiversity-related projects, including those implementing NbS. This includes BTR 1, where biodiversity is a significant co-benefit, and BTR 2, where biodiversity is the primary objective . Not all NbS projects align with the BTR marker. A BTR 1 example for NbS is the installation of urban green roofs designed for energy efficiency and temperature regulation, where biodiversity benefits are significant, but not a primary objective.

Beira/Mozambique: Thanks to a combination of green and structural infrastructure, the city of Beira in Mozambique now has effective flood control. KfW/TPF

Challenges and Risks of Nature-based Solutions

While NbS offer numerous benefits for addressing environmental problems, they also come with a range of challenges and risks:

- **Permanence:** Nature-based solutions like reforestation provide important benefits but may not last forever. For example, a forest can store carbon, but if it’s cut down or damaged later on, the carbon is released again.
- **Land and ressource rights:** Nature-based solutions in rural areas often require significant land and local support to succeed. Participation, transparency, and fair regulation of resource access are crucial to avoid conflicts, especially regarding land rights. If local concerns are ignored, NbS projects can cause community displacement or changes in land use that negatively impact local livelihoods. Proper community involvement helps prevent disputes and can even make NbS a tool for resolving land and resource issues.
- **Ecological risks:** Poorly planned NbS, such as large-scale tree planting with unsuitable species or locations, can disrupt ecosystems by altering hydrology or soil, causing negative ecological effects. NbS like reforestation or urban greenery can also unintentionally promote invasive species that harm native biodiversity and disrupt ecosystems, requiring ongoing management that raises project complexity and costs.
- **Economic viability**: Securing funding for NbS projects can be challenging, particularly in low-income areas, due to high initial costs – even if their long-term benefits are evident. Their economic success often relies on market demand for ecosystem services like carbon credits or sustainable products., e.g. from agriculture or forestry.
- **Evidence and measurability:** Measuring NbS effectiveness is challenging due to limited standard

methods, making it hard to prove impacts on biodiversity and carbon storage for many NbS. Long-term monitoring is needed, but costly. However, advances in digital tech and AI offer new ways to assess and improve NbS, helping to scale successful projects.

Understanding these risks is crucial for the success and sustainability of NbS projects. This underscores the necessity of engaging local communities, ensuring equitable participation, carrying out environmental due diligence, and establishing robust monitoring and evaluation frameworks, to help mitigate some of the above challenges and enhance the effectiveness of NbS initiatives. Following developed NbS principles (SEI 2022 and Nature 2024) and NbS Guidance (e.g. IUCN NbS Global Standard) can support this.

Key Economic Arguments for NbS

Cost-effective infrastructure: NbS in combination with gray infrastructure, can lower costs, extend asset lifespans, reduce the need for additional infrastructure and enhance project sustainability. Green infrastructure and NbS can cut construction, energy and maintenance expenses while boosting property values and saving municipalities money.

Cost-effective climate mitigation solutions: NbS are cost-effective options to mitigate climate change. NbS such as forest protection, reforestation, wetland restoration, and improved land management often have lower costs compared to technological carbon reduction methods and can sequester significant amounts of carbon dioxide.

Climate-resilient Infrastructure KfW already assesses climate risks in its due diligence process. NbS can play an important role in addressing those risks in project design and implementation. Incorporating NbS into infrastructure projects can improve climate resilience and create infrastructure better able to withstand climate impacts.

Access to climate and biodiversity finance: Projects with NbS contribute to global goods such as climate and biodiversity and can therefore provide access points to respective sources of finance. In line with this, a number of development banks are articulating their NbS engagement (e.g. ADB Nature Solutions Finance Hub, AFD, EIB, WB NBS Invest; Global Program on NbS). NbS are already eligible in German climate funds, including the P+ Partnerships, IKLU/DKTI funds and the International Climate Initiative (IKI). The Green Climate Fund and Adaptation Fund also finance programmes with NbS. Biodiversity finance remains a strong commitment by Germany (BMZ) and the push for cross-sectoral biodiversity projects is strong.

Many co-benefits: NbS can further contribute to job and income creation, the reduction of health care costs, sustainably sourced natural resources, the attractiveness of landscapes and urban spaces, and social wellbeing among others.

Opportunities for Innovative NbS Finance

Payments for ecosystem services (PES): KfW has much experience with the development and support to PES schemes, for environmental services such as water, forests and biodiversity conservation, and carbon sequestration. KfW can build on this experience to scale these mostly public schemes with access to predictable public and private finance and support the development of new schemes (e.g. KfW Central America, KfW Socio Bosque).

Harnessing carbon finance and carbon credits: KfW has already delivered significant results-based carbon finance for reduced emissions from deforestation and forest degradation (REDD+), contributing to its proof of concept (e.g. Amazon Fund, REDD Early Movers). New mechanisms such as the Tropical Forest Forever Facility to leverage private capital and reward tropical forests countries are under development. KfW is supporting reforestation and afforestation as well as agroforestry projects and further enables them to access voluntary carbon markets (KfW WALD Initiative). Potential for these project types is likely to increase, including for “blue carbon projects” (e.g. for mangrove and seagrass restoration) as well as for improved soil and grassland management. Other initiatives provide seed capital to forest landscape restoration initiatives and fund development (e.g. Restoration Seed Capital Facility).

Harnessing biodiversity finance and biodiversity credits: A new emerging opportunity to mobilize private capital are Biodiversity Credits, with methods and markets still under development.

Policy-based finance: Policy-based loans (PBLs) are gaining importance in KfWs portfolio, as in many other development banks. Sectoral or cross-sectoral PBLs can contribute to NbS by providing governments with flexible finance subject to the implementation of policy or institutional reforms that promote sustainable environmental management (e.g.KfW Colombia; WB Indonesia).

Debt-for-Nature Swaps (DfN): A new wave of debt-for-nature and climate swaps has emerged, involving both public and private creditors as well as conservation NGOs. DfN swaps are financial agreements where a portion of a developing country's foreign debt is forgiven, reduced or restructured in exchange for commitments to invest in environmental conservation and sustainable development projects. This helps countries reduce debt burdens while freeing up funds for nature conservation, including NbS measures. Germany has established a bilateral debt swap programme (see BMZ). Debt for Nature and Climate swaps generating additional finance through debt restructuring have been implemented by WB (Ecuador), IDB (Bahamas, Ecuador) and TNC/IMF (Belize).

Greening the financial sector: KfW can foster sustainable practices, including a number of NbS, through its financial sector projects. For instance, KfW enhances the greening of agrofinance portfolios of financial intermediaries by providing earmarked refinancing, using “Green Lists” (i.e. eligible sustainable practices or clients). Also, access to climate insurance can be eased through the use of NbS by farmers, municipalities and SMEs, as they reduce climate risk (e.g. R4 Rural Resilience, Restoration Insurance).

Impact funds/Blended finance vehicles: There is a rising interest among impact investors in NbS to address environmental challenges while generating financial returns. Impact investment funds, such as the eco.business Fund, the Fair Trade Access Fund, the Rabobank Acorn Fund, the AGRI3 Fund, the Climate Investor II,

and the Tamil Nadu Urban Development Fund are investing in a variety of NbS projects, including reforestation and afforestation initiatives, agroforestry, sustainable agriculture practices, wetland restoration, and urban green infrastructure. Other mechanisms mix instruments to promote nature-based value chains (e.g. LAM, Asia Climate Smart Landscape Fund).

Green Bond Markets: The green bond market has seen significant growth, with various issuers, including governments, municipalities, and corporations. Some of these initiatives are leading to increased funding for NbS like reforestation, wetland restoration, and sustainable land management. These projects often align with broader climate goals, such as carbon neutrality and climate adaptation, and play a crucial role in meeting national and international climate commitments. Beyond issuing its own Green Bonds (KfW Green Bond Framework), KfW can support the development of these markets in partner countries (e.g. LAGreen Fund, Global Green Bond Initiative, other examples Seychelles Blue Bond).

Sustainability-linked Loans: While not yet part of the KfW development bank portfolio, NbS could effectively be supported through Sustainability-Linked Loans, by integrating environmental performance targets into the loan agreements. For instance, the achievement of sustainability targets for reduced deforestation, reforestation, soil rehabilitation or green space expansion could contribute to better loan conditions (e.g. SLL WB, IFC Timberland SLL, IDB Climate SLL).

Impact Bonds: A similar results-based financing approach are Impact Bonds, that use private funding from investors to cover the upfront capital required for a provider to set up and deliver an (NbS) service, using outcomes-based contracts (e.g. Wildlife Conservation Bond, Reforestation Outcome Bond; NbS Impact Bond).

Conclusion

In a time when development funds are becoming scarcer and more contested, NbS offer a valuable entry point for cross-sectoral approaches that deliver multiple benefits for both people and nature. By integrating biodiversity and climate objectives across sectors such as agriculture, water, energy, mobility, urban planning, and conservation, NbS create synergies that improve living conditions and ecosystem health simultaneously. Achieving this requires interdisciplinary collaboration, early and thorough analysis, and meaningful engagement with local communities to ensure acceptance and long-term success. Prioritising NbS in investment strategies enables development banks to realize multiple development wins — advancing the Sustainable Development Goals, the Global Biodiversity Framework, the Paris Agreement and the Land Degradation Neutrality goals — while positioning themselves as forward-thinking leaders committed to a resilient and sustainable future for communities worldwide.

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