CLIMATE AND DEVELOPMENT BRIEF

Nature-based Solutions for Climate Resilience and Adaptation

WORLD BANK GROUP
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- Nature-based solutions (NBS) are a cost-effective way to address climate resilience challenges that bring benefits for nature, livelihoods and development.

- Scaling these solutions requires strengthening policies and institutions, closing of remaining knowledge gaps, channeling public and private financing, and keeping a strong focus on the maximization of overall development outcomes.

- The World Bank Group (WBG) uses its strategic and policy tools such as the new core diagnostic, Country Climate and Development Reports (CCDR), to help countries identify nature-based opportunities that can contribute to addressing their mitigation, adaptation and development needs.

- Over the past 10 years, the WBG has financed over 100 projects that include nature-based solutions to build resilience and is increasing its involvement in these types of investments.

The challenge

**Communities are facing growing challenges to adapt to climate change while managing the impacts of multiple global crises.** Disasters push 26 million people into poverty every year.\(^1\) Unplanned urbanization, large scale conversion of natural habitat, damming of free-flowing rivers, and climate change are among the drivers of a global increase in economic, social and natural capital losses. This includes sudden-onset disasters and slow-onset changes such as changing water balances, increasing sea level rise and temperatures. Investments in resilience and adaptation\(^2\) can be highly cost-effective in reducing vulnerability to climate risks. However, countries are struggling to mobilize and prioritize domestic finance. This is only exacerbated by the ongoing economic challenges, including rising interest rates and food and energy prices.

**Ecosystems provide significant climate adaptation and mitigation benefits globally.** Mangroves are estimated to protect more than 6 million people from annual flooding and prevent additional annual losses of $24 billion of productive assets.\(^3\) Taking into account all of their benefits, such as protection against coastal erosion and floods, job and livelihood creation for fisheries, and hosting a rich biodiversity, global mangrove wealth is now valued at over $547 billion. Understanding and using the risk reduction potential of ecosystems and combining them strategically with traditional grey infrastructure have great potential for both adaptation and nature.

**Nature-based solutions (NBS)**\(^4\) can integrate development, climate and nature into comprehensive interventions that strengthen medium-term resilience of physical and natural capital. Examples include the design and engineering of urban parks to fight flooding, the restoration of coastal wetlands to halt erosion, well-planned reforestation and rural land restoration to prevent landslides on key infrastructure, and watershed management to improve water quantity and quality for drinking water utilities. In many cases, NBS combined with physical infrastructure in green-grey approaches can increase development benefits, reduce lifecycle costs, contribute to carbon sequestration and improve environmental outcomes.\(^5\) In some areas, NBS may be the only cost-effective solution for resilience, and in other cases can help lower costs.
Despite the multiple benefits, it remains difficult to bring these solutions to scale due to policy, institutional, technical and financial challenges. This is especially true in low-income countries and fragile and conflict settings. While the share of NBS in adaptation investment is on the rise, significant potential remains to realize the full resilience, climate mitigation, biodiversity and development benefits of these approaches.

**Box 1: Nature-based Solutions (NBS) in Country Climate and Development Reports (CCDRs)**

The World Bank Group’s Country Climate and Development Reports (CCDRs) are new core diagnostic reports that integrate climate change and development considerations. They will help countries prioritize the most impactful actions that can reduce greenhouse gas (GHG) emissions and boost adaptation, while delivering on broader development goals. Many of the CCDRs that have been completed or are under preparation capture NBS as a key intervention area to strengthen climate, nature and development outcomes.

**Sahel:** The CCDR recommends the acceleration of nature-based approaches across the G5 Sahel Region at urban and landscape levels, through combined investments in ‘grey’ infrastructure (drainage, flood control infrastructure) and ‘green’ interventions (river restoration, wetland rehabilitation, ecosystem restoration) to maximize climate and development benefits.

**Vietnam:** The CCDR proposes NBS to harness the protective function and economic contribution of ecosystems (including mangroves and sand dunes) and emphasizes that a systematic approach to their rehabilitation, conservation, monitoring, and management is essential. Relevant policy, regulatory, and legal frameworks must be strengthened, and lessons from past initiatives should be consolidated to inform technical guidelines and future programs.

**Rwanda:** The CCDR recommends expanding the use of NBS in a variety of areas, including (i) ecosystem rehabilitation for flood protection; (ii) agroforestry to increase soil fertility and potentially catalyze carbon finance, (iii) wetland rehabilitation for ecotourism, ecosystem outcomes and flood control; and (iv) restoration of slopes and riverbanks to prevent soil erosion and siltation of water bodies important for energy production.

**What is Needed**

First, regulations and policies should be strengthened to make nature-based solutions an integral part of territorial, climate adaptation and infrastructure planning. Spatial planning and zoning should steer urban development away from risk zones and critical natural habitats, and identify ecosystem services that could be enhanced or developed. For example, Rwanda’s National Environment and Climate Change Policy integrates nature and climate through the protection of functional ecosystems and greening of urban spaces.

Second, institutional and intersectoral collaboration, for example between infrastructure, agriculture and environment ministries, should be enabled and enhanced to allow for the identification, implementation, and sustainable management of green-grey approaches. To ensure that interventions are financially feasible and efficient in the long term, better coordination between administrative levels (central, as well as provincial) and involvement of all stakeholders are required.

Third, protecting the stock of natural capital that produces nature-based solutions, and better engineering of the placement, species selection and other aspects of restoration activities is critical. Designing green-grey interventions with multiple benefits requires a solid evidence base and tools to convincingly communicate the benefits of NBS to stakeholders across sectors. In addition, the effectiveness and engineering aspects of NBS to complement or substitute gray infrastructure need to be better analyzed, tracked, and reported.
Fourth, scaling NBS requires mobilizing private investment and matching investment needs with the most effective financing sources. Investments in NBS are often financed from public funds as they deliver public goods. While there are some examples of NBS being used to secure privately-held economic assets, private capital can do more. Blending public and private sector finance could help de-risk investments for the private sector, for example through co-investment or insurance. By considering the value of ecosystems in relation to other investments, banks and insurance companies can be actors and potential investors in these efforts (e.g., through coral reef and other nature-based insurance). In parallel, some countries (such as Colombia, New Zealand and Australia) have taken steps to implement private sector markets for biodiversity credits. A global market for these credits has the potential to create a new source of private sector funding for projects with nature-based components.

Finally, development benefits from NBS need to be maximized. Social inclusion and natural capital that benefits the local community is critical to enhance opportunities, access to resources, and respect for rights of indigenous communities. About 38% of the global forest is found in indigenous people’s land. An estimated 1.2 billion jobs globally depend directly on healthy environments and ecosystems. NBS offer job opportunities that support the transition to a resilient and inclusive economy.

**How is World Bank Group Contributing to Solutions?**

The World Bank Group (WBG) assists clients in identifying, mobilizing finance, developing projects and improving the enabling policy environment for NBS, with the goal of integrated, replicable and scalable solutions.

The WBG is working with countries to incorporate climate and nature themes into development plans. NBS are integrated into WBG operations at the community and project level, through country-level prioritization in the WBG new core diagnostic, Country Climate and Development Reports (CCDRs), and Country Partnership Frameworks, and at the global level in the World Bank’s Climate Change Action Plan (Box 1). The Vietnam, G5 Sahel, Rwanda, Philippines and Ghana CCDRs recognize the major contributions to climate resilient development that NBS bring.

The WBG drives the creation and dissemination of actionable knowledge and tools in support of NBS identification and implementation. In Indonesia, the Bank conducted an integrated spatial and economic assessment that established the value of the countries’ mangrove ecosystems, including flood protection value, nature-based tourism, fisheries, and blue carbon, at an average $15,000 per hectare. This analysis is being used to prioritize NBS investments in mangrove conservation and restoration under the $400 million Mangroves for Coastal Resilience Project. The WBG also led the development of the global technical guidance note in collaboration with partners, including the International Guidelines on Natural and Nature-Based Features, the Catalogue of NBS for Urban Resilience and the Compendium Coastal Management Practices in West Africa to reduce coastal erosion. The WBG uses its convening power to bring this knowledge to the project level and amplify south-to-south learning and experience exchange.

The World Bank has made significant and increasing investments in NBS that build resilience and bring out multisectoral benefits. Between fiscal years 2012 and 2021, the Bank invested in over 100 projects with nature-based components, of which the components were valued at $5.5
billion. In addition to strengthening climate resilience for over 2.2 million people, these projects worked to restore or reforest more than 1.4 million hectares of degraded ecosystems and protect over 12,000 kilometers of coastal and marine areas.

The Metro Colombo Urban Development Project in Sri Lanka, for example, provided improved flood protection for thousands of urban dwellers through the restoration of vitally important wetlands which store several millions of cubic meters of water during extreme rainfall and host 280 species of wildlife, as well as through investments in drainage infrastructure. Similarly, in Colombia, the flood risks in Bogota were reduced significantly by giving more room to the river and increasing the environmental value of the Rio Bogota for the city.xx

At the landscape level, larger integrated investment programs can use NBS to restore degraded land. For example, the Ethiopia Sustainable Land Management Program treated more than 860,000 hectares of degraded land across 1,820 micro-watersheds, with positive effects on livelihoods, climate resilience and reduced greenhouse gas emissions.xxi Similarly, the Resilient Landscapes Restoration Program supports local communities across Central Asia by investing in productive landscape restoration with the objective of generating income and reversing land degradation.xxxii

The World Bank Group is also supporting private sector engagement in NBS. The World Bank supports countries to develop government-run Payments for Environmental Services (PES) programs such as in Brazilxxxiii and Costa Rica,xxxiv as well as to strengthen the enabling environment for effective private participation in global private markets such as the voluntary carbon market. These programs can enable investment by targeting ecosystems that have adaptation and resilience benefits. IFC and MIGA are engaging with the private sector as they seek to integrate NBS into project design and implementation, particularly in infrastructure. IFC is engaging with clients in the water, energy and mining sectors as well with cities to articulate the business case for NBS to increase resilience and adaptation. IFC also seeks to build the market’s awareness and encourage greater uptake of NBS by private companies in their economic activity.

Investments that are material to projects’ core operations are incorporated into IFC’s draft Biodiversity Finance Reference Guidexxxv as an accepted use of proceeds aligned with Green Bond and Green Loan Principles. This includes infrastructure type services that are core to operations. Similarly, MIGA is engaging with its clients to identify opportunities to increase deployment of NBS – both to enhance resilience of assets sponsored by MIGA clients and, through MIGA’s Non-Honoring of Sovereign Financial Obligation products, to catalyze additional funding for NBS sponsored by public sector entities.

Some of the key lessons learned from WBG engagements include:

The integration of green and grey infrastructure from initial feasibility studies through to implementation, financing and monitoring is key.xxiv In Beira, Mozambique, the World Bank and Government of Germany (KfW) financed the implementation of the Cities and Climate Change Project, which helped create one of Africa’s largest urban parks. The park is designed to reduce flooding for over 50,000 inhabitants while hosting recreation areas, a botanical garden, playgrounds and public facilities. In Western Africa, the WBG supports the West Africa Coastal Areas Program in eight countries to address coastal degradation and hazards. The program also identifies opportunities to utilize NBS for improved climate resilience, reduce coastal erosion and restore critical ecosystems such as mangroves, wetlands, and lagoons that protect against flooding and marine pollution.
A combination of community engagement, planning, and investment is critical to success. In Belize, the WBG supported coral reef restoration across a total area of 1,400 m² with nearly 29,000 planted corals.\(^{xxvii}\) By ensuring effective collaboration with key local stakeholders, including through capacity building of fishers, tour guides and the Fisheries Department, the sustainability of coral restoration activities was improved. In Argentina, the Bank supports the city of Buenos Aires in the integration of NBS in their adaptation plan, providing opportunities to optimize developments in the city and include interventions that help address the impacts of changing precipitation patterns.

Concessional resources are essential at the early stage of project design. The Bank’s ability to offer technical and advisory services both in project development and during implementation have been essential to support countries in designing and implementing NBS projects. Certain World Bank trust funds such as the Global Facility for Disaster Reduction and Recovery (GFDRR), PROBLUE, The Global Partnership for Sustainable and Resilient Landscapes (PROGREEN) and the Global Water Security and Sanitation Partnership (GWSP) are instrumental in enabling this work across the Bank’s client countries and in facilitating the flow of private capital into this market segment.

## What Will Success Look Like?

There are numerous examples of successful interventions, some mentioned in this brief, where combining green and grey approaches delivers higher benefits than grey infrastructure alone can. The challenge is to find the most efficient balance between green and grey infrastructure, including in agricultural investments, and scale green approaches by removing technical, financial and institutional barriers. Success would be reflected in the tripling of annual investments in NBS by 2030 and a four-fold increase by 2050 to address climate, biodiversity, and land degradation.\(^{xxviii}\)

From the project to strategic levels, opportunities from NBS should be incorporated into project development. Exploring the potential from nature-based components should be the norm, not the exception. Likewise, climate resilience and nature objectives should be translated into policy changes such as regulations for urban and coastal planning, environmental impact assessments and biodiversity conservation.

Investment in NBS is both a need and an opportunity. By looking at the climate, adaptation and nature crises holistically and developing integrated solutions, countries can become less vulnerable to climate change and create thriving communities who can transform their natural capital into jobs and welfare gains.

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\(^{ii}\) For an overview of the meaning of adaptation and resilience in climate, see: https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/what-do-adaptation-to-climate-change-and-climate-resilience-mean


\(^{iv}\) The UN Environment Assembly has adopted the definition of NBS 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”.

\(^{v}\) Browder, Greg; Ozment, Suzanne; Rehberger Bescos, Irene; Gartner, Todd; Lange, Glenn-Marie. 2019. Integrating Green and Gray: Creating Next Generation Infrastructure. Washington, DC: World Bank and World Resources Institute
The World Bank is developing, with support of the Least Developed Countries Fund, a project to provide targeted technical assistance and capacity building to IDA countries to encourage adoption of NBS for climate resilience.

Swann et al., 2021. Public International Funding of Nature-based Solutions for Adaptation: A Landscape Assessment


https://www.nature.org/en-us/newsroom/coral-reef-insurance-policy-triggered/

https://axaxl.com/about-us/ocean-risk-initiative


https://www.wbgkgtf.org/node/3553

The Brazil Espirito Santo Integrated Sustainable Water Management Project (P130682)

https://unfccc.int/climate-action/momentum-for-change/financing-for-climate-friendly-investment/payments-for-environmental-services-program


