#### ESG Knowledge Series

The Role of Ecosystem Services in Mitigating Environmental Impacts of Infrastructure Projects



What Are Ecosystem Services and Why Are They Important?

*Ecosystem services* are the benefits that humans derive from nature, supporting community wellbeing, economic productivity, and ecological stability. They play a vital role in mitigating biodiversity loss, buffering against ecological disruptions, and ensuring the sustainable availability of natural resources. Despite their critical importance, ecosystem services are often undervalued and neglected in development planning. A lack of awareness, inadequate action, and insufficient institutional prioritization often lead to their degradation, resulting in long-term economic costs, environmental instability, and reduced resilience to global challenges.

The Millennium Ecosystem Assessment (2005) categorizes ecosystem services into four main types:

- **Provisioning Services** Tangible resources such as raw materials, food, freshwater, and medicinal resources obtained from nature.
- Regulating Services Processes that regulate environmental conditions, such as forests purifying air, wetlands filtering water, and coastal mangroves preventing storm surges and erosion.
- **Cultural Services** Non-material benefits such as recreational opportunities, spiritual enrichment, aesthetic experiences, and educational value.
- Supporting Services Fundamental ecological processes that sustain other services, such as soil formation, nutrient cycling, and biomass production through photosynthesis.

Ecosystem services mitigate various environmental challenges. For instance, air pollution contributes to respiratory diseases and climate change, yet forests help purify the air. Water pollution and scarcity threaten communities and agriculture, while wetlands naturally filter contaminants and regulate water cycles. Extreme weather events, such as floods and storms, are intensified by deforestation and poor land management, but mangroves and green infrastructure serve as natural barriers, protecting human settlements and reducing disaster recovery costs.

These examples highlight the interconnectedness of biodiversity preservation and ecosystem services. Biodiversity-driven processes, such as crop pollination, carbon sequestration, and flood protection, provide immense economic and social value. Globally, these services are estimated to be worth USD 125–140 trillion annually—more than one and a half times the global GDP (OECD, 2019). Despite their critical role in human well-being and their staggering economic worth, they are frequently overlooked in infrastructure planning and investment decisions.

Development financing institutions, such as Multilateral Development Banks (MDBs), have a unique opportunity to lead the integration of ecosystem services into infrastructure development. By prioritizing these services in their funding and planning processes, MDBs can ensure that infrastructure projects not only support economic growth but also enhance ecological resilience and sustainability.

The Role of Development Financing Institutions in Preserving Ecosystem Services Through Nature-Based Solutions

Infrastructure development is essential for economic growth, yet when executed without environmental considerations, it can significantly degrade ecosystem services. Poorly planned infrastructure projects contribute to habitat destruction, increased flood risks due to altered hydrology, loss of agricultural productivity from soil erosion, and declining public health due to pollution.

In 2021, MDBs were the second largest financier in middle and low-income countries, financing 9% of the total value of private investment in infrastructure projects. Furthermore, 27% of private investment in infrastructure in these countries involved an MDB as a co-financier (Global Infrastructure Hub, 2022). By integrating ecosystem services into their financing frameworks, MDBs can ensure infrastructure projects deliver economic benefits while preserving or enhancing natural systems.

One of the most effective ways MDBs can achieve this is through *Nature-based Solutions (NbS)*. NbS leverage natural processes to address societal challenges, offering costeffective and sustainable alternatives to traditional engineered infrastructure. Examples of NbS in infrastructure development include:

- Mangrove Conservation along coastlines to reduce the need for expensive seawalls while supporting fisheries and biodiversity.
- Wetland Restoration to improve water quality, regulate hydrological cycles, and mitigate flood risks as a costeffective alternative to traditional infrastructure.

• Urban Green Spaces to reduce heat islands, improve air quality, enhance biodiversity, and contribute to community well-being.

MDBs are increasingly recognizing the value of NbS and integrating them into their infrastructure portfolios. Initiatives such as the World Bank's Wealth Accounting and Valuation of Ecosystem Services (WAVES) and the Asian Development Bank's (ADB) wetland restoration projects highlight this growing trend. However, while these efforts are commendable, more can be done to mainstream NbS and ensure their widespread adoption.

Best Practices for Integrating Ecosystem Services into Infrastructure Planning and Financing

To fully harness the potential of NbS and ecosystem services, MDBs and other development institutions can adopt the following best practices:



Example of a hybrid solution integrating green and grey infrastructure Source: World Bank. 2021. A Catalogue of Nature-Based Solutions for Urban Resilience.

#### 1. Integrating Ecosystem Valuation into Decision-Making

Assigning economic value to ecosystem services ensures they are factored into cost-benefit analyses and infrastructure investment decisions. Without valuation, natural contributions such as water filtration, carbon sequestration, and disaster risk reduction are often overlooked.

Recommended valuation methods include:

- Market-based Valuation: Pricing goods and services directly obtained from ecosystems, such as timber or clean water.
- Revealed Preference Methods: Estimating values based on observable behaviors, such as property values near green spaces and tourism revenue in protected areas.
- Stated Preference Methods: Using surveys to assess individuals' willingness to pay for ecosystem conservation.
- Benefit Transfer Method: Applying valuation data from existing studies to new locations, adjusting for local conditions.

Example: Revealed preference methods were used in Costa Rica to estimate the economic value of ecotourism in protected areas. Researchers analysed tourism revenue and visitor behaviour to quantify the financial benefits of preserving ecosystems like rainforests and coral reefs. This data helped policymakers justify investments in conservation and sustainable tourism, demonstrating how ecosystem valuation can inform decision-making (Hearne and Salinas, 2002).

## 2. Embedding Ecosystem Valuation and NbS into MDB-Financed Projects

MDBs can institutionalize NbS by embedding ecosystem valuation into project selection, feasibility studies, risk assessments, and performance monitoring. Key integration points include:

#### **Spatial Planning and Site Selection**

 Identify and avoid ecologically sensitive areas (e.g., wetlands, forests, mangroves) through environmental screening tools and spatial mapping.

- Incorporate buffer zones and ecological corridors into project designs to maintain biodiversity and ecosystem connectivity.
- Leverage NbS for site-specific challenges, such as using wetlands for flood control rather than relying solely on engineered solutions.

#### **Feasibility Studies and Risk Assessments**

- Conduct cost-benefit analyses that account for ecosystem services, ensuring NbS are evaluated alongside conventional infrastructure.
- Assess the long-term economic risks of ecosystem degradation (e.g., infrastructure failures due to deforestation-driven watershed decline).
- Promote hybrid infrastructure approaches, combining traditional engineering with NbS (e.g., integrating mangrove restoration with seawalls for coastal protection).



#### **Project-Level Performance Metrics & Ecosystem Key Performance Indicators (KPIs)**

- Embed ecosystem service valuation into project KPIs.
- Measure long-term contributions to climate resilience, biodiversity, and human well-being.

• Use NbS impact assessments to evaluate how projects mitigate environmental damage and enhance sustainability.

### **3. Expanding Sustainable Financing Mechanisms** for Ecosystem-Based Infrastructure

MDBs should aim to support ecosystem valuation and NbS integration with strong financial mechanisms that attract both public and private sector investment. This requires capital mobilization through innovative financing models that make ecosystem-based infrastructure financially viable at scale.

#### Green Bonds and Sustainability-Linked Loans

- Issue green bonds to finance urban green infrastructure.
- Provide *sustainability-linked loans* with financial incentives (e.g., lower interest rates) for projects that integrate ecosystem services into infrastructure design.
- Encourage national governments to create bond frameworks that direct capital towards projects that enhance NbS.

### Environmental Impact Funds and Payment for Ecosystem Services (PES)

- Establish *Environmental Impact Funds* that provide dedicated financing for ecosystem restoration and conservation projects.
- Implement PES schemes, rewarding landowners and communities for maintaining forests, wetlands, and other ecosystems that provide essential services (e.g., watershed protection, and pollination).
- Support market-based PES initiatives, allowing businesses to invest in nature restoration as part of their sustainability commitments.

## Blended Finance for Ecosystem-Based Infrastructure

• Combine public and private financing to increase capital flow into NbS projects.

- Provide guarantees and concessional financing to make NbS investments more attractive to investors.
- Encourage insurance-backed investments, where ecosystem restoration is linked to reduced risk premiums (e.g., coral reef restoration reducing storm surge damage costs).



Source: World Economic Forum, Blended finance: How setting up a financial intermediary can accelerate sustainable development

### Aligning Financial Incentives with Sustainable Infrastructure

- Require environmental cost-benefit analyses for all major infrastructure loans, ensuring that ecosystem services are explicitly considered in project finance.
- Integrate natural capital accounting into MDB financial reporting, allowing investors and stakeholders to assess the impact of infrastructure projects on ecosystem services.
- Develop sustainability-linked finance standards, ensuring that funding criteria prioritize infrastructure that enhances, rather than depletes, ecosystem services.

By scaling up financing solutions, MDBs can ensure that nature-based solutions are not only environmentally sound but also financially viable, accelerating the adoption of ecosystem-based infrastructure.

### 4. Strengthening Policy and Capacity Building for Long-Term Impact

MDBs should aim to complement financing efforts with strong policy support and capacitybuilding initiatives to ensure sustained ecosystem service integration in infrastructure planning.

### Developing Policy Toolkits for Ecosystem-Based Infrastructure

- Create regulatory frameworks that require ecosystem services to be included in environmental and social impact assessments (ESIAs) for MDBfunded projects.
- Provide model tools for ecosystem-based urban planning and infrastructure development.
- Establish or promote NbS certification standards to incentivize compliance among project developers.



#### Strengthening Institutional Capacity for NbS Implementation

- Offer capacity-building programs for government agencies, project developers, and local communities to enhance their ability to implement and monitor NbS.
- Provide technical assistance for local governments to integrate NbS into municipal infrastructure projects.
- Support cross-country knowledge exchanges to share the best practices on

ecosystem service valuation and financing.

- Develop NbS implementation frameworks that align corporate sustainability commitments with ecosystem-based infrastructure investment.
- Partner with technology firms and research institutions to advance datadriven NbS planning and monitoring.

# The Case for Prioritizing Ecosystem Services in Development

By aligning policy frameworks, building capacity, and facilitating private sector participation, MDBs can ensure that ecosystem-based infrastructure development is institutionalized and sustained beyond individual projects.

MDBs and development financing institutions are uniquely positioned to transition from traditional infrastructure to green infrastructure that enhances ecosystem services. By embedding NbS and ecosystem valuation into investment strategies, MDBs can ensure infrastructure development aligns with sustainability and resilience goals.

As we face the dual challenges of climate change and rapid urbanization, the time to act is now. Investing in ecosystem services is not only a strategy for environmental protection but also a means to enhance infrastructure efficiency, improve human interaction with nature, and maximize benefits for all communities involved.



Useful Tools and Resources		Nature-Based Solu	Nature-Based Solutions Assessment Tool (NBSAT)	
		https://tnfd.global	https://tnfd.global/tools-platforms/nature-based-	
		solution-assessme	solution-assessment-tool-nbsat/	
Guidance Manual on Value Transfer Methods for Ecosystem Services https://www.unep.org/resources/report/guidance- manual-value-transfer-methods-ecosystem-services		By: NBSAT	NBSAT calculates and documents ecosystem improvements from nature-based restoration projects, assisting in goal setting, cost-benefit analyses, and progress tracking towards SDGs.	
By: UNEP	This manual provides guidance on estimating the value of ecosystem	Nature-Based Solutions for Comprehensive Disaster and Climate Risk Management (CRM-NbS Toolkit)		
	services using value transfer	https://www.undr	https://www.undrr.org/publication/nature-based- solutions-comprehensive-disaster-and-climate-risk- management-toolkit	
	methods, facilitating the	solutions-compreh		
	incorporation of these values into	management-tool		
	decision-making processes.		This toolkit supports countries in	
Asian Development Bank (ADB) Nature-Based Solutions			integrating nature-based solutions	
for Climate Change Adaptation and Disaster Risk			into comprehensive disaster and	
Management		By: FAO	climate risk management, aligning	
https://www.adb.org/publications/nature-based-			with the Sendai Framework for	
solutions-climate-change-adaptation-disaster-risk-			Disaster Risk Reduction	
management		Biodiversity Con	servation and Sustainable Natural	
	This guide explores the benefits of using nature-based solutions to promote sustainable and resource- efficient infrastructure, providing practical examples and methodologies for implementation.	Resource Manage	Resource Management	
By: ADB		https://ses-toolkit	https://ses-toolkit.info.undp.org/standard-1	
			Part of UNDP's Social and	
			Environmental Standards, this	
			resource outlines requirements for	
		By: UNDP	maintaining and enhancing	
			biodiversity and ecosystem services	
			in development projects.	
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