Nature-based Solutions to Address Climate Change, Biodiversity Loss and Sustainable Development

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AIT Climate Change & SD Program Seminar
13 February 2025



OUTLINE

- What is a nature-based solution (Nbs)?
- What are some benefits of NbS?
- What are some examples of NbS in selected sectors?
- What are the challenges to effectively introducing NbS in development sectors?
- How can we overcome the challenges?
- What NbS tools are available?
- Conclusions

What is a Nature-based Solution?

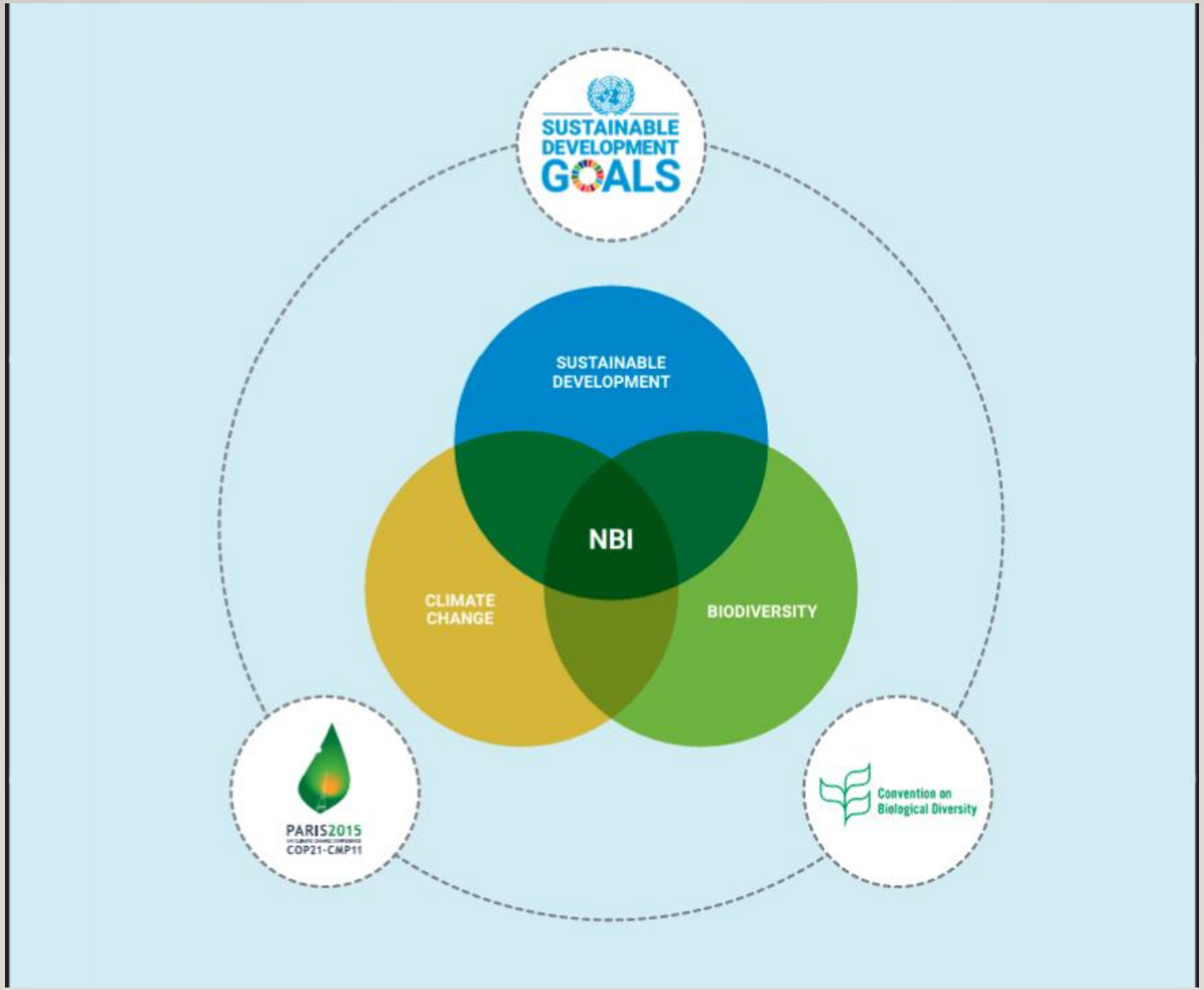
Nature-based solutions are "actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits."*

*2022 United Nations Environment Assembly

NbS leverages nature and the power of healthy ecosystems to promote sustainable development. They can provide a more holistic and multifunctional approach to development.

Climate change adaptation and disaster risk reduction
Biodiversity conservation
Water security
Economic and cultural benefits
Livable cities

Climate change mitigation
Food security
Human health
Sustainable infrastructure
Raised living standards


SUSTAINABLE DEVELOPMENT GOALS
SUSTAINABLE DEVELOPMENT
NBI
CLIMATE CHANGE
BIODIVERSITY
PARIS2015
COP21-CMP11
Convention on Biological Diversity

GREEN INFRASTRUCTURE (GI)

Green Infrastructure Ontario Coalition

Nature-based Solutions (NbS)/Nature-based Climate Solutions

Natural Infrastructure (NI)

Low Impact Development (LID)

NATURAL ASSETS:*
- Wetlands
- Forests
- Parks
- Meadows
- Lawns and gardens
- Soil

ENHANCED ASSETS:*
- Rain gardens
- Green roofs and walls
- Bioswales
- Urban trees
- Naturalized stormwater ponds

ENGINEERED ASSETS:*
- Permeable pavement
- Rain barrels
- Cisterns
- Perforated pipes
- Infiltration trenches

GREY INFRASTRUCTURE:*
- Bridges
- Roads
- Parking lots
- Culverts
- Pipes

What are some benefits of Nature-based Solutions?

European Commission

NATURE BASED SOLUTIONS

Good for biodiversity

Deployment of urban green infrastructure increases habitat for nature.

Good for disaster risk reduction

Coral reefs dissipate more than 97% of wave energy.

[Nature communications, 2014]

Good for our health

Health benefits from NBS include

- reduced depression,
- mental health improvement,
- reduced cardiovascular morbidity,
- improved pregnancy outcomes,
- obesity and diabetes reduction.

[EKLIPSE, 2017]

Important for jobs and business

Over 56,000 jobs created through the Emscher Landscape Park in North Rhine Westphalia region in Germany.

[WWF ILO Report: Nature Hires, 2020]

Vital for the climate

37% of climate mitigation needed until 2030 to keep global warming below 2°C.

[IPBES GA SPM key message D8, 2019]

References:

1. EKLIPSE, *An impact evaluation framework to support planning and evaluation of nature-based solutions projects*, 2017, https://bit.ly/3daSnSC.

2. IPBES Global Assessment on Biodiversity and Ecosystem Services, *Status and Trends - Nature's Contributions to People (NCP)*, 2019, https://bit.ly/3li7Bsx.

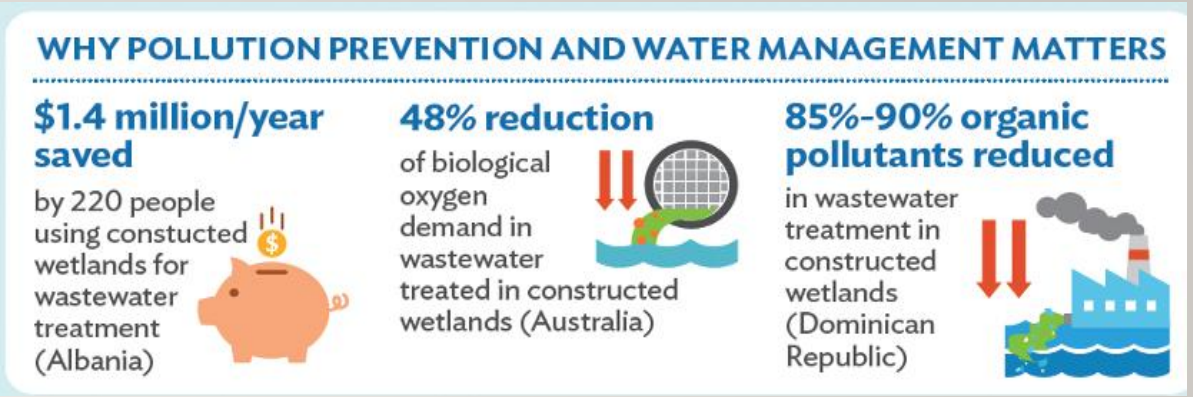
3. Nature communications, *The effectiveness of coral reefs for coastal hazard risk reduction and adaptation*, 2014, https://go.nature.com/30FR2y3.

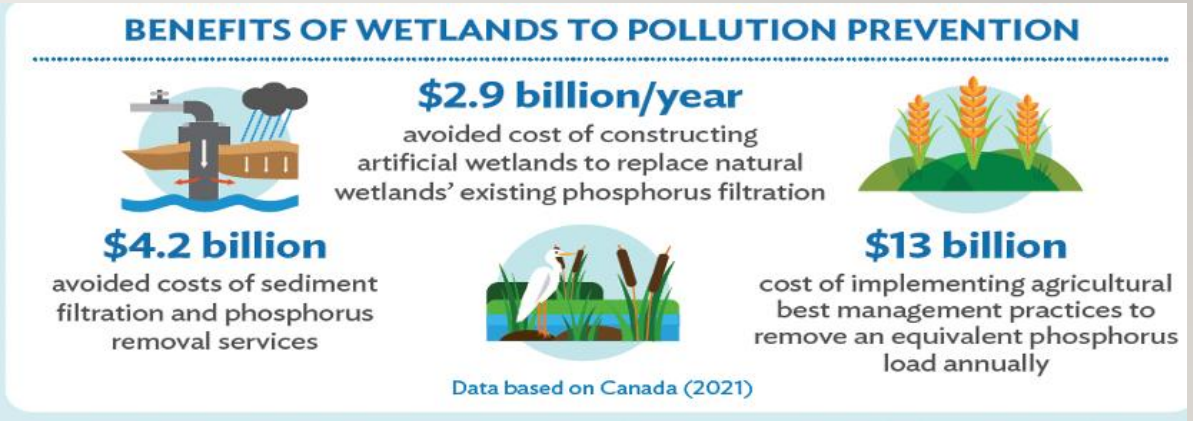
4. WWF & ILO, *NATURE HIRES: How Nature-based Solutions can power a green jobs recovery*, 2020, https://bit.ly/3k7CFdO.

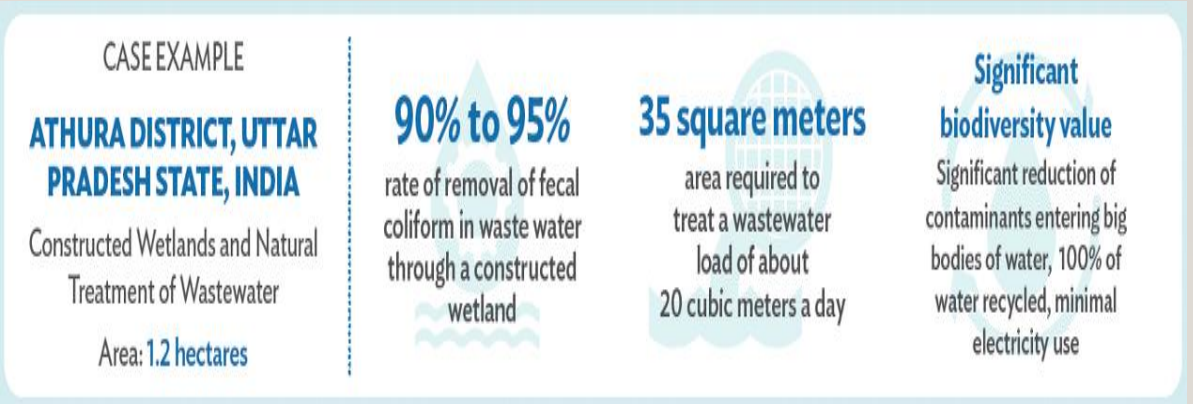
Environment

UNEP, 2021. Smart, Sustainable and Resilient Cities: the Power of Nature-based Solutions

Wastewater Treatment and Water Resource Management







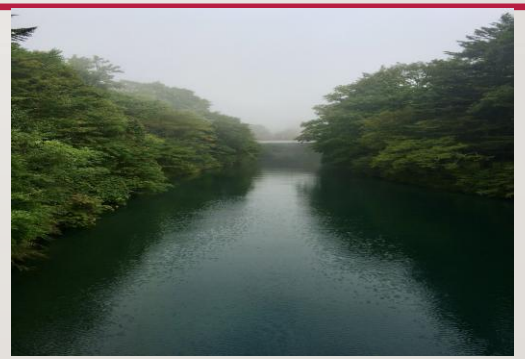
What are some examples of Nature-based Solutions in selected sectors?

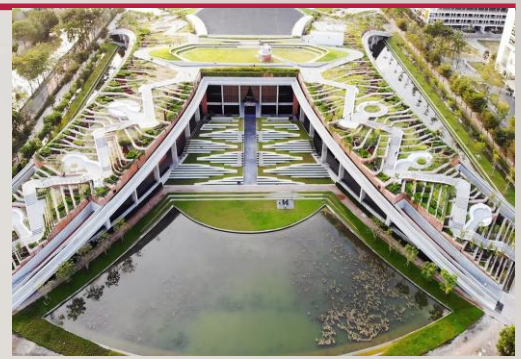
PRC: JIANGXI PINGXIANG INTEGRATED RURAL-URBAN INFRASTRUCTURE DEVELOPMENT

Introducing a sponge city into the project design

Pingxiang is a headwater city: project focused on flood risk and river rehabilitation

- Rural-to-urban: create ecological rivers, e.g., restore vegetation, wetlands, flood plains; wildlife habitat
- Urban green infrastructure: green embankments, river greenways with public access, wetland parks
- Capacity building





Bioswale concept diagram: (1) Dirty and polluted water from rooftops, roads and parking lots enters the bioswale; (2) Water is slowed down by various plants and rocks, pollutants settle out, clean water infiltrates the soil; (3) Water enters the perforated pipe and is slowly absorbed into the ground; (4) Excess stormwater exits the bioswale and flows through the pipe into the recipient, cleaner then when it entered and in the amount significantely reduced. Source: http://www.cranejapan.co/grass-bioswale-diagram.html

PHI: INTEGRATED FLOOD RISK MANAGEMENT SECTOR PROJECT

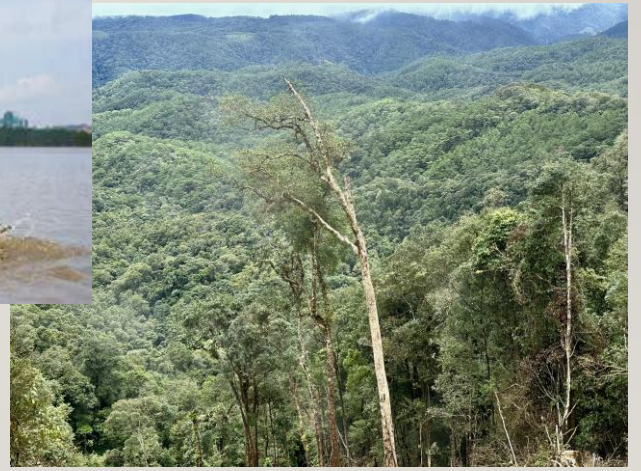
Emphasizing NbS in the project design

Project: reduce flood risks at 6 river basins

~~Traditional hard flood control civil works~~

Comprehensive, integrated approaches: civil works plus flood preparedness, nonstructural measures including NbS:

- Whole of river basin approach
- Coastal mangroves for SLR
- Forest protection, rehabilitation
- Natural floodwater storage areas
- Embankment set backs
- Floodplain protection
- Green urban areas
- Community involvement



ROADS IMPROVEMENT PROGRAM (NEPAL) & RAILWAY PROJECT (BANGLADESH)

Mitigating risk to globally vulnerable wildlife endangered by lateral infrastructure

Nepal: 2 high priority roads, 41 km & 115 km
Bangladesh: railroad through 8 upazilas, 3 PAs

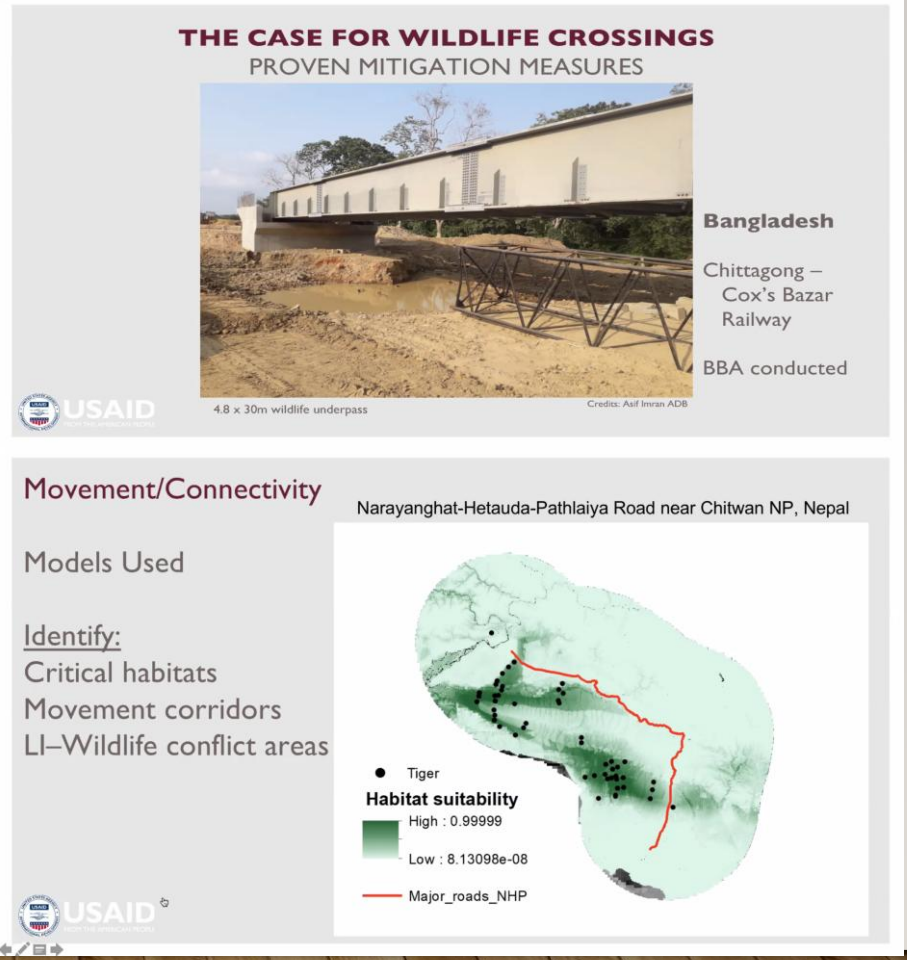
Nepal Road

- Bengal tiger and greater one-horned rhino
- At least 5 wildlife underpasses
- Biodiversity conservation plan
- Compensatory afforestation program

Bangladesh Railway

- Cameras – early warning system, speed control
- Overpasses at active elephant crossings

- Awareness programs for engineers
- Facilitate scientist-engineer collaboration



VIE: SECONDARY GREEN CITIES DEVELOPMENT PROJECT

Strengthening socioeconomic development in secondary cities through small-scale, green and climate resilient infrastructure

- Small-scale, green, climate resilient infrastructure in 3 cities to strengthen socioeconomic development
- Based on existing green city action plans, especially water sensitive design

Gvt wanted rivers/ponds with concrete & other old methods

- Awareness training for decision makers
- TA for study trip to Singapore
- Economic study demonstrating benefits

Plan to provide natural edge around water bodies, observation decks for public, pumped water circulation in ponds

PRC: YANGTZE RIVER GREEN ECOLOGICAL CORRIDOR COMPREHENSIVE AGRICULTURE DEVELOPMENT

Transforming high-input agriculture into productive, sustainable systems

Support for introducing agricultural packages across various production bases along the Yangtze

Examples of NbS measures employed:

- Reduce water use through water scheduling based on crop need
- Reduce fertilizer use as indicated by soil testing
- Reduce pesticide use through integrated pest management
- Awareness raising sessions on climate smart agriculture, watershed management, integrated river basin management to open doors
- Est service centers functioning as specialized extension agencies

Realized later the need to assign value to benefits from NbS measures, especially over the long term

REGIONAL FLYWAY INITIATIVE
Regional landscape approach to NbS

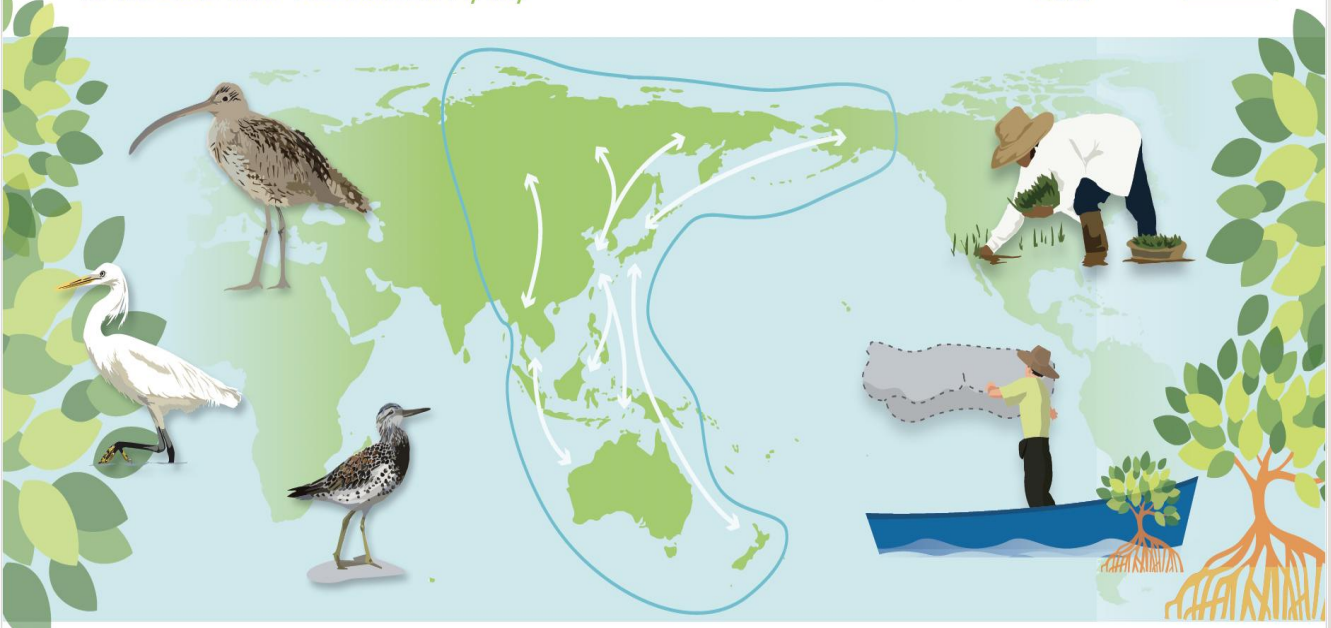
REGIONAL FLYWAY INITIATIVE

Investing in Sustainable Wetlands Management in the East Asian–Australasian Flyway

BirdLife INTERNATIONAL

EAAFP

ADB



Nature-Based Solutions that Deliver for People, Nature, and the Climate

The Regional Flyway Initiative (RFI) seeks to mobilize $3 billion in investments to protect, restore, and sustainably manage a vast regional network of natural wetlands along the East Asian-Australasian Flyway. The large-scale regional program aims to preserve their globally significant biodiversity values and the ecosystem services and benefits they provide to hundreds of millions of people over the long-term.

Regional Flyway Initiative Projects: Investment Concepts

As an initial guide, ADB presents five broad conceptual investment models for wetland sites:

CATALOGUE OF NATURE-BASED SOLUTIONS FOR RENEWABLE ENERGY

Nature-Based Solution	Infrastructure Service	Performance	Key Driver of Biodiversity Loss Addressed
Pollinator-friendly solar	Decreasing latent heat for solar power	Improve **energy production efficiency**; reduce costs for maintenance and mowing; improve infiltration of stormwater; carbon sequestration services	Land use change; climate change
Agrivoltaics (crops)	Decreasing latent heat for solar power	Improve energy production efficiency; **increase crop yield**; lower irrigation costs; improve infiltration of stormwater; carbon sequestration services	Land use change; overexploitation of resources; climate change
Agrivoltaics (livestock)	Decreasing latent heat for solar power	**Lower maintenance costs**; heat abatement for livestock; increase productivity of dairy cattle; improve soil quality; carbon sequestration services	Land use change; climate change
Alternative concrete mixes	Protection of coastal assets for wind power	**Increase durability of structure** & reduce maintenance costs from scouring [compared to regular concrete]; reduce regulatory compliance penalties; improve water quality; carbon sequestration services	Land and sea use change; pollution; climate change
Cable protection alternatives	Protection of coastal assets for wind power	**Lower installation costs**; less disruption in installation; reduce mitigation penalties for policy compliance; improve water quality; carbon sequestration services	Land and sea use change; pollution; climate change
Reforestation and forest conservation	Erosion control to increase water quality for hydroelectric power	**Decrease sedimentation in reservoir**, extending lifespan of power plant; lower maintenance costs; increase energy production	Land use change
Wetland, oyster and coral reef restoration	Protection of coastal assets for wind power and transmission/distribution lines	**Reduce damage on assets** and linear facilities; reduce maintenance costs; reduce erosion surrounding coastal infrastructure; carbon sequestration services	Land and sea use change; climate change

What are the challenges to effectively introducing Nature-based Solutions in development sectors?

CHALLENGES

- Decision makers' and beneficiaries' doubts about NbS having a realistic role in delivering benefits in the context of sector development projects and programs

CHALLENGES

- Ensuring that capacity constraints are clearly identified and addressed early

CHALLENGES

- Outdated policies, building codes, construction standards, legislation and planning guidelines

CHALLENGES

- Long-term investment and development needs versus normal short-term planning initiatives
- Undertaking and effectively communicating economic valuation for benefits from NbS

CHALLENGES

- Allocating sufficient finance or recognizing opportunities for innovative finance to sustainably cover long-term implementation and maintenance costs

NbS Financing Challenges

Challenges	Possible Solutions
Funding constraints: • large gap between needed and available financing (governments that manage natural capital are not well funded; private sector investment likely to come from MSMEs with limited access to credit) • available financing limited, costly and short term • projects are not viable and bankable (have high risks, low returns, require large upfront capital and long payback periods); • ecological benefits are not monetized and not reflected in the return on investment; timeline for financial returns on natural capital investments are often longer than the tenor of traditional lending)	• **Viability and bankability**: use TAs to build pipeline of long-term programs (with successful business models) • **Leverage**: mobilize private sector investments and commercial funds • **Carbon finance**: carbon credits, biodiversity credits (compliance market & voluntary carbon market) • **Bundle/package** NbS to lower the transaction cost (programmatic approach to offer integrated solutions) • **De-risk** project structuring by taking on upfront risk and rewarding private sector investors based on results • Value of nature and ecosystem services need to be integrated in the financing instrument (e.g. benefit to mental health/people, livelihood support) • Engage private sector, especially the **insurance industry**: explore possible use of insurance for restoration work to make the investment sustainable and resilient – can be a model to explore in other NbS context (sea grass, mangroves, flyway) • Find/match the financial sources with the scale of benefits (global vs regional) – factor willingness to pay by governments for NbS depending on the benefit (loss and damage in post 2020 GBF landscape) • Enhance return for FIs (through fiscal stimulus / enhanced government procurement system and local tax breaks) • Develop potential scenarios (with risk modeling)

Nature Solutions Finance Workshop Report, ADB, 2023

Challenges	Possible Solutions
Capacity constraints: • **Governments** lack regulatory and legal framework on NbS and have limited experience / resource / skills to implement and enforce NbS projects • **Project sponsors** lack capacity to structure required investments • **Local capital market players** unfamiliar with financing instruments and risks and see limited financial benefits to investment in NbS. • Local **financial institutions** lack specialized lending instruments, proxies for credit or guarantees, and/or concessional finance in their portfolios to encourage MSME investments in NbS	• **Buy-in from the government:** policy and enabling environment (proper subsidy and / or tax breaks) • **Market development**: Facilitate capital market development for environmental protection, biodiversity investment, biodiversity credits, and climate change; • Build capacity of borrowers / key stakeholders (nurture) • Develop a Hub and networks of partnerships (champions): partner with NGOs to build on their network and to reduce transaction costs
Technical constraint: • Different definitions, taxonomies and scope of NbS (countries have limited and/or different understanding of NbS) • Quantifying results is complex due to lack of transparent and public data on the performance and return of investment of NbS projects • Project development costly and time consuming to monitor, report and verify (MRV) NbS outcomes and to avoid double counting	• **Taxonomies**: use existing frameworks (tag eligible projects and do validation/verification) and give broader understanding to support clients in mainstreaming NbS and designing new solutions to help them implement NDCs and other commitments. • **System for tracking impact/co-benefits**: deploy digital technology to track the impact; use flexible approach to track different levels of financial and economic return and co-benefits; align the tracking with the Paris Agreement to maximize development impact; support private sector clients on aligning with the Paris Agreement through the TA resources as it requires huge transformation. • **Platform for international best practices**: NBS, ESG, circular economies and the upcoming Taskforce on Nature-related Financial Disclosures (TNFD) which will be released this autumn.

CHALLENGES

- Anticipating and dealing appropriately with tradeoffs and unintended consequences

How can we overcome these challenges?

OVERCOMING THE CHALLENGES

- Employ multi-level governance
  - Start with a national strategy
  - Encourage both vertical and horizontal governance
  - Broad participation

OVERCOMING THE CHALLENGES

- Build awareness of NbS opportunities and benefits

OVERCOMING THE CHALLENGES

- Assess building codes, construction standards and planning guides and introduce NbS elements and/or eliminate NbS blockages where possible

OVERCOMING THE CHALLENGES

- Assess opportunities to amend policies and regulations to accommodate NbS
- Flexibility is essential as requirements for NbS vary by location, climatic conditions and over time

OVERCOMING THE CHALLENGES

- Assess and address capacity issues
  - Access case studies, share lessons and good practice, provide training

OVERCOMING THE CHALLENGES

- Innovative financing
  - Access international green funds
  - Bring in private sector
  - Strengthen NbS financial analytical tools to demonstrate viability

What NbS tools are available?

TOOLS & REFERENCES

IUCN

IUCN Global Standard for Nature-based Solutions

A user-friendly framework for the verification, design and scaling up of NbS

First edition

TOOLS & REFERENCES

Integrated Valuation of Ecosystem Services and Tradeoffs (InVest)

https://naturalcapitalproject.stanford.edu/software/invest

InVEST® User Guide

natural capital PROJECT

Stanford | Woods Institute for the Environment

Stanford | Department of Biology

Stockholm Resilience Centre | Stockholm University

INSTITUTE ON THE ENVIRONMENT | UNIVERSITY OF MINNESOTA Driven to Discover

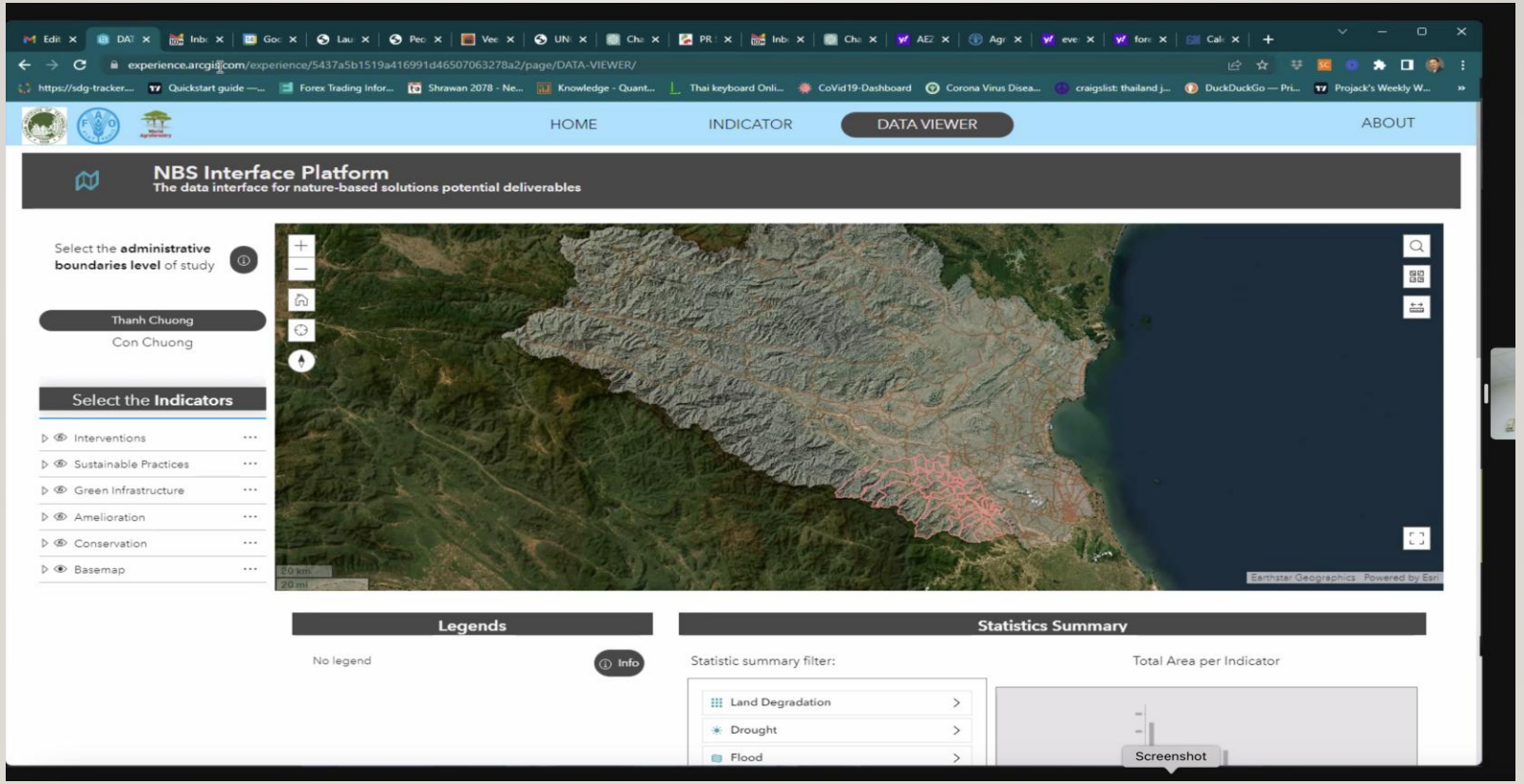
Beijer Institute OF ECOLOGICAL ECONOMICS | KUNGL. VETENSKAPS AKADEMIEN THE ROYAL SWEDISH ACADEMY OF SCIENCES

The Nature Conservancy

WWF

Suggested citation: Natural Capital Project, 2025. InVEST 0.0. Stanford University, University of Minnesota, Chinese Academy of Sciences, The Nature Conservancy, World Wildlife Fund, Stockholm Resilience Centre and the Royal Swedish Academy of Sciences. https://naturalcapitalproject.stanford.edu/software/invest

TOOLS & REFERENCES

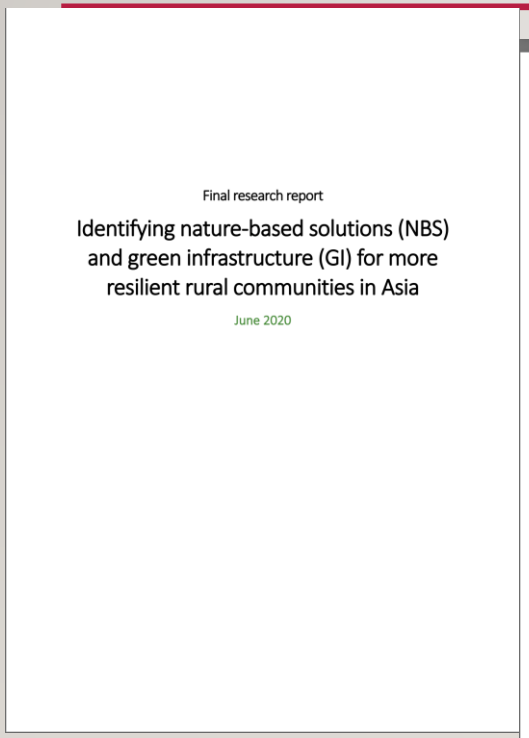


TOOLS & REFERENCES

Ecosystems (IUCN typology 2.1)	Intervention type	Number of case studies where specific interventions in specific ecosystems, implemented in specific countries, presented a positive effect on spec														
		Loss of food production	Soil erosion	Reduced water availability	Freshwater flooding	Biomass cover loss	Reduced soil quality	Loss of other ecosystem goods	Coastal erosion	Loss of timber production	Reduced water quality	Drought	Wind damage	Wildfire	Coastal inundation	Storm surge	Desertific
Tropical-subtropical montane rainforests		2	5	4	3		2	4		1			1				
	assisted natural regeneration and restoration with native species		1	1	1												
	assisted natural regeneration and soil conservation		1				1										
	fire and water management, protection and restoration	1	1	2				2									
	natural regeneration		1														
	plantation (fruiting trees in small scale), protection and restoration	1	1	1	1		1	1		1			1				
	protection and restoration with native species							1									
	selective logging				1												
Temperate subhumid grasslands		3	6	4	2	1	4				1						
	assisted natural regeneration	2	3				2										
	assisted natural regeneration and protection																
	assisted natural regeneration and restoration with native species										1						
	grazing management	1	1	1			1										
	natural regeneration and restoration with native species		1		1												
	restoration				1												
	restoration with native species		1	3		1	1										
Trophic savannas		11	3	1		1	1	1				4					
	restoration using native species and by controling erosion	1	1														
	assisted natural regeneration	1	1														
	assisted natural regeneration and protection	1															
	assisted natural regeneration and restoration with native species	1		1		1	1										
	grazing management	2	1														
	grazing management and protection	3										2					
	protection	1										2					
	restoration with native species	1						1									
Deciduous temperate forests		2	1			4				4							
	assisted migration of plant species									4							
	restoration with native species	2	1			4											
	thinning																
Intertidal forests and shrublands		1		1					3				2		1	2	
	creation of mangrove														1		
	natural regeneration and restoration with native species																
	protection	1							1				1			1	
	protection, restoration with native species and sustainable use			1					1								
	restoration with native species								1				1			1	
Boreal and temperate montane forests and woodlands				5	3	1				2							
	forest management and restoration with native species			1	1												
	grazing management					1											
	natural regeneration			1													
	natural regeneration after clearcut			2	1												
	restoration with native species				1												

NbS Evidence Platform (Oxford, et al)

TOOLS & REFERENCES



Final research report

Identifying nature-based solutions (NBS) and green infrastructure (GI) for more resilient rural communities in Asia

June 2020

FAO | Identifying nature-based solutions (NBS) and green infrastructure (GI) for more resilient rural communities in Asia | ICEM
Draft Report for Review – June 2020

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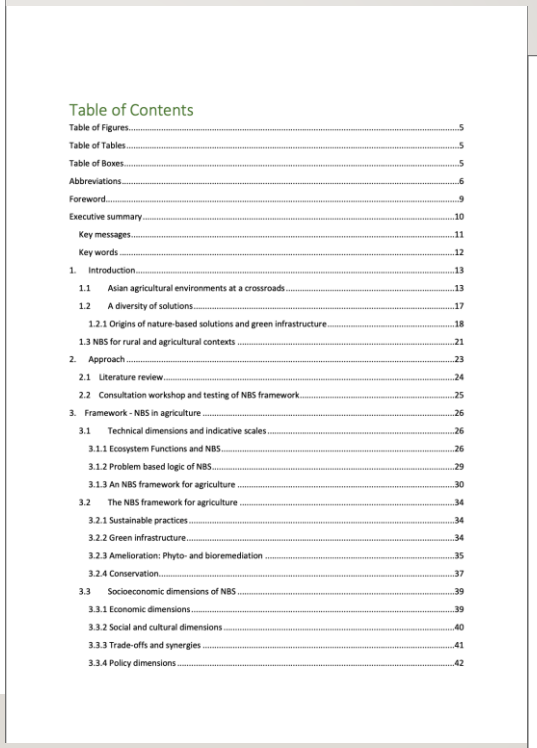

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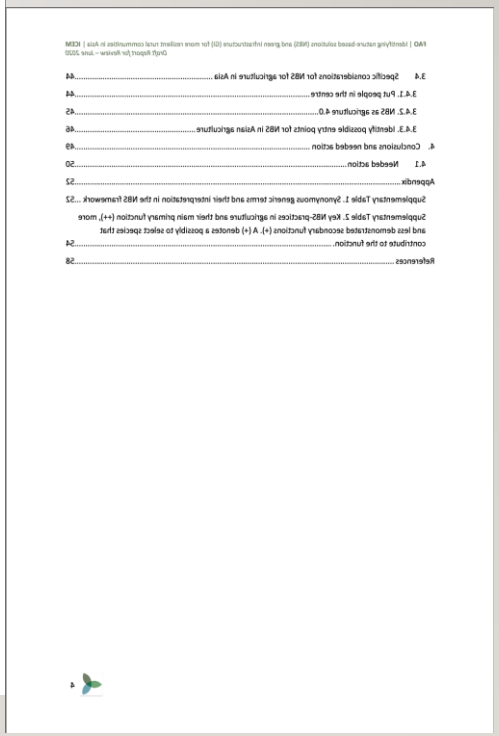

TOOLS & REFERENCES

CATALOGUE OF NATURE-BASED SOLUTIONS FOR INFRASTRUCTURE PROJECTS

DRAFT FOR DISCUSSION

CONSERVATION INTERNATIONAL

IFC International Finance Corporation WORLD BANK GROUP
Creating Markets, Creating Opportunities

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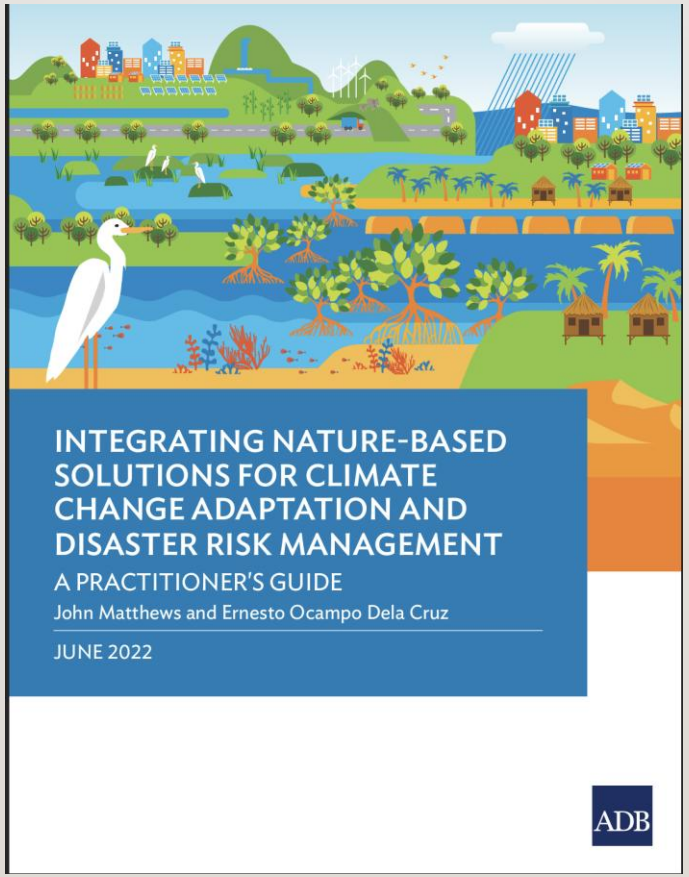
CONSERVATION INTERNATIONAL
IFC International Finance Corporation
Creating Markets, Creating Opportunities

TOOLS & REFERENCES



CONCLUSIONS

1) NbS is real and viable and beneficial and efficient
2) For most development sectors in Asia, there are many NbS examples to replicate and tools to use
3) Take note of possible early needs: assessing and modifying key policies, regulations and standards; at the project level, providing awareness and capacity building and undertaking NbS economic valuation studies