

# NATURE-BASED SOLUTIONS FOR DISASTER RISK MANAGEMENT



Photo by Stefan/Flickr

## THE WORLD BANK NATURE-BASED SOLUTIONS PROGRAM

*Established in 2017, the World Bank NBS Program informs and enables the World Bank operational teams and clients to make use of natural and modified ecosystems for functional purposes, to reduce risks associated with natural hazards and achieve other development objectives.*

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## Emerging Natural Solutions

Nature-based Solutions (NBS) that strategically conserve or restore nature to support conventionally built infrastructure systems (also referred to as gray infrastructure) can reduce disaster risk and produce more resilient and lower-cost services in developing countries. In the disaster risk management (DRM) and water security

sectors, NBS can be applied as green infrastructure strategies that work in harmony with gray infrastructure systems. NBS can also support community well-being, generate benefits for the environment, and make progress on the Sustainable Development Goals (SDGs) in ways that these gray infrastructure systems alone cannot.

Though NBS have yet to be fully integrated into decision-making or to compel widespread investment in developing countries, this is on the brink of change. Developing countries and their partners (including multilateral development banks and bilateral agencies) are increasingly utilizing NBS in DRM, as well as in water security, urban sustainability, and other development projects.

These growing numbers of NBS projects offer lessons and insights to help mainstream NBS into development decision-making. As more disaster risk managers understand and integrate well-designed NBS into DRM projects, more finance can be routed to nature-based projects that are cost-effective and resilient.

With that goal in mind, the World Bank's Nature-based Solutions Program aims to facilitate uptake of NBS in water management and DRM projects.

## Program Objectives

The program seeks to inform and enable World Bank operational teams and clients to incorporate NBS considerations into project plans and investments by

1. identifying the NBS investments across the World Bank portfolio;
2. addressing the challenges and obstacles within the institution and in the client engagement process;
3. mainstreaming nature-based solutions among clients, management and operational staff by providing technical guidance and conducting pilot projects; and
4. fostering knowledge exchange between staff, and with practitioners outside the World Bank.

Exchanging knowledge, experiences and lessons learned across a range of stakeholders will help guide the planning and implementation of nature-based solutions across World Bank Group practices, helping champion these solutions in the arenas of policy-making and investment for disaster risk reduction and other development objectives.

## Featured Publications

The World Bank NBS Program has been exchanging knowledge, experiences, and lessons learned across a range of stakeholders to enhance the planning and implementation of nature-based solutions across the World Bank portfolio. Key resources include the following:

- G. Browder, S. Ozment, I. Rehberger Bescos, T. Gartner, and G. Lange. Forthcoming. ***Integrating Green and Gray: Creating Next Generation Infrastructure***. Washington, DC: World Bank and World Resources Institute.
- World Bank. 2017. ***Implementing Nature-Based Flood Protection: Principles and Implementation Guidance***. Washington, DC: World Bank. <http://documents.worldbank.org/curated/en/739421509427698706/Implementing-nature-based-flood-protection-principles-and-implementation-guidance>.
- World Bank. 2016. ***Managing Coasts with Natural Solutions: Guidelines for Measuring and Valuing the Coastal Protection Services of Mangroves and Coral Reefs***. M. W. Beck and G-M. Lange, eds. Washington, DC: Wealth Accounting and the Valuation of Ecosystem Services Partnership (WAVES), World Bank.
- S.A. Soz, J. Kryspin-Watson, and Z. Stanton-Geddes. 2016. ***The Role of Green Infrastructure Solutions in Urban Flood Risk Management***. Washington, DC: World Bank. <https://openknowledge.worldbank.org/bitstream/handle/10986/25112/108291.pdf?sequence=4&isAllowed=y>.

## Nature-based Solution Project Highlights

### Metro Colombo Urban Development Project | SRI LANKA



Photo by World Bank

**Challenge:** Urban Flooding

**NBS:** Urban green spaces, reservoirs & wetlands

**Cost of components with NBS:** US\$120 million

**WB Practice:** Social, Urban, Rural & Resilience

This project, established by the Sri Lankan government, utilizes a mixture of green and gray infrastructure to reduce flood risks, improve drainage and create recreation opportunities, in the catchment area of the Colombo Metropolitan Region water basin. Nature-based solutions such as wetland protection and restoration are implemented in addition to traditional approaches such as bank protection walls. This photo features restored urban wetlands at the Beddagana Wetland Park.

### Nigeria Erosion and Watershed Management Project | NIGERIA



Photo by World Bank

**Challenge:** Gully Erosion

**NBS:** Watershed restoration with forests & vegetation

**Cost of components with NBS:** US\$406 million

**WB Practice:** Environment & Natural Resources

The Government of Nigeria, through the Ministry of Environment, state and local governments is implementing this project to reduce the vulnerability to soil erosion in targeted sub-watersheds. The multi-sectoral project will finance interventions to prevent and reverse land degradation on a demand-driven basis, initially focusing on gully erosion sites in southeastern states that threaten infrastructure and livelihoods. This photo features the Atakpa Gully erosion site after its hybrid engineering and vegetative land management restoration intervention.

## NATURE-BASED SOLUTIONS IN THE DISASTER RISK MANAGEMENT PORTFOLIO

The World Bank's portfolio of Disaster Risk Management (DRM) projects was US\$52.87 billion across 681 different projects from fiscal years (FY) 2012-2018. Since 2012, 76 DRM projects have been approved across the world that contain NBS, with relevant project components totaling US\$2 billion (see Figures 1 and 2).

These projects target a number of hazards and risks, including: urban, river and coastal flooding; coastal erosion; landslides and landscape erosion; and drought (see Figure 3, noting projects apply to more than one hazard). They are implemented by six Global Practices: Environment & Natural Resources (35); Social, Urban, Rural & Resilience (29); Agriculture (5); Water (5); Social Protection & Labor (1); and Transport & Information and Communication Technology (1). Figures 2 and 3 show the project distribution around the world, and aggregate investments in NBS project components containing NBS.

FIGURE 1 | Nature-based Solutions in the Disaster Risk Management Portfolio

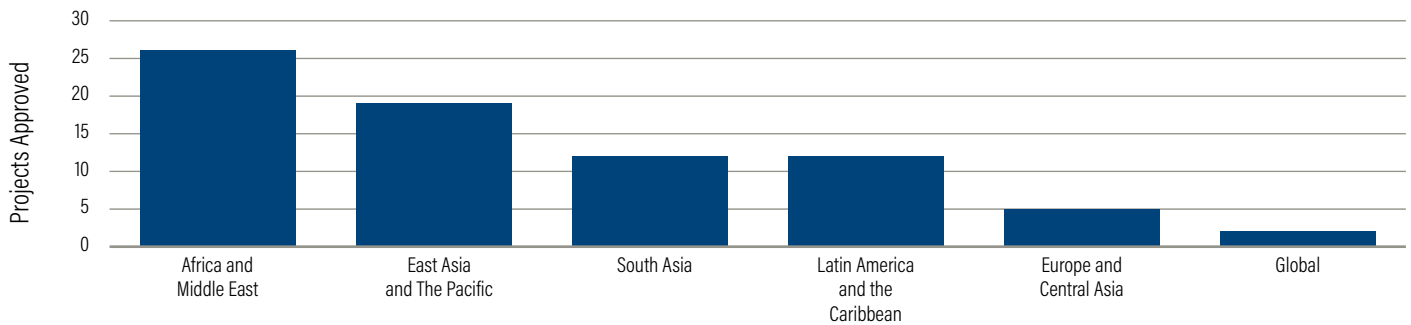


FIGURE 2 | Investments in Project Components Containing Nature-based Solutions by Region, 2012-2018

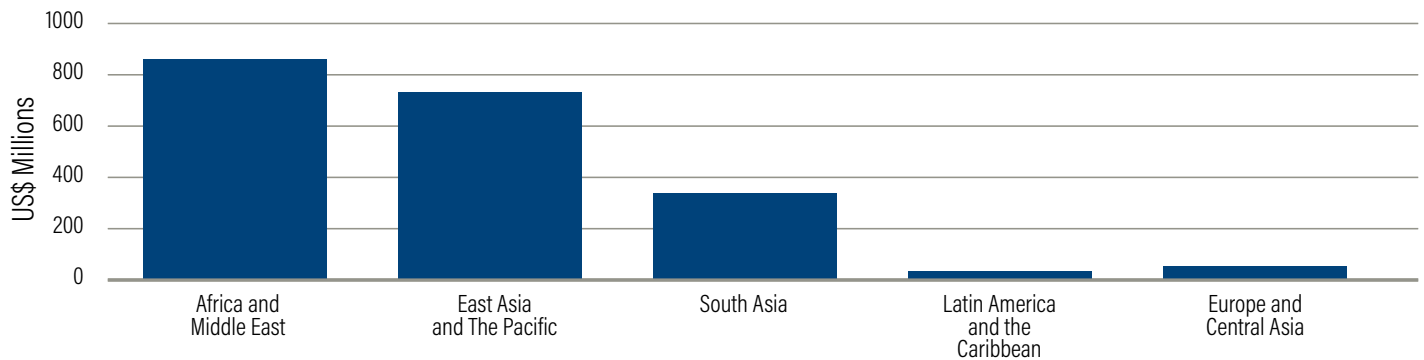
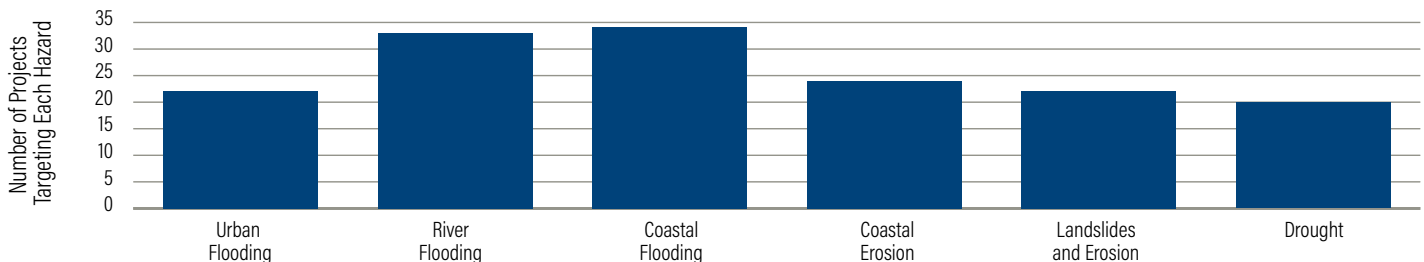
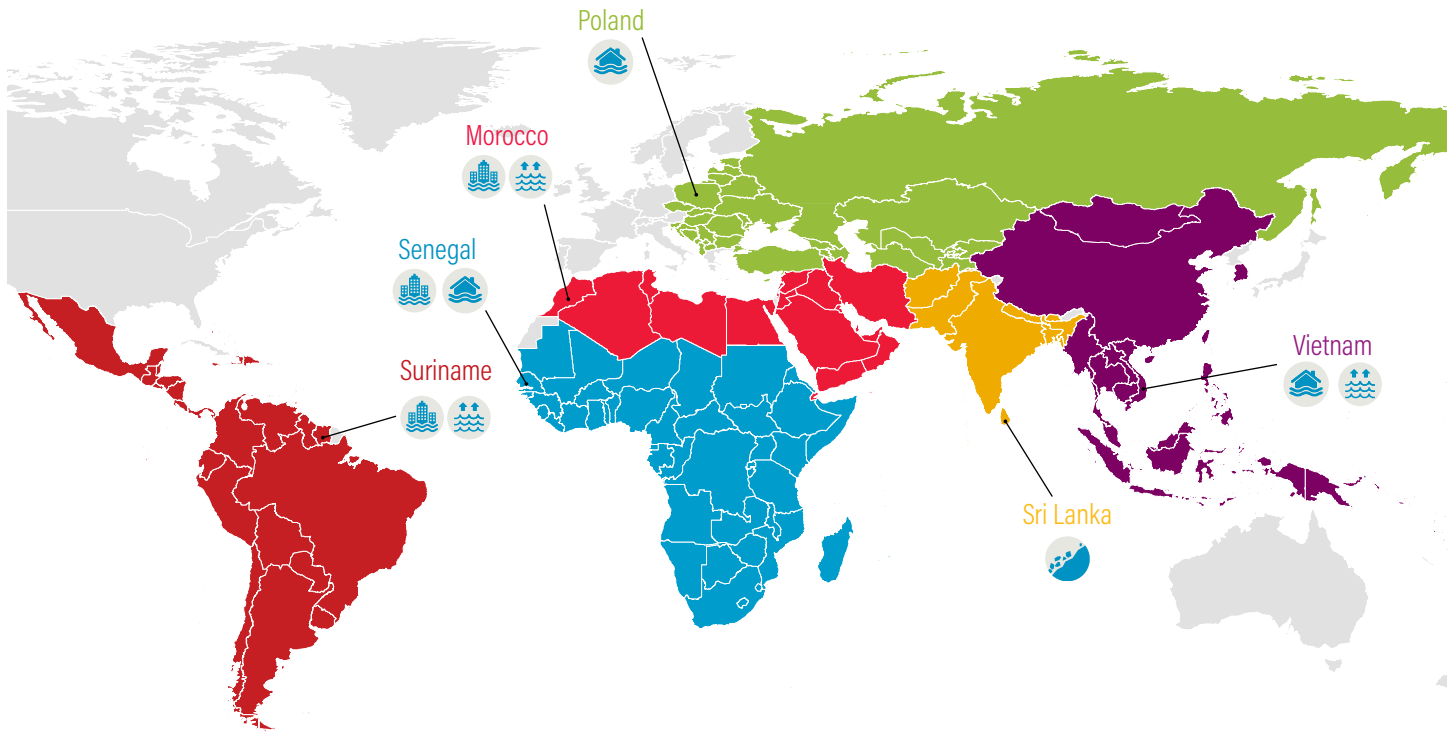


FIGURE 3 | Hazards Targeted by Projects Containing Nature-based Solutions, 2012-2018



# Nature-based Solutions for Disaster Risk Management Project Case Studies

The map below highlights some examples of DRM projects and their NBS components targeting a variety of hazards across the world.



-  Coastal & urban flooding
-  Coastal erosion
-  River flooding
-  Landslides

**LATIN AMERICA & THE CARIBBEAN**  
Greater Paramaribo Flood Risk Management

**Location:** Suriname

**Challenges:** Coastal & urban flooding; coastal erosion

**NBS:** Mangrove restoration; rivers & floodplain management

**Cost of NBS-related Component:** US\$ 225,000

**EUROPE & CENTRAL ASIA**  
Odra-Vistula Flood Management Project

**Location:** Poland

**Challenge:** River flooding

**NBS:** Dry polder & embankment retrieval

**Cost of NBS-related Component:** US\$ 22M

**AFRICA**  
Stormwater Management and Climate Change Adaptation Project

**Location:** Senegal

**Challenge:** Urban & river flooding

**NBS:** Artificial & natural retention ponds; wetlands

**Cost of NBS-related Component:** US\$ 4M

**SOUTH ASIA**  
Forest-based Landslide Risk Management Program

**Location:** Sri Lanka

**Challenge:** Landslides

**NBS:** Restoration of forests & vegetation

**Cost of NBS-related Component:** US\$ 150,000

**MIDDLE EAST & NORTH AFRICA**  
Integrated Coastal Zone Management Project

**Location:** Morocco

**Challenge:** Coastal & urban flooding

**NBS:** Forests & vegetation; inland & coastal wetlands; dunes & beaches

**Cost of NBS-related Component:** US\$ 4M

**EAST ASIA & THE PACIFIC**  
Mekong Delta Integrated Climate Resilience and Sustainable Livelihoods Project

**Location:** Vietnam

**Challenge:** Coastal flooding & erosion; river flooding

**NBS:** Mangrove restoration & re-connect river

**Cost of NBS-related Component:** US\$ 243M