Resilient by Nature: Increasing Private Sector Uptake of Nature-based Solutions for Climate-resilient Infrastructure

A Market Assessment for Latin America and the Caribbean

Acclimatise Group Ltd.
United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)

Climate Change Division

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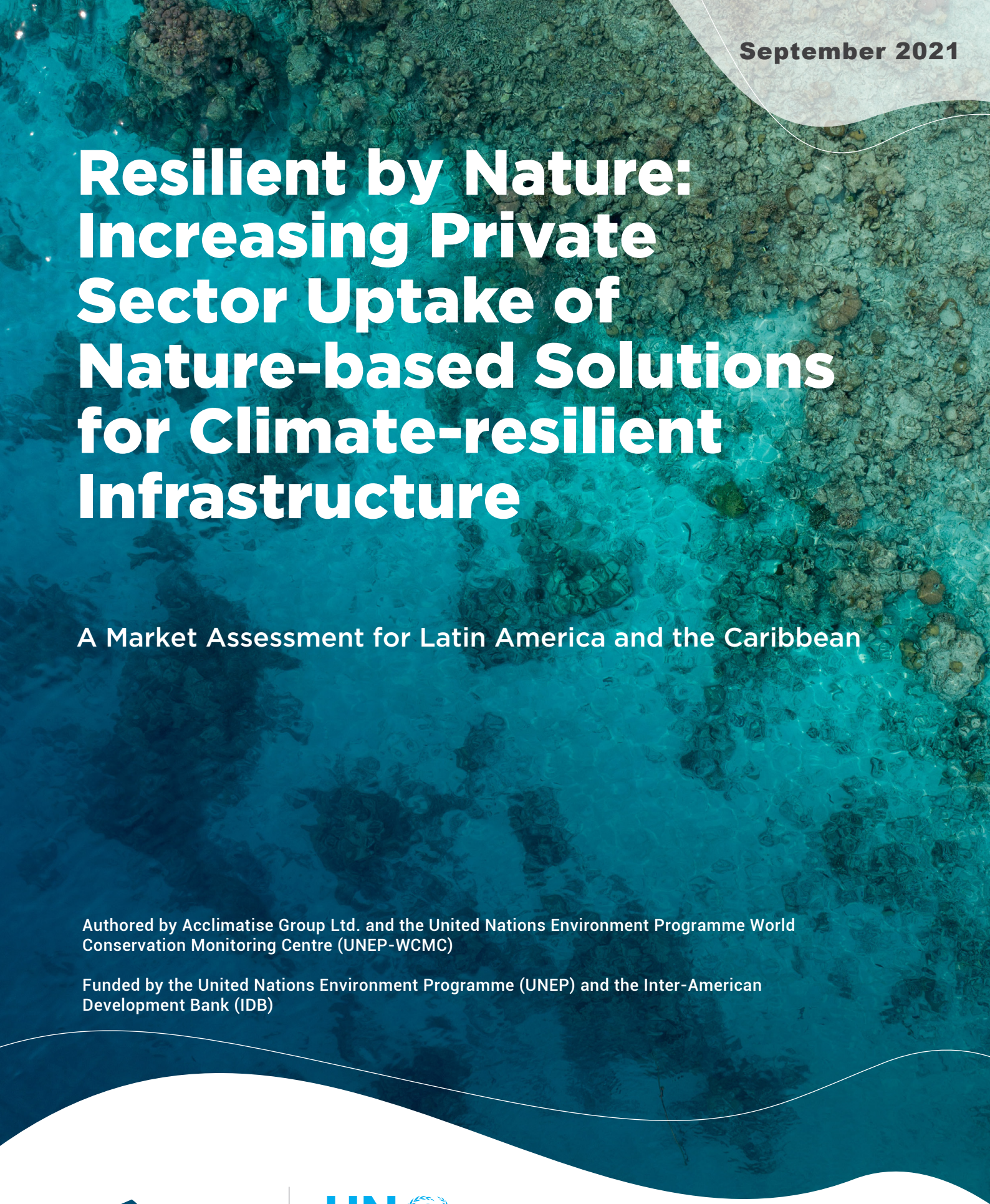

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Authored by Acclimatise Group Ltd. and the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC)

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Contents

CASE STUDIES

SELECTED ACRONYMS

CbA	Cost-benefit Analysis
CSR	Corporate Social Responsibility
IDB	Inter-American Development Bank
LAC	Latin America and the Caribbean
MDB	Multilateral Development Banks
NbS	Nature-based Solutions
PES	Payment for Ecosystem Services
PPP	Public-Private Partnership
UNEP	UN Environment Programme
UNEP-WCMC	UN Environment Programme World Conservation Monitoring Centre

KEY TERMS

Gray infrastructure: "involves engineered assets that provide one or multiple services required by society, such as transportation or wastewater treatment"[1]

Green infrastructure[a,2]: "a strategically planned network of natural and semi-naturalareas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas"[3]

Infrastructure: "structures and facilities that underpin power and other energy systems (including upstream infrastructure, such as the fuel production sector), transport, telecommunications, water, and waste management. It includes investments in systems that improve resource efficiency and demand-side management, such as energy and water efficiency measures. Infrastructure includes both traditional types of infrastructure (including energy to public transport, buildings, water supply and sanitation) and, critically, also natural infrastructure (such as forest landscapes, wetlands and watershed protection)"[4]

Natural capital: "the finite stock of environmental assets, such as water, land, air, species and minerals that produces a flow of ecosystem goods and services which are important for human well-being and for the economy"[5]

Nature-based Solutions (NbS): "actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"[6]

Sustainable infrastructure: "infrastructure projects that are planned, designed, constructed, operated, and decommissioned in a manner to ensure economic and financial, social, environmental (including climate resilience), and institutional sustainability over the entire life cycle of the project"[7]

DOCUMENT SUMMARY

The outcomes of this document are summarized in an Emerging Findings discussion paper, which can be accessed here.

a The terms 'green infrastructure' and 'natural infrastructure' are often used interchangeably.[8] This report uses the term 'green infrastructure', which includes natural areas that provide infrastructure services.

A NOTE FROM THE PROJECT FUNDERS

Inter-American Development Bank

Climate change is one of the greatest challenges facing our economies, health, food security, and national security. It affects our ability to deliver energy, transport, logistics, water, sanitation, and communications services. The Inter-American Development Bank Group (IDB Group) mandate is to help governments, the private sector, and the civil society of Latin America and the Caribbean (LAC) to strengthen their capacities to achieve net zero emissions and adapt to the impacts of climate change.

Investment for climate-resilient infrastructure is at the core of the IDB Group agenda. Nature-based Solutions (NbS) are a cost-effective way to build infrastructure resilient to the changing climate, while delivering societal benefits. Setting out the business case for these solutions is an important first step in building support and securing funding and financing because many governments and businesses are unaware of the opportunities and cost-efficiencies of NbS. To date, private sector uptake of NbS has been weak across LAC.

The IDB is delighted to have collaborated with the UN Environment Programme (UNEP), Acclimatise, and the UN Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) to explore solutions for existing policy, technical, and financial barriers to NbS, and, in doing so, to increase private sector uptake of NbS in infrastructure across LAC.

This report results from this collaborative effort. It presents the findings and provides recommendations for infrastructure project developers, financial institutions, and policymakers to create a more enabling environment for NbS in LAC.

IDB
Inter-American
Development Bank

A NOTE FROM THE PROJECT FUNDERS

UN Environment Programme

The Global Commission on Adaptation has rightly noted the importance of mobilizing the private sector if we are to adopt large-scale approaches to NbS for building climate resilience (Adapt Now: A Global Call for Leadership on Climate Resilience, 2019). We need to move away from the current position, where NbS is a niche, poorly understood option for private sector investors, mostly to be addressed under the Corporate Social Responsibility agenda. We should move towards a situation where NbS options are recognized by the private sector for their effectiveness and are assessed alongside other options as capable of delivering effective adaptation solutions, as well as additional benefits for mitigation, biodiversity, and human health and welfare. We need NbS for climate resilience to become the "new normal".

This report addresses these issues in LAC, a region where private sector investment is particularly important. Unlike in Asia, where only 10 per cent of infrastructure investment comes from the private sector, in Latin America, around 50 per cent of infrastructure investment is from the private sector. This report is designed to facilitate the shift that is needed towards NbS by analyzing some of the barriers to the adoption of NbS by the private sector and identifying the opportunities. Yet, one thing is clear: overcoming the barriers and seizing the opportunities will not be achieved by the private sector alone. It will also require significant changes in public sector policy, regulation and procurement.

UNEP is pleased to be supporting the preparation of this report with the IDB, and we thank Acclimatise and UNEP-WCMC for their work. This report will inform both UNEP's large and growing portfolio of ecosystem-based adaptation projects, and the portfolios of many other institutions.

Global Commission on Adaptation. (2019). Adapt Now: A Global Call for Leadership on Climate Resilience. Available at, https://gca.org/global-commission-on-adaptation/report

UN environment programme

Rain gardens retain stormwater runoff helping to reduce pressure on the stormwater drainage system.

Source: DASonnenfeld /CC BY-SA

1. Increasing the uptake of Nature-based Solutions for climate-resilient infrastructure

Nature-based Solutions (NbS) have the potential to contribute to climate-resilient infrastructure in Latin America and the Caribbean (LAC), where a wealth of natural capital is under threat, vulnerability to the impacts of climate change is increasing, and there is significant demand for infrastructure.

1.1 Introduction

As greenhouse gas emissions continue to rise, climate change impacts are becoming more acute and frequent, increasing the need for climate resilience in infrastructure investments across Latin America and the Caribbean (LAC). Climate-related hazards, exacerbated by El Niño–Southern Oscillation (ENSO) events, have led to disasters causing billions of dollars in damage and production losses[9]; and such costs will only increase over time. Through such disasters, and slower-onset consequences, climate change can impact both infrastructure service delivery (e.g. water supply) and infrastructure assets (e.g. roads and buildings). In parallel, biodiversity and ecosystem functions and services are deteriorating at rapid rates worldwide. In LAC, forests are being destroyed at a rate double the global average. As many as 40 per cent of mangrove species along the Atlantic and Pacific coasts of Central America are threatened with extinction, and 66 per cent of LAC coral reefs are already damaged[10]. Yet, nature is essential for human existence, quality of life, and for climate change adaptation and mitigation.

Nature-based Solutions (NbS; Figure 1) can play a significant role in building climate resilience, for example:

- Trees and vegetation stabilize soils with their root systems, providing mechanical reinforcement to help reduce landslides, erosion, and flood risk (instead of, or in addition to, retaining walls).
- Healthy coral reefs and mangroves serve as effective breakwaters against coastal storm surge, reducing flood risk (instead of, or in addition to, seawalls).
- Forests and other upland vegetation help to regulate water supply during periods of drought (instead of, or in addition to, built water distribution systems).

In reality, the role of NbS is likely to fall along a spectrum, from providing additional resilience for existing infrastructure (e.g. restoring forests adjacent to a road to extend the life of a retaining wall that protects the road from landslides), to

reducing the quantity or specification of gray infrastructure required to achieve the same resilience (e.g. restoring forests adjacent to a road to reduce the length or height of the retaining wall required to protect it from landslides), to replacing the gray infrastructure entirely (e.g. restoring forests adjacent to a road so it is adequately protected from landslides without the need for a retaining wall).

In addition to helping society adapt to the hazards exacerbated or created by climate change, ecosystems such as forests and wetlands play an important role in natural carbon sequestration. As such, ecosystems are essential to achieving the Sustainable Development Goals (SDG)[11] and the global commitments set out in the Paris Agreement[12]. Therefore, solutions are urgently required that can build climate resilience and deliver enhanced infrastructure services, while helping to reduce atmospheric greenhouse gas levels and maintain the valuable ecosystems on which humans depend.

Investments in energy, transport, water supply, sanitation, irrigation, and flood protection are critically important for economic development. Yet, meeting infrastructure demands with high-carbon, inefficient, resource-intensive, climate-vulnerable, and otherwise unsustainable investments will undermine the delivery of the SDGs and exacerbate the challenges presented by climate change and the degradation of our natural resources. NbS have an important role to play in both meeting the rising demand for infrastructure services (for instance, restoring upland habitats can maintain water supplies as precipitation levels decrease), and strengthening the resilience of gray infrastructure assets (for instance, managing coral reefs can improve the performance of seawalls against more frequent storm surges).

NbS can be applied in a variety of contexts (e.g. urban, rural) to meet infrastructure needs (Figure 1). At the same time, they can also generate a series of co-benefits, such as climate regulation, habitat for biodiversity, and poverty reduction that are essential to community well-being. NbS and their co-benefits can help to meet national and global commitments, including biodiversity targets, the Sendai Framework for Disaster Risk Reduction[13], and the Addis Ababa Action Agenda[14] and contribute towards securing fundamental human rights such as gender equality (see Box 1). NbS are, therefore, an integral component of the Sustainable Infrastructure Agenda[15].

There has been extensive interest from conservation organizations in supporting the implementation and scaling up of NbS, in particular due to the multiple benefits that NbS can deliver to society and for the environment. While the support of non-governmental organizations and donors is important, philanthropy, Corporate Social Responsibility (CSR) activities, and public investment alone will not mainstream the use of NbS to increase infrastructure resilience. Policymakers, project developers (e.g. engineers, contractors, architects), and private sector stakeholders involved in infrastructure investment and development (e.g. banks, pension funds, insurance companies) are all critical to the success of implementing NbS to help address the risks posed to infrastructure by a changing climate. As the private sector plays a prominent role in financing infrastructure investments in LAC, it will influence and drive the infrastructure agenda[16] Additionally, businesses that create and operate their own infrastructure (e.g. buildings, roads) can use NbS to increase the climate resilience of their operations. The challenge is to convey how NbS can address resilience requirements to those involved in infrastructure investment, procurement, construction, and operation.

Box 1: Integrating gender equality into NbS

Women and men can be affected in different ways by climate change impacts, they often play different roles in managing and using natural resources, and they can have different dependencies on infrastructure. Therefore integrating a gender perspective in the design and implementation of NbS for infrastructure is critical. In turn, well designed NbS can help reduce the risks posed by climate change while contributing towards women's empowerment and gender equality.

Not only is gender equality a fundamental human right, but it is key to economic growth and achieving the Sustainable Development Goals (SDGs), as well as other commitments under international agreements such as the Convention on Biological Diversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCCC).

To maximise the effectiveness and positive outcomes of using NbS to increase the climate resilience of infrastructure, policymakers, project developers and financing organizations should therefore integrate gender considerations throughout all levels of NbS planning and implementation – from designing gender-sensitive policies to considering gender differentiated roles and impacts of NbS. Such actions include:

Policymakers

- Recognize the vital role that women play in the management of natural resources, and draw on this expertise when developing NbS policies.
- Consult relevant stakeholder groups, particularly those who are disproportionately impacted by a lack of climate-resilient infrastructure such as women, to ensure gender considerations are fully integrated into policies on NbS.
- Develop policies that promote the use of NbS for infrastructure projects to achieve a range of social and environmental aims, targets and international commitments, including gender equality.
- Consider collecting sex disaggregated statistics for NbS projects to help address gender-environment data gaps and inform the development of effective future policies.

Project Developers

- Build gender-balanced project teams that have the skill sets to understand, evaluate and integrate the expertise and needs of all stakeholder groups, including women.
- Undertake a program of consultation to:
  - draw on the expertise of stakeholder groups involved with the management of natural resources
  - understand the impacts of climate change on different stakeholder groups (including women) and their infrastructure related needs
  - consider how NbS could help address some of these challenges.
- Integrate gender considerations throughout the life-cycle of projects to create long term opportunities to empower women and ensure their active participation e.g. ensure that awareness raising, capacity building, partnership development and implementation activities for the use of NbS for climate resilient infrastructure are gender-responsive.
- Incorporate costs and co-benefits for all stakeholder groups into project cost-benefit analysis to demonstrate the value of implementing NbS for climate-resilient infrastructure.
- Consider the use of gender-responsive frameworks (e.g. the UN Women Private Sector Accountability Framework) or gender-responsive indicators in company policy and project assessments to support gender equality and inform decision making.

Financial Institutions

- Integrate gender considerations and/or gender-responsive indicators into the governance and risk-management systems established to create an enabling environment for NbS investments.
- Consult with stakeholder groups to develop new financial support mechanisms that support gender equality and women's empowerment through projects that use NbS for climate resilient infrastructure.
- Recognize the important role that financial mechanisms, such as gender and green bonds, can play in supporting women's empowerment.

1.2 What are Nature-based Solutions?

Nature based solutions are "actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits"[17].

Nature-based Solutions (NbS) provide a range of ecosystem-related approaches to address societal challenges[18]. NbS can encompass natural infrastructure and green infrastructure, as well as approaches that combine green and gray elements (referred to as "hybrid approaches")[b]. This report looks specifically at how NbS can be used to support or develop climate-resilient infrastructure. Examples of how NbS can help increase the climate resilience of infrastructure include restoring watersheds to regulate water supply and decrease sedimentation in order to maintain the function of a hydroelectric dam, and management / rehabilitation of coral reefs to dissipate wave energy and reduce flood risk. NbS may help to mitigate multiple hazards, such as flood risk, landslides, and water stress, while generating a series of co-benefits, including conserving biodiversity, providing incomes, and offering recreational opportunities. While some gray infrastructure can also create co-benefits (for instance, recreation opportunities offered by a reservoir), NbS can offer greater versatility than gray infrastructure alone in the face of multiple challenges. Furthermore, NbS can support the delivery of infrastructure services with greater resource efficiency[c] than gray solutions, while sequestering carbon and increasing resilience to the impacts of climate change. NbS can also provide direct economic value by reducing losses through enhanced resilience (such as reducing inland flood risk) and, in some cases, deliver benefits that may generate revenue. The profile of NbS is growing because their benefits are increasingly being recognized, especially in the context of climate change. For example, NbS were featured as one of six priority Action Portfolios by the Secretary General of the United Nations at the 2019 UN Climate Action Summit[19] and will be one of the presidency's four key themes for the UN Framework Convention on Climate Change 26th Conference of the Parties (UNFCCC COP 26) in 2021. Figure 1 shows how NbS and gray infrastructure can enhance the climate resilience of infrastructure and infrastructure services, and provides examples of where the two types of solutions could be integrated.

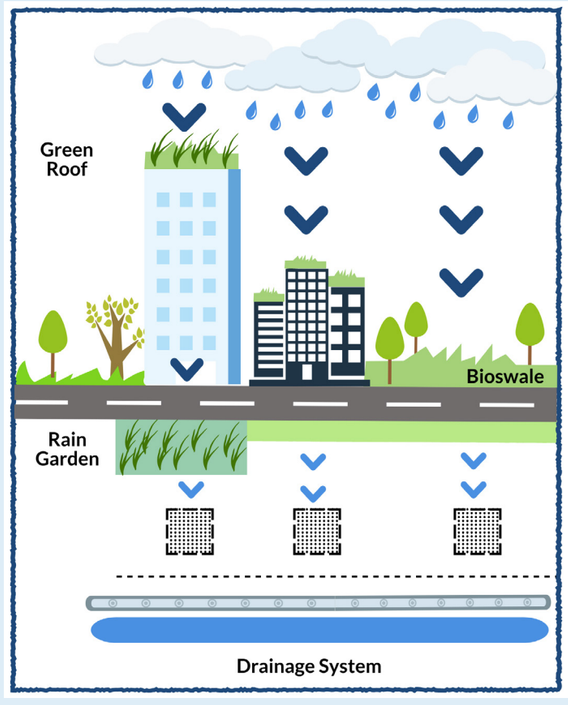
Figure 1. Nature-based and gray solutions for addressing climate risks[20]

Climate Risk	Gray Solutions (Engineered)	Nature-based Solutions
Urban stormwater/flood management	• Retrofitted/enhanced urban storm-water drainage systems • Engineered flood protection	• Green roofs • Urban gardens and green spaces • Riparian and wetland vegetation restoration, creation, and management
Coastal flooding, storm surge, sea-level rise, and erosion	• Seawalls, dykes, permanent artificial walls, and temporary storm barriers • Improved drainage systems	• Conservation, management, restoration, and (in some cases) creation of: • Coral reefs (including using artificial substrate) • Oyster reefs • Sea grass beds • Coastal wetlands, mangroves, and salt marshes • Sand dunes and beaches
Inland flooding	• Alluvial dykes and dams (creation, retrofitting, and maintenance) • Improved pumping, piping, and storage systems	• Upslope vegetation restoration and management • Forest restoration • Riparian and wetland restoration/creation and management, living weirs, and check-dams • Floodplain management
Landslides	• Retaining walls • Gabions	• Upslope vegetation restoration management • Reforestation and afforestation (where appropriate)
Water scarcity	• Reservoirs/dams • Concrete catchments • Desalination plants (if coastal) • Aqueducts	• Watershed restoration, including reforestation (where appropriate) • Permeable "green" areas for groundwater replenishment
Soil erosion and sedimentation	• Retaining walls • Terracing • Dredging programs	• Upslope vegetation restoration and management • Reforestation and afforestation (where appropriate) • Management of littoral vegetation and wetlands

Integrated Example 1: Green roof, bioswale and rain gardens to regulate stormwater run-off and reduce flows to drainage systems

Integrated Example 2: Restoring/conserving mangrove belts that support sea dykes as a first line of defense, reducing flood risk and erosion

Integrated Example 3: Watershed restoration surrounding dams to regulate water supply and decrease sedimentation



b Definition based on Cohen-Shacham, et al. (2016)[21] and Browder, et al. (2019)[22]. Note the term NbS encompasses a larger concept than what is presented here; see Cohen-Shacham, et al. (2016) for a broader definition and the origin of NbS.

c For example, green roofs have been shown to be effective at regulating temperature, thereby decreasing the need for energy for heating and cooling[23].

1.3 About this Market Assessment

This Market Assessment examines how NbS can contribute to climate-resilient infrastructure through the protection, management, and restoration of natural capital. It was produced as part of a collaboration between The Inter-American Development Bank (IDB), the United Nations Environment Programme (UNEP), Acclimatise and the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC).

This report focuses on private sector actors (specifically **private financial institutions** and **project developers**). The private sector plays a prominent role in financing infrastructure investments in LAC[d]; therefore, it can have great influence on driving the infrastructure agenda. This report examines the barriers to, opportunities for, and actions required to increase private sector use of NbS in this context, focusing on: the role of **policy** in NbS uptake; **awareness, governance**, and **capacity**; technical **tools and skills** to deliver NbS; and **finance** and **funding**.

The **intended audience** of this report includes:

- **Policymakers** concerned with financing, planning, developing, and operating infrastructure, particularly within national government ministries, and regional and local governments.
- **Financial institutions**, private and public investors and lenders, and Multilateral Development Banks (MDBs).
- **Infrastructure project developers**, including engineers, architects, designers, and contractors.
- **Infrastructure operators** and **private businesses** commissioning proprietary infrastructure, such as factories and buildings.

A summary of the barriers, actions, and opportunities for these key stakeholder groups is provided at the end of each chapter.

This Market Assessment is informed by desk-based research, case studies, questionnaire responses, and interviews with policymakers, financial institutions, non-governmental organizations (NGOs), project developers, academics, and NbS experts across LAC. The methodology can be found in Annex A.

Summaries of relevant case studies are included throughout the text, while detailed descriptions of the projects are provided in Annex B. These projects focus on enhancing the resilience of infrastructure assets and services using NbS. In these cases, private sector actors may be project developers, implementers, partners, investors, and/or financers.

Cost-benefit Analyses (CbAs) have been completed for a subset of case studies to show the overall economic and financial viability of NbS investment; the results can be found in Box 8 and Annex C.

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d From 1990 to 2013, the private sector invested $680 billion in infrastructure investment in LAC, about 30 per cent more than high-growth Asian economies[24].

Box 1. Recognizing complexity and commonality in NbS and resilient infrastructure

This Market Assessment discusses barriers, actions, and opportunities in relation to NbS for climate-resilient infrastructure in LAC. It is important to note that:

- Many barriers, actions, and opportunities will apply to NbS more generally (e.g. permitting challenges), and are not exclusive to private sector uptake of NbS for climate-resilient infrastructure.
- Some barriers, actions, and opportunities may also apply to climate-resilient gray infrastructure (e.g. a lack of metrics or difficulties securing finance).
- Some gray infrastructure projects can also deliver co-benefits (e.g. recreational opportunities).

Recognizing these complexities, and some of the common challenges shared between NbS and resilient infrastructure more broadly, will help to identify both lessons learned and opportunities for action to meet the growing demand for infrastructure in a changing climate.

Sand dunes protect against coastal erosion and offer tourism and recreation opportunities.

Source: Pixabay

2. The role of policy in NbS uptake

2.1 Introduction

Governments[e] and companies planning and developing infrastructure projects use policy to understand and identify the geographic, design, and operational requirements for their work. The entities funding infrastructure projects (e.g. governments, MDBs, commercial banks, investors), together with insurers, NGOs and civil society, will seek confirmation that the work is being conducted in line with relevant policy. Therefore, national, regional, local, and sectoral policies are important mechanisms to encourage the private sector to increase the use of NbS to develop climate-resilient infrastructure.

Recognizing the value of NbS in policy frameworks can help to mainstream them into decision-making. If NbS are missing from policy frameworks, policy environments are unclear, or existing requirements actively discourage the use of NbS (e.g. by favoring gray solutions), project developers may be less likely to consider NbS for infrastructure schemes. Furthermore, financial institutions may not be willing to provide funds, and governments may be unable to issue permits for them.

A wide range of different policies are relevant to NbS uptake, such as National Infrastructure Plans, environmental policies, and sectoral plans (Figure 2). These policies, and the framework they create, vary from country to country, and from local to national level. Each country's unique legislative and policy context will result in a different set of challenges or enabling factors for NbS. While steps are being taken in LAC to integrate the concept of NbS into national policy frameworks and laws, this study found that several perceived and potential policy and legislation barriers still remain.

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e *National, regional and local governments are structured in different ways. Here, the term "government" is used for all ministries, departments, offices, and regulators that may be involved with infrastructure development.*

Figure 2. Types of policies of relevance to NbS for climate resilient infrastructure

2.2 Barriers

This study asked people working in governments and on NbS projects in LAC about the policy barriers to NbS uptake. They identified the following main groups of barriers:

- Dominance of gray infrastructure.
- Complex policy environments.
- Permitting and approval challenges.
- Lack of financial incentives for NbS.

2.2.1 Dominance of gray infrastructure

Many policy frameworks were originally developed in the context of gray infrastructure, so these approaches are currently more prominent than NbS. Gray infrastructure approaches have many years of science, engineering, evidence gathering, best practice, and operational experience behind them. This has set the standard for infrastructure projects, and governments have developed national policy frameworks accordingly. For example, using retaining walls to protect railways or roads from landslides may be a more familiar approach to project engineers than managing upland vegetation. NbS are rarely explicitly presented in policies or laws that are of direct relevance to project developers, such as National Development Plans (NDPs) or engineering standards. For example, Paraguay's National Infrastructure Plan and Mexico's National Development Plan 2019-2024, make no reference to using NbS to achieve development objectives.

Until NbS are better represented in infrastructure-relevant policy frameworks (e.g. Environmental Impact Assessment (EIA), development, procurement, and other policies), gray infrastructure is likely to be the default approach.

2.2.2 Complex policy environments

Complex policy environments can deter project developers from using NbS for climate-resilient infrastructure. Such policy environments can lead to conflicts, which drive uncertainty and risk for both project developers and the organizations funding infrastructure projects. In LAC, unclear policies have created barriers to to using NbS in the water sector[25]. The greater the number of relevant policies (climate, forestry, biodiversity, infrastructure, planning, finance, etc.) and the tiers of government involved (national, regional, municipal, etc.), the greater the risk of policy misalignments and complexity. For example, ecosystems located in the intertidal zone, such as mangroves and marshes, may fall under the jurisdiction of government departments in charge of both terrestrial and coastal areas. This complexity could discourage the uptake of NbS.

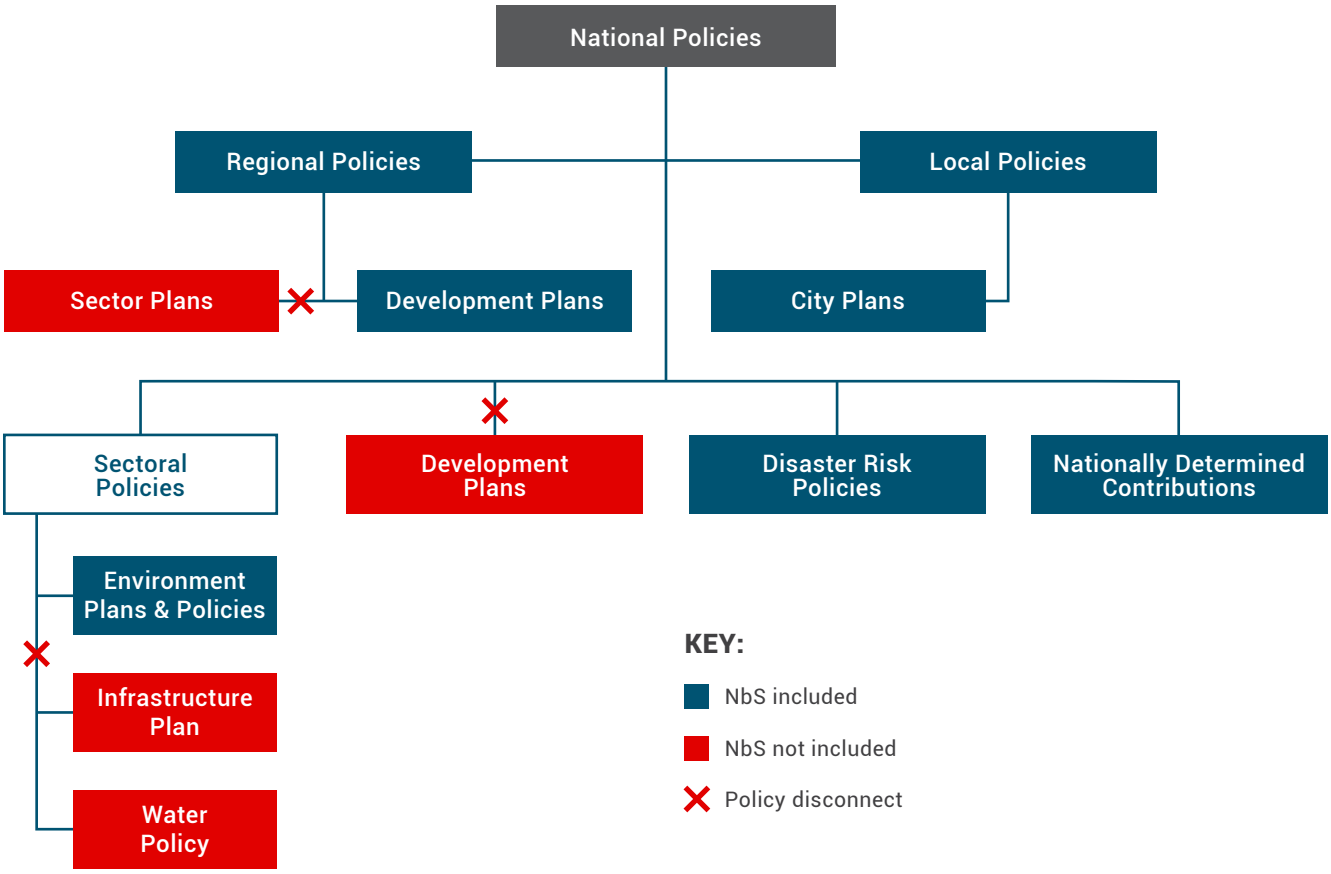
Even when levels of policy complexity are low, project developers are likely to be less familiar with navigating aspects of the policy environment for NbS than for gray infrastructure. Indeed, a complex policy environment can create barriers for traditional and resilient gray infrastructure approaches, regardless of any added complexities that may arise from some elements of NbS projects (particularly where they are used as a complementary approach).

Policies that support the use of NbS in one area (e.g. climate change) may not be linked with other relevant areas (e.g. planning). The concept of NbS is gaining profile, particularly through international conventions and agreements relating to climate change. Under such agreements, some countries in LAC have made commitments to use NbS to help build resilience to climate change. However,

most of these commitments have not yet been cascaded into policies that are directly relevant to infrastructure project development (Figure 3). For example, Colombia's National Development Plan[26] and the National Infrastructure Plan do not explicitly reference NbS, although NbS are referenced in other, climate-related, national policy documents. While NbS may feature in high-level, climate-related commitments, these commitments are not always coordinated with planning and sectoral policies to drive implementation of NbS for climate resilient infrastructure on the ground. This barrier is also likely to apply to resilient gray infrastructure projects.

Changes to the policy environment within the lifetime of an NbS project can create barriers to successful implementation. It can take many years for NbS to provide the full range of benefits they offer, so frequent changes in government ministers, civil servants, policies, and/or procedures can challenge their overall success. NbS policies or programs initiated or supported by one administration could be changed or cancelled by the next as priorities and/or budgets are realigned, leading to a shift in the perceived value of the NbS. While this can also be the case for traditional and resilient gray infrastructure approaches, newer or novel policies associated with NbS may be at particular risk of being withdrawn.

Figure 3. Illustration of how policy disconnects for NbS could occur between different levels and types of policies



2.2.3 Permitting and approval challenges

Lack of regulator experience of using NbS in infrastructure projects can lead to delays and uncertainty for private sector implementers. As NbS are often considered a "new" approach, the additional time required to secure appropriate permits may disincentivize their uptake in projects. Regulators are likely to be familiar with the process for approving traditional infrastructure projects, including which departments they need to coordinate with, and the mechanisms they need to use. Yet, a comparative lack of experience with NbS projects could lead to delays as regulators determine which departments they need to liaise with (Section 3.2 discusses governance and capacity challenges further). Government departments often follow existing processes and procedures when reviewing infrastructure projects to ensure they are aligned with national policy. Departments may not be well positioned to encourage or promote the use of NbS if they are not explicitly mentioned in policy. Government decision makers may also choose traditional infrastructure approaches over those that use NbS in order to minimize risk and uncertainty.

Complex permitting processes can disincentivize private sector uptake of some NbS. Two key barriers to the uptake of NbS are the high number of permits required for certain projects, and the potential requirement for extensive liaison and coordination among government authorities (beyond what is typical for a gray infrastructure project). Permits may relate to land use and access, and can be particularly complicated if NbS are land-intensive (e.g. undertaken at the watershed level), take place on public lands (e.g. in a protected area), or involve the use of natural resources that are protected under government legislation (e.g. coral reefs). Such projects may require specific permissions or concessions to be obtained across various levels of government. Uncertainty and potential delays in permitting can lead to increased risk and costs for both companies and governments, and may significantly reduce the likelihood of a project being taken forward. Conversely, some NbS (e.g. upslope vegetation management) may have very minimal permitting requirements compared to traditional infrastructure approaches (e.g. retaining wall construction).

The governance and financing arrangements required for some NbS are not always in place or supported by national legislation. In some instances, new and innovative legal arrangements for governance structures are required for NbS (see Section 3.2). If there are no existing models for NbS projects (such as the water fund models developed in Peru, Costa Rica, and Colombia), identifying permitting requirements and setting up appropriate legal concessions and arrangements can be complicated and resource intensive. Project developers may, therefore, favor traditional engineering approaches because the permitting process is clearer and better understood.

Infrastructure projects that involve NbS (either as alternatives to gray infrastructure or as complementary approaches) may also require novel financing arrangements, such as setting up trusts to manage watersheds. In some countries, these frameworks are well established. In others, the legal mechanisms needed for public and private organizations to work together to financially support NbS are lacking. For example, in Case Study 1, legislative barriers contributed to the challenge the water fund, Aquafondo, faced in securing financial resources for its watershed restoration project in Peru. As Peruvian legislation did not allow public bodies such as SEDAPAL (Lima's water and sewage service) to directly contribute to private funds, the public sector could not provide long-term support to Aquafondo.

Case Study 1: Funding watershed restoration to secure water supply in Lima, Peru

Location: Lima, Peru
Challenge: Water insecurity
Solution: Watershed restoration

Aquafondo is a water fund, which was set up in 2010 to promote sustainable investment in water for Lima, to recognize the value of ecosystem services, and provide an efficient financial mechanism to protect and enhance the function of watersheds. The project aims to attract funding from private sector organizations with Corporate, Social, and Environmental Responsibility programs in order to finance water-related conservation projects in the Rimac, Chillón, Lurín and upper Mantaro watersheds. These restoration projects aim to reduce Lima's water insecurity in the face of ongoing ecosystem degradation and climate change.

The glaciers that feed into the Rimac, Chillón and Lurín watersheds are retreating at an increasing rate in response to climate change, while total rainfall in these areas is predicted to decrease. These, and other, factors are putting pressure on the water supply. Aquafondo uses a financial mechanism to improve the management of the watershed for the continued and resilient provision of high-quality fresh water in the face of climate change. The fund also aims to promote green interventions that create co-benefits for communities engaged in supporting improved watershed management; for instance, they may gain higher yields, reliable local agriculture, and sustainable energy sources like biomass.

In Peru, Aquafondo has partnered with a small number of NGOs, universities, and private sector organizations (through corporate environmental and social responsibility programs). The Nature Conservancy, GEA Grupo, Peruvian Society of Environmental Law, Pontifical Catholic University of Peru, University of Engineering and Technology, Backus, Pavco, Rotoplas, Nestlé, and Hydro-Geo are contributing towards the water fund.

Pilot projects have successfully illustrated the potential for local communities to receive co-benefits from interventions that aim to increase downstream water security in the future. For example, in San Pedro de Casta, the restoration of traditional amunas (ancient stone canals used to absorb downpours) to improve yields has increased economic returns and regulated hydrological flows for the dry season.

The interaction between environmental laws and permitting for NbS can be complex and is not always supportive of NbS. Protected areas legislation, for example, may preclude or encourage NbS depending on the context and details of the instrument. Strict legislative protection could prevent the use of NbS by prohibiting any form of intervention in an area. However, NbS may be permissible in protected areas or other protection categories where implementing traditional gray infrastructure approaches would not be possible. For example, Volkswagen Mexico pioneered a 750 ha forest restoration scheme on protected lands to regulate water supply for its automotive facility and the broader community (Case Study 2). Working in protected areas may also require broader consultation with community members, including indigenous groups that have jurisdiction or traditional rights. Such additional permitting, approval, and liaison processes can present barriers to private sector uptake of NbS.

Case Study 2: Volkswagen Mexico: securing water supply through reforestation, Mexico

Location: Puebla, Mexico
Challenge: Water supply shortages
Solution: Reforestation

Volkswagen Mexico operates an automotive manufacturing facility in Puebla-Tlaxcala Valley, Mexico, which is a region that experiences dry conditions and water stress.

Years of deforestation and forest fires on the volcanic slopes of Popocatépetl and Iztaccíhuatl (combined as "Popo-Itza"), driven primarily by livestock farming and illegal logging, have led to increased rainwater run-off and decreased groundwater retention. Furthermore, water supply has reduced due to variable precipitation patterns and rising demands from an ever-increasing population.

The water supply in the Puebla Tlaxcala Valley is reliant on the contribution of vegetation on the slopes of Popo-Itza to groundwater replenishment. In an effort to replenish groundwater, Volkswagen Mexico undertook a pilot project to plant 300,000 trees, build earthen dams, and dig pits on the slopes of Popo-Itza. Initial successes led Volkswagen Mexico to partner with their automotive suppliers and continue to Phase II of the project (planting 100,000 tress), and, later, Phase III (planting a further 90,000 trees). In total, Volkswagen Mexico planted nearly 500,000 trees over 750 ha of land.

The Popo-Itza project has generated a range of benefits for Volkswagen Mexico and the broader community, such as providing educational opportunities for young people, employment opportunities for local communities, and habitat for an endangered rabbit species. The reforestation scheme contributes 1.3 million m^3 of water to groundwater reserves per year – a higher volume than Volkswagen Mexico consumes each year.

2.2.4 Lack of financial incentives for NbS

A lack of policy-driven financial incentives contributes to low private sector adoption of NbS. At present, there are few mechanisms in place to financially incentivize the private sector to adopt NbS, or for governments to encourage its use in infrastructure procurement. Mechanisms like Costa Rica's Payment for Ecosystem Services (PES) framework – which is key to supporting the implementation of NbS projects, such as water funds (Case Study 4) – are not available in all countries. Moreover, private sector actors are still exploring whether certain NbS are financially viable (Section 2.4). Therefore, a lack of financial incentives, government subsidies or blended finance mechanisms that can offset the perceived risks associated with NbS contributes to their low uptake. In addition, a lack of price differentials for assets or services delivered by NbS also disincentivizes greater private sector action. For example, Volkswagen Mexico was unable to negotiate reduced water rates for its Puebla manufacturing facility, despite its use of NbS contributing an additional 1.3 million m^3 of water into groundwater reserves annually (Case Study 2). With NbS still perceived as "novel" approaches by many project developers, financing institutions, and regulatory authorities, a lack of financial support in national policy and legislation can limit uptake.

2.3 Actions and opportunities

This Market Assessment reviewed opportunities to address or reduce policy-related barriers to the uptake of NbS for climate-resilient infrastructure. These include:

- Assessing and increasing coherence within and across policy environments.
- Integrating NbS into procurement processes for infrastructure.
- Developing targeted support for NbS through changes in financial policy.

2.3.1 Assessing and increasing coherence within policy environments

Policies directing the achievement of existing ambitions and commitments on climate change and biodiversity can be used to encourage the uptake of NbS for sustainable infrastructure. Many different types and levels of policy and legislation are, or could be, of relevance to NbS in LAC (Figure 3). For example, National Biodiversity Strategies and Action Plans (NBSAPs)[f] and Nationally Determined Contributions (NDCs)[g] may already refer to NbS. Governments could use these as a basis for integrating NbS into sectoral, or other, policies for infrastructure projects.

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f National Biodiversity Strategies and Action Plans (NBSAPs) are developed by countries in response to Article 6 of the Convention on Biological Diversity (CBD). NBSAPs outline a country's approach to "conservation and sustainable use of biological diversity" as part of their obligations for national biodiversity planning[27].

g Nationally Determined Contributions (NDCs) are prepared by countries under the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC). NDCs outline a country's efforts to "to reduce national emissions and adapt to the impacts of climate change"[28].

A robust, upstream policy and institutional framework is recognized as critical to delivering sustainable infrastructure; within this, NbS are likely to play a key role[29]. Reviewing the existing policy frameworks and how NbS are currently represented within them (e.g. undertaking a "gap analysis") can help governments identify:

- If and how NbS could be better mainstreamed to develop harmonized, cross-departmental policies.
- Where there are existing policy conflicts, overlaps, and gaps.

Such a "policy map" can also help project developers navigate the planning process for projects that include NbS – both where NbS are used instead of gray infrastructure and where they are used as complementary approaches.

Countries pursuing ambitious infrastructure programs are putting into place regulatory regimes that simplify legal permissions and allow them to be granted more quickly. Including NbS in this process could be key to facilitating their uptake. Depending on the national context, a number of different approaches can be taken to develop a clear and consistent policy environment for NbS including:

- Developing overarching infrastructure policies that are inclusive of NbS; for instance, integrating NbS into procurement policies, Public-Private Partnership (PPP) frameworks and legislation, so that they are uniformly considered in infrastructure development.
- Integrating NbS into overarching "Future Visions" for climate-resilient infrastructure.
- Identifying and addressing "barrier policies".
- Integrating NbS into all relevant policies over time.

Creating clear, long-term policies could encourage greater uptake of NbS. More stable policy and regulatory frameworks, including those around investment and PPPs, are likely to be key to fostering private sector involvement in NbS. This could be achieved through the development of NbS-inclusive "Future Visions" – policies that set out the aspirations for development over a longer time frame – particularly if such plans are legally binding. It is also critical that NbS are mentioned in NDCs, if they are not already included. In all cases, drawing explicit links between infrastructure development, NbS, and private sector involvement will help to set the regulatory and policy framework to encourage private sector uptake.

Adopting natural capital accounting at the country level enables governments to better integrate NbS into relevant policies. Natural capital accounting allows governments to create a balance sheet or value-based assessment of national natural capital assets, such as forests or mangroves. Understanding which natural capital assets are present in an area enables governments to assess interdependencies between natural capital and policy. It provides a tool for governments to identify and manage the risks and opportunities related to natural capital. Natural capital accounting can also be a useful way to understand how NbS can support the integration of climate change considerations into national Systems of Environmental-Economic Accounting (SEEA). Multilateral Development Banks (MDBs) and other organizations, such as the International Monetary Fund (IMF), are well positioned to promote natural capital accounting; for example, they can support governments in integrating biodiversity and climate-related "asset and flow accounts" into their calculations, and help streamline approaches across finance, planning, and other government departments.

Lessons from Costa Rica, where natural capital is embedded within national accounting[30], could offer useful insights for other LAC countries where natural capital is less integrated into development planning. Initiatives that support government engagement with natural capital accounting include IDB's Natural Capital Lab[31], and the United Nations' Natural Capital Accounting and Valuing Ecosystem Services Project[32].

Guidance on the integration of NbS into relevant policy instruments can build capacity and political will for policymakers to facilitate NbS uptake. As NbS are a relatively new approach, they may not be widely understood within some government departments. Guidance on what NbS entail, and how they can be integrated in different policies, procedures, and procurement processes could build awareness among policymakers and political leaders and help them identify entry points for promoting increased NbS uptake. Such guidance should target key policies for biodiversity, climate-resilience, and infrastructure planning, including national development plans, sectoral plans, Nationally Determined Contributions, climate-risk assessments/strategies and adaptation plans, Disaster Risk Reduction and Disaster Risk Management (DRR and DRM) policies, Strategic Environmental Assessments (SEA), Environmental Impact Assessments (EIA), and National Biodiversity Strategies and Action Plans (NBSAPs).

2.3.2 Integrating NbS into procurement processes for infrastructure

Procurement processes for infrastructure could be used to create an opening for NbS. The entity that procures infrastructure, whether government, private corporation, or PPP, exerts significant influence over the project terms and specifications. Therefore, including reference to, evaluation of, and requirements for NbS in procurement documents, such as invitations to tender and contracts, could directly change the actions of downstream providers (e.g. project developers, funders, insurers). In turn, this would encourage providers to secure the necessary expertise to win contracts and deliver policy-compliant projects. NbS may not be appropriate or viable in every context; however, including evaluation of NbS as a routine and mandatory requirement of project development will promote NbS uptake by demonstrating its viability in relation to other options.

Incorporating NbS in sector-specific (e.g. transport, water, energy) procurement processes would further establish NbS as viable technical solutions to many infrastructure challenges. Incorporating NbS into sector procurement may help to shift the perception of NbS from being a conservation or CSR exercise, towards being a viable design option for climate-resilient infrastructure that can deliver co-benefits that some gray solutions do not.

Governments could use PPPs to require private sector actors to consider NbS as a means to increase the climate-resilience of long-term infrastructure investments. PPP frameworks govern agreements between the public and private sector on large infrastructure projects. PPPs form a significant part of infrastructure investment across LAC, totaling US $33.2 billion in 2016[33]. To support this investment strategy, countries such as Chile and Brazil have developed frameworks and legislation to support PPPs[34]. This legislation outlines how PPPs should be structured and includes requirements for allocating risk between parties[35]. While PPPs could act as a vehicle for increasing the consideration and uptake of NbS, they can be impacted by short-term political cycles. Establishing government entities to support PPPs over longer time periods than elected terms can reduce risks for private sector investors[36]. Such entities could act as enablers for the inclusion of NbS in procurement processes.

Integrating climate resilience and dynamic risk allocation into PPPs will help to address the high degree of uncertainty associated with NbS over the long periods that PPP contracts often operate. In turn, this could encourage uptake of NbS. For example, dynamic risk allocation is included in PPP legislation in Mexico, although there are explicit limitations on contract renegotiations. Additionally, National Climate Change Financing Strategies (such as the one currently being developed in Jamaica) may provide mechanisms for developing co-financing instruments like PPPs[37].

2.3.3 Developing targeted support for NbS through changes in financial policy

Governmental financial support for the private sector to complete pilot NbS projects may reduce the perceived risk of investment and scale-up private sector engagement in the short term. Government support for novel approaches and technologies encourages innovation and funding. As such, government support for NbS could drive innovation and build the confidence of project developers and funders in the short term. For instance, financial support was offered by governments for solar panels initially, but was progressively phased out as the market developed. Initial support for NbS could be targeted at low-cost solutions with benefits in the short-term to build confidence in the use of the approach[h]. Policies could take the form of financial incentives (e.g. grants, tax relief, subsidies) or legal requirements for NbS to be considered in infrastructure projects. However, the aim of any such policies should be to engage the private sector in longer-term NbS projects.

Such financial support would need to be carefully designed to include environmental and social safeguards, in order to avoid creating perverse incentives or unintended consequences resulting from implementing NbS. For example, financial support for planting trees to stabilize slopes against increased heavy rainfall should only be provided if the species planted are appropriate to the local environment (i.e. not invasive or likely to compromise water availability elsewhere in the catchment). Similarly, the potential negative consequences of policies designed to support mangrove regeneration on communities, infrastructure, and businesses elsewhere along a coastline (e.g. capture of sediments by the mangrove depleting beaches) should be considered when the instruments are developed.

Tax-based (or other) incentives for private sector uptake may help to build the business case as the NbS market develops. A number of studies have identified the lack of financial resources for NbS as a barrier to implementation. Polices and laws that provide financial support for NbS will build the business case for their use and help encourage project developers and financial institutions to consider them. An example of such an instrument is a law in Peru that provides a mechanism for tax refunds in exchange for private sector investment in infrastructure. Another Peruvian law defines tools and incentives to generate, channel, and transfer financial resources into investing in ecosystem services (a key component of NbS projects) though a voluntary agreement between those who contribute to ecosystem conservation or restoration and the beneficiaries of those ecosystem services.

Existing mechanisms for tax collection could also be explored for their potential to support NbS projects. In Puerto Morelos, Mexico, for instance, a hotel concession is collected from hotel owners and tourism operators with beachfront properties. This concession is used by the government to purchase an insurance policy for the MesoAmerican Reef and to fund ongoing coral reef restoration (Case Study 3). The concession has been in place for years, contributing to coastal improvement projects and infrastructure.

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h Targeted financial policies may also be necessary to incentivize uptake of NbS where there is a significant delay between implementation and recognition of financial benefits. See Section 5.2.1 for more information.

Case Study 3: Coastal Zone Management Trust, Mexico

Location: Puerto Morelos, Quintanta Roo, Mexico
Challenge: Hurricane-induced storm surge
Solution: Financial mechanism for protecting the coral reef

In 2018, the Coastal Zone Management Trust Fund was established in Quintana Roo to recognize the important revenue-generating opportunities and coastal-protection services offered by the MesoAmerican Reef. The Trust Fund collects money from hotel and tourism concessions to fund ongoing coral reef maintenance and restoration activities, and to purchase a novel parametric insurance policy for hurricane-induced coral reef damage.

Quintana Roo lies within the Atlantic hurricane belt, which poses a high risk to tourism-related commerce. Following four hurricanes in Quintana Roo, coastal hotels in Puerto Morelos that benefitted from the protective services of the reef suffered less damage than those other coastal properties that did not have reef protection. In recognition of the region's high hurricane risk, and the damage to reef systems, the Trust Fund was developed as an innovative financial mechanism to ensure the ongoing maintenance and protection of the reef.

The Trust Fund has a complex governance structure, which initially led to delays in setting up its legal arrangements. The federal government officially owns the reef and is responsible for decision-making regarding reef management and the use of the hotel concession tax. In order to facilitate a more transparent and inclusive process to reef management, a voting structure was set up to decide how to spend the fund money and what interventions to prioritize. The Trust Fund is used to purchase an annual parametric insurance policy for the coral reef and to fund ongoing maintenance.

The insurance premium amounts to about 10 per cent of the policy coverage (e.g. $3 million coverage would cost $300,000 annually), and the insurance payout is dependent on whether a hurricane exceeds a particular threshold of 110 knots (200 km/hr) in the covered area. The first coverage purchase was for the 2019 hurricane season, where Mexico-based insurer, Afirme Seguros Grupo Financiero SA de CV, purchased a $3.8 million policy to repair hurricane damage. To date there have been no recorded losses.

Case Study 4: Ensuring water security in Costa Rica: Agua Tica Water Fund

Location: Costa Rica
Challenge: Water availability
Solution: Watershed restoration

The Agua Tica Water Fund in Costa Rica contributes to the protection of more than 160,000 ha of watersheds, securing water provision and water quality for 57 per cent of the country's population and for 75 per cent of the national industry located within the Greater Metropolitan Area of San José (GAM). Water availability is increasingly limited across the GAM. Population growth, poor land-use planning, and overexploitation of water resources have led to the degradation of the natural environment, water scarcity and a reduction in water quality. Furthermore, climate predictions indicate a reduction in rainfall that will increase water stress in the area.

The national government established the Aquafondo PES scheme in 1996 under Forestry Law 7575. This provides mechanisms whereby companies can support landowners in their efforts to protect prioritized ecosystem services. A range of projects have been introduced under the Agua Tica Water Fund to address the need for information from private partners about the impact of PES payments and to plan future investments. For example, between 2014 and 2016, Florida Bebidas and Coca-Cola® FEMSA compensated landowners for setting aside 605 ha of private land for forest conservation and restoration.

The technical team of Agua Tica (ESPH, UNA-SIL, FUNDECOR), with support from The Nature Conservancy (TNC) and the Latin American Water Funds Partnership, also monitor water sources, water quality, soil conditions, and land cover within the GAM. They have established a network of hydro-meteorological stations, at 20 strategic sites across the GAM, to record climatic conditions and generate a baseline for future comparison. The data collection will increase understanding of the impacts of PES payments and will guide future project investments

Case Study 5: Water for Life and Sustainability Fund, Colombia

Location: Cauca Valley, Colombia
Challenge: Variable water supply driven by drought and El Niño events
Solution: Watershed restoration

The Cauca Valley is a highly populated area, with about 1.2 million inhabitants living in five major surrounding cities, and around 5 million people living downstream. The valley is also Colombia's largest sugarcane producing region, with around 2,750 family-run sugar plantations and 13 sugar mills. Increasing water demands associated with population growth and agricultural irrigation mean that most of the river basins in the region experience water scarcity, with higher incidence in the dry season (in January and February, and from June to September).

Fondo Agua Por La Vida y la Sostenibilidad (the Water for Life and Sustainability Fund) was established in the Cauca Valley near Cali, Colombia, in 2009, by sugarcane growers and producers through their sector associations (Asocaña and Procaña, respectively). They partnered with The Nature Conservancy (TNC), associations of river users, private companies operating in the region, and the Colombian government environment authority to support financing of habitat conservation and restoration projects that would address the issue of water scarcity and improve the quality of water for catchment users.

Typical investments generated with the accrued capital include: changing land use or intensity (such as less intensive agriculture and ranching); fencing; creating silvopastoral systems; forest enrichment and restoration; enhancing protected areas; land acquisitions; and restoring riparian areas, slopes, and biodiversity corridors.

The Water for Life and Sustainability Fund has generated an abundance of benefits for ecosystems and people in the Cauca Valley. The Fund has invested more than US $8 million across 29 municipalities, thus affecting the water supplies of more than 3.5 million inhabitants. To date, the Fund has entered into 123 agreements and contracts with public and private entities.

In recent times, a portion of the concession has also been earmarked for coral reef projects, which has provided private sector stakeholders with benefits, including from enhanced resilience as well as tourism associated with a healthy coral reef, without the need for additional funding. These types of projects can be replicated in other countries and modified according to the context and aspirations of the government implementing the initiative.

Governments can also encourage NbS project development by using incentives linked to the delivery of co-benefits. For example, if a company leads a reforestation project that promotes water regulation for the broader region, it could be offered lower water rates.

Payment for Ecosystem Services (PES) have proved important for supporting NbS in several countries in LAC. PES frameworks have been particularly valuable for the development of water funds (Case Studies 4 and 5). For example, Costa Rica has a well-developed PES framework through its Environmental Services Payment (PSA) program, while Colombia has targets for municipal and departmental entities to "direct at least 1% of annual revenues towards PES that compensates landowners or direct land acquisition in source water areas"[38]. Jamaica is currently developing a PES project in partnership with IDB to support watershed management for ecosystem services[39].

National governments could require businesses to invest a percentage of annual revenues back into NbS initiatives. CSR schemes that integrate NbS have the potential to build climate resilience and generate additional co-benefits for local communities. Many companies are already using CSR to support NbS activities (Case Studies 2 and 5), but this could be pushed further if governments require companies to invest in NbS. For example, India is the first country in the world to make CSR mandatory, requiring businesses with a net worth exceeding US $73 million to invest 2 per cent of annual revenues into education, poverty, gender-equity, or hunger-related CSR initiatives[40]. Government-mandated CSR initiatives that focus on nature conservation and restoration could, over time, establish a precedent for business investment in NbS. In LAC, this approach could drive investment in natural systems, which in turn, can generate societal benefits.

2.4 Summary

Policy Barriers

Actor	Barriers
Infrastructure Project Developers	• Gray approaches still dominate the infrastructure policy environment compared to NbS. • Known or potential policy misalignments that increase a company's (perceived) risk of contravening legislation may mean NbS are overlooked. • The permitting process for NbS is less well established or understood, and presents greater uncertainty than gray infrastructure approaches. • There is a lack of policies, legislation, and incentives that encourage innovation and financial support to pilot NbS.
Policymakers	• Traditional engineering options often remain the default approach for governments as they are better reflected in national policy and regulations. • The permitting process for NbS is less well established or understood, and NbS projects may require more cross-ministerial cooperation and liaison than gray infrastructure approaches.

Gray infrastructure approaches, such as seawalls, are often still the default response to climate risks in coastal areas.

Source: Pixabay

Policy Actions

Actor	Actions
Infrastructure Project Developers 	• Secure financial support for NbS projects in order to reduce the perceived risk of investment and scale-up private sector engagement in the short term. • Invest a percentage of annual revenue into CSR-driven biodiversity or NbS initiatives to help build internal capacity and awareness.
Policymakers 	• Use existing policy ambitions and commitments in relation to biodiversity, climate change and other global priorities for achieving sustainable development, such as gender equality (Box 1), to help mainstream NbS. • Create clear, long-term policies to encourage greater uptake of NbS and highlight the value of NbS for addressing climate vulnerabilities in the long term. • Adopt natural capital accounting at the country level to help identify opportunities for NbS integration. • Use infrastructure planning policies and frameworks to create an opening for NbS. • During procurement, use PPPs as a mechanism to require the consideration of NbS to build climate resilience into long-term infrastructure investments. • Use government financial support for NbS pilot projects to reduce the perceived risk of investment and scale-up private sector engagement in the short term. • Use tax-based (or other) financial incentives for private sector uptake to help build the business case as the NbS market develops. • Use PES schemes as a mechanism to support NbS. • Require businesses to invest a percentage of annual revenues back into CSR-driven biodiversity initiatives.
Financial Institutions 	• Support the adoption of natural capital accounting at the country level to help governments identify opportunities to better integrate NbS. • Develop guidance on the integration of NbS into relevant policy instruments, building capacity for policymakers to facilitate NbS uptake (see also Box 1). • During procurement, use PPPs as a mechanism to require the consideration of NbS to build climate resilience into long-term infrastructure investments. • Provide financial support to the private sector to complete pilot NbS projects, thereby reducing the perceived risk of investment and scaling-up private sector engagement in the short term.

Conserving ecosystems is important to safeguard gray infrastructure against flood and landslide risks.

Source: Pixabay

3. Awareness, governance, and capacity

3.1 Introduction

Raising awareness among decision makers and project developers of the advantages and opportunities for innovation provided by NbS is critically important. Without increased awareness, even the most supportive enabling policies and financial mechanisms are unlikely to drive NbS uptake. Furthermore, a lack of familiarity with NbS can reinforce a business-as-usual approach and limit consideration of NbS. Capacity for NbS uptake can be fostered through cross-ministerial dialogues, institutional champions, forward-thinking political leaders, informed and engaged stakeholders, and partnerships that build support and buy-in for NbS (e.g. between NGOs and companies).

Governance can be complex in any infrastructure project; however, those featuring NbS (particularly in the context of infrastructure resilience) may face challenges that project developers are unfamiliar with. Leveraging lessons learned from other projects can prove useful for navigating and overcoming new governance challenges. Case studies, particularly those for which the business case is well documented and accessible, can be valuable resources for project developers, financial institutions, and policymakers.

A lack of government capacity to enforce relevant legislation and create a corruption-free environment for infrastructure projects poses a challenge both to NbS and to resilient infrastructure more broadly. While governments typically have legislation in place to protect or manage a country's natural assets, enforcement of environmental legislation is critically important to ensure that natural capital is protected and not damaged by illegal activities (e.g. mineral extraction, logging). Furthermore, histories of corruption could decrease the willingness of private sector actors to use NbS in infrastructure development if this requires government partnership or cooperation. Similarly, concerns around private sector corruption could be a barrier to government involvement in projects that use NbS. Encouragingly, measures to increase transparency in LAC have increased private sector confidence in infrastructure investment in the region.

3.2 Barriers

This study asked people working in financial institutions, governments and on NbS projects in LAC about the governance barriers to NbS uptake. They identified the following main groups of barriers:

- Lack of NbS awareness.
- Governance complexities.
- Limited enforcement capacity and transparency.

3.2.1 Lack of NbS awareness

Project developers may be unfamiliar with NbS, or may have biases about the efficacy of NbS for delivering services that are usually provided by gray infrastructure[41]. For many decades, traditional approaches to infrastructure design have informed project development and provided the basis of

engineering and design curricula across academic institutions. Indeed, they are often the principal approaches taken by most professional associations and their members. Financial mechanisms that are built around gray infrastructure may not consider the services that NbS can offer, either for supporting gray infrastructure, or as an alternative to it. Similarly, many actors involved with the policy and legislative frameworks in LAC have limited or no background in NbS. Increasing uptake of NbS in the region will, therefore, require a range of institutions to adopt new training, financing, and project development approaches.

3.2.2 Governance complexities

Responsibility for environmental and/or natural capital activities is often decentralized, so project developers may need to engage with more governance bodies than they do for gray infrastructure. Complex jurisdictions can make any change to land use or management challenging and lengthy, whether for NbS or gray infrastructure projects. Engaging and negotiating with the relevant authorities at different levels of government can involve extensive and complex negotiations or bureaucracy, and may require new governance arrangements. For example, in establishing the Coastal Zone Management Trust (Case Study 3), complex governance arrangements, involving multiple stakeholder groups and various tiers of government, created extensive project-related bureaucracy that led to significant delays – project inception began in 2015, but the Trust Fund was not fully operational until 2019. As a result, the Trust Fund designers reason that the implementation of pilot projects is likely to be easier in countries where government jurisdiction over natural resources is simpler and involves fewer actors. Additionally, in countries where central government does not have jurisdiction over natural capital, the mechanism can be decentralized, and local governments can retain greater control[42].

Consultation and engagement with a wide range of stakeholders is often required to ensure the potential impacts of NbS are considered and co-benefits delivered. Extensive consultations and assessments can add to project complexity and delays, particularly for projects that occur at a landscape scale (e.g. watershed restoration) when compared with those that take place within a site boundary (e.g. a constructed wetland on a private site). Stakeholder mapping, engagement, and negotiations are complex and resource-intensive processes[43], especially for PES schemes and watershed-restoration projects that cross broad areas. For instance, a landscape-scale restoration project in Peru found it challenging to reach a consensus between a large number of stakeholders with different views on water supply management in the Nor Yauyos-Cochas Landscape Reserve (NYCLR; Case Study 6). In one region, a measure was proposed to develop an irrigation system and create wetlands, while allowing livestock to lightly graze a new area. This measure offered water-regulation benefits for local people, wildlife, and the private energy company, Compañía Eléctrica El Platanal S.A. (CELEPSA), so was conceptually popular. However, stakeholders were unable to agree on organizational measures to prevent the new area from becoming overgrazed, which ultimately stopped the restoration from being undertaken.

Although NbS can deliver co-benefits, and some arrangements may include incentives for local communities (e.g. PES schemes, creation of local green jobs), this does not guarantee that communities are willing to participate. Individual or community aspirations may not align with NbS goals. For example, mangroves provide multiple benefits, yet in some tropical regions, they are perceived as a nuisance and have been cleared for conversion to aquaculture ponds and housing[44].

Case Study 6: Managing water supply for hydroelectric power through watershed restoration in the Nor Yauyos-Cochas Landscape Reserve, Peru

Location: Nor Yauyos-Cochas Landscape Reserve, Peru
Challenge: Water availability
Solution: Watershed restoration

The Nor Yauyos-Cochas Landscape Reserve (NYCLR) covers more than 220,000 ha in the Andean highlands, conserving the watersheds for the Cañete and Cochas-Pachacayo Rivers. A few months before the area was designated in 2001, hydroelectric concessions were granted to a private energy company, Compañía Eléctrica El Platanal S.A. (CELEPSA), to operate on the Cañete River downstream of the reserve. The reserve is classified as a "direct use protected area", and, as such, the sustainable use of natural resources is permitted. Nineteen native communities live in the reserve, divided into 12 districts; there are approximately 15,000 inhabitants in total. Grassland and water resources are essential for both the livelihoods of the local communities (pastoral activities and growing local crops) and CELEPSA's energy production, but natural and semi-natural areas of wetland and grassland have recently been lost or degraded.

Local stakeholders, including farmers and CELEPSA, are concerned about the climate-related pressures on the reliability of water supply in the near future. As a result, CELEPSA have created the Patronage of Nor Yauyos-Cochas Landscape Reserve to reconcile the interests of the local population, the NYCLR authority, and themselves. The group focuses on the role of the NYCLR in water availability and distribution, as well as improving grassland and livestock management.

A participatory planning process, managed by the Reserve Authority, found that local people had concerns over implementing climate adaptation measures in the face of uncertainty over future climate impacts. Consequently, no-regret measures were designed for the community, which would have a positive impact under any future scenario. These measures aim to build general resilience in communities and ecosystems, with additional benefits that address non-climatic stresses. Further consultation was undertaken with the local community and external experts to increase the social and environmental benefits resulting from the proposed measures. Three strategies were identified: (i) the restoration of "green infrastructure" (natural wetland and grassland habitats) in the upper Cañete catchment to promote the capture and storage of water; (ii) the restoration of pre-Colombian, local hydraulic infrastructure controlling the water flows, helping to increase vegetation cover; and (iii) the management of camelids (including alpacas and llamas) and the conservation of vicuña.

There have already been successes: the restoration of 26 km of canals between 2009 and 2016 has increased the efficiency of water conduction by 82 per cent.

Case Study 7: Buenos Aires Urban Ecosystem Regeneration Program, Argentina

Location: Buenos Aires, Argentina
Challenge: Variable water supply
Solution: Artificial wetlands

The neighborhood of Villa Soldati, located in southwestern Buenos Aires, is bordered by the Riachuelo, Argentina's most contaminated river and one of the most polluted waterways in the world. It is also crossed by the Cildáñez Stream, an outlet for industrial waste and effluents from a nearby livestock market. Run-off from around 1,500 local businesses, including tanneries, chemical plants, and factories, flows directly into the Riachuelo, contaminating it with arsenic, cadmium, and lead.

The lack of cleaning and maintenance of Cildáñez Stream, as well as three overflow lakes, has also been linked to regular floods. Due to these combined effects, the Riachuelo often gets blocked when it rains, and the overflow affects the surrounding neighborhoods. In 2013, Buenos Aires saw an historic level of flooding, and Villa Soldati was one of the most affected neighborhoods in the city. As a result of the risk of flooding, combined with factors related to social vulnerability, Villa Soldati is considered to be one of the most vulnerable areas in Buenos Aires.

The government of Buenos Aires undertook urban ecosystem restoration work to reduce pollution and its impacts under the Urban Ecosystems Regeneration Program. The restoration works included: making use of native flora in the creation of artificial wetlands; phytoremediation (the use of plants to stabilize ground and remove contaminants) to reduce flood risk and pollution; and the creation of a natural park.

Initial results reported by the Buenos Aires Environmental Protection Agency have been very positive, with outcomes that have helped to address flood risk, limit the further contamination of waterways from polluted soil and groundwater, and improve water quality. The creation of the natural park has also helped to restore vegetation that can regulate water resources, increase water filtration, and control erosion and run-off. The construction of artificial wetlands has improved water quality by eliminating turbidity, reducing organic pollutants, and eliminating odors and solids. It has also increased the dissolved oxygen in the water and reduced the amount of salts left by the organic load. Additionally, the use of vegetation rafts has helped to stabilize heavy metals and water infiltration, preventing flooding.

NbS may require new and/or complex governance arrangements that can operate across various jurisdictions and with multiple stakeholder groups. Gray infrastructure projects may entail complex governance arrangements, but NbS can have additional, new or different complexities that project developers are unfamiliar with. However, the lessons learned from both successful and failed NbS projects can help project developers to avoid certain challenges in prospective projects.
Ministries of environment are often heavily involved with NbS projects, but may find it challenging to navigate sector-specific processes and governance structures that are more ordinarily the responsibility of other government departments. The capacity of government ministries to support NbS projects may also be limited.

3.2.3 Limited enforcement capacity and transparency

Without the capacity for enforcement, even innovative and well-designed policies to preserve natural capital and support NbS may prove ineffective. Despite the adoption of strong environmental policies in LAC, deforestation, illegal road-building, resource extraction from protected areas, and unauthorized mining still persist throughout the region[45]. Barriers to enforcement include a lack of political will and leadership, technology, personnel, and funding. Such barriers can equally apply to NbS approaches and traditional infrastructure projects. For example, a major challenge to the success of the Volkswagen Mexico reforestation initiative (Case Study 2) was the illegal removal of trees on Popo-Itza. In this example, as in others, private security has been hired to prevent illegal logging and ensure project success.

Some PES schemes across LAC have also faced implementation challenges due to weak regulatory enforcement, contested or unclear land ownership, and limited government capacity[46]. While national policies supporting PES schemes are important, governments and funders also have an important role to play in promoting equitable governance, supporting capacity building for PES schemes, enabling transparent monitoring arrangements, and promoting and securing tenure arrangements[47].

Key ministries involved with NbS may have unequal or limited enforcement capacities or resources. Ministries of environment, for example, may have less enforcement powers compared to ministries of finance. This could prove particularly challenging if conservation goals linked to NbS are at odds with development priorities[48]. The impact of limited enforcement resources has been felt by the Buenos Aires Urban Ecosystem Regeneration Program (Case Study 7). The project faced challenges concerning contaminant disposal and illegal dumping. To reduce pollution and allow the program to realize its full potential, both industry-led action and the enforcement of existing legislation will be required.

Actual or perceived corruption among any stakeholder group could decrease participation in, or goodwill for, NbS projects. Cases of corruption in the infrastructure sector in LAC have emerged in recent years, disrupting social stability and economic growth. Of note is “The Lava Jato” or “Car Wash” investigation in Brazil, which revealed bribes amounting to US $780 million were given to government officials by Odebrecht, a Brazilian construction company[49].

NbS projects may also be vulnerable to corruption, particularly if they require new governance arrangements or policy concessions. Individuals and organizations involved in project development and operation, including regulation, construction, and funding, may be motivated by personal gain and request compensation in exchange for support of new project arrangements[50]. In Quintana Roo, long running mismanagement of public funds has eroded the confidence of hotel owners and

tourism operators in the governance process of the Coastal Zone Management Trust (Case Study 3). The governance process stipulated that the government would ultimately decide how to spend the Trust Fund money, raising concerns among private sector stakeholders that NbS funds would be misused or misappropriated. Indeed, the former governor of Quintana Roo is serving a prison sentence on corruption charges and personal appropriation of public funds[51]. Therefore, there is a high level of distrust of government officials, and a general sentiment that this will only be rectified once local businesses see the government putting the Trust Fund to good use.

Encouragingly, increased transparency can help the LAC region revive business confidence and private investment in infrastructure. New governments, elected in 2019, have brought in a wave of anti-corruption programs and reforms in many countries, including Mexico, Colombia, Argentina, and Chile, reinforcing business confidence in infrastructure investments[52].

3.3 Actions and opportunities

This section reviews the opportunities to address or reduce governance-related barriers to the uptake of NbS for climate-resilient infrastructure. These include:

- Raising awareness.
- Creating support mechanisms.

3.3.1 Raising awareness

Engaged and informed stakeholders can drive demand for NbS. Strong stakeholder support and engagement, inclusive of the private sector, was cited as a key enabler in the majority of the case studies included in this Market Assessment. To drive demand for NbS, a wide range of activities and educational reform will be required, over an extended period of time, to ensure all relevant stakeholders, have the tools and information available to interact with one another on potential schemes. To achieve this:

- NbS need to be on the curricula of relevant university courses (e.g. engineering, town planning).
- Business and biodiversity platforms can help to raise awareness of NbS among private sector and government partners (e.g. the Biodiversity Partnership Mesoamerica)[53].
- Partnerships with NGOs should be encouraged to support companies, governments and communities that are implementing NbS.

Private sector alliances relating to Disaster Risk Reduction (DRR) or biodiversity could help raise awareness among others in the private sector. In 2014, through the United Nations Office for Disaster Risk Reduction (UNDRR), private sector groups in LAC made a voluntary commitment to DRR and resilience-building. In line with this, the UNDRR is leading the Private Sector Alliance for Disaster Resilient Societies – a group of private sector entities that have committed to align their work with the Sendai Framework for disaster risk reduction[54]. The Alliance has members from Argentina, Colombia, Mexico, Peru, and Paraguay.

Raising awareness among the private sector that NbS can offer cost-effective alternatives that reduce risk and offer revenue-generating opportunities,

could increase uptake. An important first step in creating private sector awareness of NbS – and moving it beyond the CSR agenda – is to develop tools and information that articulate the business case (Section 5). Ultimately, a robust business case and feasibility study will have to be completed for each project. However, communicating the financial or risk-reduction benefits of NbS in private sector circles (e.g. through professional associations) may reframe conventional perceptions of nature and natural capital. For instance, mangroves may offer low-cost solutions to reduce flood risk to coastal infrastructure, while offering co-benefits such as aquaculture production and climate mitigation. Such co-benefits can bolster a company's reputation and social license to operate.

Case studies that present a strong business case can generate private sector interest in NbS. If industries are aware of successful, well-established NbS projects (e.g. Case Study 8), they may be inclined to consider similar approaches. Information on projects that set a precedent for successful NbS implementation may make risk-averse businesses more inclined to try innovative approaches, particularly when this information is well documented and easily accessible.

3.3.2 Creating support mechanisms

Institutional champions, including government ministers, lenders and investors, project developers and industry representatives, can create buy-in for NbS within their respective institutions and beyond. Institutional leaders, particularly those who are high-ranking and visible e.g. Chief Executive Officers (CEOs), can be highly influential in promoting, building support for, overcoming resistance to, and implementing NbS. For example, a Volkswagen Mexico director was the visionary behind the 750-acre reforestation scheme on Popo-Itza, which adds 1.3 million m^3 to groundwater reserves annually (Case Study 2). The director was inspired after visiting a Fiat factory in Italy, which grows and maintains fruit trees for factory workers. In light of the water shortages in the Puebla region of Mexico, the director considered how Volkswagen Mexico could use trees to bring more water to the factory and, ultimately, the community. By championing this novel concept at Volkswagen Mexico, the director was able to generate buy-in and, eventually, see the implementation of NbS.

Enhancing capacity to integrate NbS into decision-making within, and between, ministries responsible for planning, financing, and implementing infrastructure projects could improve uptake. The conservation and sustainable management of natural capital is integral to sustainable economic development. Dialogues between different levels of government and different ministries[i] can help to share experiences, build confidence, and raise awareness, thus mainstreaming NbS across policy frameworks. These dialogues can break down barriers between government ministries that have key roles in implementing NbS, such as planning, finance, environment, and infrastructure. Furthermore, cross-ministry dialogues enable policymakers to create frameworks that are more coherent and consistent across both national and regional levels – frameworks that are vital for encouraging private sector uptake of NbS (Section 2). Existing initiatives, such as IDB's climate-policy dialogues, offer opportunities to broker such discussions in LAC[55].

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i For example, the 2019 United Nations Pre-Conference of the Parties in Costa Rica hosted a session for LAC Ministers of Finance on the Value of Natural Capital and NbS in national planning activities, underscoring the importance of awareness raising and capacity building.

Case Study 8: Watershed forest restoration to support the functioning of the Itaipu Dam, Brazil/Paraguay

Location: Itaipu Dam, Brazil / Paraguay
Challenge: Soil erosion and sedimentation
Solution: Forest and watershed restoration

The hydropower company, Itaipu Binacional, operates the Itaipu Dam, located on the Paraná River on the border between Brazil and Paraguay. The hydroelectric dam is the world's second largest by installed capacity (14,000 MW), and the largest in terms of effective generated output (103.1 TWh in 2016). The company has been involved with designing, implementing and financing NbS, including large-scale forest restoration and protection on company-owned land, and working with local people within the Parana watershed to restore forests and improve soil management (the Itaipu Preserva Project).

Sediment flowing into rivers and decreasing the lifespan of dams is a problem in watersheds throughout Latin America; it is exacerbated by soil exposure and erosion caused, in part, by deforestation and poor management of agricultural land. Over the half-century prior to the Itaipu Dam's construction, large areas of land in the watershed had been degraded through forest clearing for soy and corn plantations, smallholdings, small cities, and meat-packing plants, reducing the provision of ecosystem services. Sedimentation and periods of dry weather posed significant challenges for the Dam's efficient functioning and economic return.

Itaipu Binacional needed a secure, high-quality (in terms of chemical and physical properties), continuous water flow to maintain energy generation. Plans were made to protect and, where absent, create a natural forest buffer around the edge of the reservoir. The aim was to reduce erosion and encourage natural water filtration through the soil, reducing sediment loads and regulating water flows. Without the efforts of Itaipu Binacional on forest restoration, removal of sediment within the reservoirs through dredging would have been a financially expensive and environmentally harmful process. Their participation in creating natural, water-management processes through forest restoration and soil filtration has proven considerably advantageous. In the company-owned area surrounding the Dam, Itaipu Binacional has planted more than 44 million trees and created a network of protected natural areas connecting two national parks (Iguaçu and Ilha Grande) in Brazil and a binational reserve belonging to Itaipu (Paraguay and Brazil).

The initial restoration and protection efforts of Itaipu Binacional have provided a range of benefits for the functioning of the Dam, as well as for local communities and wildlife. The program has seen rapid expansion, and now operates in 55 municipalities in Brazil and 15 municipalities in Paraguay. It has also become an internationally recognized model for watershed management and sustainable water and energy solutions around the world. UNESCO has designated Itaipu Binacional's 1 million ha territory as a Biosphere Reserve.

By sharing experience and expertise, partnerships and projects can build capacity and networks in the private sector and governments. In 2018, The Nature Conservancy (TNC) and the International Water Association (IWA) launched a joint research project: Building Nature-based, Resilient Water Systems: Catalyzing the Role of Water Regulators. This project involves the International Water Regulators Network, IWA Specialist Groups, and other networks, and aims to build capacity among water regulators to develop policies and regulations that are supportive of NbS in water management[56]. Cross-sector partnerships, such as these, can support information dissemination, capacity building, and collaborations for NbS projects.

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3.4 Summary

Awareness, governance, and capacity barriers

Actor	Barriers
Infrastructure Project Developers	• NbS may not be readily considered by project developers who usually work with gray infrastructure. • Project developers may not have knowledge or experience of NbS, creating a potential capacity barrier for design and implementation (Section 4). • NbS are often characterized by complex governance arrangements across various jurisdictions and with multiple stakeholder groups.
Policymakers	• Governments can face challenges when it comes to enforcing legislation relevant to NbS because of a lack of trained personnel and/or funding. This can be compounded by unequal enforcement capacities between ministries. • Policymakers may not have knowledge or experience of NbS, creating a potential capacity barrier for permitting and support (Section 2). • Legacies of corruption within infrastructure projects in LAC have, and will, reduce private sector confidence in both traditional and climate-resilient infrastructure investment, particularly with regards to NbS.

Awareness, governance, and capacity actions

Actor	Actions
Infrastructure Project Developers 	• Share case studies that present a strong business case in order to develop private sector interest in NbS. • Raise awareness that NbS can offer both cost-effective risk-reduction benefits and revenue-generation opportunities, which go beyond the CSR agenda. • Use existing mechanisms (e.g. private sector alliances relating to DRR or biodiversity) and business and biodiversity platforms to engage with NbS.
Policymakers 	• Use cross-ministry policy dialogues to promote and enforce integrated policy, planning, and legislation that supports NbS uptake (see also Box 1).
Financial Institutions 	• Develop partnerships and projects to build NbS-relevant capacity and networks in the private sector and government.
Infrastructure Project Developers 	• Use institutional champions, including government ministers, lenders and investors, project developers, and industry representatives, to create buy-in for NbS within their respective institutions and raise innovation standards among other institutions.
Policymakers 	• Engage and inform stakeholders to raise awareness of, and demand for, NbS.

Forest restoration provides a range of services including reducing the risk of floods and landslides.

Source: Pixabay

Urban green infrastructure can reduce the heat island effect and help regulate storm-water runoff.

Source: Pixabay

4. Technical tools and skills needed to deliver NbS

4.1 Introduction

NbS project development, implementation, monitoring, and evaluation requires a wide range of technical skills[57]. These skills include the capacity to evaluate the costs and benefits of NbS, so projects can be properly compared with alternatives and, where appropriate, the business case can be made. Project developers need to establish multi-disciplinary teams and have access to relevant guidance and methodologies to plan, design, build, and operate infrastructure. In addition to the technical skills needed to develop and implement traditional infrastructure, NbS require other, complementary skill sets (Figure 4). Understanding the actual or perceived gaps in the skill sets of public and private sector actors (e.g. project developers, financiers) will help to identify key barriers to increasing the uptake of NbS for infrastructure projects.

Figure 4. Examples of the areas of expertise (skill sets) required to deliver NbS

Engineering standards, guides, and tools are an important part of designing infrastructure, though most do not explicitly refer to NbS. A number of guides and tools for NbS already exist, but they are not widely known outside the conservation community:

- The Convention on Biological Diversity's (CBD) internationally focused, Guidelines for Ecosystem-based Approaches (EBA) to Climate Change Adaptation and Disaster Risk Reduction, provides information for policymakers, implementers, and civil society, and is relevant to countries in LAC (all signatories to the CBD).
- The IUCN Global Standard for NbS includes businesses among its target audiences.
- Colombia's guide to the use of EbA is a national-level document.
- Guidance for policymakers and project developers who have an interest in increasing infrastructure resilience with NbS (Box 2 and Box 3) is being developed by IDB and UNEP.

Further examples of international initiatives and tools that may be of use to both project planners and financers interested in NbS are given in Table 1.

Box 2. Increasing Infrastructure Resilience with Nature-based Solutions – Creating Guidance for Policymakers

UNEP and UNEP-WCMC are developing a technical guidance document[58] to support policymakers in identifying policy opportunities to encourage private sector uptake of NbS to increase infrastructure resilience. It provides a summary of what NbS are and why they are increasingly prominent in international and national policy environments, before offering suggestions on how NbS can be integrated into planning and procurement processes for infrastructure. The guidance builds on consultations with stakeholders in LAC, and references a range of external sources where policymakers can find more information and relevant tools.

Table 1. International initiatives addressing some of the challenges affecting NbS uptake

Initiative	Objective	Main NbS challenge it helps to address
The Natural Capital Coalition	*Connecting Finance and Natural Capital: A Supplement to the Natural Capital Protocol* - Provides a framework to help financial institutions assess the natural capital impacts of, and dependencies on, their investments and portfolios[j, 59]. Colombia in particular has been highly engaged in testing the broader Natural Capital Protocol.	Awareness of business case for action and a means of assessing risks and opportunities associated with NbS financing
Microfinance for Ecosystem-based Adaptation (MEåbA)	Provided several Monetary Financial Institutions (MFIs) in Colombia and Peru with support in developing micro-loans to reduce the vulnerability of small agricultural producers to climate risks[60].	Access to finance
The Wealth Accounting and the Valuation of Ecosystem Services (WAVES) partnership	Helps country leaders to carry out natural capital accounting exercises to inform policy and planning processes[61]. This could drive those countries undertaking such assessments to explore the use of NbS. Colombia, Costa Rica, Ecuador, Guatemala, and Mexico have implemented environmental accounts, and nine other countries are undertaking their first pilot accounts.	Access to information to understand appropriateness and value of different NbS in different geographies
Exploring Natural Capital Opportunities, Risks and Exposure, ENCORE	Aimed at credit providers, ENCORE helps users better understand and visualize the impact of environmental change on the economy[k, 62].	Lack of understanding of risk profiles of NbS and a lack of links to business risk
CDP's Matchmaker platform	A global clearing house and marketplace for cities to showcase suitable investment opportunities to potential investors in areas such as flood control, waste management, sustainable transportation, renewable energy, water management, and energy efficiency[63].	Lack of adequate project pipelines
Coalition for Private Investment in Conservation (CPIC)	Creates blueprints for the successful delivery of priority conservation projects as attractive investment opportunities for the private sector, and connects project developers with deal-structuring support systems. The coalition has five different working groups for areas of conservation management: (i) coastal resilience; (ii) forest landscapes; (iii) green infrastructure for watershed management; (iv) sustainable agriculture intensification; and (v) sustainable coastal fisheries[64].	Lack of adequate pipeline of projects and lack of standardized success metrics
Adaptation Fund	Provides financial support for projects and programs that help vulnerable communities adapt to climate change. Established under the Kyoto Protocol of the UN Framework Convention on Climate Change (UNFCCC)[65].	Access to finance
The Economics of Ecosystems and Biodiversity (TEEB)	Global initiative that works on 'making nature's values visible to decision makers. Provides a structured approach to the economic valuation (where appropriate) of the range of services and benefits provided by ecosystems and biodiveristy[66].	Access to information on benefits in economic terms

4.2 Barriers

This study asked people working in governments, financial institutions and on NbS projects in LAC about the technical tools and skills barriers to NbS uptake. They identified the following main groups of barriers:

- A shortage of the skills and data required to value and communicate NbS benefits and costs.
- A lack of skills required to design and implement NbS.
- Few tools and guidance documents on NbS specifically for project developers.

4.2.1 Shortage of the skills and data required to value and communicate NbS benefits and costs

Project developers and investors lack adequate data to evaluate the performance of NbS over their potential lifespans. Many NbS projects are relatively new and lack sufficient performance histories to demonstrate value and impact. The lack of NbS performance metrics can impair the development of a proof of concept, as well as the operational management and delivery of benefits. In turn, this can generate uncertainties relating to the value, effectiveness, and return on investment of NbS[67]. Information on the costs of NbS development and implementation show that these values can be highly variable, affecting the development of NbS risk profiles. Performance metrics are particularly important during the operational phase in order to: ensure that NbS meet the required infrastructure service performance; confirm that the intended co-benefits are delivered; and to make sure results are fed back into decision-making processes affecting the use of NbS in the future. Without adequate performance data to inform a risk evaluation of a project's lifespan, project developers cannot calculate and forecast cash flows, revenue streams, and adjusted risk returns on the investments.

4.2.2 Lack of skills required to design and implement NbS

Many engineers and other relevant stakeholders in LAC have not received training on designing or delivering NbS. Most contractors, architects, engineers, and financiers lack familiarity with NbS and remain reliant on their knowledge of gray infrastructure measures and built approaches. Similarly, many actors involved with the policy and legislative frameworks in LAC have limited or no background in NbS.

Within the private sector, a lack of awareness of NbS, and the skills required to implement them, can lead to challenges around structuring the right team and incorporating NbS into tender responses. Guidance on how to build teams with the required expertise could, therefore, be beneficial to this process. Skills of relevance to NbS (e.g. landscape design) may not be recognized as such, and specialist training for private sector actors for specific tasks relating to NbS projects (e.g. post-storm restoration and training of restoration specialists[68]) may not be available.

NbS are not on the standard curricula of many engineering degree courses, or on the agenda of many professional bodies in LAC. Instead, much of the capacity building for engineers and project

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k According to the person who was interviewed from this entity, the initiative has received a lot of interest from Mexico, Brazil, and Colombia, which have very active business communities, a good culture of collaboration, and supporting interest from policy.

l Developed by the Natural Capital Finance Alliance as part of the Advancing Environmental Risk Management project, in partnership with UNEP-WCMC and financed by the Swiss State Secretariat for Economic Affairs (SECO) and the MAVA Foundation. Two Colombian banks are currently testing the tool, Davivienda and Banco de Bogotá.

planners on NbS in LAC is done through NGOs, such TNC, rather than through educational institutions or professional bodies. As such, many NbS projects partner with NGOs or with academic institutions that do have specialist departments or knowledge of NbS.

A lack of understanding regarding NbS performance variability creates a challenge to developing risk profiles for NbS. As living systems, NbS are sensitive to external stressors and environmental conditions, including climate change. Engineers and project planners may need guidance to anticipate and understand the functional variability of NbS in the same way that they understand the performance and tolerances of traditional gray infrastructure materials under different conditions. For example, the efficacy of seagrass in attenuating wave energy may peak in the summer months during reproductive phases, lessen in the milder spring and fall months, and be non-existent during winter months when biomass and density are low[69]. This is in contrast to a seawall that is expected to (although does not always) perform uniformly, regardless of seasonality. However a seawall does not have the flexibility to adapt to changing climates in the way that some NbS can; for example, oyster reefs can adapt and grow in response to sea-level rise.

Project developers considering NbS need to be able to evaluate and manage the risks associated with NbS performance despite a current lack of models and measurement tools to calculate performance fluctuations.

The traditional organizational structure of infrastructure developers may be a barrier to developing project teams with appropriate skill sets for NbS. The lack of a particular specialist or teams with the appropriate skill sets are barriers to NbS uptake and implementation. The traditional sector-based division structure (e.g. roads division, rail division, energy division, etc.) of many large companies involved in infrastructure development potentially creates a barrier to collaboration and the development of technical capacity for the design and implementation of complex NbS[70]. Many smaller businesses may specialize in one area required for the delivery of NbS, but not in another. The design teams for large infrastructure projects do often include specialists in fields that would help to deliver NbS. However, the lack of knowledge and experience of applying these skills to NbS specifically, coupled with requirements for additional specialist skills in some instances, may reduce uptake. Furthermore, the institutional changes required to shift emphasis from projects that are led by traditional infrastructure divisions to ecological or other specialist divisions may take time to implement.

Lack of expertise in government processes and systems can create a technical barrier to implementation. As a relatively new area, both project developers and governments may find it challenging to understand where NbS fit into government planning and permitting. This means navigating the existing policy framework for a project that includes NbS may take longer than for a traditional gray infrastructure project, where the pathways and processes are better known (Section 2). Governments may also lack experience of designing infrastructure tenders to include NbS. As a result, NbS may not be included in the types of invitation to tender that project developers respond to.

4.2.3 Lack of NbS tools and guidance documents specifically for project developers

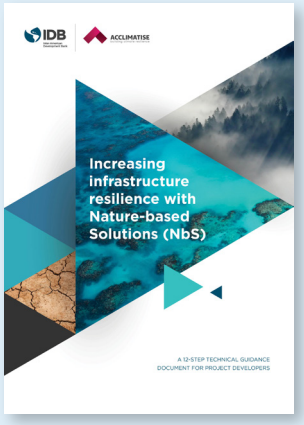
The lack of standards, tools, and guidance on NbS specifically designed for project developers in LAC poses a challenge to developing projects that include NbS. Traditional gray approaches to infrastructure often rely heavily on design tools and standards, the equivalent of which may not exist for NbS. The World Water Development Report 2018 identified that "there is a lack of technical guidance, tools and approaches to determine the right mix of NBS and grey-infrastructure options"[71]. Although a wide range of NbS tools exist, most have not yet been assessed for use by project developers, and

are not widely known outside the conservation community. For example, the EbA Tools Navigator, developed by UNEP-WCMC, the International Institute for Environment and Development (IIED), the International Union for Conservation of Nature (IUCN), and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, includes more than 240 tools, methodologies, and guidance documents for different project stages. Many of these may be applicable to private sector NbS projects in LAC, but have not yet been evaluated for this purpose.

There is also a lack of guidance on the potential displacement of climate-related impacts, unintended consequences, and impacts outside the direct control of NbS project partners. The risks associated with gray solutions are generally well known or can be understood via standard feasibility studies, modeling, and impact assessments. As NbS are complex systems (e.g. involving living elements), there may be more factors that could impact their effectiveness and performance, and different risks that are not immediately apparent in assessments. These risks include climatic or seasonal variations, invasive species, displacement of climate risk (e.g. increasing downstream flood risk as a result of the intervention), or factors outside the project boundary (e.g. agricultural run-off, deforestation). The lack of guidance regarding these risk factors compared to those for gray infrastructure options may create challenges in adequately determining risk profiles and appropriate risk management strategies. However, the flexibility offered by many NbS may help to compensate for this uncertainty.

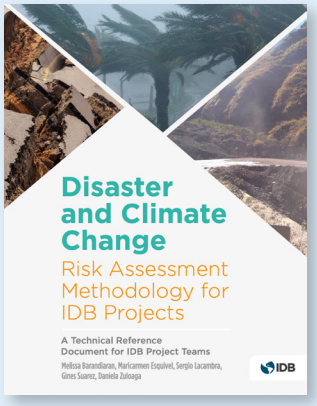
Box 3. Increasing Infrastructure Resilience with Nature-based Solutions – Creating Guidance for Project Developers

In an effort to bridge the technical guidance gap, IDB and Acclimatise have produced a 12-Step Technical Guidance document[72] specifically targeted at project developers to help them to integrate NbS into project pipelines. The guidance covers a range of topics, such as project governance, policy and permitting, and economic and financial structuring, and references a variety of external sources where project developers can find further guidance.



Box 4. IDB's Disaster and Climate Risk Assessment Methodology

The IDB has developed a methodology[73] to facilitate the identification and assessment of climate change effects, as well as opportunities to increase resilience, in all relevant projects during their upstream preparation and implementation phases. It builds upon the current disaster risk screening process and provides guidance for project teams, executing agencies, technical experts, and external consulting and design firms on conducting disaster and climate change risk assessments in relevant operations, ensuring added value to projects. While this methodology was not designed explicitly for NbS, it is applicable through its focus on infrastructure Disaster Risk Management (DRM) and resilience building.



4.3 Actions and opportunities

There are opportunities to improve the technical tools and skill sets required to implement NbS, including:

- Assessing and tailoring existing tools and guidance for project developers.
- Improving skills through educational institutions and professional bodies.

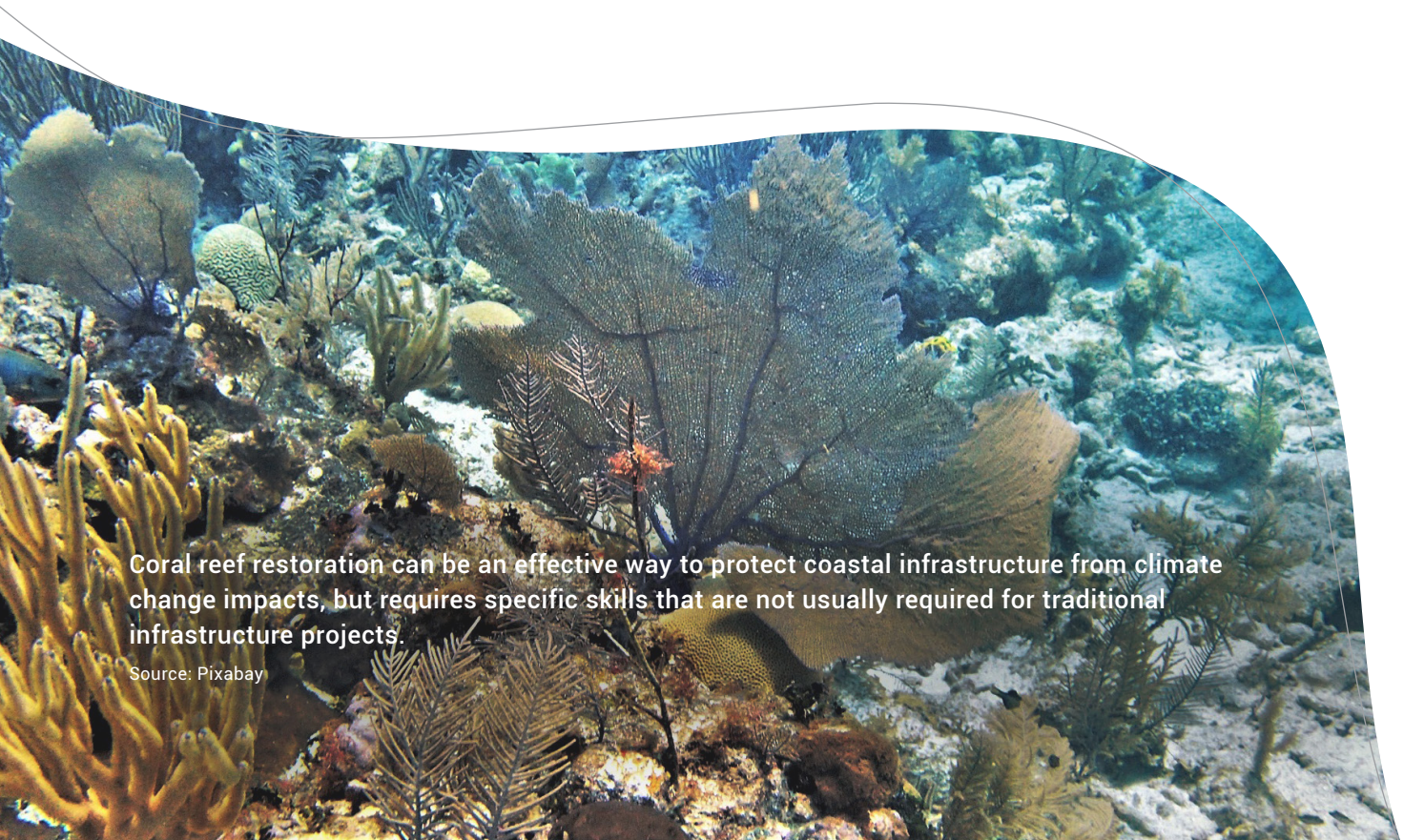
4.3.1 Assessing and tailoring existing tools and guidance for project developers

Existing tools and guidance of relevance for project developers or policymakers interested in NbS need to be better signposted. New NbS guidance documents may be needed if specific guidance for certain stakeholder groups (e.g. project developers) is not available. These targeted documents should build upon the wealth of existing relevant information, tools, and guidance to help overcome technical implementation barriers, particularly where capacity is lacking. IDB's Increasing Infrastructure Resilience with Nature-based Solutions (NbS)[72] (Box 3), focuses on how to integrate NbS within a project development cycle. It also covers the importance of processes less commonly associated with traditional infrastructure development, such as adaptive management in the context of a changing climate and incorporating NbS into guidance on climate/environmental risk assessments for projects. IDB's Disaster and Climate Risk Assessment Methodology (Box 4) also provides a useful resource for climate risk assessment, applicable to both gray and NbS infrastructure projects.

4.3.2 Improving skills through educational institutions and professional bodies

Integrating NbS into traditional engineering curricula will increase awareness among engineers and provide them with the skill sets required to design and implement projects. Academic institutions can play an important role in mainstreaming NbS for infrastructure projects within the engineering community. For example, the Engineering Department of the Universidad Nacional Autónoma de México (UNAM) is integrating green infrastructure into curricula and post-doctoral research projects, providing graduates with skill sets relevant to NbS projects.

Professional associations for project planners could raise awareness of NbS among their membership through outreach and Continuing Professional Development (CPD). Integrating NbS into the work plans of professional engineering bodies would signal the importance of considering novel approaches. Training can help to keep project planners up-to-date with best practices and latest knowledge, and can help them to learn new and additional skill sets. For example, the Colombian Council of Sustainable Infrastructure offers continuing education courses focused on adhering to performance standards for "Living Buildings"[74]. In addition, integrating NbS elements into sustainable infrastructure courses will raise awareness among project planners.



Coral reef restoration can be an effective way to protect coastal infrastructure from climate change impacts, but requires specific skills that are not usually required for traditional infrastructure projects.

Source: Pixabay

4.4 Summary

Technical tools and skills barriers

Actor	Barrier
Infrastructure Project Developers 	• A lack of NbS learning within standard university engineering curricula and training courses in LAC drives reliance on traditional gray infrastructure. • Identifying and sourcing the required skill sets for project development can be complex and challenging. • The lack of tools and guidance for engineers limits capacity for developing NbS projects.
Policymakers 	• A lack of experience with planning, permitting and procurement processes for NbS can create a barrier for governments interested in encouraging the use of NbS in infrastructure projects.

Technical tools and skills actions

Actor	Actions
Infrastructure Project Developers 	• Use professional associations to raise awareness of NbS among their membership through outreach and CPD (Section 3). • Integrate NbS into traditional engineering curricula to increase awareness among engineers and provide them with the skill sets required to design and implement projects.
Policymakers 	• Improve the signposting of existing NbS tools and guidance that are relevant to project developers or policymakers.

Watershed restoration can help regulate water supply to reservoirs and limit sedimentation affecting dams

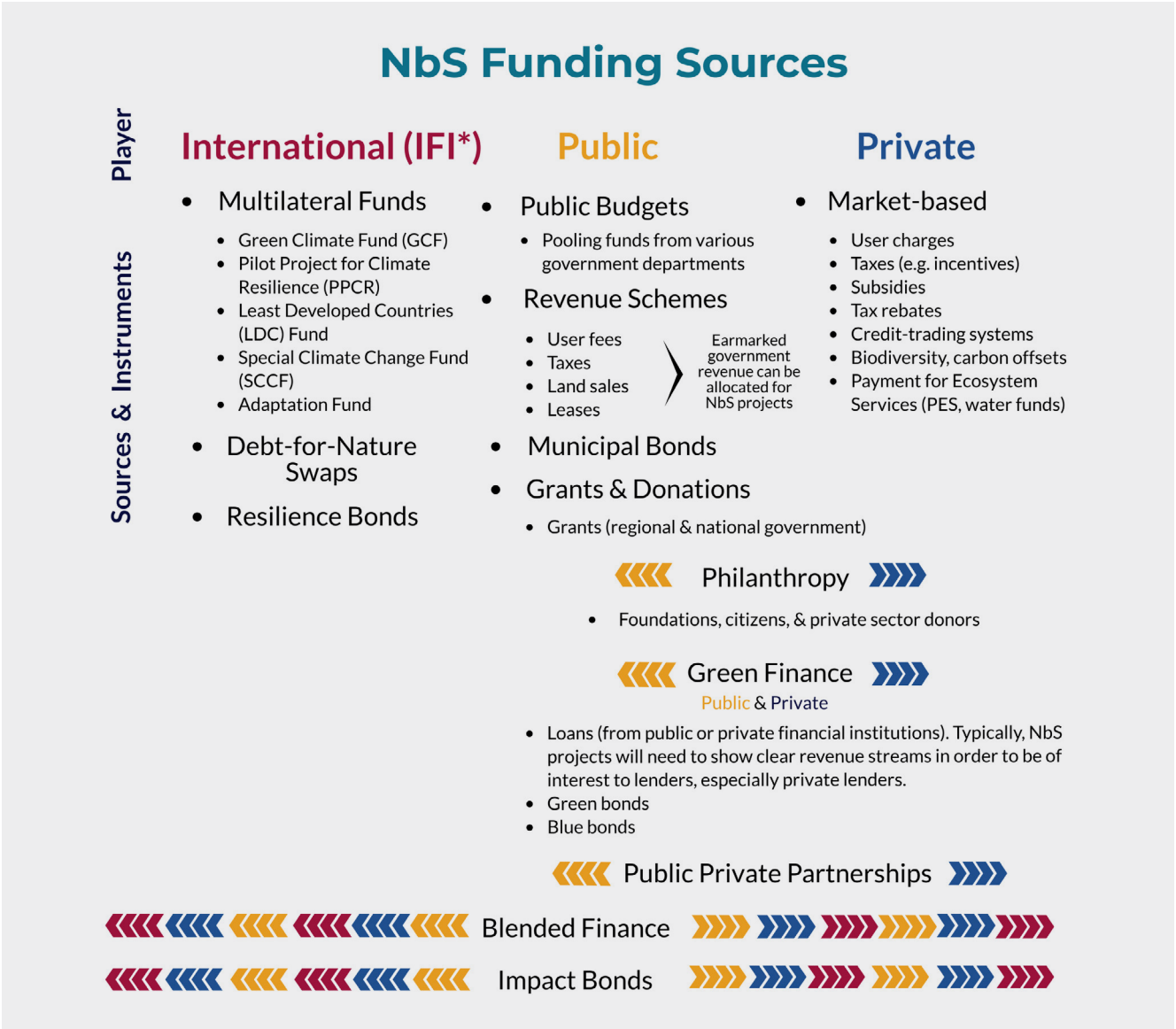
Source: Pixabay

5. Finance and funding

5.1 Introduction

Much like sustainable and resilient infrastructure projects, the private sector will need to secure innovative sources of finance and funding[i] for NbS projects. Figure 5 shows the actors that are typically involved in NbS project finance, and possible funding sources and instruments.

Figure 5. NbS Funding Sources



Source: Authors, modified from Trinomics and IUCN. (2019). Approaches to financing nature-based solutions in cities. Working document prepared in the framework of the Horizon 2020 project GrowGreen.

* International Finance Institutions (IFI) e.g. IDB

Box 5. What is the business case for NbS?

NbS, such as restored wetlands or mangroves, can offer economically viable and effective infrastructure solutions in themselves, or they can strengthen the resilience of gray solutions, such as drainage systems or seawalls, to climate change impacts. The business case for NbS derives from a combination of:

- Reduced upfront capital investments (e.g. ecosystems may already be in place and only require maintenance for optimal functioning).
- Reduced operational and maintenance costs over the project lifespan (e.g. constructed wetlands have lower operational and maintenance costs compared to conventional wastewater treatment facilities).
- Avoided losses due to resilience benefits.
- A wide range of co-benefits, including biodiversity conservation, improved livelihoods, or revenues from tourism, many of which can be valued and monetized.

A clear business case and proof of concept is important to secure NbS finance and funding. The general principles supporting NbS investment (i.e. the capacity of NbS to respond effectively and cost-effectively to a range of context-specific challenges, while delivering a range of social, environmental, and economic co-benefits) are well documented (Box 5). There are also a growing number of case studies that demonstrate successful use of NbS, including by the private sector.

Therefore, the private sector may explore NbS in order to:

- Pursue efficiency and lower operational and maintenance costs.
- Maintain the quantity or quality of key economic inputs (e.g. water for a hydroelectric plant).
- Avoid losses and protect assets from the impacts of extreme events (e.g. protecting coastal pipelines from storm surges).
- Respond to threat multipliers (e.g. to mitigate the consequences associated with the combined effects of drought conditions and increased water extraction in growing urban areas[75]).

However, it can be challenging to build a detailed and specific business case in order to secure investment for an NbS project – this is a key and understudied barrier[76]. While the general business case for NbS continues to develop, there remains a need to create a new business case for each NbS project (as for other infrastructure projects).

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m Finance refers to meeting the upfront capital costs of the asset (e.g. public or private financing), while funding refers to how the asset is paid for over the duration of its lifecycle (e.g. user, taxpayer, customer).

5.2 Barriers

This study asked people working in financial institutions and on NbS projects in LAC about the financial barriers to NbS uptake. They identified the following main groups:

- Challenges defining the business case and developing a proof of concept.
- Lack of access to finance.
- Few suitable insurance schemes.

5.2.1 Challenges defining the business case and developing a proof of concept

Many project developers do not have experience of developing a business case for NbS. The need to identify the direct and indirect benefits, as well as financial flows and outflows, across the entire lifespan of NbS projects can be challenging for those more used to gray infrastructure. As NbS are inherently multifunctional (often more so than gray alternatives), project developers or financial institutions may be unfamiliar with capturing the associated costs (Box 6), benefits, and additional co-benefits they present[77]. Such information is required in order to build a detailed business case and access financing. Calculating gray infrastructure costs is supported by decades of standard and precedent; yet, calculating NbS costs can be new, more complex, and may include additional transaction and opportunity costs. Project developers may find it difficult to adequately determine revenue sources (or avoided losses) and capital requirements over the lifespan of NbS, making it more challenging to forecast project cash flows and to demonstrate the financial viability of NbS investments.

These challenges are not unique to NbS – it can also be difficult to justify additional costs for the implementation of engineered resilience measures for gray infrastructure. However, calculating operational expenditure for NbS (e.g. recurrent costs over the lifespan of the project, such as those associated with forest management or replacement planting) often requires additional information on the dynamic and variable nature of ecosystems, and the impact of external stressors (e.g. climate change) on those ecosystems. Without this information, project developers may encounter challenges in demonstrating how NbS can deliver against the procurement brief, the longer-term operational performance requirements, and revenue objectives (this is also a challenge for many ecosystem-based adaptation measures[78]).

Box 6. Useful definitions for NbS CbA[79]

Capital expenditure (CAPEX): upfront investment costs inclusive of initial capital and material expenses covering all aspects of design, permitting, and construction. Note that NbS schemes may involve additional land requirements, which may incur additional purchase, transaction, or governance costs compared to gray infrastructure solutions.

Operational expenditure (OPEX): costs over the project lifespan (e.g. pest control, landowner payments), inclusive of any expenses associated with decommissioning.

Opportunity costs: the foregone value of implementing NbS as opposed to an alternative option (e.g. using land for an alternative purpose).

Transaction costs: costs associated with the time, effort, and resources to implement, monitor, and maintain NbS projects. This may include feasibility studies, securing permits, training staff on new construction techniques, and stakeholder engagement costs. As project developers tend to have less experience with NbS, the transaction costs are likely to be higher than those associated with traditional infrastructure projects.

Data is required to build the business case for NbS, but if it is lacking, or the costs of accessing it are high, uptake of NbS may be impeded, particularly if resources are limited. Project developers will require access to site-specific data to understand NbS performance, properly calculate the time required to reap NbS benefits, and account for seasonal variations that could impact costs. In addition, the resources required to develop new knowledge, data, and tools to evaluate NbS (compared to conventional alternatives where information is often already well-established), may pose a practical barrier to project development; especially, if the transaction costs associated with coordinating and negotiating across multiple stakeholders groups are considered to be high. Business-as-usual approaches that can use existing data, reproduce existing methodologies, and require less engagement will have lower transaction costs than those that require a new approach.

The co-benefits of NbS are key to developing the business case, but they can be difficult to assess. Articulating the multiple benefits of NbS in monetary terms over time is very difficult. NbS projects will generate direct benefits (e.g. increased water supply to a factory), as well as co-benefits that are more diffuse and difficult to value in monetary terms, particularly if they do not have a market price (e.g. wildlife habitats, carbon sequestration, amenity values). While there are various methodologies used to value ecosystem services, a CbA requires a robust understanding of how ecosystems deliver benefits, which can be challenging to assess.

There may also be a delay between when NbS are implemented, and when the benefits start to be realized[m]. There is usually a time lag before NbS fully mature and their functionality may continue to improve or change over time[80]. For example, the capacity of a forest to regulate water supply is likely to be limited when the trees are saplings, but at full potential when the trees reach maturity. When considering benefits over the lifespan of NbS, methodologies may differ from those for traditional project development because costs and benefits may not be realized at the same time. It is, therefore, important to take this into account when developing the business case.

Without clear information on how and when NbS will deliver benefits, and how those benefits will be monetized, it can be difficult to make a business case for NbS. It can also be challenging to perform the analysis (e.g. CbA and discounted cash flow analyses) required to demonstrate the viability of NbS when compared with gray infrastructure.

The risks and uncertainties associated with NbS performance can be more difficult to quantify than those relating to gray alternatives. Developing a successful and financially sustainable business case for NbS (either as an alternative or complementary approach to gray infrastructure) requires a robust knowledge of the resilience challenges, and an in-depth understanding of nature's capacity to address these challenges. For example, estimating the holding capacity of a stormwater drainage tunnel can be done accurately through a mathematical equation, while estimating the capacity of green infrastructure (e.g. bioswales, rain gardens, green spaces) to regulate stormwater flows is considerably more complicated. Gray infrastructure may, in some instances, also show performance variability, but those who fund and finance projects are likely to better understand gray infrastructure risk management. Furthermore, higher due diligence costs, and a lack of experience within financial institutions of evaluating NbS risk profiles, can make project development and approval more challenging. By contrast, traditional infrastructure has well-documented risk profiles that can inform financial entities' due diligence processes (although this is not always the case when considering climate change risks).

5.2.2 Lack of access to finance

A lack of entry points for project developers to secure NbS financing, and a lack of guidance on how to access innovative financing, can be barriers to NbS uptake. At present, project developers face challenges in securing funding and finance for NbS projects. As with other innovations, such as renewable energy and energy-efficiency technologies, it can take decades for markets to mature. Until NbS can tap into mainstream infrastructure funding streams, this time lag presents an interim challenge for project developers to access financing for NbS (Box 7). Commercial banks, for example, need to see a market signal in order to develop new financial products that can accommodate the investment profiles of NbS (e.g. that are fit-for-purpose considering return on investment and risk profiles[n]). Due to a perceived lack of demand, few financial institutions in LAC have financed NbS directly, either as stand-alone solutions, or as components of integrated, infrastructure projects.

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m Government financial policies could be one mechanism to help address this in the short term. See Section 2.3.3 for more information.

n New financial products have started to emerge in the region, but they are mostly designed and promoted by NGOs. Such is the case with the Cloud Forest Blue Energy Mechanism, proposed by Conservation International and TNC, which aims to mobilize domestic commercial finance, bringing together environmental valuation methods and 'pay for success' financing approaches in order to reforest and conserve cloud forests in LAC[81].

Box 7. Financing barriers for green investments

Financing barriers that are common across a broader range of green investments include[82]:

- General investment barriers, such as low-risk adjusted returns, high real and perceived risks, and upfront investment needs.
- Demand-side barriers, including a lack of understanding of investment opportunities, preference for near-term benefits, and a lack of in-house capacity to develop investment proposals.
- Supply side barriers, including a lack of access to long-term capital, unsuitable bank-lending practices, a lack of suitable risk-management mechanisms, and high upfront costs.

Financial institutions lack information on the investment potential of different types of NbS, how they create and capture value, and the scales at which they operate. So far, the majority of NbS projects in LAC have been financed through grant and concessional instruments, and financial resources provided by multilateral funds[o], bilateral cooperation, or government sources[p]. Private equity and debt finance to support NbS have not been extensively deployed in the region. Project financers are, as yet, unlikely to have experience financing NbS projects and may be unfamiliar with the approaches and the associated risks. As a result, NbS may be perceived as riskier than traditional engineering solutions, regardless of their actual risk profile.

Traditional funding models may not attract investors, or produce enough capital, to support growth in the NbS market. NbS can have long maturity and service delivery timelines, which may not align with the time frames in which investors expect to recover costs and realize returns. A key advantage of NbS over gray infrastructure projects is the generation of co-benefits. However, as these benefits are often non-exclusionary and shared in the public domain (e.g. habitat provision, carbon sequestration), the opportunities for free riding can make it difficult for investors to account for them. Indeed, the benefits to the public that NbS can deliver, create the impression that financing should be the responsibility of governments, and not private actors[83].

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o Multilateral funds that can finance NbS include: the Green Climate Fund (GCF), the Pilot Program for Climate Resilience (PPCR), the Least Developed Countries Fund (LDFC), the Special Climate Change Fund (SCCF), the Adaptation Fund and the Adaptation for Small holder Agriculture Programme.

p Sources of government financing for NbS include taxes and royalties, PES, water funds, and green sovereign bonds.

5.2.3 Few suitable insurance schemes

NbS projects face challenges distributing risk because there is a lack of insurance products able to meet NbS risk profiles over their lifespans. Insurance is critically important to hedge the risk associated with NbS projects. However, traditional insurance contracts generally operate over shorter time frames (e.g. one year) than those needed to financially protect against the potential failure of highly variable NbS investments. Therefore, it is unlikely that NbS project developers will be able to capture the cost of NbS investment failure within the lifespan of a conventional insurance product.

Limited reliance on insurance schemes in LAC creates challenges for the development of NbS insurance products. LAC countries are more heavily reliant on post-event assistance, than countries investing in pre-event preparedness. Yet, there is still lower insurance penetration[q] in LAC countries when compared to other parts of the world. In addition, there are high levels of mistrust towards insurance companies in LAC, and low levels of awareness, understanding, and interest among local stakeholders about the utility of, and access to, climate insurance products[84].

Due to the lack of precedent, it is difficult for insurers to develop NbS focused insurance portfolios or to promote the use of NbS as insurance solutions. Firstly, the risk profiles and operational costs for insuring against loss within ecosystems in developing countries tend to be too few in number or too small in scale to attract insurance; this makes it difficult for insurance companies to develop insurance products[r,85]. Secondly, there is no formal integration of NbS into insurance policies at present, so the risk reduction values of NbS cannot translate into lower premiums (in the same way that reinforced shingle can reduce a homeowner's insurance premium).

Encouragingly, insurers and reinsurers are starting to respond to demand for natural capital insurance products and the market is growing. At US $3.8 million, the insurance policy for Mexico's MesoAmerican reef (Case Study 3) is a leading example of insurers providing parametric coverage for natural assets. Although NbS financing in LAC is in an early stage, the emergence of products like resilience bonds and natural capital insurance indicates that the market is moving in the right direction. However, it is likely to take time before a wide range of suitable insurance policies for NbS are available.

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q The ratio between insurance premiums written and gross domestic product (GDP).

r Conditions for the deployment of insurance schemes could be improved; for example, through the development of risk pools for insurance, such as the Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company (CCRIFSPC).

5.3 Actions and opportunities

Financial institutions, governments, project developers, and businesses can take advantage of a range of opportunities and actions to help improve funding and financing models for NbS. These include:

- Developing partnerships, information and data to define the business case.
- Developing sustainable business models to fund NbS.
- Developing and refining finance mechanisms.
- Promoting support from MDBs.
- Leveraging insurance products for NbS.
- Integrating NbS appraisals into investment and lending cycles.

5.3.1 Developing partnerships, information and data to define the business case

Fostering partnerships could help build capacity in the private sector to develop the business case for NbS. Many project developers will be familiar with creating business cases for gray infrastructure projects, but may lack the data and/or experience they need to do the same for NbS. If data are not available, or there are other capacity gaps around building the business case, project developers could engage with academic institutions (e.g. postgraduate research programs) and NGOs to support data collection and modelling for NbS projects (e.g. to quantify the monetary value of ecosystem services).

Sharing data relevant to NbS is key to defining the business case for NbS. Local institutions may already have access to NbS data, or may be willing to support community projects or initiatives to generate new data. This may build community buy-in for a project, fill capacity gaps, and minimize the transaction costs associated with project development. Using existing mechanisms (or creating new ones where appropriate) to share such information could enable decision makers within businesses to develop a business case to consider NbS alongside gray options or as an alternative.

Creating and disseminating case studies that show the economic and financial viability of existing NbS projects will help to demonstrate "proof of concept" and generate interest. Case studies can also provide guidance on appropriate assumptions and methodologies for how NbS-specific costs and benefits can be accounted for in order to build confidence and capacity in NbS. For example, a CbA for Now Jade's artificial coral reef (Case Study 9) shows that the reef is a more economically viable option for protecting against coastal erosion than annual sand replenishment – a business-as-usual alternative (Box 8).

Case Study 9: Now Jade's artificial coral reef, Mexico

Location: Puerto Morelos, Mexico
Challenge: Beach erosion
Solution: Artificial coral reef (hybrid)

Now Jade is a luxury resort located in Mexico's Mayan Rivera, in the town of Puerto Morelos. In 2008, it embarked on a long-term beach restoration program, including the construction of two modular artificial reefs and the restoration of the local sand dune system.

The resort's neighboring marina generates changes in sand-transport dynamics, which, coupled with extreme weather events like hurricanes, causes severe beach erosion. After considering a range of solutions, Now Jade selected modular artificial coral reefs to counteract these impacts, based on their potential effectiveness and economic and ecological value. The modular reefs, made out of prefabricated concrete elements, are designed to emulate the functioning of natural coral reefs, and provide a substrate that can be colonized by coral species. In addition to wave attenuation, coral reefs play an important role in sediment reduction and erosion regulation. During extreme events, reefs can act as barriers against sediment transport, helping to reduce storm impacts through sand retention.

During Phase 1 of the project, an initial reef was constructed, facing the north side of the beach. This first reef generated positive results, but it did not provide full beach protection. To fully protect the resort, a second reef was constructed farther south. Together, the two reefs now significantly reduce the amount of beach erosion and eliminate the costs (US $420,000 annually) that Now Jade would otherwise need to pay for sand replenishment (transfer and deposition of sand on the beach).

Box 8. Cost-benefit Analyses (CbAs)

The results of three CbAs are profiled below to show the economic viability of three NbS case studies profiled in this Market Assessment. The discount rate (DR) for Nor-Yauyos Cochas CbA is 6 per cent (consistent over the project lifespan), a DR commonly used for landscape-scale projects that include government and non-governmental organizations. The Itaipu and Now Jade case studies use a 12 per cent DR (consistent over the project lifespan) as this is commonly used for private sector actors and has been used in previous IDB-funded studies[86]. The full CbA results and methodologies are provided in Annex C.

Nor Yauyos-Cochas Landscape Reserve (NYCLR; Case Study 6)

The NYCLR program – hydro-consolidation of the Cañete River basin – is in the early stages of implementation, and includes restoration of grassland and bofedales[s], maintenance of traditional hydraulic infrastructure, and construction of dykes to store more water in natural lagoons. Between 2011 and 2019, a stakeholder group, including famers and energy company Compañía Eléctrica El Platanal S.A. (CELEPSA), undertook restoration works covering a total of 65.5 ha across the Yanama Bofedal (13.5 ha), Apas Grassland (22 ha), and other areas (30 ha; Case Study 6). A large investment has also been made to lay the groundwork for future planned restoration work. The direct financial benefits of these NbS to CELEPSA are associated with revenue from improved water flows at the El Platanal Hydroelectric.

To date, only some of the planned NbS activities have been undertaken, but the preparatory works for these NbS will support a range of future activities as well. With only a small amount of the planned restoration work having taken place, to date, the Net Present Value (NPV) is negative if only the direct financial benefits[t] are considered over the 30-year analysis period (using a 6 per cent discount rate[u]).

However, in addition to the direct benefits, the program already delivers a range of co-benefits, such as an increase in pastureland. This can translate into alternative sources of profitable income for local communities (e.g. alpaca wool and products made from it), and into increasing carbon storage over time. In order for the NPV to be positive for the NbS activities carried out to date, each of the 65.5 ha would need to be generating additional annual benefits of around US $3,320/ ha/yr from 2025 to 2041, if all costs are included in the analysis. This reduces to US $1,585/ha/yr if it is assumed that up to half of the costs to date are associated with preparations for future NbS activities. Calculating the value of co-benefits at the landscape level can be very challenging. However, with many restored ecosystems estimated to generate benefits well in excess of these figures, the NPV of the NbS under the NYCLR program is likely to be positive when these important co-benefits are considered. For example, one estimate based on The Economics of Ecosystems and Biodiversity (TEEB) Climate Issues Update[87] puts the benefits of restoring grasslands at US $1,010/ha/yr and inland wetland habitats at US $14,200/ ha/yr (average scenario)[88].

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s A wetland vegetation habitat found in the Andes.

t Revenue generated from electricity as a result of additional water supply from the NbS.

u See Annex C for the rationale for this choice of discount rate.

Although direct activities have been undertaken in an area of 65.5 ha, the wider area of intervention is more than 467.66 ha, and has a region of influence that is greater still. The estimated additional volume of water (for the surface flow) that can be achieved with the NYCLR of the National Service of Natural Protected Areas is approximately: 9.3 million cubic meters (Mm^3) in response to the establishment of small dikes in three lagoons, and 0.56 Mm^3 due to the restoration of wetlands.

Watershed forest restoration to support the functioning of the Itaipu Dam (Itaipu Preserva Project) (Case Study 8)

Under the Itaipu Preserva Project, between 2014 and 2022, 1,753 ha of land will have been reforested and 409 ha subject to forest enrichment and natural regeneration management[v], at a cost of over US $9 million (Case Study 8). The benefits of this project can be seen both in terms of financial benefits to the company involved, Itaipu Binacional (e.g. the avoided cost of dredging as a result of decreased sedimentation from reforested areas), and wider co-benefits (e.g. biodiversity conservation or contributions to sustainable livelihoods). Over the anticipated 184-year lifespan of the project (as stated by Itaipu Binacional), and using a 6 per cent discount rate, the NPV of the Itaipu Preserva Project is estimated at around US $45,000,000 based on direct financial benefits alone[w].

The forest restoration, enrichment, and natural regeneration management carried out by the Itaipu Preserva Project is likely to generate a wide range of co-benefits, including biodiversity conservation and improved water quality for downstream users. Such co-benefits are challenging to monetize, particularly at the landscape scale and for projects that are of long duration.

In order for the NPV to be positive using a 12 per cent discount rate over the 184-year lifetime of the project, each of the 2,162 ha of restored forest would need to generate additional benefits of around US $1,425 annually from 2027. With many restored ecosystems estimated to generate benefits well in excess of this, the overall benefits generated by the Itaipu Preserva Project could be considerably higher.

Now Jade's artificial coral reef (Case Study 9)

Over a 20-year period, the CbA showed that the artificial reef provided a positive NPV of US $2,504,309 demonstrating the economic viability of the investment. If incorporating coastal flood risk reduction services provided by the artificial reefs (a non-monetized co-benefit), the NPV may be as high as US $4,392,106. While the installation of the artificial reefs required high upfront capital investment, the operation and maintenance costs were very low, thereby reducing, and eventually eliminating, the costs associated with artificial sand replenishment. The investment was economically viable and presented a strong alternative for the business-as-usual approach.

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v Including tree planting and vegetation management.

w The direct financial benefits were taken to be the avoided cost of sediment dredging and the income from electricity generated during the extended lifespan of the dam.

5.3.2 Developing sustainable business models to fund NbS

Previously tested models of private sector involvement in NbS can be used as templates by project developers for future projects in LAC. For example, over the past decade, TNC (with support from IDB) has replicated a water fund model throughout South America, with particular success in Ecuador. TNC's portfolio includes a number of funds and initiatives by water producers in different stages of development. The funds provide a constant source of finance for the conservation of more than 7 million acres of watersheds, which secures drinking water for around 40 million people[89]. These well-established designs for funding and implementing NbS can be replicated in other contexts; they may even be improved upon using the lessons learned in prior contexts. TNC has designed a water funds toolbox, which provides important resources to evaluate and, if feasible, replicate the process in other countries. Engineering consortiums, MDBs, and NGOs could play an important role in creating, collating, and disseminating information for NbS projects in regard to successful business models and their value capture. A central repository of sustainable NbS business models could be an important resource for project developers, financers, and project partners, helping to build confidence and reduce risk perceptions associated with NbS projects.

5.3.3 Developing and refining finance mechanisms

Developing appropriate and competitive financing instruments for NbS projects is important for attracting investment. Financing instruments that de-risk NbS, increase their appeal to commercial interests, and match NbS value capture (including scale and longevity), are key to the future uptake of NbS investments[90]. Blended finance, resilience bonds, results-based financing, private sector led guarantees, and aggregating credit facilities could be further deployed to de-risk NbS and attract private investors. Blended finance improves access to finance (below the market rate), de-risks projects for investors, and incorporates support and technical assistance for pipeline development[91]. It can also help to deliver risk-adjusted returns that are more in line with market expectations. The concessional financial aspect of blended finance may be used to underwrite risks, provide technical assistance, stimulate innovation, and generate market incentives (e.g. credit enhancement tools, including payment guarantees in exchange for upfront investments)[92].

Resilience bonds can be used specifically to leverage private and public capital to monitor, maintain, and protect ecosystems; as such, they may become important instruments in promoting NbS uptake. Resilience bonds can be designed to fund risk-reduction projects via a resilience rebate that turns avoided losses into a revenue stream and uses an issuance system that restores damaged ecosystems and can be scaled to cover restoration[93]. Compared to catastrophe bonds, which payout when disaster strikes, resilience rebates are used to fund measurable risk-reduction projects; therefore, they can leverage new project finance for resilient infrastructure and could potentially fund NbS projects offering measurable risk reductions. Although most resilience bonds have, so far, been issued in North America to fund public infrastructure projects[x], some initiatives are looking to extend this novel concept to developing countries, for example through the Centre for Global

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x This is partly because this is where the bond market has sparked most interest.

Disaster Protection[94]. Several financial institutions in LAC operating in the green bonds market could consider extending their services to issue resilience bonds (e.g. the Banco Nacional de Costa Rica, FIDA, Banobras[95], Bancoldex, Bancolombia; Box 9).

Public and private lenders can use social and development impact bonds to tie payment for service delivery to the achievement of measurable outcomes[96]. Unlike traditional bonds, payment for results schemes are only redeemed by the investors if specific social or environmental outcomes are achieved. They generally involve an investor providing upfront capital for the project, alongside a service provider, and an outcome-funder (e.g. the payer) who returns the capital to the original investor, including a small surplus in the event of success. For example, in 2016, DC Water, the District of Colombia's Water and Sewage authority, issued a US $25 million Environmental Impact Bond to finance green infrastructure investments to manage combined stormwater and sewage overflows. If, upon evaluation, the green infrastructure measures perform better than predicted at reducing stormwater flows to combined sewer systems, the bond's investors will receive an outcome-based payment of US $3.3 million dollars[97]. Result-based financial investments have been explored in LAC in sectors such as health care and solid waste management; they could likewise be used for NbS projects[98,99].

Table 2 summarizes five examples of financing structures for NbS in LAC.

Table 2: Summary of examples of financing structures for NbS in LAC

Example	Financing Players	Project Financing
1. Coastal Zone Management Trust, Quintana Roo, Mexico (Case Study 3)	Private (hotel and tourism operators)	• Hotel and tourism operators with beachfront properties pay a concession to the government. • 25% of the total concessions are put in a Trust Fund, which is allocated for ongoing coral reef maintenance and the purchase of an annual parametric insurance policy. • Parametric insurance premium is roughly 10% of the coverage amount, (e.g. US $3 million insurance coverage would cost US $300,000). • If a qualifying event occurs (e.g. hurricane in Quintana Roo), the insurance will pay out, and that money (i.e. US $3 million) will be used to repair any damage caused to the reef. • The first coverage was purchased for the 2019 hurricane season – a $3.8 million policy from Mexico-based insurer Afirme Seguros Grupo Financiero SA de CV.
2. TNC water fund financing model (LAC-wide)	Public and private	• Finance pooling mechanisms based on PES. Downstream public and private users invest in upstream land and water management activities (e.g. reforestation), aggregating investment capital through the water fund. • Seed capital can be provided by a private party, the government, or both.
3. Managing water supply for hydro-electric power through restoration of the NYCLR, Peru (Case Study 6)	Public and private	• Corporate stewardship financing model. • A private company, CELEPSA, manages a Patronage in collaboration with SERNANP (the government national protected area authority) to contribute to the management of the NYCLR; the Patronage's major objective is the conservation of ecosystem services, in particular, water regulation. • On top of the funding from the Patronage, some activities were funded by the Ecosystem based Adaptation Mountain Ecosystems Project (2011–2015).
4. Climate-resilient livestock farming, Southern Cone, Argentina (Case Study 7)	Multilateral (GEF) and public foundation money (including US Forest Service and Bobolink Foundation)	• Seed capital provided by GEF for the first 10 years; the total financing was approximately US $800,000 and annual project costs are around US $100,000. • The Grasslands Alliance is taking steps to move towards a self-sustaining and market-based approach exploring how some of the profit from certified beef sales goes towards covering project costs. However, international funding will still be required to keep the project running during the transition period as the economic conditions in Argentina are currently not conducive for private investment.
5. Watershed forest restoration to support functioning of the Itaipu Dam, Paraguay/ Brazil (Case Study 8)	Public (municipalities) and private (dam authority)	• The Itaipu Preserva project was initiated in 2014 with approximately US $11.5 million in binational financing to expand efforts to restore and encourage natural regeneration of degraded areas in the protection strip of the Itaipu Binacional reservoir. • Blended finance program where one-third of seed funding (approximately US $8 million in 2007) was provided by the dam operator (Itaipu Binacional) through its annual budget for Coordination and Administration; one-third was provided by cities; and one-third by farmers and other community actors.

Box 9. Innovative financing

Resilience bonds

The ability of NbS to build resilience and offer co-benefits (e.g. carbon sequestration, biodiversity conservation) can make them eligible for cost-sharing, investment pooling, and innovative finance mechanisms, such as resilience bonds. As a form of catastrophe bond, resilience bonds link insurance premiums to the resilience of projects and provide a way to monetize avoided losses through a rebate structure. The resulting dividends can be used for other resilience activities, such as training infrastructure operators on NbS maintenance or other capacity building. The European Bank for Reconstruction and Development recently issued the first ever climate resilience bond, which raised US $700 million[100]. These funds can be used towards developing climate-resilient infrastructure and could support NbS projects.

Green bonds

Green bonds can mobilize resources from domestic and international capital markets for climate change adaptation, renewables, and other environmentally friendly projects.[101] They operate in the same was as conventional bonds, but the proceeds can only be invested in projects that generate environmental benefits, which could include NbS. According to the IDB, green bonds may mobilize US $7 billion of green finance in LAC in 2020 particularly within countries like Mexico, Peru and Colombia[102]. In order to support their deployment, IDB is now developing a Green Bonds Transparency Platform[103] which uses blockchain technology to upload and check detailed information on transactions, bond performance, earnings utilization, and environmental impact of green bond issues in the region. The Platform responds to the need to increase transparency in this rapidly evolving market and is expected to be deployed later in 2020.

Blue bonds

Modelled on green bonds, blue bonds are applicable to ocean and coastal-based activities. The first sovereign blue bond was issued by the Seychelles to attract private investment in sustainable fisheries management in 2016. Proceeds from this blue bond are being used to support fisheries management activities through grants and loans, and are distributed through the Seychelles Conservation and Climate Adaptation Trust (SeyCCAT) and the Development Bank of the Seychelles. Some analysts doubt the model can be easily replicated elsewhere, due to the unique circumstances of the Seychelles, but there is certainly increasing interest in this funding model with some seeing the "potential to engage a large, liquid investor base, if the size of the investment can reach around US $50-100 million or more"[104].

Public financial institutions can extend the provision of credit guarantees (either directly or involving the government) to help absorb all, or part, of debt service default risks and encourage NbS uptake[105]. Credit guarantees de-risk investments, helping to capture greater private capital. Models such as the Energy Savings Insurance scheme developed by Bancoldex could be adapted for NbS (Box 10). Similarly, large corporates can act as guarantors of NbS investments by embedding guarantees in supply chain risk management strategies. In Colombia, for example, Grupo Grasco – a market leader in edible oils and cleaning products – provides guarantees to support the investment efforts of palm oil cooperatives seeking financial assistance from the farming association, Indupalma.

Box 10. Energy Saving Insurance schemes developed by Bancoldex to promote the uptake of energy-efficient technologies in hotels, clinics, and hospitals in Colombia

The development of guarantee schemes can be challenging because they tend to be tailored to specific projects. Outputs from a recent Global Impact Investment Network report[106] offer valuable recommendations for the development of guarantees for NbS in LAC, in accordance with a series of principles. The report notes the need to standardize guarantee terms across a large number of investments, namely: (i) the objectives of the guarantee; (ii) the types of risks addressed; (iii) the coverage level; (iv) financial return expectations; and (v) triggers of, and access to, the guarantee. Development of guarantees can also be complemented with the promotion of low interest schemes and grace periods issued by the financial institutions, which can further help to foster loan uptake[y].

The Bancoldex scheme seeks to incentivize the use of business payment models based on results. It aims to match the demand and supply of energy services through the provision of guarantees against savings generated by investments in energy efficiency. The model has been established with the support of an insurance company (SURA), and an energy auditing service provider (Icontec), which validates actual energy savings that can be assessed against the investment. Accordingly, the model is supported by a three-tier mechanism through the provision of: (i) standardized contracts; (ii) validation by third party technology providers; and (iii) an insurance scheme.

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y According to the Environment Defense Fund, sustainable infrastructure can spur economic growth and increase property values[106]. The benefit can be captured through marginal increases in tax revenue from increased property values, which can be used to repay sustainable infrastructure investments. A similar system could be explored for NbS.

Aggregate credit facilities, such as habitat banks and water funds, can attract NbS investment. Habitat banks leverage capital paid by companies to compensate for their environmental impacts to support the preservation or restoration of ecosystem service provision. Similarly, water funds leverage capital from different water users benefiting from the provision of ecosystem services in a particular catchment. Both of these mechanisms can help to reduce transaction costs and attract larger investments. In addition, they can offer a suitable financing model for companies when NbS offer shared benefits within a single landscape. Regional examples include the habitat banks in the Departments of el Meta and Antioguia, in Colombia[108], as well as water funds in Peru, Costa Rica and Colombia (Case Studies 1, 4 and 5). Similarly, debt and private equity funds, which have been explored in conservation finance, can also be established to build NbS investment pipelines. This can help to reduce individual investment transaction costs and attract larger investors.

5.3.4 Promoting support from MDBs

MDBs have an important role to play in developing and supporting mechanisms to promote NbS investments. Local Financial Institutions (LFIs) could develop credit enhancement mechanisms to attract private investors for NbS until their financial viability is fully demonstrated and uptake is mainstreamed. MDBs support LFIs to develop favorable instruments through the provision of concessional lending mechanisms, grants, and technical cooperation. This support has been effective in developing innovative markets in LAC, including for energy-efficient technologies, photovoltaic panels, and other renewables.

In Mexico, the Leveraging Green Investments (LGI) program, supported by the IDB, is offering Bancoldex the opportunity to structure a green financing strategy through its Energy Savings Insurance program. The program scales-up energy efficiency investments in the tourism sector, promotes a pre-investment facility to scale-up private green investments in PPPs[109], and supports investments in the generation of non-conventional and renewable sources of energy.

In a similar fashion, the LGI program has enabled la Sociedad Hipotecaria Federal (SHF) to partner with IDB and Germany's KfW group to promote investments in its energy-efficient housing program "EcoCasa". It offers cheaper lending rates to developers and financial intermediaries who adhere to the 20 per cent reduction in greenhouse gas (GHG) emissions as compared to a baseline scenario[110]. The program also provides reductions on loan interest rates of up to 3 per cent, which is resulting in increased uptake by developers and successful project implementation.

International lending facilities dedicated to supporting green investments can develop NbS-specific financial and technical assistance. International lending facilities can promote their services among projects developers and borrowers, and emphasize the value of investing in NbS. Table 3 shows the lending facilities that are supporting green investments, their services, and their delivery partners.

Table 3. International lending facilities dedicated to supporting green investments

Financial assistance facility	Services	Delivery partners
Blue Natural Capital Financing Facility (BNCFF)[111]	Provision of assistance (e.g. grant funding or reimbursable grants) to beneficiaries and project sponsors to prepare the technical, legal, and financial dimensions for blue natural capital projects (e.g. related to the ocean). The BNCFF also assists project proponents in accessing debt, equity, and donor funding, and introduces investments to appropriate funders.	The BNCFF is supported by the Ministère du Développement durable et des Infrastructures (MDDI), Government of Luxembourg, and led by the International Union for Conservation of Nature (IUCN)
Inter-American Development Bank (IDB) Natural Capital Lab	A risk-tolerant hub within the IDB Group that pursues an agenda of blended finance projects.	IDB Group (IDB, IDB Invest, IDB Lab)
NatureVest	Seeks to source and utilize US $1 billion of investment capital for conservation by 2021.	The Nature Conservancy (TNC)
Natural Capital Financing Facility[z]	Financial instrument that supports biodiversity and climate adaptation project delivery through tailored loans and investments, backed by an EU guarantee.	European Investment Bank and European Commission

z Although only focused on the provision of financing support to NbS projects within Europe, the mechanism offers a good example of instruments that can be fostered in LAC.

5.3.5 Leveraging insurance products for NbS

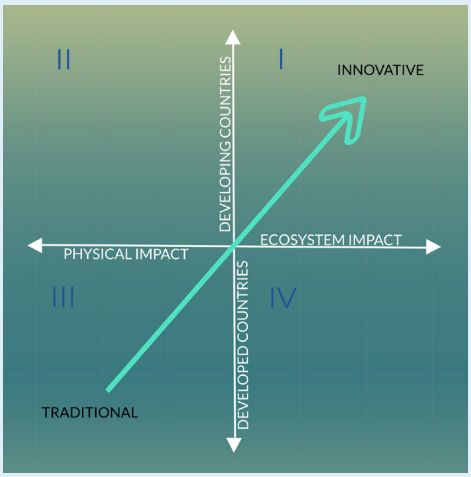
The insurance industry can support NbS risk transfer in LAC through the deployment of innovative insurance solutions. Insurance payments for risk reduction – catastrophe bonds – could be applied to natural ecosystems providing NbS. Examples in LAC include the Caribbean Catastrophe Risk Insurance Facility (CCRIF)[aa], and the Global Ecosystem Resilience Facility (GERF), which support coastal communities in the Caribbean. The primary benefit of risk-pooling is collective financial protection in the event of disaster, for example from storms and floods[112].

Parametric insurance schemes for ecosystem restoration should be further leveraged to secure NbS investment. The Coastal Zone Management Trust (Box 3) provides an example of insuring an important natural asset in a multitiered stakeholder scheme. One of the biggest advantages of parametric insurance is the quick turnaround time for payouts and lower transaction costs, compared to traditional indemnity coverage. Financial institutions that are already involved in parametric insurance, such as CCRIF, FONDEN (Mexico's fund for natural disasters), and Agroasemex in Mexico, Swiss Re and AgroBrasil in Brazil, and the Association of Insurance in Uruguay, could expand their service portfolio to include insurance for NbS.

Insurance schemes for ocean risks affecting marine and coastal areas should be structured to follow the XL Catlin framework for ocean risk insurance solutions (Box 11).

Box 11. Insurance solutions to respond to ocean risks affecting marine ecosystems

The development of risk-transfer mechanisms to cover ocean risks is important for countries that have a high percentage of their GDP in the blue economy (e.g. fishing, tourism), such as small-island Caribbean states. Recent investigations by insurer, XL Catlin[113], suggest that there are two main types of insurance options that can help to reduce ocean risks: (i) encouraging the uptake of insurance products by people and economic sectors in the blue economy; and (ii) the development of insurance schemes for the restoration of ecosystems. There is a continuum of ocean risk insurance products that could be exploited, depending on the type of insured asset and the level of development in the country where it is introduced.



Source: XL Catlin. (2018). Ocean Risk and the Insurance Industry. Available at, https://www.oceanrisksummit.com/Content/press-releases/FALK-MAIN-REPORT-FINAL-LOW-RES.pdf

aa Between 2014 and 2018, the Caribbean Catastrophe Risk Insurance (CCRIF) issued payouts amounting to millions of dollars within 2 weeks of a disaster event[113].

5.3.6 Integrating NbS appraisals into investment and lending cycles

Financial institutions should systematically mainstream the appraisal of NbS potential within their infrastructure investment and loan portfolios. The incorporation of NbS within larger infrastructure projects is already happening within some MDBs; yet, they remain a small component of much larger infrastructure portfolios. Mainstreaming NbS appraisal into infrastructure loan and investment portfolios, and setting targets for NbS investment, can drive borrowers to consider NbS as a condition of securing finance and funding. While NbS may not always be the appropriate solution in every context, a requirement to consider NbS approaches may increase uptake among project developers. Financial institutions could also collectively align themselves to promote NbS mainstreaming into infrastructure investment; for example, through joint collaborations focused on leveraging NbS to achieve their commitments in alignment with the Paris Agreement[115] or the SDGs.

Integrating NbS risks and opportunities into standards and credit rating schemes for sustainable infrastructure could promote NbS uptake. For instance, the Global Infrastructure Basel (GIB) Foundation has developed a GIB sustainable and resilient infrastructure standard and a sustainable credit rating scheme that support transformative actions in the field of infrastructure development and finance. They have also helped to produce a Sustainable and Resilience Underwriting Standard (SuRe®) – a global, voluntary standard, integrating key sustainability and resilience criteria for infrastructure development. In the future, the expansion of these types of products could incorporate risk-reduction instruments for NbS investments.

Financial institutions should integrate Environmental, Social and Governance (ESG) considerations into governance and risk-management systems to create an enabling environment for NbS investments. Several national and international initiatives in LAC are supportive of the development of standards to better integrate green financing, ESG, and sustainability goals within companies' and financial institutions' mandates. These include:

- **The Green Protocol** (Protocolo Verde), Colombia – led by Asobancaria, with the support of several national financing institutions, the Protocol uses credits, investments, and programs to generate instruments to promote private financing of sustainable development initiatives, the sustainable use of renewable natural resources, the protection of the environment, and the competitiveness of productive sectors in the country[116].
- **The Mesa de Finanzas Sostenibles** (roundtable on sustainable finance) in Paraguay – currently led by Banco Sudameris, promotes responsibility in the financial sector to support and strengthen the transition to a sustainable economy, and commits to developing sustainable products and practices[117].
- **Equator Principles,** for identifying, assessing and managing environmental and social risk in projects, as a means to provide safety minimum standards for due diligence and monitoring in support of responsible risk decision-making[118].
- **International Finance Corporation (IFC) Environmental and Social Performance standards**, a benchmark on IFC clients' responsibilities for managing their environmental and social risks[119].
- **The Sustainable Development Goals (SDGs)**, 17 goals adopted by all United Nations Member States in 2015 as part of the 2030 Agenda for Sustainable Development, which calls for urgent action to end poverty, improve health and education, reduce inequality, and spur economic growth – all ensuring climate change objectives are met, as well as the preservation of land and water ecosystems[120].

Adopting practices that promote greening the financial system (e.g. decarbonizing portfolios) and support financing green investments (e.g. financing alternative sources of energy) are fundamental to the development of an investment culture that is more inclusive of NbS.

5.4 Summary

Finance and funding barriers

Actor	Barriers
Infrastructure Project Developers 	• Methodological challenges in calculating all the costs, benefits, impacts, performance, and risk profiles of NbS increase real and perceived risk for private sector investors and implementers. • A lack of proof of concept reduces access to financial sources and makes deployment at scale difficult.
Financial Institutions 	• There is a lack of adequate instruments to de-risk NbS investments. • A lack of clear demand and market signals limit the creation of new instruments to finance NbS. • A lack of insurance products suitable or available for NbS limits the capacity of project developers to manage risks and secure financing.

Finance and funding actions

Actor	Actions
Infrastructure Project Developers 	• Prioritize the development of the business case to drive demand for financial products that can support NbS. • Develop a central repository of sustainable NbS business models to help build confidence and reduce risk perceptions associated with NbS projects.
Financial Institutions 	**Develop and refine finance mechanisms, in particular:** • Instruments that de-risk NbS projects, increase their appeal to commercial interests, and match NbS value capture (scale and longevity). • Resilience bonds for NbS investment. • Social and development impact bonds (e.g. green and gender bonds; see Box 1) that tie payment for service delivery to the achievement of measurable outcomes. • Credit guarantees. • Aggregate credit facilities (e.g. habitat banks, water funds).

Actor	Actions
Financial Institutions 	**Integrate NbS appraisals into investment and lending cycles:** • Systematically mainstream NbS appraisal within infrastructure investment and loan portfolios. • Integrate NbS risks and opportunities into standards and credit rating schemes for sustainable infrastructure. • Integrate ESG considerations (e.g. Box 1) into governance and risk-management systems to create an enabling environment for NbS investments. **Encourage MDB-specific support:** • Partner with local financial institutions interested in expanding their green portfolios to help them to develop and publicize NbS-related pilots, case studies, and products. • Support the development of result-based financing schemes (e.g. social and development impact bonds). • Promote the expansion of the resilience bonds market. • Promote the proliferation and expansion of aggregate credit facilities (e.g. habitat banks, water funds). • Develop blended finance mechanisms. • Provide credit guarantees. **Leverage insurance products for NbS:** • Deploy innovative solutions to support risk transfer. • Continue development of natural capital parametric insurance schemes. • Structure additional insurance schemes for ocean risk (e.g. following XL Catlin framework).

Risk-transfer mechanisms for ocean risks are important for countries that have a high percentage of their GDP in the blue economy, for example, small-island Caribbean nations

Source: Pixabay, David Mark

Forest and watershed management can help regulate water supply.

Source: Pixabay

6. Way Forward

NbS have the potential to help increase the climate resilience of infrastructure in LAC in cost-effective ways, and are key to realizing the Sustainable Infrastructure Agenda. Beyond risk management, NbS also present opportunities for business innovation and profitability, green job creation, and a wide range of positive social and environmental outcomes (e.g. Box 1).

Despite the capacity of NbS to deliver multiple benefits, their potential to support climate-resilient infrastructure in LAC remains largely untapped. Increasing the use of NbS will require changes to policy frameworks, capacity building among project developers, and the deployment of innovative financial instruments. It will also require leadership among government ministers, lenders, investors, project developers, and industry representatives to champion new agendas and raise innovation standards.

Raising awareness of the importance of natural capital to sustainable economic development is essential to break the silos separating policymakers, decision-makers and professionals involved with management of the natural environment from those involved in engineering. By integrating natural capital into economic development, countries in LAC can potentially achieve multiple goals (e.g. infrastructure requirements, enhanced resilience, climate change mitigation, urban regeneration) in a cost effective and streamlined manner. Importantly, policymakers can exert great influence over downstream actors (e.g. financial institutions, infrastructure developers) by integrating NbS into policy and procurement briefs. With a wealth of natural capital, and high demands for infrastructure investment, LAC countries are ideally positioned to become global leaders in climate-resilient infrastructure development using NbS.

By integrating NbS into their projects, project developers may be able to access new market niches, competitively respond to tenders, and potentially find new sources of finance and funding. For example, decades ago, energy efficiency finance was rarely included in project development, yet it is now fully mainstreamed into investment decision processes. The NbS market has the potential to grow in a similar way, and project developers with the skill sets to develop successful NbS projects will be ideally positioned to seize the opportunities this growth may bring.

As with any new technique or technology, there is a learning curve for NbS. Yet, with technical support and guidance from MDBs, academic institutions, professional associations, and NGOs, and society more broadly (particularly those directly involved with the management of natural resources such as local communities), private sector actors can acquire the necessary capacity and skill sets to develop effective NbS projects. Some actions may take a few years to implement, such as mainstreaming NbS into engineering curricula; yet others can be realized in the near-term (e.g. developing technical guidance documents for NbS).

Financial institutions in LAC have the potential to be at the cutting edge of NbS product development. Flagship natural capital-based insurance products have emerged in the region already. Other financing mechanisms (e.g. resilience bonds, impact bonds) have demonstrated international successes. Such products have laid the groundwork for a methodological approach that can be replicated in LAC. Articulating the business case for NbS projects will help signal demand for, and drive development of, new financial products to support NbS. MDBs can play a valuable role in supporting governments and financial institutions in LAC to

expand their portfolios to include natural capital-based products and services.

Coordinated action by all those involved with infrastructure development, including policymakers, project developers, and financial institutions, is needed to create the enabling conditions for greater private sector uptake of NbS (Box 12). Such action will help to capitalize on the current opportunity to scale-up NbS use, and will contribute to meeting the urgent need for sustainable and climate-resilient infrastructure in LAC.

Box 12. Targeted actions to drive private sector uptake of NbS in LAC

Policymakers

- Integrate NbS into policy commitments for multiple, linked objectives (e.g. national development planning, climate and DRR commitments, social and gender equality targets, infrastructure plans).
- Translate policy commitments into laws and regulations that govern the delivery of infrastructure by project developers on the ground.
- Seek opportunities to use existing coordination mechanisms between different ministries, departments, and levels of government involved with infrastructure delivery (e.g. environment, finance, planning) to ensure that the potential of NbS is realized and goals are aligned.
- Integrate NbS into infrastructure planning and procurement processes, so that downstream actors obtain the necessary expertise to win contracts and deliver policy-compliant projects.

Project Developers, Academia, and NGOs

- Develop new technical skill sets and capacities within gender-balanced, multidisciplinary teams to deliver NbS projects, informed by the knowledge and expertise of stakeholders from scientific and local communities (among others).
- Support education opportunities by integrating NbS into continuing professional development (CPD) and academic curricula (e.g. engineering) in order to equip future project developers and engineers with the skills relevant to NbS.
- Prioritize the development of the business case to create demand for the development of commercial products supportive of NbS finance.
- Share experiences of using NbS through case studies and dialogue.

Financial Institutions

(MDBs, public financial institutions, and international lending facilities)

- Deploy financial instruments to de-risk projects (e.g. risk underwriting, provision of guarantees, technical assistance).
- Provide support to local financial institutions while they build a track record and common understanding of NbS finance, particularly where they deliver a range of positive social and environmental outcomes.

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