Nature-Based Solutions in Latin America and the Caribbean

SUPPORT FROM THE INTER-AMERICAN DEVELOPMENT BANK

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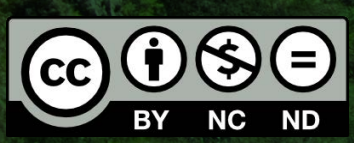
Suggested Citation: Oliver, E., S. Ozment, M. Silva, G. Watson, and A. Grünwaldt. 2021. "Nature-Based Solutions in Latin America and the Caribbean: Support from the Inter-American Development Bank." Washington, DC: Inter-American Development Bank and World Resources Institute.

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Nature-based solutions in Latin America and the Caribbean: support from the Inter-American Development Bank / Emmie Oliver, Suzanne Ozment, Alfred Grunwaldt, Mariana Silva, Gregory Watson.
p. cm. — (IDB Monograph ; 956)
Includes bibliographic references.

1. Finance-Environmental aspects-Latin America. 2. Finance-Environmental aspects-Caribbean Area. 3. Bank loans-Environmental aspects-Latin America. 4. Bank loans-Environmental aspects-Caribbean Area. 5. Investments-Environmental aspects-Latin America. 6. Investments-Environmental aspects-Caribbean Area. I. Oliver, Emmie. II. Ozment, Suzanne. III. Grunwaldt, Alfred. IV. Silva, Mariana. V. Watson, Gregory. VI. Inter-American Development Bank. Climate Change Division. VII. Series.
IDB-MG-956

JEL Codes: O13, O18, O19, O44, Q54, Q56, Q57, R11
Keywords: Nature-based Solutions, Sustainable Infrastructure, Climate Resilience, Green Infrastructure, Natural Disaster Risk Management, Natural Capital, Climate Change Adaptation, Infrastructure Services, Water and Sanitation, Transportation, Energy, Housing and Urban Development.



Cover photo: Coatzacoalcos, México | BID Ciudades Sostenible.
Inside cover photo: Chimborazo, Ecuador | Fernando Tapia.

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Highlights

- Governments across Latin America and the Caribbean (LAC) face formidable challenges in extending and maintaining infrastructure to serve their populations, especially as climate change and ecosystem degradation endanger communities and infrastructure assets across the region.
- To help address these challenges, the Inter-American Development Bank (IDB) aims to increase its support of nature-based solutions (NBS) in accordance with the Bank's 2020 Mainstreaming Action Plan for Environmental and Social Sustainability.
- Because of their ability to generate benefits across multiple sectors, NBS can play an important role in maximizing infrastructure service delivery in economic recovery efforts in the wake of the COVID-19 crisis.
- The IDB offers technical and financial support for integrated green-gray projects, which utilize NBS as part of large-scale infrastructure projects. The IDB also supports clients to advance enabling conditions for effective NBS adoption across key sectors.
- This issue brief serves two main functions. First, it describes the IDB's growing focus on NBS and provides a tour of the IDB's main offerings regarding NBS project support and investment. Second, it serves as a baseline of the IDB's activities related to NBS on which the Bank and partners can build moving forward.
- Going forward, the IDB will ramp up support for clients to incorporate NBS considerations and opportunity analysis in country agreements and throughout all stages of project preparation, from investment identification to execution.

EXECUTIVE SUMMARY

Context

Countries in Latin America and the Caribbean (LAC) face a substantial investment gap in their work to achieve the Sustainable Development Goals (SDGs) and their nationally determined contributions (NDCs) to the Paris Agreement. With a limited amount of capital to invest in basic infrastructure services in the wake of the COVID-19 crisis, and an investment gap of nearly $150 billion per year (Cavallo and Powell 2019), there is a critical need to maximize the impact of public funding, private capital, and blended forms of finance leveraged toward achieving these goals.

Nature-based solutions are uniquely positioned to deliver benefits across multiple sectors and can serve as tools to both mitigate and adapt to climate change. NBS are defined as 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" (Cohen-Shacham et al. 2016). This brief focuses on NBS that are targeted at specific infrastructure services, such as water supply, flood risk reduction, and landslide reduction. Because of their ability to efficiently generate high-value services and co-benefits when combined with traditional gray infrastructure investments (Browder et al. 2019), NBS can play a critical role in maximizing the impact of capital invested in the region's infrastructure. Numerous regionally focused studies have generated a wealth of information about the potential added value of NBS, and a critical mass of projects within LAC have generated robust lessons learned about how to better integrate NBS into infrastructure and development planning (Ozment et al. 2021).

About This Issue Brief and the Series

This issue brief provides a baseline characterization of IDB-supported NBS activities intended to serve as a starting point for expanded support for NBS at the IDB. The issue brief has three main sections:

- **Section 1** provides information on the relevance of NBS considerations in infrastructure planning and projects related to the water, housing and urban development, transportation, and energy sectors.

- **Section 2** provides an overview of the implementation of NBS within the IDB's operations in its Infrastructure and Energy Sector and Climate Change and Sustainable Development Sector, including commitments and investments related to NBS.
- **Section 3** highlights the IDB's ongoing work to create a knowledge foundation that promotes further investment in NBS among its clients. IDB resources provide further guidance and support on NBS project preparation.

This brief is one in a three-part series of knowledge products that aims to set an agenda for key decision-makers and investors on why and where in LAC to invest in NBS and to provide guidance on how to set enabling conditions for scaling. The series explores the current status and trends of NBS activities—both broadly throughout LAC and specifically in IDB operations—to establish a baseline on which decision-makers can build to drive increased support for NBS. The series also explores the institutional, economic, and financial conditions required to scale up NBS investment and outlines strategies to apply them to the LAC context.

The two other briefs in this series are

- **"Nature-Based Solutions in Latin America and the Caribbean: Regional Status and Priorities for Growth,"** which identifies 156 projects throughout LAC that utilize NBS either on their own or in combination with gray infrastructure to address water quantity or quality concerns; reduce urban, coastal, and river flooding; or reduce landslide risk. Over half of the projects are still under preparation. The others are being implemented. Across the board, most projects are still seeking funding to ensure that they can reach the scale needed to deliver their envisioned benefits. This issue brief takes stock of the NBS activity in the region, outlines their potential to contribute to progress on the SDGs, and identifies key barriers to and opportunities for growth and scaling.
- **"Nature-Based Solutions in Latin America and the Caribbean: Financing Mechanisms for Regional Replication,"** which reviews innovative financing models worldwide that are advancing NBS to cost-effectively meet SDGs and mitigate the negative impacts of climate change. This issue brief aims to connect unmet NBS investment needs with underutilized financial resources by sharing evidence of what is working well, identifying opportunities to adapt these models to the LAC context, and highlighting five strategies that leverage private capital to finance NBS. These include green bonds, land-based financing strategies, blended market-rate and concessional loans, endowments, and insurance policies.

This series is intended for a broad range of stakeholders who are key to advancing NBS, including national and subnational governments, infrastructure operators, donors, development banks and other financial institutions, and civil society. This series is produced by the Inter-American Development Bank and World Resources Institute with support from Cities4Forests, the FEMSA Foundation, and the Pan-American Development Foundation.

Key Findings

Several NBS projects and ongoing sustainability efforts at the IDB build a rich foundation for the Bank's priority of increasing NBS investments. Although there is already a significant history of investment in NBS, there is substantial room for growth across the Bank's portfolio. The IDB's Infrastructure and Energy Sector and its Climate Change and Sustainable Development Sector invested $19.73 billion in 162 projects between 2015 and mid-2020 (IDB 2020a). A review of these investments identified 28 projects with NBS components, listed in Appendix A, with total IDB investments amounting to $813.23 million. These projects utilized NBS for a variety of investment objectives, including enhancing water quality and mitigating flooding. For example, some projects invested in forest restoration to enhance water quality, while others invested in mangrove forests to enhance the resiliency of coastal infrastructure. The Bank has leveraged an additional $436.77 million from external donors and contributions from government counterparts, securing a total of nearly $1.25 billion in funding toward projects with NBS components. It should be noted that these figures represent the resources for the entire project, including non-NBS interventions (see Figure ES-1).

The Bank has also spearheaded some of the region's most novel and successful NBS strategies, such as the Latin American Water Funds Partnership (IDB 2020b), technical guidance on increasing infrastructure resilience with NBS (Silva et al. 2020), and innovative financing instruments that blend public and private investment, supported by the Natural Capital Lab.

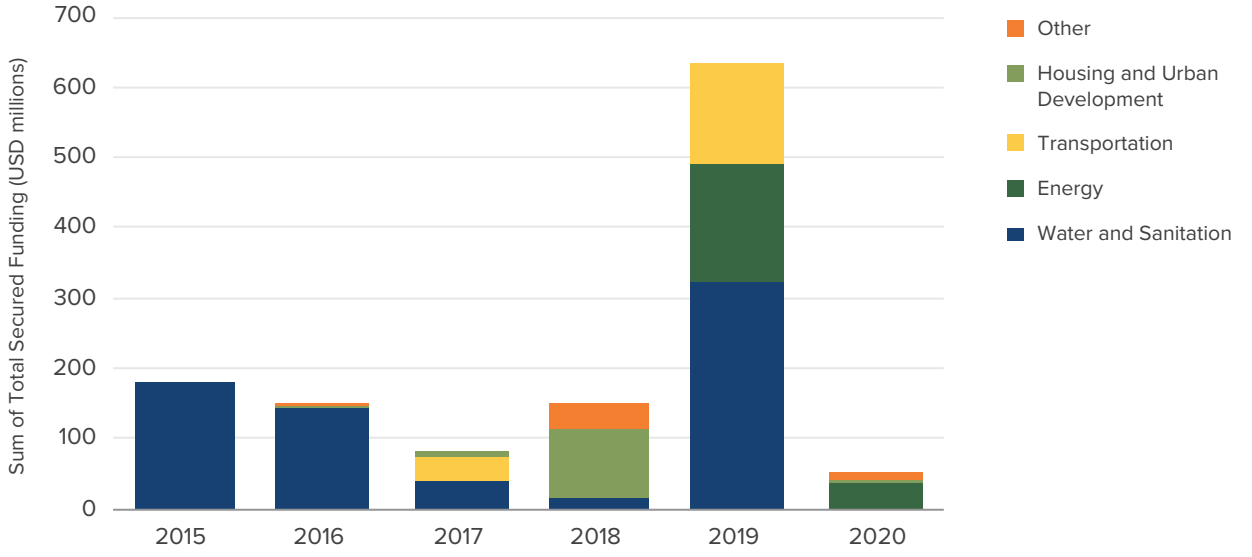
Integrating NBS and traditional infrastructure can improve overall cost-effectiveness, resilience, and performance of infrastructure service delivery. In the case of the IDB, about one-half of projects that include NBS are "green-gray" projects that contain large-scale investments in traditional infrastructure alongside the NBS investment (Figure ES-2). A review of projects with NBS interventions targeted at the Water and Sanitation, Housing and Urban Development, Transport, and Energy Divisions found that investments to date have been concentrated on delivering benefits related to the Water and Sanitation (15 projects) and Housing and Urban Development (10) Divisions. There were a smaller number of NBS projects directed toward delivering outcomes for the Transport (7) and Energy (3) Divisions. Despite being implemented by a single IDB sector or division, many of the projects identified were found to benefit more than one sector. Opportunities exist to further seize NBS benefits across each of these sectors, as well as others in the Bank's operations, including forestry, agriculture, and tourism. Incorporating NBS into conventional "gray" infrastructure also presents the opportunity to leverage nontraditional forms of finance, such as climate finance and funds dedicated to "green" initiatives, to deploy toward infrastructure investments.

The IDB 2020 Mainstreaming Action Plan for Environmental and Social Sustainability (2021–25) provides the formal operational guidance necessary to mainstream NBS within the IDB's portfolio (IDB 2020c)**.** Notably, the Mainstreaming Action Plan includes cross-cutting action plans related to climate action, disaster risk management, and natural capital, all of which include NBS considerations. This issue brief provides a baseline assessment of the IDB's investment in NBS from which these plans can make progress.

Conclusion

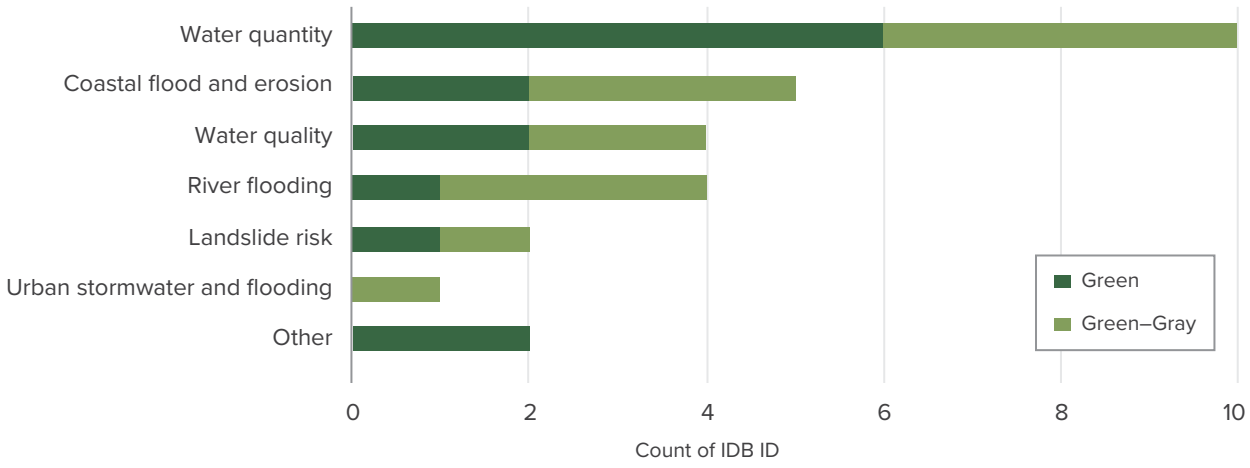
There is a growing track record of NBS support at the IDB, ranging from the incorporation of NBS into broad-scale institutional plans to the deployment of NBS strategies in loan and grant operations. However, there is still ample room for the IDB to grow its support for NBS. Projects with NBS components currently represent only a small frac-

Figure ES-1 | IDB-SUPPORTED NBS AND GREEN-GRAY PROJECTS BY YEAR



Note: The 28 projects identified in this graph are listed in Appendix A. Projects were identified through a partial review of the approved projects database, and through consultations with IDB staff listed in Appendix B. This review only covers projects through mid-2020. In 2020 the IDB portfolio was largely redirected to emergency relief funding related to COVID-19. "Other" benefiting sectors in this graph include forestry, agriculture, and tourism.
Source: Authors.

Figure ES-2 | NUMBER OF GREEN AND GREEN-GRAY PROJECTS, BY INVESTMENT OBJECTIVE



Note: "Green" projects are defined as those which focus project funding on ecosystem preservation, restoration, or management to achieve development outcomes. "Green-gray" projects combine traditional gray infrastructure investments with ecosystem management to produce more resilient and lower-cost services.
Source: Authors.

tion of total spending in the IDB's Infrastructure and Energy Sector and Climate Change and Sustainable Development Sector. And, despite a growing pipeline of NBS projects in the region, research from this series demonstrates that a majority of NBS projects in LAC have failed to achieve scale due to a lack of sufficient involvement from financial institutions and governments. Increased support for NBS from the IDB and its clients can help both scale NBS applications in sectors where successes are already well-established as well as pioneer innovative applications and models for NBS.

The IDB and partners should scale up its support for NBS through addressing key gaps related to NBS project preparation, financing, and capacity building. Unlike most traditional infrastructure investments, NBS are multisectoral and implemented on a broad, landscape level. Because of this, cooperation among a network of actors, including finance institutions, governments, nongovernmental organizations, and communities, is critical to NBS success. The IDB should work with its clients to extend new partnerships to support the already ample and growing pipeline of NBS projects in LAC.

To achieve this, the IDB should engage clients early and often throughout planning and project preparation processes to understand where and how NBS can best be applied to meet development goals. The IDB's grants and technical assistance can provide much-needed support to conduct the technical, financial, and economic analyses required for concept-stage projects to reach bankability. Furthermore, the IDB should support the development of even more NBS projects by screening the infrastructure investment proposals it receives to identify NBS opportunities and work with clients to integrate NBS with traditional infrastructure to achieve optimal results. Even more, the IDB should work with partners to develop innovative financing models that leverage additional sources of finance, including private finance, to further scale region-wide investment in NBS. Finally, capacity and knowledge-building efforts from the IDB—including trainings, cross-sectoral exchanges, and developing tools to evaluate the effectiveness of NBS—can help chart new pathways for NBS adoption across LAC and better enable decision-makers to advance these strategies.

NBS present an opportunity for the IDB to advance the region's progress in achieving the SDGs and NDCs in a way that prioritizes social inclusion and environmental sustainability. As governments have limited resources to invest in infrastructure and increasing challenges resulting from climate change and ecosystem degradation, NBS offer cost-effective and resilient strategies to achieve their development priorities. By forging creative partnerships and building confidence in NBS through flagship projects and initiatives, the IDB can play a key role in developing and scaling NBS throughout the region.

Rio Capivari, Campinas | Renan Pissolatti, WRI Brasil

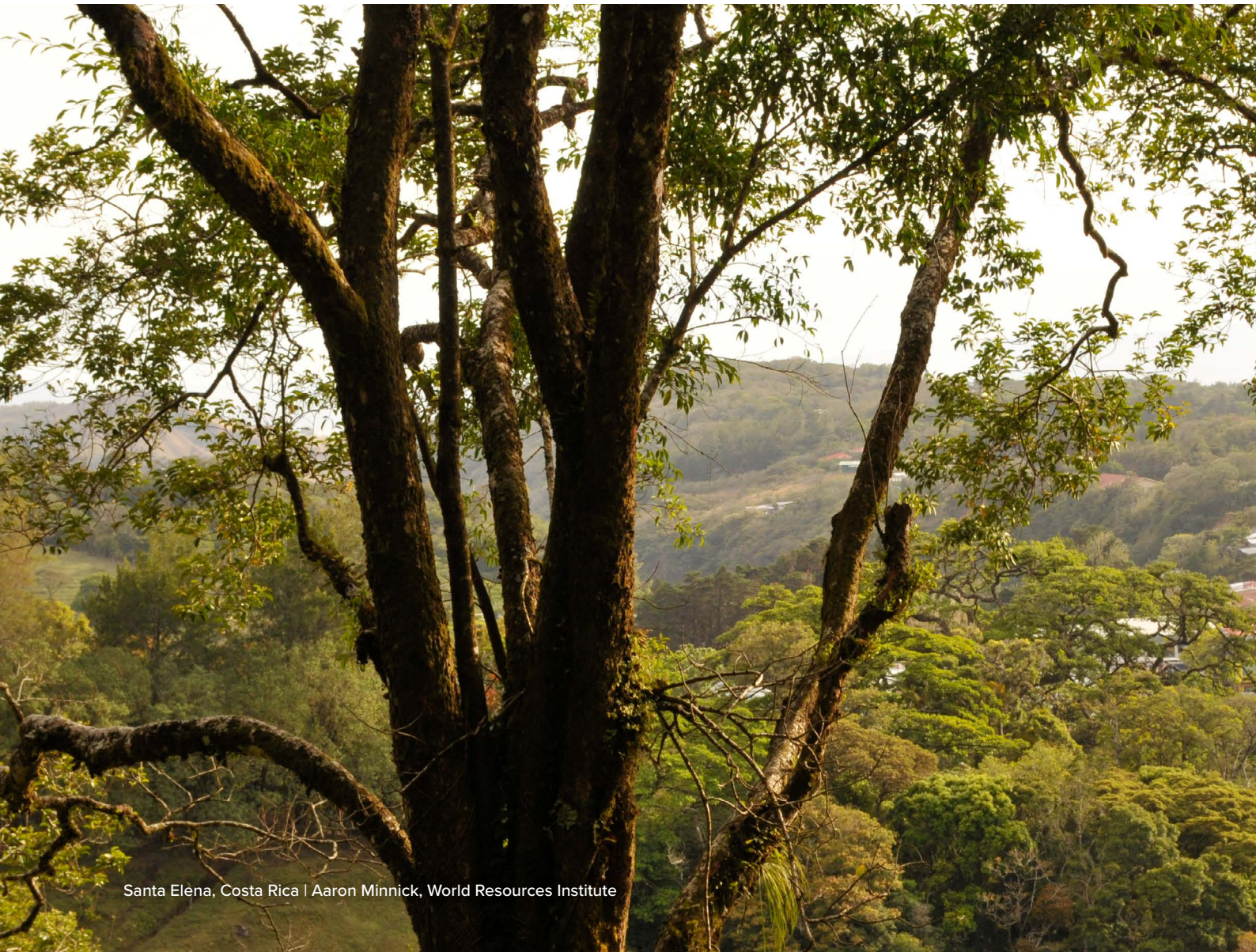
INTRODUCTION

Nature-based solutions (NBS) refers to the strategic restoration, protection, or management of ecosystems to intentionally achieve development outcomes to address societal challenges (Cohen-Shacham et al. 2016). NBS is an umbrella concept that embraces multiple ecosystem-based approaches, such as ecosystem-based adaptation, ecological engineering, and green infrastructure.

This issue brief focuses on NBS targeted at specific infrastructure services, such as water supply, flood risk reduction, and landslide risk reduction, because of their relevance to four priority infrastructure divisions at the Inter-American Development Bank (IDB): Water and Sanitation, Housing and Urban Development, Transport, and Energy (see Browder et al. 2019 for similar focus). This approach to NBS is largely synonymous with green infrastructure, which has been defined as a subset of NBS that intentionally and strategically preserves, enhances, or restores elements of a natural system to help produce higher-quality, more resilient, and lower-cost infrastructure services (WWAP/UN-Water 2018).

The IDB works to reduce poverty and inequality in Latin America and the Caribbean (LAC) by providing financial and technical support in the forms of loans, grants, and technical assistance (IDB 2020d). NBS represent a key opportunity for the IDB to advance its mission, particularly around infrastructure development, in a way that prioritizes social inclusion, human health, climate, and environmental sustainability. In addition to the NBS applications profiled in this issue brief, NBS can be implemented to address additional investment objectives of the IDB's clients, including biodiversity, food security, carbon removal, wildfire risk reduction, air quality improvement, public health, and livelihood enhancement, among others (Brill et al. 2021). The "Nature-Based Solutions in Latin America and the Caribbean: Regional Status and Priorities for Growth" issue brief in this series explores these co-benefits in more detail and outlines how NBS can be leveraged to achieve the SDGs through a socially inclusive approach (Ozment et al. 2021).

Although investments in NBS have been gaining traction in LAC in the past decade (Ozment et al. 2021), NBS are a relatively new suite of technical options that IDB clients can implement to meet the service delivery and societal needs of the 21st century, including resilience to climate change. NBS are flexible and can be more adaptively managed than gray infrastructure investments, which tend to be more costly to modify after initial construction. This feature of NBS allows project developers to cost-effectively mitigate and respond to a variety of climate hazards



Santa Elena, Costa Rica | Aaron Minnick, World Resources Institute

and uncertainties. By extending the menu of options for achieving infrastructure objectives to include NBS, the IDB's clients can achieve a new optimum of service delivery, making projects more cost-effective, resilient, and beneficial than when using built infrastructure technologies alone.

Equally important, utilizing NBS can help address the financial challenges that hinder infrastructure development. NBS can cost-effectively improve the performance of infrastructure, while also generating cross-sector coinvestment opportunities. As pointed out in Browder et al. (2019), adopting green-gray infrastructure can help close the infrastructure investment gap by strategically enhancing the service delivery of gray infrastructure investments. This issue brief outlines the emerging infrastructure needs across the water and sanitation, housing and urban development, transportation, and energy sectors[1] in LAC and potential applications of NBS to efficiently deliver services and enhance resilience across the IDB's portfolio.

Despite this opportunity, NBS are not currently in widespread use in the Infrastructure and Energy Sector. Governments and infrastructure investors have been supporting NBS projects in meaningful ways, but on an ad hoc basis. Reaching scale will require a formal and strategic integration of NBS across the Infrastructure and Energy Sector to address the challenges that currently face the region.

This issue brief aims to guide IDB clients and partners on why and how to integrate NBS into IDB-supported projects, and to provide a baseline characterization of IDB-related NBS activities to build on. The issue brief has three main sections:

- **Section 1** provides information on the relevance of NBS considerations in infrastructure planning and projects related to the water, housing and urban development, transportation, and energy sectors.
- **Section 2** provides an overview of the implementation of NBS within the IDB's operations in its Infrastructure and Energy Sector and Climate Change and Sustainable Development Sector, including commitments and investments related to NBS.
- **Section 3** highlights the IDB's ongoing work to create a knowledge foundation that promotes further investment in NBS among its clients. IDB resources provide further guidance and support on NBS project preparation.

The scope of review focuses on current activities and project investments from 2015 to mid-2020 through the IDB's Infrastructure and Energy Sector and Climate Change and Sustainable Development Sector. The review primarily covers NBS support related to water supply and/or quality, flood risk reduction in coastal, river, or urban settings, and landslide risk reduction. Sources of information include public IDB project documents and consultations with IDB staff listed in Appendix B, including IDB country specialists, NBS project leads, sector specialists, and other key staff.

IDB clients, including governments and industry in LAC that fund and/or manage infrastructure projects, may use this document to better understand how to fit NBS into their project design and implementation, and how to work with the IDB to advance NBS projects.

Lima, Peru | Willian Justen de Vasconcellos

Section 1:

SECTOR-SPECIFIC GUIDANCE ON INTEGRATING NBS INTO INFRASTRUCTURE PROJECTS

This section provides guidance on identifying the role of NBS and green-gray infrastructure solutions in addressing the investment needs in priority sectors for IDB investment: water and sanitation, housing and urban development, transportation, and energy.

For each sector, this section provides (a) an overview of the relevance of NBS to the sector, and (b) a table that profiles the application of NBS to various types of projects throughout LAC and globally. Illustrative examples of types of NBS that can enhance performance and reduce risks in these four sectors can be found in Boxes 1–5.

WATER AND SANITATION

Increasing pressures on LAC's ecosystems—including deforestation, urbanization, and climate change—are putting unprecedented stress on existing water and sanitation infrastructure. Droughts and shrinking glaciers, for example, pose a threat to water security for expanding arid cities in the Andes (Kinouchi et al. 2019). Deforestation in LAC's forests, from Central America to Southern Brazil, has contributed to both decreases in water quality and intensified flooding (Bonnesoeur et al. 2019; Mello et al. 2018; Bradshaw et al. 2007). The region's growing megacities are faced with the compounding challenges of ensuring equitable access to sanitation services, treating wastewater cost-effectively, and mitigating against urban floods. Predictions of increased water scarcity in many areas of LAC (Magrin et al. 2018, 68) pose a threat to the region's economies, especially those heavily reliant on agriculture. The recent addition of water to commodity futures markets in the United States (Chipman 2020) indicates increasing global recognition of the economic value of water in water-stressed regions.

Restoring, managing, and conserving ecosystems alongside built water infrastructure increases resilience to climate change, reduces infrastructure operating costs, increases infrastructure life spans, and improves service delivery. NBS are especially complementary to built infrastructure in the water sector because they help to maintain high water quality, smooth the peaks and valleys of flow periods, and ensure that hydrological regimes can underpin consistent water supply. The strategic management of forests and wetlands, for example, can reduce the burden on water treatment facilities by reducing sediment and pollutant loads in source water. These ecosystems can also increase groundwater recharge rates, thereby simultaneously preventing flooding and increasing aquifer levels for drought resilience. In addition to boosting resilience, investments in ecosystems can reduce operating costs: by conserving and restoring forests in the watersheds upstream of the world's 534 largest cities, water utilities could save an estimated $890 million in treatment costs per year (McDonald and Shemie 2014). Table 1 provides more detail on how NBS can complement, enhance, or safeguard common water and sanitation infrastructure. Boxes 1 and 2 highlight projects from the IDB's portfolio that illustrate how NBS can be applied to the water and sanitation sector.

Given the forecast of a $14 billion dollar annual investment need in the water and sanitation sector in the region until 2026 (Hutton and Varughese 2016), it will be critical to invest in ecosystem-based approaches to maximize resilience.

Huamantanga, Canta. Lima, Perú | InfoAndina Programa

Box 1 | CASE STUDY: SUSTAINABLE FOREST MANAGEMENT IN HONDURAS

HONDURAS (2016)

- IDB project ID: HO-L1179
- Funding: IDB ordinary capital (OC) Loan: $15 million; Fund for Special Operations (FSO): $10 million
- Amortization period: IDB OC: 30 years; FSO: 40 years
- Interest rate: IDB OC: Single currency facility-fixed; FSO: 0.25 percent
- NBS investment objective: Water quantity, Water quality

Forests play an important role in provisioning ecosystem services in Honduras, notably in enhancing water quality and regulating interseasonal water availability. An outbreak of pine bark beetles starting in 2012, however, compromised the ability of the forests to supply these valuable ecosystem services. From 2012 to 2016, pine bark beetles destroyed over 480,000 hectares of forests, representing a quarter of the country's pine forests and disrupting the provision of ecosystem services to an estimated 71 percent of the country's population (IDB 2016). Recognizing the role of forests in maintaining the country's water supply, the Government of Honduras sought an Inter-American Development Bank loan to finance the recovery and maintenance of forest ecosystems in priority watersheds affected by the bark beetle.

In order to address forest degradation on both public and private lands, the project took a multifaceted approach. First, the loan aimed to finance the restoration and maintenance of public forests infested by the bark beetle by implementing activities such as forest enrichment with native species, removing dead wood, and thinning. This component took special consideration to involve community organizations responsible for comanaging publicly owned forests and to promote participation of women in both restoration activities and project management. To promote sustainable management of forests on private lands, the loan also included a component to fund the design and implementation of a pilot program to provide incentives for private forest owners to implement restoration activities. To increase capacity to adapt to future stressors, the loan also included a component to strengthen the country's forest health department and finance research on adaptation to climate change.

Source: IDB (2016).

Box 2 | CASE STUDY: BOLIVIA RESILIENT TO CLIMATE RISKS

BOLIVIA (2017)

- IDB project ID: *BO-L1188*
- Funding: IDB ordinary capital (OC) loan: $34 million; IDB concessional loan: $6 million
- Amortization period: IDB OC: 20.5 years; IDB concessional loan: 40 years
- Interest rate: IDB OC: LIBOR-based; IDB concessional loan: 0.25 percent
- NBS investment objective: Flood risk reduction, landslide risk reduction

Bolivia faces increasing challenges related to climate change, particularly ones associated with flooding, drought, and landslides: by 2030, nearly 24 percent of the country is predicted to be impacted by frequent flooding and 27 percent of the country is predicted to be affected by persistent droughts (IDB 2017a). To build resilience to these risks, the Government of Bolivia sought support from the Inter-American Development Bank to implement projects to mitigate climate-related hazards and improve the sustainable management of natural capital throughout the country in several priority areas. These areas included the Rocha River Basin in Cochabamba, where nearly 60,000 inhabitants and more than 13,000 buildings were estimated to be exposed to flood risk, and the Alpacoma River Basin southwest of La Paz, where landslides were estimated to impact more than 100,000 people between 2000 and 2015.

This loan pursued climate risk management comprehensively by implementing ecosystem-based approaches (such as reforestation and riparian stabilization) alongside other adaptation strategies, including gray infrastructure (such as flood abatement reservoirs and dike protection) and social measures (such as community-based early warning systems and environmental awareness promotion) in priority areas around the country, including the Rocha and Alpacoma Basins. The loan also financed a component to improve climate change adaptation capacity, including funding for local training in climate risk analysis and to support integration of climate change adaptation considerations in departmental development plans and national river basin plans. Importantly, this loan also included funding for a study to characterize and evaluate climate risk to native, Indigenous, and multicultural populations to be used as an input to design more inclusive public policies related to disaster risk management.

Source: IDB (2017a).

Table 1 | NATURE-BASED SOLUTIONS FOR THE WATER SECTOR

TYPE OF INVESTMENT		INFRASTRUCTURE NEEDS	INVESTMENT OBJECTIVE	NATURE-BASED SOLUTIONS	PROJECT IMPLEMENTATION EXAMPLES
Integral management of water resources	**Urban, periurban, and rural water supply**	To meet water and sanitation SDGs by 2030, it is estimated that ~$14 billion of investment per year will be needed in Latin America and the Caribbean (LAC). Although ~96% of LAC's population has access to basic drinking water services, the quantity and quality of LAC's water supply face multiple threats.[2] For example: Locations across LAC, including western slopes of the Andes and the dry corridor of Central America, are projected to experience intensified water stress.[3] Land use change, urbanization, and unregulated industrialization contribute to low water-quality inputs for municipal water treatment, resulting in high filtration and treatment costs.	**Water security**	Forests, wetlands, and floodplains in upper watersheds can improve surface water availability by increasing storage capacity, improving base flows, and enhancing water quality. Water security can be al[4]so be enhanced by managing ecosystems, such as floodplains or engineered percolation ponds, for groundwater recharge.[5]	The Latin American Water Funds Partnership includes 25 existing water funds and 14 water funds under development that finance nature-based solutions (NBS) in urban watersheds to enhance water security and quality.[6]* The Tietê River Recovery Project in the state of São Paulo, Brazil, financed the recovery of 36 hectares of riparian buffer zones to decrease erosion and increase water quality.[7]* The drinking water regulator of Peru offers water service providers funding incentives to implement NBS and Indigenous water management systems to increase groundwater filtration and enhance water security in the dry season.[8] The Volkswagen Mexico Group finances watershed protection and reforestation to help secure water supply for its factory's operations in Puebla, Mexico.[9]
			Water quality	Forestland, inland wetlands, and riparian areas surrounding water sources can naturally filter biological and chemical impurities, reducing erosion and improving water quality.[10]	
	Urban, periurban, and rural sanitation	Only ~31% of LAC's total population and ~37% of the urban population have access to safely managed sanitation services.[11] Only ~66% of the population is connected to sewer systems, and only 30–40% of wastewater in sewers across LAC is treated before being discharged into the environment.[12] In order to meet Sustainable Development Goals for sanitation in the region by 2030, ~$3.4–11.8 billion needs to be invested in sanitation.[13]	**Enhanced wastewater treatment and management**	Constructed wetlands for municipal and industrial wastewater treatment can reduce stress on built wastewater infrastructure and be a cost-effective method to remove pollutants, especially for rural communities.[14] These wetlands could be a critical step in water reuse and nutrient recovery. Urban forests, bioswales, and permeable pavements can reduce the chances of sewage system overflows during high-rainfall events.[15]	In Masaya, Nicaragua, a constructed wetland built in 1996 treats domestic wastewater generated by ~1,000 people.[16] The wetland is effective at treating the water to meet discharge standards for nearly all pollutants, and the water is able to be reused for irrigation in nearby fields.[17] A Global Environment Facility–funded watershed project in Tobago financed the construction of an artificial wetland to treat 4,500 cubic meters of wastewater per year from a fish processing plant to reduce nutrient runoff to a nearby reef zone.[18]
	Urban drainage	Rapid urbanization has led to poorly developed drainage infrastructure in many cities across LAC. A survey of 70 major cities across LAC estimated that ~44 million people are exposed to urban flood risk that could be mitigated with green infrastructure interventions.[19]	**Urban stormwater management**	Urban forests, bioswales, and wetlands can help trap urban stormwater runoff to reduce urban flooding. These interventions can also prevent pollutants—including heavy metals, oils, and chemicals— from contaminating downstream water bodies.[20]	Peru's Comprehensive Storm Drainage Program in Priority Cities includes nature-based solutions, such as permeable pavements and distributed bioretention, alongside gray drainage infrastructure investments.[21]*

** IDB-supported project.*

HOUSING AND URBAN DEVELOPMENT

Already considered one of the most urbanized regions in the world, LAC's cities continue to grow: the percentage of the population living in urban areas is projected to increase from the current roughly 80 percent to about 90 percent by 2040 (IDB 2015). However, infrastructure services and housing supply have largely not kept pace with the region's rapid urbanization: approximately 24 percent of LAC's urban population lives in informal settlements with lack of access to basic services (UN-Habitat 2015). This rapid, unplanned expansion has led to the development of challenges—urban heat islands, pluvial flooding, and even landslides—that are intensified by climate change.

As LAC's cities grow, NBS can increase cities' resilience to climate change, improve public health, and enhance infrastructure service delivery to residents. Urban riparian areas, permeable pavements, and bioswales, for example, can reduce impacts of pluvial and riverine flooding in cities (Soz et al. 2016). Green roofs, urban forests, and parks can further contribute to urban flood mitigation while also reducing urban heat (Santamouris 2014; Ko 2018). Targeted forestation and vegetation management also reduce landslide risk in urban areas near hillsides (Smyth and Royle 2000).

NBS in urban areas are especially well-positioned to deliver multiple investment objectives across sectors, including urban transportation, water and sanitation, and public health. In addition, investments in urban NBS can generate abundant co-benefits for social well-being, including increased access to green space and urban air quality improvements (see Ozment et al. 2021). Table 2 describes how integrating NBS can complement, enhance, or safeguard common housing and urban development investments. Box 3 highlights an example from the IDB's portfolio that illustrates how integrating green and gray infrastructure can create advantages for the housing and urban development sector.

Box 3 | CASE STUDY: HOUSING AND REHABILITATION PROGRAM IN BAÑADO SUR

ASUNCIÓN, PARAGUAY (2018)

- IDB project ID: PR-L1152
- Funding: IDB ordinary capital loan: $100 million
- Amortization period: 23.5 years
- Interest rate: LIBOR-based
- NBS investment objective: Riverine and urban flood mitigation

Located on the banks of the Paraguay River in Asunción, the Bañado Sur neighborhood has faced periodic floods that are predicted to intensify due to climate change and upstream land use changes. These floods damage homes, streets, water systems, and electricity infrastructure: in 2018, 23,000 people in the riverside Bañados neighborhoods were affected by flooding. In response to increased housing needs, the Government of Paraguay and the Municipality of Asunción have created a Master Development Plan for the riverside neighborhoods in the city that is adaptive to the Paraguay River's periodic flooding (IDB 2018c). This loan operation is financing nature-based solutions to mitigate flood risk along with the construction of 1,500 new housing units and infrastructure to enhance basic public services, including access to drinking water, sanitation, and solid waste collection.

A $9.8 million component in the loan is dedicated to green infrastructure solutions. This component will fund the restoration of the lagoons and wetlands that border the river as well as the creation of a linear park alongside the river, both of which will create a natural buffer area protecting the neighborhood from rises in the river level during peak flood events. The component will also fund the construction of parks and green infrastructure within the neighborhood to increase infiltration during storm events to mitigate urban flooding. Although the funding for these interventions has already been secured, the Inter-American Development Bank is currently contracting engineering firms to design the green infrastructure interventions. Notably, the project places significant focus on community engagement and livelihood enhancement: a $12.3 million dollar component is directed toward activities to increase social and institutional stability in the neighborhood, including job training (with an emphasis on access for women) and a program to train and hire local workers for infrastructure works.

Source: IDB (2018c).

Table 2 | NATURE-BASED SOLUTIONS FOR THE HOUSING AND URBAN DEVELOPMNENT SECTOR

TYPE OF INVESTMENT	INVESTMENT NEEDS	INVESTMENT OBJECTIVE	NATURE-BASED SOLUTIONS	PROJECT IMPLEMENTATION EXAMPLES
Housing **Neighborhood upgrades** **Urban land planning and management** **Urban rehabilitation and heritage** **Sustainable cities**	Cities in Latin America and the Caribbean (LAC) are collectively gaining half a million new residents each month.[22] LAC's urban housing supply has not matched the rate of urban growth: 24% of LAC's urban population lives in informal settlements without adequate infrastructure services.[23] These settlements are often in areas vulnerable to natural hazards, such as landslide-prone slopes or river floodplains.[24] Climate change has posed a compounding series of threats to urban areas in LAC. For example: • The urban heat island effect in LAC's eight biggest cities is estimated to raise urban temperatures by 3–8°C.[25] • ~7.5 million inhabitants in LAC and $334 billion of built capital are situated at elevations below the 100-year extreme sea level.[26]	**Urban landslide prevention**	Forestation and vegetation of degraded hillsides near urban areas can serve to stabilize slopes, reducing landslide risk.[27]	At least 1 million people in the Lima, Peru, metro area live in landslide-prone areas. To combat landslide risk, the town of Independencia north of Lima created a 14-acre Ecological Forest Park and planted 3,500 trees.[28] After an urban landslide in Freetown, Sierra Leone, a World Bank–funded recovery effort has focused on reforesting denuded hillsides to complement gray infrastructure slope stabilization.[29]
		Urban flood prevention	Green infrastructure solutions, such as urban wetlands, bioswales, green buffer zones, green roofing, permeable pavements, and urban parks increase infiltration of stormwater, reducing impacts of urban flooding.[30]	Peru's Comprehensive Storm Drainage Program in Priority Cities project includes nature-based solutions (NBS), such as permeable pavements and distributed bioretention, alongside gray drainage infrastructure investments.[31]* After extreme urban flooding events in 2003 and 2007, Santa Fe, Argentina, began to implement green-gray drainage infrastructure interventions, including urban wetlands, urban parks, and bioswales.[32]*
		Riverine flood mitigation	Strategic conservation of upper watersheds and protecting urban floodplains with green space can reduce risk of riverine flood damage in cities.[33]	The Housing and Rehabilitation Program in the Bañado Sur neighborhood of Asunción, Paraguay, combines riparian restoration with neighborhood rehabilitation to mitigate riverine flooding.[34] In Curitiba, Brazil, riparian restoration and the establishment of urban parks alongside the Barigui River help prevent urban flood damage.[35]
		Coastal flooding protection	Strategic management of coastal ecosystems, including coral and oyster reefs, coastal wetlands, mangrove forests, and sandy beaches and dunes can protect coastal cities against storm surge and coastal erosion.[36]	Coral reefs off the coast of the Mexican state of Quintana Roo are protected through a parametric insurance policy.[37] The reef is estimated to provide flood protection for 4,600 people and $42 million reduction in flood damage annually.[38] Mangroves are estimated to provide flood protection for more than 150,000 people per 20 kilometers (km) of forest in Cancún, Mexico; Guayaquil, Ecuador; and San Luis, Brazil, and more than $250 million of infrastructure per 20 km in Cancún; Paramaribo, Suriname; and San Juan, Puerto Rico.[39]
		Urban heat mitigation	Urban green space and canopy can reduce ambient urban heat.[40]	The Green Corridors program in Medellín, Colombia, led to a 2°C reduction in the city's average temperature.[41] In Rio de Janeiro's Favela Green Roof pilot program, homes with green roofs were up to 20°C cooler indoors during peak heat than those with traditional roofs.[42]

Note: *IDB-supported project.

TRANSPORTATION

Increasing hazards driven by climate change—urban flooding on city streets, landslides on mountain roads, and coastal flooding and erosion near ports and airports—threaten the state of both existing infrastructure and future investments (Fay et al. 2017). About half of the region's infrastructure investment goes to the transportation sector (Fay et al. 2017), and these investments need to grow to meet mobility needs. LAC will need to spend an estimated 1–2 percent of regional gross domestic product on road construction alone by 2030, not taking into account other transportation infrastructure, such as airports and ports (Rozenberg and Fay 2019). These investments should contribute to the larger goal of reducing carbon emissions in the transportation sector, including investing in public transportation.

NBS can act as "no regrets" solutions by protecting transportation investments from natural hazards, mitigating against their negative environmental impacts, and providing a suite of co-benefits. Managing forests to reduce landscape risk near roads can be up to 16 times more cost-effective than repairing damaged road networks (Grima et al. 2020). Coastal ecosystems such as reefs and tidal wetlands can reduce coastal flooding and erosion for coastal highways and railways (Webb and Dix 2018). Urban green infrastructure interventions such as permeable pavements, parks, and green roofs can help reduce risks from stormwater flooding, which can disrupt and damage urban transportation systems (Hakimelahi et al. 2017). NBS can also enhance safety for pedestrian pathways and bike networks (Mullaney et al. 2015). Even more, the integration of NBS into traditional transportation infrastructure can provide opportunities to leverage additional sources of public and private funding dedicated to environmental objectives.

Table 3 describes how integrating NBS can complement, enhance, or safeguard common transportation investments. Box 4 showcases an example of a project from the IDB's portfolio that integrates NBS into project plans to safeguard transportation infrastructure investments.

Box 4 | CASE STUDY: CLIMATE-RESILIENT COASTAL MANAGEMENT AND INFRASTRUCTURE PROGRAM

JUNKANOO BEACH, CENTRAL LONG ISLAND, EAST GRAND BAHAMA, AND ANDROS, BAHAMAS (2017)

- IDB project ID: BH-L1043
- Funding: IDB ordinary capital loan: $35 million
- Amortization period: 24 years
- Interest rate: LIBOR-based
- NBS investment objective: Coastal flood mitigation

Throughout the Bahamas, hurricanes, tropical storms, and sea level rise intensified by climate change threaten coastal communities and infrastructure. One meter of sea level rise is predicted to place 38 percent of the country's airports, 90 percent of its seaports, and 14 percent of its road networks at risk of flooding (Simpson et al. 2010). Nature-based solutions (NBS) can play a significant role in mitigating these flooding effects: one study found that the strategic management of ecosystems such as mangroves, seagrasses, and coral reefs could reduce the length of shoreline on the island of Andros that is exposed to erosion and flooding by 20 percent (Natural Capital Project 2016). This loan aims to build resilience to these risks through investing in coastal protection infrastructure—including both gray infrastructure, such as breakwaters and groins, and NBS—at several locations throughout the country, including Junkanoo Beach, Central Long Island, East Grand Bahama, and Andros (IDB 2017b).

This loan will finance several upgrades to roads throughout the country, each accompanied by NBS to enhance resiliency. In East Grand Bahama, this project will include the upgrading of a causeway that will enhance road access for vulnerable coastal communities. The construction of the causeway is intended to restore hydrological flows to a 35-kilometer stretch of mangroves and tidal creek around the future East Grand Bahama National Park. In Central Long Island, this loan will finance the restoration of 15 kilometers of mangroves alongside the rehabilitation of a road bypass that was damaged by Hurricane Joaquin in 2015. Finally, the loan includes a $3 million component to pilot natural infrastructure projects, such as restoring 200 hectares of mangroves to increase resilience to coastal flooding in Andros, an important site for the country's tourism industry. A local nonprofit, Bahamas National Trust, has been contracted to assist in mangrove planting and to help facilitate community engagement, including stakeholder engagement meetings and environmental education initiatives with local schools.

Source: IDB (2017b).

Table 3 | NATURE-BASED SOLUTIONS FOR THE TRANSPORTATION SECTOR

TYPE OF INVESTMENT	INVESTMENT NEEDS	INVESTMENT OBJECTIVE	NATURE-BASED SOLUTIONS	PROJECT IMPLEMENTATION EXAMPLES
Road/railway construction and rehabilitation	Between 2015 and 2030, Latin America and the Caribbean (LAC) will need to invest ~1–2% of gross domestic product annually in road construction to meet mobility goals.[43] Surface and riverine flooding causes ~73% of global expected annual damage to roads and railways; coastal floods cause ~15%.[44] These hazards will likely intensify due to climate change. Landslides also pose a major threat to road networks in LAC, especially in the Andes and in mountainous areas of Central America.[45]	**Riverine flood regulation**	The ecological restoration of watersheds and riparian areas and can attenuate riverine flooding and consequent damage to road networks.	The restoration of 25 hectares of riparian areas alongside Johnson Creek in Portland, Oregon, reduced the flooding risk of a nearby road from once every two years to once every six to eight years. Models suggest the project will generate $30 million in benefits over the next century.[46]
		Coastal flood protection	Strategic management of coastal ecosystems near coastal roads can help mitigate flooding and erosion, particularly during storm events.[47]	Project Greenshores in Pensacola, Florida, created two miles of oyster reefs, salt marsh, and seagrass beds to protect the Bayfront Parkway. Sections of the parkway protected by the living shoreline have experienced less damage from hurricanes than nearby sections.[48] Coastal wetlands reduced flood heights on coastal roads in New Jersey by up to 1.2 meters (m) during Hurricane Sandy.[49]
		Landslide prevention	Strategic management of ecosystems near road networks with landslide risk can reduce the risk of landslides by stabilizing soils.[50]	A study in Colombia found that creating forested buffer zones near roadways at risk of landslides through a payment for ecosystem services program was ~16 times more cost-effective than repairing damage.[51]
Urban mobility	~80% of LAC's population lives in urban areas.[52] Traffic congestion, high costs for public transportation, and limited designated bike lanes are principal inefficiencies in urban mobility in the region.[53]	**Urban flood prevention**	Permeable pavements, bioswales, green roofs, and urban riparian areas can increase drainage, thereby preventing flooding of urban transportation networks.[54]	Eugene, Oregon, constructed 457 m of green bioretention gardens alongside its 14.5-kilometer bus rapid transit route to mitigate flooding and treat runoff.[55]
		Optimizing walking and biking routes	Urban forests and green areas can enhance bike and walking routes by providing shade and protective distance from vehicles.[56]	In Rio de Janeiro, Brazil, the Recreio Green corridor, designed to connect fragmented, urban green areas, provides comfortable and safe walking and bike lanes and shaded bus stops.[57]
Airport construction and upgrades	Passenger air traffic in LAC is projected to triple in volume by 2040, requiring an additional ~$53 billion of investment in airports.[58] At least six major airports in LAC face inundation with one meter of sea level rise, and many others are vulnerable to storm surge.[59]	**Coastal flood protection**	Strategic management of coastal ecosystems near airports can help mitigate coastal flooding and erosion.	Models suggest that living shoreline techniques and marsh island restoration could mitigate wave height and storm surge near JFK International Airport in New York City.[60]
		Stormwater management	Bioretention systems, permeable pavements, and vegetated filter strips can promote drainage of runways and other paved surface areas. These interventions can also complement gray stormwater treatment infrastructure.[61]	Hartsfield-Jackson International Airport in Atlanta has invested in bioswales and bioretention strips to mitigate stormwater runoff and meet the city's stormwater infiltration requirements.[62]
Ports and canals	LAC is expected to require ~$55 billion of new investments in ports by 2040 to meet growing shipping needs.[63] Climate change is expected to reduce the reliability of maritime structures at ports in LAC by 60% by 2070.[64]	**Erosion management**	Inland watershed management can reduce sediment flow into ports and canals, reducing expensive dredging costs.	One study found that a payment for an ecosystem services program to reduce sedimentation in the Panama Canal could be nearly five times more cost-effective than dredging.[65]
		Storm protection	Strategic management of coastal ecosystems near ports can help mitigate flooding erosion, particularly during storm events.[66]	An artificial sandbar breakwater in Lekki, Nigeria, was constructed as a hybrid approach to protect the port from high wave energy and erosion.[67]

Natal, Brasil | Sergio Andrés Moreno, BID Ciudades

ENERGY

A variety of threats driven by climate change pose risks to both existing assets and future investments in the energy sector across LAC: droughts decrease productivity of hydroelectric facilities, wildfires and landslides can damage transmission and distribution infrastructure, and coastal erosion can undermine coastal pipelines (Schaeffer et al. 2012; Varianou Mikellidou et al. 2018). Increased temperatures due to climate change also drive increased demand for electricity, as the market for indoor cooling grows (Birol 2018). Electricity demand in LAC is expected to increase 72 percent from 2016 levels by 2030 (Paredes 2017), with an estimated annual investment need of $8 billion to $24 billion (Fay et al. 2017).

Through NBS, investors can reduce risk and increase efficiency in each stage of energy service delivery, from production to consumption. Investments in ecosystems upstream of hydropower plants can help secure a reliable water supply for electricity generation, mitigate siltation in reservoirs, and increase the life span of hydropower equipment (Arias et al. 2011; Rycerz et al. 2020; Russo 2010). Strategic management of ecosystems surrounding transmission and distribution lines can help protect transmission infrastructure from natural hazards such as landslides, flooding, and wildfire (Grima et al. 2020; Muhs et al. 2020). Finally, green roofs and green spaces can mitigate extreme urban heat, reducing the need for indoor cooling (Santamouris 2014; Zhang et al. 2014). Table 4 describes how integrating NBS can complement, enhance, or safeguard common energy sector investments. Integrating NBS into energy infrastructure projects can also open up a wide array of private and public funds, including climate finance. Box 5 provides an example from the IDB's portfolio of a project that is investing in NBS to enhance the performance of a hydropower facility.

Box 5 | CASE STUDY: RENOVATION OF FRANCISCO MORAZÁN HYDROELECTRIC POWER PLANT TO FACILITATE THE INTEGRATION OF RENEWABLE ENERGIES HO-L1203

CORTÉS DEPARTMENT, HONDURAS (2020)

- **Funding source**: IDB ordinary capital (OC) loan: $560,000; IDB concessional loan: $1.04 million; cofinancing: $16.4 million; local counterpart contribution: $18.82 million
- **Amortization period**: IDB OC: 20 years; concessional: 40 years; cofinancing: 40 years
- **Interest rate**: IDB OC: LIBOR-based; concessional: 0.25 percent; cofinancing: 0.25 percent
- **NBS objective**: Water security for hydroelectric operations

The Francisco Morazán Hydroelectric Power Plant is the most productive hydropower facility in Honduras, accounting for 16.4 percent of the country's electricity supply. Since the plant began operation in 1986, dated equipment and wear and tear have caused inefficiencies in production and have increased the facility's risk of unplanned stops. Climate change poses an additional risk to the facility's production: projections of decreased precipitation in the region imply that hydroelectric output will likely decrease over the next century. In order to mitigate these risks, the National Electric Power Company sought a loan from the Inter-American Development Bank (IDB) to modernize the dam's equipment and protect its water supply by pairing upgrades to the built infrastructure of the facility with investments in watershed management (IDB 2020e).

A separate IDB study found that a 3 percent increase in forest cover in the facility's watershed would increase the plant's total annual production by approximately 5 percent (Esquivel et al. 2016). In order to promote the sustainable management and restoration of the forests upstream of the plant, the project included a $1.7 million component dedicated to capacity building for staff, including the plant's watershed management unit. Specifically, this component would support the creation of community tree nurseries to serve as sources for the reforestation, and it would promote nonconventional crops and best agricultural practices in the watershed. This component also includes a watershed reforestation program that aims to reforest 300 hectares in the watershed upstream of the dam.

Source: IDB (2020e).

Table 4 | NATURE-BASED SOLUTIONS FOR THE ENERGY SECTOR

TYPE OF INVESTMENT	INFRASTRUCTURE NEEDS	INVESTMENT OBJECTIVE	NATURE-BASED SOLUTIONS	PROJECT IMPLEMENTATION EXAMPLES
Energy transmission infrastructure construction and rehabilitation	Electricity demand in Latin America and the Caribbean (LAC) is expected to increase 72% from 2016 levels by 2030.[68] Increasing the connectivity of the LAC's electricity grids could save the region $30 billion by 2030 when paired with investments in renewable energy.[69] Climate hazards such as coastal storm surge, landslides, and wildfires pose an increasing threat to transmission infrastructure investments across LAC.[70]	**Protection of transmission lines from natural hazards**	Strategic nature-based solutions (NBS) surrounding transmission infrastructure can help buffer against environmental hazards and reduce replacement costs.[71]	Approximately 30% of power lines in Colombia are constructed in areas with high or very high landslide risk.[72] One study found that creating forested buffer zones around power lines to reduce landslide risk was 45.6% the cost of replacing power lines.[73] California energy company Pacific Gas and Electric manages forest tracts surrounding power lines to mitigate wildfire risk and contributed $5 million to the U.S. Forest Service in 2020 for wildfire prevention efforts.[74] Shell has funded the creation of living shoreline infrastructure to protect coastal pipelines in Louisiana from wave erosion.[75]
Hydropower plant retrofits	Hydropower represents nearly 44% of LAC's total electricity generation, the region's largest source of renewable energy.[76] Technical retrofits are needed to increase the life span and efficiency of hydropower facilities.[77] **Resilience to droughts**: Droughts may cause a ~40% reduction in hydroelectric generation in Central America by 2090.[78] **Glacial melt**: Andean hydropower plants representing 732 MW of installed capacity are heavily reliant on now-retreating glaciers for inflow during dry seasons.[79]	**Reducing sedimentation in hydroelectric dams**	Strategic ecosystem conservation and restoration reduces sedimentation of hydroelectric reservoirs, reducing risk of outages, dredging costs, and wear and tear on equipment.[80]	The Itaipú Preserves program in Brazil and Paraguay protects 101,000 hectares of land upstream of the Itaipú dam, reducing sediment loads and generating a net present value of $45 million in direct financial benefits for the dam.[81] Eight hydropower plants in Costa Rica finance watershed management as part of the country's national payment for ecosystem services program.[82]
		Maintaining regular flows for hydroelectric power generation	Stabilized hydrology of watersheds through NBS leads to a steadier water supply, adding security to hydroelectric production.[83] Intact forests can regulate regional precipitation patterns, resulting in more consistent runoff and increased hydroelectric production.[84]	The Peruvian hydropower operator CELEPSA finances watershed management in the Nor–Yauyos Cochas Landscape Reserve upstream of its facility. The restoration of 26 kilometers of pre-Colombian infiltration canals increased water conduction by 82%, providing more than 8 billion additional cubic meters of water per year.[85] One study found that a scenario of a 20–40% reduction of forest cover in the Amazon basin by 2050 could result in a decline of the power generation of the Belo Monte hydropower dam to only 25% of its maximum annual capacity.[86]
Energy-efficiency building upgrades	In 2014, buildings accounted for 24% of total energy consumption in LAC, and energy consumption in the building sector is projected to increase 35–75% in the region by 2060.[87] Growing demand for indoor cooling is a large driver for this increase.[88] Spikes in indoor cooling usage during heat waves stress electricity grids and can cause power outages.[89]	**Increasing energy efficiency in buildings**	Green roofs have been found to reduce energy usage in buildings by up to 32% in warm climates through reductions in demand for cooling.[90] Pairing building efficiency upgrades with urban green space and canopy can mitigate ambient heat, reducing cities' need for cooling.[91]	Mexico City's Azoteas Verdes program financed the creation of 21,949 square meters of green roofs on public buildings.[92] In 2015, the city initiated a tax incentives program for private green roofs.[93] The Green Corridors program in Medellín, Colombia, led to a 2°C reduction in the city's average temperature.[94] In Beijing, urban green spaces were found to contribute a 60% reduction in net cooling energy usage.[95]

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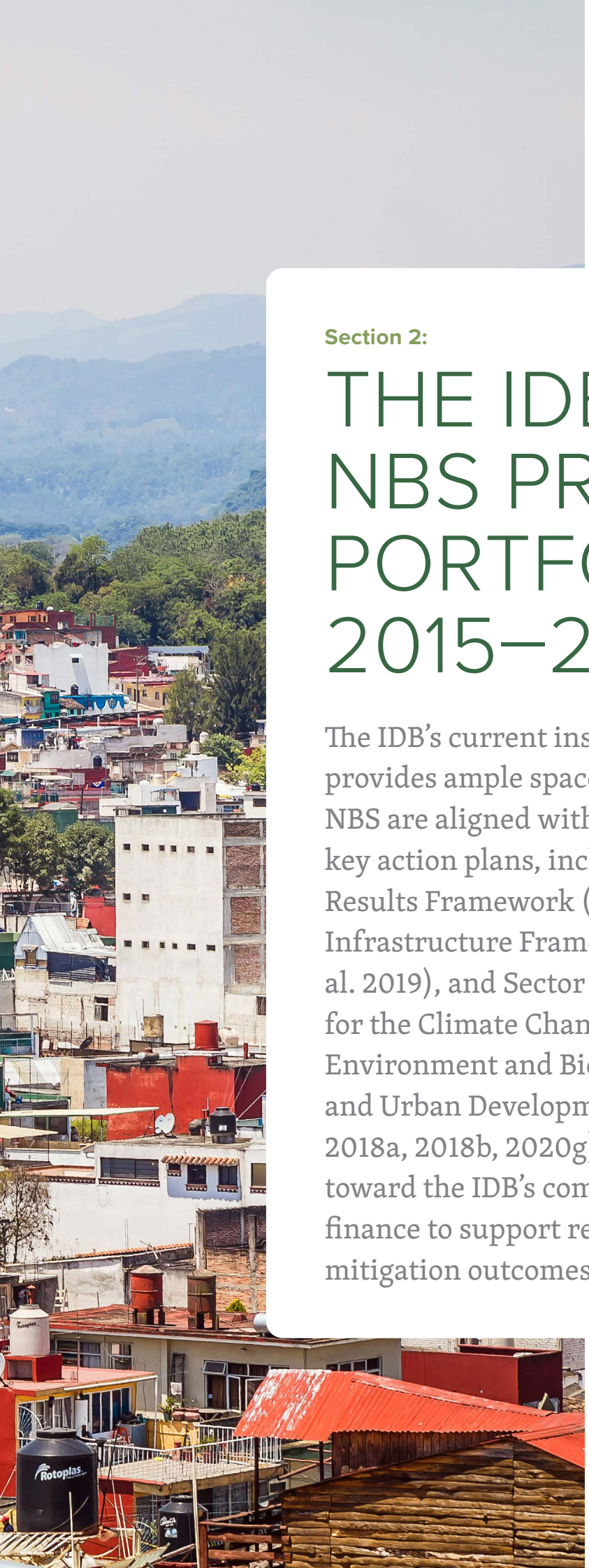


Section 2:

THE IDB'S NBS PROJECT PORTFOLIO, 2015–2020

The IDB's current institutional framework provides ample space for NBS support. NBS are aligned with many of the IDB's key action plans, including the Corporate Results Framework (IDB 2020f), Sustainable Infrastructure Framework (Bhattacharya et al. 2019), and Sector Framework Documents for the Climate Change, Water and Sanitation, Environment and Biodiversity, and Housing and Urban Development Divisions (IDB 2017c, 2018a, 2018b, 2020g). NBS can also be used toward the IDB's commitment to use climate finance to support resilience or adaptation and mitigation outcomes.

Several institutional plans provide the focus necessary to scale up NBS in the Bank in upcoming years, most notably the Mainstreaming Action Plan for Environmental and Social Sustainability (IDB 2020e). This overarching plan includes several components that support incorporation of NBS across IDB operations, including cross-cutting action plans related to Climate Action, Disaster Risk Management, and Natural Capital. As a result, country dialogues, strategies, and programming will now emphasize natural capital. NBS are an important component of the concept of natural capital, which is defined as "the finite stock of environmental assets that produce a flow of ecosystem goods and services which are important for human well-being and for the economy" (Cohen-Shacham et al. 2016).

As a part of the Mainstreaming Action Plan, the IDB will conduct pipeline screening to identify opportunities to enhance sustainability through NBS and other approaches. The IDB will also invest in knowledge and capacity building to support clients to adopt well-designed NBS. This policy creates space for the IDB to work with clients to identify and act on high-potential opportunities to integrate NBS into their infrastructure and broader development plans.

These actions should result in a growing number of projects and increasing investment dedicated to NBS. In order to track progress, it is important to understand the baseline for the IDB's recent investments in NBS. This section establishes that baseline.

From 2015 to mid-2020, the IDB's Infrastructure and Energy Sector and Climate Change and Sustainable Development Sector invested a combined $19.73 billion across 162 projects, including both technical assistance and loans. **Of these, 28 projects included some degree of NBS in their design, representing a total value of nearly $1.25 billion. Of this investment, $813.28 million was from the IDB's own funding sources, including ordinary and concessional capital.** The remaining funds were sourced from either country counterpart contributions or from external funds managed by the IDB. These external sources include both bilateral funds, such as the Nordic Development Fund and the United Kingdom's Department for Environment, Food, and Rural Affairs, or multilateral funds, such as the Global Environment Facility or the Global Climate Fund. Three of these investments were technical cooperation to support a network of 24 active NBS projects in the Latin American Water Funds Partnership, meaning that the IDB has directly or indirectly supported at least 52 NBS projects. A recent regional analysis of NBS projects in LAC found 156 projects that are either active or under preparation, suggesting that IDB-supported projects account for approximately one-third of the NBS projects in the region (Ozment et al. 2021). Details are discussed below.

Notably, the 28 identified projects in the IBD portfolio included NBS elements in some component of the design at the time of project approval. Due to a lack of thorough and consistent reporting on NBS inclusion in projects after this stage, this review did not capture any projects that incorporated NBS later in the environmental due diligence, final design, or implementation stages.

Geographic spread. The IDB's country-specific NBS projects span 15 countries (Figure 1). The countries with the most IDB-supported NBS projects are Honduras (4), Bolivia (3), and Peru (3). All of these projects are coordinated with national governments.

Figure 1 | MAP OF IDB INVESTMENTS IN NBS PROJECTS PER COUNTRY, 2015-2020

Note: Not pictured are three regional technical cooperation projects supporting the Latin American Water Funds Partnership.
Source: Authors.

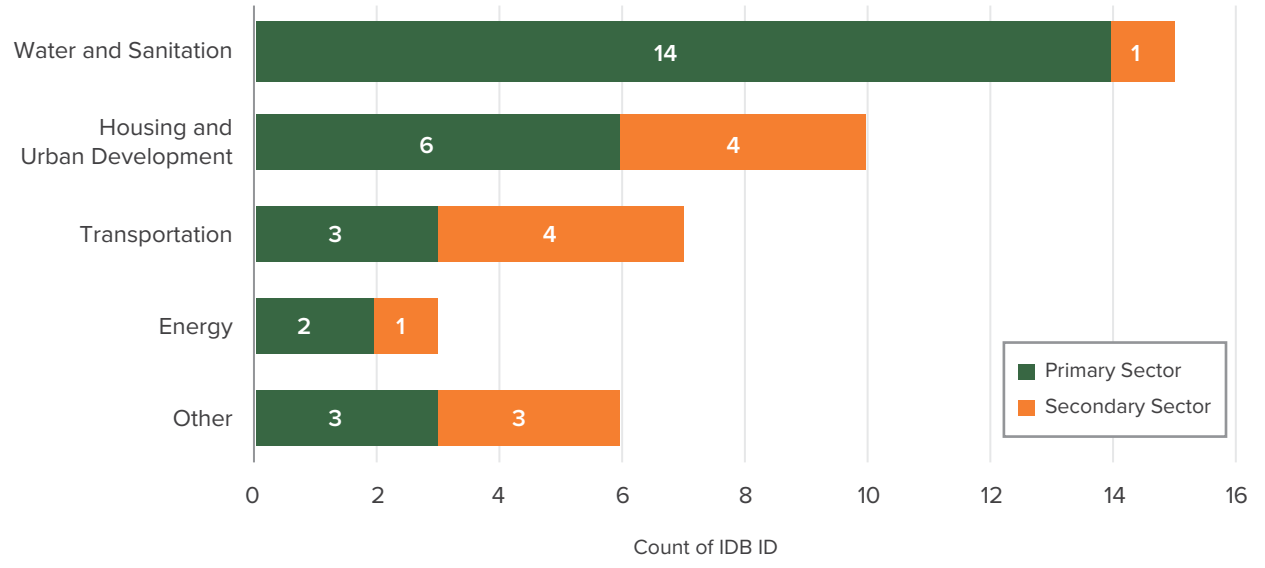
Benefiting sectors and investment objectives. NBS, by their nature, often generate benefits beyond their primary investment objective. This review identified IDB-supported NBS projects with primary benefits targeted at the water and sanitation, housing and urban development, transportation, and energy sectors, among others (Figure 2). Most of these projects also provided benefits for a secondary sector, adding increased value for the NBS investment. This suggests that although NBS projects may be aligned with one sector, multisectoral cooperation is often necessary in NBS implementation.

NBS strategies. As previously discussed, NBS refers to the strategic protection, restoration, or management of ecosystems. The type of targeted ecosystems varies based on location and intended impacts. Figure 3 shows which NBS are most used for each type of investment objective reviewed. Projects that employ more than one type of NBS were categorized as first, second, or third, depending on degree of use in the project. Across the IDB's NBS portfolio, NBS components are used more frequently in forests and agroforestry, which implies that the land restoration benefits of these NBS could be significant. All but four projects used a combination of NBS approaches, which fits with best practice. The most common combinations of NBS are forests with riverbeds and riparian areas, and forest with agroforestry.

Co-benefits. As mentioned above, a distinguishing characteristic of NBS projects is their ability to deliver a variety of benefits to different sectors simultaneously. Co-benefits refer to benefits that are generated beyond the primary investment objectives of NBS projects, and often are key factors that allow NBS to outperform gray alternatives in achieving sustainable outcomes, particularly in regard to supporting biodiversity and social impact.

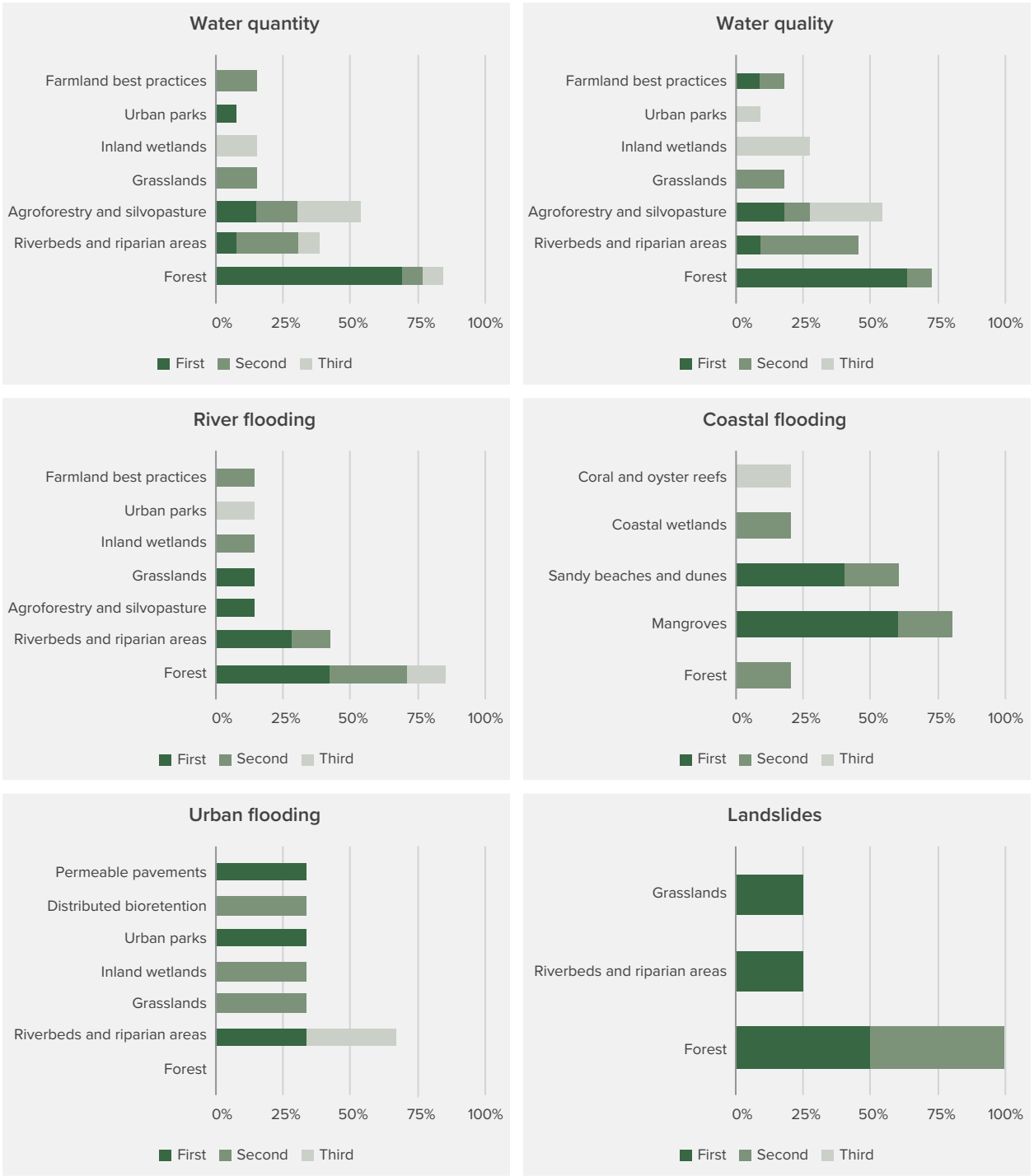
Two-thirds of the IDB-supported NBS projects analyzed intended to positively impact biodiversity. Nearly 40 percent aimed to contribute to carbon sequestration, while food security (17 percent of projects), job creation (17 percent), public health (14 percent), and recreation and ecotourism (14 percent) were also important to several projects. About 80 percent of the projects specified community engagement plans, and 50 percent specified a gender equity focus. The IDB and its clients are giving above-average attention to these topics (as measured by the number of projects that include specific gender equity and community engagement emphasis in project design) compared to the regional norm for NBS projects (Ozment et al. 2021). This is perhaps due to the IDB's environmental and social safeguard requirements.

Figure 2 | NUMBER OF PROJECTS TARGETING BENEFITS FOR KEY SECTORS



Note: For the purposes of this report, the NBS component of each project was assigned a primary benefiting sector and, if applicable, a secondary benefiting sector. "Other" benefiting sectors include forestry, agriculture, or tourism.
Source: Authors.

Figure 3 | PERCENT OF PROJECTS USING EACH NBS STRATEGY PER INVESTMENT OBJECTIVE



Note: First, second, and third designations refer to the degree of use. First-listed NBS are the primary NBS employed in the project, second are the secondary, and so on.
Source: Authors.

Funding and financing support. The IDB is deploying a variety of funding options for clients to advance NBS. The IDB solely supported 10 of the 28 NBS projects using either an ordinary capital loan or concessionary loan, proving that some clients have been willing to finance projects that include NBS components through debt (Figure 4). In these cases, NBS components were often part of a larger gray infrastructure operation. In addition, 13 projects were supported through a grant or technical cooper-

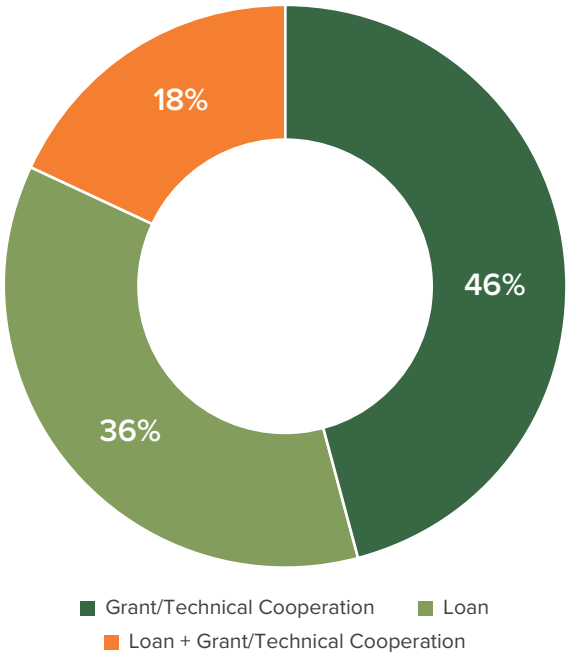
ation operations, which have, in some cases, focused on project preparation and feasibility analysis and thus lay the groundwork for bankable NBS projects. These projects were supported either in full or in part through IDB-managed external funds, such as grants from multilateral funds (i.e., the Global Environment Facility and the Green Climate Fund) and bilateral donors (i.e., the Nordic Development Fund). Five of the projects were financed through ordinary capital loans supplemented either with grants or technical cooperation. In these cases, the NBS components of the projects were usually funded by the grant or technical cooperation.

The amount of funding directed specifically to NBS interventions is unknown, due to lack of clear reporting on NBS-specific expenditure in project proposals. Where funding for NBS was reported, the proportion of funding directed toward NBS interventions varied from representing the whole of the project funds to a small portion of a larger infrastructure project. While this report seeks to establish a baseline of IDB-supported NBS activities, this lack of tracking of specific spending on NBS interventions makes it difficult to establish a baseline of actual spending toward NBS. Thorough tracking of funds directed toward NBS components in coming years will enable the IDB to identify priority areas to scale up support for NBS across its portfolio.

Insights on NBS project origination in the IDB's portfolio. To better understand the origination, design, and implementation process of NBS projects in the Bank, the project leads of operations with identified NBS components were surveyed. Their collective feedback sheds light on the experiences of promoting NBS and ideas for smoothing the process in the future. Most project leads indicated that including NBS enhanced, rather than hindered, the project preparation process and the final project plan. Projects with NBS tended to actively involve local communities, advance climate adaptation plans, and contribute to the sustainability of the investment. Although most NBS projects were reported to be initiated by the IDB during the project design process rather than through a formal request from the client, most project leads surveyed expressed a general sense that interest in NBS is growing among clients, and that the clients were open to exploring NBS.

Challenges of NBS implementation. For projects that did face challenges around NBS, the challenges reported by project leads were largely related to local stakeholder consultation, land tenure, lack of data on monetized benefits of NBS, and difficulty preparing

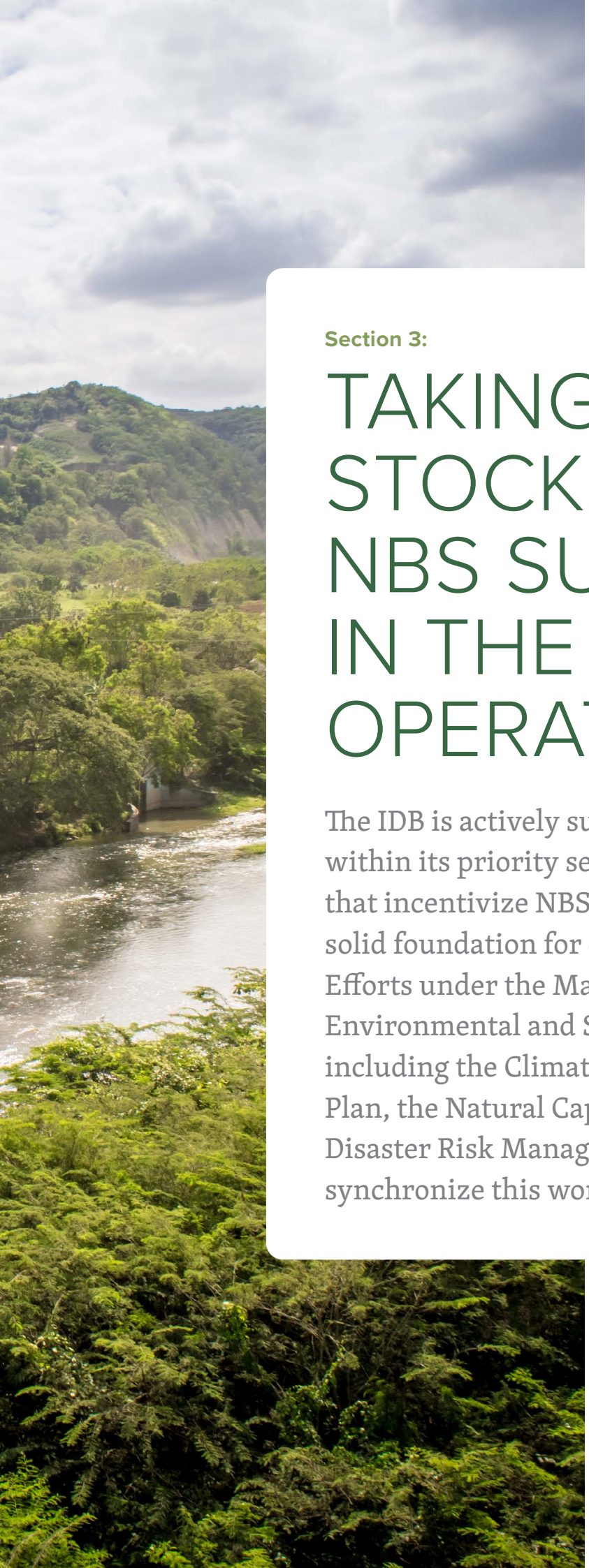
Figure 4 | INSTRUMENTS USED FOR PROJECTS WITH NBS COMPONENTS



Source: Authors.

the terms of reference due to the unique characteristics of NBS projects. The cross-sectoral nature of NBS and the centrality of community involvement often require additional knowledge and skill sets that traditional infrastructure consultants lack. And while NBS have a long history of applications in some sectors—such as water and sanitation—their application in others—such as transportation and energy—is more novel. IDB-led NBS projects are not alone in experiencing these challenges: the regional scan of NBS projects conducted as a part of this series found that projects in all of these sectors face similar challenges (Ozment et al. 2021).

Addressing challenges to NBS implementation. Despite the challenges to NBS implementation identified above, the IDB is making progress in facilitating further NBS uptake through bridging knowledge gaps and scaling up support for NBS implementation. This has primarily taken the form of creating additional research and knowledge products as well as internal and external capacity building, piloting proof of concept projects, and forging cross-sectoral partnerships. These activities are further described in Section 3.



Section 3:

TAKING STOCK OF NBS SUPPORT IN THE IDB'S OPERATIONS

The IDB is actively supporting activities within its priority sectors and initiatives that incentivize NBS uptake, serving as a solid foundation for expanded NBS efforts. Efforts under the Mainstreaming Plan for Environmental and Social Sustainability, including the Climate Change Climate Action Plan, the Natural Capital Action Plan, and the Disaster Risk Management Plan, add to and synchronize this work in individual sectors.

This section reviews ongoing efforts of the Natural Capital Lab, the Infrastructure and Energy Sector, the Climate Change and Sustainable Development Sector, and other key teams at the Bank, including Capital Markets, Research, and the Social Sector (Table 5). The review focuses on these sectors and divisions because of their particular relevance in successfully scaling NBS.

THE IDB'S NATURAL CAPITAL LAB

Launched in 2018 with an initial $25 million commitment from the Government of France, the Natural Capital Lab serves as a risk-tolerant hub within the IDB Group to incubate, accelerate, and scale solutions that preserve and enhance natural capital and biodiversity in LAC. The Lab acts as a platform to convene actors across the public and private sectors to form strategic cross-sectoral partnerships. NBS projects can leverage financial support through the Lab in the form of grants, loans, equity, and other risk-tolerant capital to test innovative financial mechanisms. For example, the Lab is working in Panama to conduct an economic evaluation of the ecosystem services of the country's mangrove forests to better enable Panama to build new, data-driven mechanisms that can drive funding toward mangrove and coastal conservation (IDB 2020i). The Lab has also recently partnered with the Government of Colombia to work toward structuring a public-private partnership and creating a new financial mechanism to fund 650 hectares of mangrove restoration near the city of Barranquilla (IDB 2021).

The Lab is working with the IDB's sector and division teams to advance new forms of financing for NBS. It has also supported the development of key knowledge products that detail best practices mainstreaming, adopting, and financing NBS projects (Alpizar and Madrigal 2020) and profile innovative IDB-supported conservation finance initiatives in the region, including both pooled funds and direct investments (Studer 2020). The "Nature-Based Solutions in Latin America and the Caribbean: Financing Mechanisms for Replication" issue brief in this series further highlights the work of the Natural Capital Lab and charts a path forward for increased adoption of innovative financing models for NBS in LAC (Marsters et al. 2021).

WATER AND SANITATION DIVISION

Through the project document review, it was identified that, since 2015, the IDB's Water and Sanitation Division in the Infrastructure and Energy Sector included the use of NBS as part of the design of seven projects, representing a total funding of $374 million

Table 5 | REVIEWED IDB SECTORS AND DIVISIONS

	SECTORS	DIVISIONS
IDB	Infrastructure and Energy	Water and Sanitation
		Transport
		Energy
	Climate Change and Sustainable Development	Housing and Urban Development
		Climate Change
		Environment, Rural Development, and Disaster Risk Management
	Social	Education; Social Protection and Health; Gender and Diversity; and Labor Markets (reviewed together)
	Department of Research and Chief Economist	
IDB INVEST	Capital Markets	

Source: IDB (2020h).

(including IDB funds, external sources, and client contributions). According to estimates, at least $28 million of this is directly supporting NBS project components, although the data are incomplete since NBS contributions are not currently tracked.

Furthermore, the IDB Water and Sanitation Division has promoted implementation of NBS in the water sector through several tools and initiatives:

- The IDB is a founding partner of the **Latin American Water Funds Partnership**, a flagship collaboration of natural infrastructure projects for water security and quality in the region (Latin American Water Funds Partnership n.d). Specifically, the IDB is working to launch a platform for the knowledge exchange across water funds, a course for water fund managers on financing strategies, and a research agenda that will focus on the scientific and economic analysis of existing water funds.
- The IDB **Hydro-BID** tool, an open-source and integrated system that models hydrology in the LAC region under scenarios of climate and land-use change (Nalesso and Coli 2017). This allows water resource managers to make better-informed water management decisions—including on green infrastructure—to mitigate floods, promote water security, and enhance water quality.
- **Research and technical cooperation** supported by the IDB has helped build data regarding the efficacy of NBS across LAC. For example, the technical cooperation program titled "**Integrated Watershed Management and Support for the Design and Operation of Water Infrastructure**" has funded research and modeling of high Andean wetlands as an essential part of ecosystem services for the water sector.
- The Water and Sanitation Division is creating a series of **knowledge products** to help clients understand how to use NBS to address key challenges in the water sector. These knowledge products include the 2019 discussion paper, **"The Role of Green Infrastructure in Water, Energy, and Food Security in Latin America and the Caribbean"** (Crisman and Muñoz Castillo 2019) as well as two forthcoming studies on **regional water security** and **transboundary water management.**

TRANSPORT DIVISION

Since 2015, the IDB's Transport Division in the Infrastructure and Energy Sector has invested in at least one green-gray project, wherein NBS was incorporated as a protective measure along a roadway. The IDB's Climate Change and Sustainable Development Sector has also supported NBS projects that directly benefit the transportation sector, using NBS to safeguard roads. These projects have a total value of $180 million.

The IDB has also promoted implementation of NBS in the transportation sector by developing the report **Natural Capital and Roads: Managing Dependencies and Impacts on Ecosystem Services for Sustainable Road Investments** (Mandle et al. 2016). The report outlines the protective value of NBS for roads against a variety of natural hazards and provides a series of best practices for project developers to leverage ecosystem services. The report also outlines strategies to mitigate the negative environmental impacts of roads.

ENERGY DIVISION

Since 2015, the IDB's Energy Division has supported at least two green-gray projects totaling $204 million, with at least $450,000 going toward NBS. Both of these projects utilize NBS upstream of hydropower facilities to regulate water flows and siltation to reduce costs of hydropower facility operation.

Multiple knowledge products published by experts across IDB divisions outline potential contributions of NBS to the energy sector and can serve as resources for IDB clients to incorporate NBS into energy projects:

- The 2016 technical note **"Vulnerability to Climate Change of Hydroelectric Production Systems in Central America and Their Adaptation Options"** (Esquivel et al. 2016) provides an analysis of anticipated climate impacts on hydropower facilities in Latin America and discusses the potential effectiveness of NBS for maintaining hydropower output in the case of drought.
- The IDB's 2019 discussion paper **"The Role of Green Infrastructure in Water, Energy, and Food Security in Latin America and the Caribbean: Experiences, Opportunities, and Challenges"** (Crisman and Muñoz Castillo 2019) offers

Store Bay, Trinidad and Tobago | Renaldo Matamoro

a multisectoral, holistic approach to green infrastructure solutions. The report identifies several opportunities for green infrastructure interventions for the energy sector in LAC, including watershed management for hydroelectric production and sustainable management of forest and agricultural landscapes for biofuels.

HOUSING AND URBAN DEVELOPMENT DIVISION

Since 2015, the IDB's Housing and Urban Development (HUD) Division has invested in at least two green-gray projects, totaling $107.4 million with at least $595,000 going to NBS. The broader Climate Change and Sustainable Development team has supported four additional projects with NBS components, further demonstrating the importance of NBS to this division. See Box 3 for an illustrative example of an HUD project with NBS components.

HUD provides project developers interested in urban applications of NBS with ample experience and expertise in project design and implementation. This division has team members who are fully dedicated to advancing NBS in the HUD portfolio and are proactively tracking the pipeline for ripe opportunities to incorporate green and gray infrastructure. HUD offers the following forms of support for project developers:

- The division serves as the convener of the **IDB Cities Network.** The network is a platform for over 200 municipalities in LAC to share knowledge, lessons learned, and best practices regarding environmental, economic, and social sustainability. Cities in the network gain access to collaborations that can increase innovation and investment in urban development, including in NBS.
- The toolkit **"Climate-Resilient Biodiverse Cities in Latin America and the Caribbean"** offers urban decision-makers in LAC a 10-step road map for designing strategies that foster biodiversity in Latin American cities (Scott-Brown and Rodríguez 2020)**.** This guide can serve as a tool for cities in LAC to design and implement NBS to preserve and enhance ecosystem services.
- The Challenge of Financing Urban Infrastructure for Sustainable Cities report provides regional, city-level, and sectoral analyses of investment needs for infrastructure in LAC (Bonilla-Roth and Zapparoli 2017). The report outlines potential financing mechanisms and avenues for the private

sector, governments, and international financial institutions to channel capital into Latin America's urban infrastructure needs.

- A series of three **Urban Green Infrastructure Manuals** (forthcoming) will serve as a guide for project developers to incorporate NBS into urban environments. The three manuals will be divided into the following themes: challenges, opportunities, and best practices; implementation and monitoring; and country analyses.
- HUD's recent report **Urban Parks: New York City** outlines lessons learned from New York City parks and guidance for how they can be translated into the LAC context (Schoen 2020). The report covers financing mechanisms for each park's construction and maintenance, the role of zoning and design, and community participation and offers lessons learned for parks in LAC.

CLIMATE CHANGE DIVISION

Recognizing NBS's role in both climate change mitigation and adaptation, the IDB's Climate Change Division (CCS) is championing NBS within the IDB and supporting development of knowledge products and institutional arrangements to scale up investment in NBS.

- The 2019 discussion paper "**Nature-Based Solutions: Scaling Private Sector Uptake for Climate Resilient Infrastructure in Latin America and the Caribbean**" (Watkins et al. 2019) provides recommendations for policymakers, project developers, and financial institutions to enable private sector uptake of NBS.
- **"Increasing Infrastructure Resilience with Nature-Based Solutions"** (Silva et al. 2020) provides a 12-step technical guide for project developers in LAC to implement NBS to substitute, complement, or safeguard gray infrastructure for climate resilience.
- The **"Attributes and Framework for Sustainable Infrastructure"** (Bhattacharya et al. 2019) serves as a guide to assess the sustainability of infrastructure investments across economic, environmental, social, and institutional dimensions. The framework emphasizes nature-based solutions and natural capital as critical components of sustainable infrastructure design.

The division offers other forms of support to clients seeking to implement NBS. Here are several examples:

- **Climate finance**: CCS supports clients in developing innovative economic tools and financing schemes to promote blended investment in climate-related projects. The division also leverages funding for NBS from a variety of multilateral and bilateral partner funds, including Climate Investment Funds, the Global Environment Facility, the Green Climate Fund, the Forest Carbon Partnership Facility, and UKAid. The IDB portfolio utilizing these funds amounted to $6.7 billion between 2009 and 2020 (IDB 2020j).
- **NDC INVEST Platform**: The IDB leads NDC INVEST, a climate finance facility that helps advance countries' commitments to the Paris Agreement. A "pipeline accelerator" component under the NDC INVEST platform provides grant support for preparation of projects that help mitigate climate change and boost resilience, and a "finance mobilizer" component supports efforts to mobilize public and private finance for climate action at scale (IDB 2020k). NBS and green-gray projects are excellent fits for both the accelerator and mobilizer components of NDC INVEST: NBS projects can provide significant climate benefits and also tend to need project preparation resources and new sources of finance (Ozment et al. 2021).

- **Institutional capacity building**: CCS partners with government ministries in LAC—particularly ministries of finance and planning—to support capacity building for low-carbon sustainable development, including implementation of NBS.
- CCS leads the **Sustainable Infrastructure Community of Practice**, which serves as the implementing arm of the IDB's sustainable infrastructure framework. The community of practice provides a multisectoral platform for project teams to collaborate on sustainable infrastructure project design and implementation, including NBS-based projects.

ENVIRONMENT, RURAL DEVELOPMENT, AND DISASTER RISK MANAGEMENT

The Environment, Rural Development, and Disaster Risk Management Division (RND) of the Climate Change and Sustainable Development Sector leads the IDB in its use of NBS to achieve cross-sectoral investment objectives. Since 2015, RND has invested in 14 projects with NBS—more than any other division. Projects led by RND are inherently cross-sectoral, enhancing resiliency for infrastructure assets in the urban development, transportation, and water and sanitation sectors. Beyond supporting the incorporation of NBS into projects, RND offers several institutional assets that facilitate NBS adoption for clients:

- The **"Disaster and Climate Change Risk Assessment Methodology for IDB Projects"** (Barandiarán et al. 2019) helps IDB project teams assess risk levels and mitigation options for infrastructure investments. The guide positions ecosystem-based adaptation as a "no regrets" strategy for disaster and climate change risk mitigation and provides project developers with a framework to assess their effectiveness and applicability.
- **The Climate and Disaster Risk Assessment Community of Practice** within the IDB provides technical support for IDB project teams to integrate climate and disaster risk assessment and planning into infrastructure projects. The community's multisectoral nature provides project developers with the expertise across sectors necessary to incorporate NBS strategies into projects as risk-reduction measures.

SOCIAL SECTOR

As discussed above, well-designed NBS projects can achieve multiple benefits that contribute to community well-being. However, it takes careful understanding of local social dynamics, as well as thoughtful program design, to deliver such benefits (Browder et al. 2019). NBS are unique in that they tend to rely more on community management as compared to gray infrastructure alone, making the social sector engagement a critical part of successful project design and implementation. The Social Sector at IDB provides skills and expertise in areas such as the following that are critical to ensuring effective and equitable design of NBS that benefit communities:

- **Gender.** The Social Sector's Gender and Diversity Division has implemented programs to promote gender inclusion and mainstreaming at a regional level for sectors including energy, transportation, and finance. Similar programs could be applied toward regional NBS initiatives. For individual projects, the Gender and Diversity Division offers expertise in equitable project design that promotes the active involvement of women throughout every stage of project development.
- **Indigenous peoples.** As an active participant in every IDB project that involves Indigenous peoples, the Gender and Diversity Division assists in facilitating Indigenous communities' active involvement in project design and execution. Beyond this support, the division offers training for project managers in cultural analysis and project cocreation. The division's past work with Indigenous peoples with potential NBS applications includes creating maps of Indigenous territories, promoting the integration of local knowledge and materials into infrastructure design, and promoting economic opportunities for Indigenous peoples through agroforestry programs.
- **Education**. The Social Sector's Education Division can contribute expertise in designing vocational training and advanced training programs to build local capacity needed for the design and maintenance of NBS projects. The Education Division's expertise in curriculum design can also contribute to NBS objectives by promoting initiatives that mainstream environmental education and ecosystem services in public education.

DEPARTMENT OF RESEARCH AND CHIEF ECONOMIST

The Department of Research and Chief Economist leads research and development of the IDB's flagship publications and synthesizes areas of expertise across IDB sectors. The 2020 report **"From Structures to Services: The Path to Better Infrastructure in Latin America and the Caribbean"** (Cavallo et al. 2020) illustrates the role that NBS can play in infrastructure planning and investing in LAC on a macro scale. The chapter titled "Back to Nature: Alternatives to Concrete and Skill" details green infrastructure's role in delivering infrastructure services in LAC. The chapter highlights six types of nature-based solutions and their infrastructure applications: coral reefs, mangroves, forests, constructed wetlands, green roofs, and green spaces.

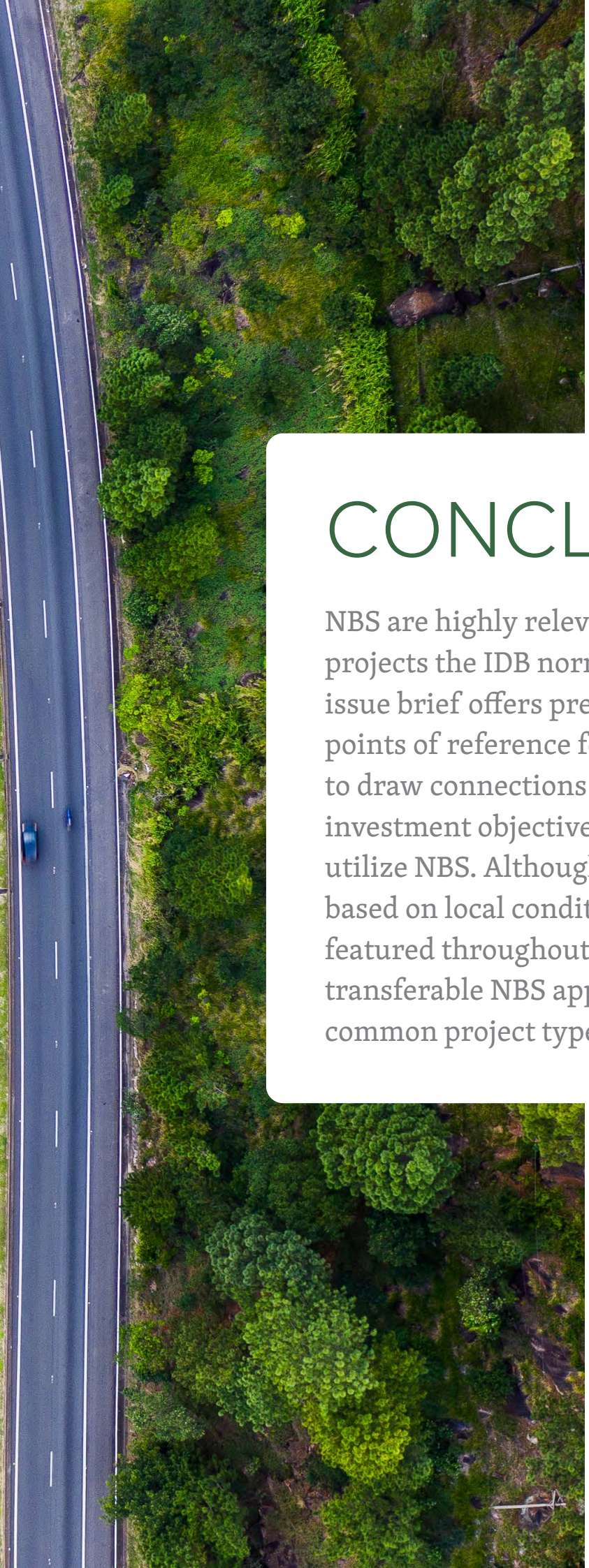
Panamá Viejo, Vía Cincuentenario, Panamá | Franklin Canelon

CAPITAL MARKETS AND IDB INVEST

The Capital Markets Division provides technical assistance programs for member countries, encourages private and public capital funding for climate-related investment, and promotes strategic dialogue and partnerships among regulators, capital markets, and financial sector stakeholders. Here are examples of efforts the team has undertaken on natural capital that lay a foundation for new work on NBS:

- The IDB Natural Capital Lab's proposed **Jaguar Bond** (Green Finance for LAC 2020), which would be the world's first biodiversity bond of its kind, aims to attract $200 million allocated by the private sector to preserve jaguar habitat. The plan is to guide investments through a special purpose vehicle to sustainable operations in the agriculture, forestry, and ecotourism sectors to support biodiversity conservation and sustainable economic development in jaguar landscapes (Studer 2020). Although not specifically catered to NBS, the bond's model provides an example for future NBS initiatives in the region.
- The **Peru Biodiversity Fund** aims to support businesses and local governments in the Peruvian Amazon that preserve biodiversity through sustainable forest and land management. The fund seeks to provide technical assistance and seed capital for new enterprises and initiatives that rely on the bioeconomy to remove barriers to private investment for conservation and restoration (Netto 2020).
- The IDB has been involved in structuring 20 percent of the total number of **green bonds** in the region (Green Finance for LAC 2020) through **technical assistance** to commercial financial institutions and national development banks, and by providing **anchor investments** and **guarantees** to promote investor confidence. The IDB also hosts the **Green Bonds Transparency Platform**, which aims to promote investor confidence by increasing transparency and comparability of bonds in LAC. While none of the green bonds supported by the IDB have included NBS to date, the number of green bonds for NBS is increasing globally and shows potential for application in LAC.
- The **Financial Innovation Lab (FIL)** serves as a platform to create investment vehicles and financial structures that can use donor funds alongside private and public capital to finance climate change mitigation and adaptation projects. Although most of the FIL's activities to date have centered on mitigation projects, the expertise in the FIL could support increased adoption of NBS.
- The IDB and IDB Invest are founding partners of **Green Finance for LAC**, a knowledge exchange platform that showcases innovative green financing models throughout LAC, including NBS projects.

Rio Atibaia, Campinas | Renan Pissolatti, WRI Brasil



CONCLUSION

NBS are highly relevant to many of the types of projects the IDB normally invests in, and this issue brief offers preliminary guidance and points of reference for IDB staff and clients to draw connections between their projects' investment objectives and opportunities to utilize NBS. Although NBS must be designed based on local conditions, the examples featured throughout this report highlight transferable NBS applications for these common project types.

To support the implementation of new approaches that unite green and gray to achieve optimal performance and resilience, the IDB offers its clients resources, financing opportunities, knowledge networks, and other forms of support. The track record over the past five years has prepared the IDB with in-house knowledge on incorporating NBS into investments to keep project approval timelines on track and to enhance the overall project preparation and execution process.

There is also recognition that changes are needed for the IDB to grow its NBS investments beyond this point. The IDB is prepared to facilitate this institutional shift through initiatives under the Mainstreaming Action Plan for Environmental and Social Sustainability. Four interrelated areas of work related to NBS are foreseen:

Upstream client engagement. The IDB aims to engage with clients to understand where the loss and degradation of ecosystems poses risks to physical infrastructure assets and communities to prioritize areas for intervention and to chart a policy agenda to create necessary enabling conditions for NBS. To facilitate this process at an institutional level, the IDB is working to incorporate NBS consideration in relation to its country strategies, sector frameworks, and corporate responsibility framework. These strategies and frameworks guide the IDB's investments and provide an opportunity to discuss how NBS could help make progress toward their clients' priorities.

Externally, the IDB can foster interest in NBS and build capacity for NBS adoption in the region by partnering with clients to provide resources and training that will allow for better integration of NBS into project design and deployment. Ultimately, each infrastructure project proposal to the IDB should consider options for integrating NBS to enhance infrastructure system performance. The IDB can support this process by supporting the feasibility analysis and project appraisal of NBS projects to evaluate the business case for investment.

Piloting new financing models. This review demonstrates that NBS can be incorporated into traditional infrastructure investments. Work from the Natural Capital Lab in particular highlights the importance of leveraging private finance toward NBS going forward. IDB clients, partners, and donors can work with the Lab to deploy philanthropic resources toward NBS projects with potential to unlock additional resources from the public and private sectors, thereby multiplying the impacts of the initial investment. NBS valuation methods should be mainstreamed in project cost-benefit and lifecycle analyses and support development of revenue streams from the multiple benefits of NBS to demonstrate value and secure financing. The "Nature-Based Solutions in Latin America and the Caribbean: Financing Mechanisms for Regional Replication" issue brief in this series highlights the challenges and opportunities that the IDB faces in adopting and scaling these mechanisms in the LAC context.

Supporting a pipeline of NBS projects. To better mainstream NBS across IDB operations, infrastructure projects in the IDB project pipeline should be scanned to identify opportunities to integrate NBS to enhance service delivery and resiliency. In addition, the IDB is poised to deploy its technical cooperation and grant funding to support NBS project preparation—providing additional resources and technical assistance for developing project concepts, analysis and development of business plans and securitized cash flows, and structuring financial models that enable coinvestment in NBS—so that NBS can be amplified in the mainstream project pipeline.

Because NBS deliver services across sectors, NBS projects in the project pipeline are particularly ripe to be co-led by multiple Bank divisions and to benefit multiple executing agencies.

Knowledge and capacity building. Because of the relative newness of NBS, the typical project preparation process is insufficient to thoroughly evaluate opportunities to integrate NBS into routine infrastructure investments. Further honing NBS design and appraisal tools to fit the decision-making processes of infrastructure planning and investment as well as building the capacity of decision-makers are high priorities of the IDB to enable increased uptake of NBS. Within the IDB, cross-sectoral communities of practice centered on biodiversity, sustainable infrastructure, and disaster risk reduction exist and can serve as hubs for cross-sectoral knowledge exchange and training on NBS. These communities of practice can help the Bank leverage and improve its existing expertise in its Social, Infrastructure and Energy, and Climate Change and Social Development Sectors, among others.

A critical part of building knowledge around NBS is monitoring the economic, ecological, and social successes of flagship projects. Because benefits from NBS require a relatively long time frame to accrue, it will be essential for the IDB to work with partners to establish long-term monitoring plans for NBS projects to increase knowledge and create data-driven planning tools. Capturing and communicating information on NBS performance will be key in both building confidence and generating the interest and demand required to scale NBS across the region.

Through the initiatives described above, the IDB is working with clients to better understand where and how NBS can achieve their development priorities. Faced with increasing challenges related to climate change and with limited resources to invest in critical infrastructure, governments in LAC require innovative solutions to address their societal goals. As detailed in this brief, NBS provide a new investment opportunity to cost-effectively deliver critical infrastructure services and enhance resiliency to climate change.

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APPENDICES

Comunal Coworking, Lima, Peru | Dan Gold

APPENDIX A. LIST OF THE IDB'S NBS PROJECTS FROM 2015 TO 2020

All project information was gathered from the IDB's public project database, accessible at https://www.iadb.org/en/projects.

YEAR	COUNTRY	PROJECT NAME	DIVISION	IDB ID
2015	Haiti	Natural Disaster Mitigation Program II; Climate-Proofing of Agriculture in the Center–Artibonite Loop Area	WSA	HA-L1097, HA-G1031
2015	Bolivia	Multipurpose Program for Potable Water and Irrigation for the Municipalities of Batallas, Pucarani, and El Alto	RND	BO-L1080, BO-G1004, BO-X1012
2016	Colombia	Sustainable Management and Conservation of Biodiversity in the Magdalena River Basin	RND	CO-T1412
2016	Mexico	Conservation, Reforestation, and Community Development in the Biological Corridor in the Ahuisculco Mountains/La Primavera Forest	CCS	ME-T1325
2016	Bolivia	Lake Titicaca Cleanup Program	WSA	BO-L1118
2016	Belize	Support for Improving Disaster and Climate Resilience in Sustainable Tourism	RND	BL-T1080
2016	Bahamas	Support to Climate-Resilient Tourism Development in San Salvador	RND	BH-T1052
2016	Regional	Water Funds: A Conservation/Climate-Resilient Model for Stressed Watersheds in Latin America and the Caribbean	WSA	RG-T2751
2016	Honduras	Sustainable Forest Management	RND	HO-L1179
2017	Bahamas	Climate-Resilient Coastal Management and Infrastructure Program	RND	BH-L1043
2017	Bolivia	Bolivia Resilient to Climate Risks	RND	BO-L1188
2017	Peru	Support to the National Platform for Sustainable Cities and Climate Change in Lima	HUD	PE-T1355
2017	Belize	Design and Preparation of the Sustainable Development Plan for the Caracol Region	RND	BL-T1088
2018	Paraguay	Housing and Rehabilitation Program for Bañado Sur in Asunción	HUD	PR-L1152
2018	Peru	Forest Investment Projects in Peru	RND	PE-L1232
2018	Regional	Water Funds: A Sustainable Climate Adaptation and Resilience Model for Stressed Urban Watersheds in LAC	WSA	RG-T3184
2018	Regional	Water Funds: A Conservation/Climate-Resilient Model for Stressed Watersheds in Latin America and the Caribbean	WSA	RG-T3177
2019	Honduras	Program for the Restoration of Climate-Resilient Forests and Forestry for Sustainable Water-Related Ecosystem Services	RND	HO-G1252, HO-L1200
2019	Peru	Comprehensive Storm Drainage Program in Priority Cities in Peru	WSA	PE-L1238
2019	Costa Rica	Sustainable Management of Ecosystem Services	RND	CR-T1148
2019	El Salvador	Strengthening the Climate Change Resilience in El Salvador's Coffee Forests	RND	ES-L1135
2019	Brazil	Tietê River Recovery Project Upstream of the Penha Dam in the State of São Paulo—Renasce Tietê	WSA	BR-L1536
2019	Ecuador	Border Integration Project—Axis Road No. 4 Bellavista-Zumba-La Balza Zamora-Chinchipe Province	TSP	RG-L1132
2019	Honduras	Canaveral–Rio Lindo Hydropower Complex Rehabilitation and Uprating Project: Comprehensive Management Plan of Lake Yojoa	ENE	HO-T1297; HO-L1102
2020	Jamaica	Blue Carbon Restoration in Southern Clarendon, Jamaica	CCS	JA-T1169
2020	Guatemala	Sustainable Forest Management Project	RND	GU-G1005, GU-L1165
2020	Panama	Valuing, Protecting, and Enhancing Coastal Natural Capital	RND	PN-T1233
2020	Honduras	Renovation of the Francisco Morazán Hydropower Plant to Facilitate the Integration of Renewable Energy	ENE	HO-L1203

Note: CCS = Climate Change; ENE = Energy; HUD = Housing and Urban Development; RND = Environment, Rural Development, and Disaster Risk Management; TSP = Transport; WSA = Water and Sanitation.

APPENDIX B: CONSULTED IDB STAFF

The authors would like to thank the following staff from the Inter-American Development Bank for their valuable inputs to this report:

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ABBREVIATIONS

CCS Climate Change Division: Inter-American Development Bank

FIL Financial Innovation Lab

FSO Fund for Special Operations

HUD Housing and Urban Development Division: Inter-American Development Bank

IDB Inter-American Development Bank

LAC Latin America and the Caribbean

LIBOR London Inter-bank Offered Rate

NBS nature-based solutions

NDC nationally determined contribution

OC ordinary capital

RND Environment, Rural Development, and Disaster Risk Management Division: Inter-American Development Bank

SDG Sustainable Development Goal

ENDNOTES

1 In this issue brief, *sector* may refer to either a sector of the economy or an administrative unit within the IDB. As an economic sector, the term is lowercased (as a common noun). As the formal name of an administrative unit, it is capitalized (as a proper noun). Thus, for example, the transportation sector of the economy and the Social Sector within the IDB.

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ACKNOWLEDGMENTS

This report was prepared through a partnership between the Inter-American Development Bank and World Resources Institute, with support from the Pan American Development Foundation and the FEMSA Foundation.

The authors are immensely grateful to all who contributed to this publication effort.

The authors would like to thank our peers who provided critical review and feedback, including Juliana Salles Almeida (IDB), Renata Marson Teixeira de Andrade, Luana Betti (WRI); María Franco Chuaire (WRI), Martha Cuba de Cronkelton (Ministry of Environment, Peru), Steven Carrion (World Bank), Elizabeth Folkunger (Swedish International Development Agency), Pablo Lazo (WRI), John Matthews (AGWA), and Caitlin Smith (WRI).

Among our colleagues at WRI, strategic oversight was provided by Betsy Otto, Charles Iceland, and Todd Gartner. James Anderson (WRI), Andrea Garcia Salinas (IDB), Emilia Suarez (WRI), and Romain Warnault (WRI) helped us navigate the publication planning, peer review, and production process.

The authors would like to thank following staff from the Inter-American Development Bank for their valuable inputs to this report: Carmen Albertos, Mariana Alfonso, Gerard Alleng, Jean Pol Armijos Leray, Johan Arroyo López, Ophélie Chevalier, María Eugenia de la Pena, Thierry Delaunay, Julian Dorr, Maricarmen Esquivel Gallegos, Jaime Fernández-Baca, Alfred Hans Grünwaldt, Sergio Lacambra Ayuso, Robert Langstroth, Marion Le Pommellec, Isabella Marinho, Cristina Mercerreyes Espinosa, Juan Manuel Murguia, Raúl Muñoz Castillo, María Netto, Edgar Orellana Arevalo, Gmelina Ramírez, María Cecilia Ramírez, María Eugenia Roca, Laura Natalia Rojas Sánchez, Jorge Omar Samayoa, José Manuel Sandoval Pedroza, Márcia María Silva Casseb, Germán Sturzenegger, Gines Suárez Vázquez, Alejandro Taddia, Denea Larissa Trejo Carcamo, Hori Tsuneki, Patricio Zambrano-Barragán, and Daniela Zualoaga Romero.

FUNDACIÓN FEMSA

PADF PAN AMERICAN DEVELOPMENT FOUNDATION

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