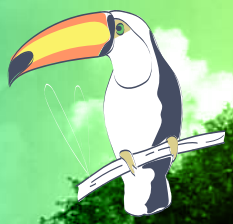
AMAZONIA FOREVER



AMAZONIA:
A JOURNEY TOWARD PROSPERITY & RESILIENCE

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FOREWORD

Amazonia, encompassing 40% of South America and nearly 47.3 million people, is one of the most ecologically and culturally significant regions on Earth. It is home to unparalleled biodiversity, invaluable freshwater reserves, and communities whose ancestral knowledge and stewardship are essential to the region's preservation and future. Amazonia is also an important global nature capital with its wealth, resilience, and economic opportunities for the continent and the world.

Yet, Amazonia faces mounting pressures - from environmental degradation to social inequality and economic vulnerability - that threaten both its integrity and the well-being of its inhabitants, pushing the region toward a point of no return.

In response to this urgent context, this publication presents key social, environmental, and economic regional challenges and opportunities. It brings together diagnostics, evidence, and recommendations to support sustainable and inclusive economic growth, in one unified space.

Amazonia Forever lies at the heart of this publication and of our work at the Inter-American Development Bank. As our flagship program for Amazonia, it is our holistic umbrella program to sustainably develop the region and improve people's quality of life. Amazonia Forever provides the framework for this work, focused on expanding innovative financing, boosting knowledge exchange, and facilitating regional coordination. The program is built on 5 pillars: combating deforestation and strengthening environmental institutions; bioeconomy and creative economy; people; cities and resilient infrastructure; and sustainable and resilient agriculture, cattle and forestry. To date, it has mobilized $1.2 billion from partners and catalyzed over $5.3 billion in IDB financing. In the last two years, Amazonia Forever has increased the available resources by more than five times—from $1 billion in 2023 to over $5 billion in 2025.

Collaboration is at the center of Amazonia Forever. Through close partnership and contributions by donors and organizations such as the World Bank Group, the Green Climate Fund, the Climate Investments Funds, Germany, Italy, Switzerland, the United Kingdom, Sweden, Israel, Belgium and Spain, as well as other diverse actors, we are promoting greater coordination to maximize our impact on the ground.

The IDB was the first multilateral development bank to establish a dedicated Amazonia Unit and adopt a comprehensive regional economic-financial coordination umbrella program for the region. With this report we are taking the next step to advance our collective

understanding of the unique challenges of the region and, more importantly, to find policy solutions to guide our efforts so we can ensure that Amazonia will be here forever.

Building on this foundation, the publication offers a detailed analysis of the region's current state, while highlighting pathways for transformative action, and a strategic vision to guide our institutional response going forward.

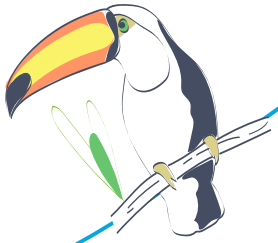
Several key conclusions emerge from the analysis in the report:

- **First,** Amazonia is approaching a critical ecological threshold, but there is a small window of opportunity, where decisive action can reverse harmful trends.
- **Second,** institutional strengthening, greater coordinated financing flows, and cooperation efforts across the region are required to address effectively the issues presented in this publication.
- **Third,** technological innovation and data-driven approaches can significantly enhance policy design and service delivery.
- **Finally,** preserving Amazonia is not only a regional concern, it is a global imperative that demands international coordination and a sense of shared responsibility.

As you will see in the following pages, the IDB and key partners are leading with resolve, unity, and vision toward a future where Amazonia thrives, forever.

Warm regards,

ILAN GOLDFAJN



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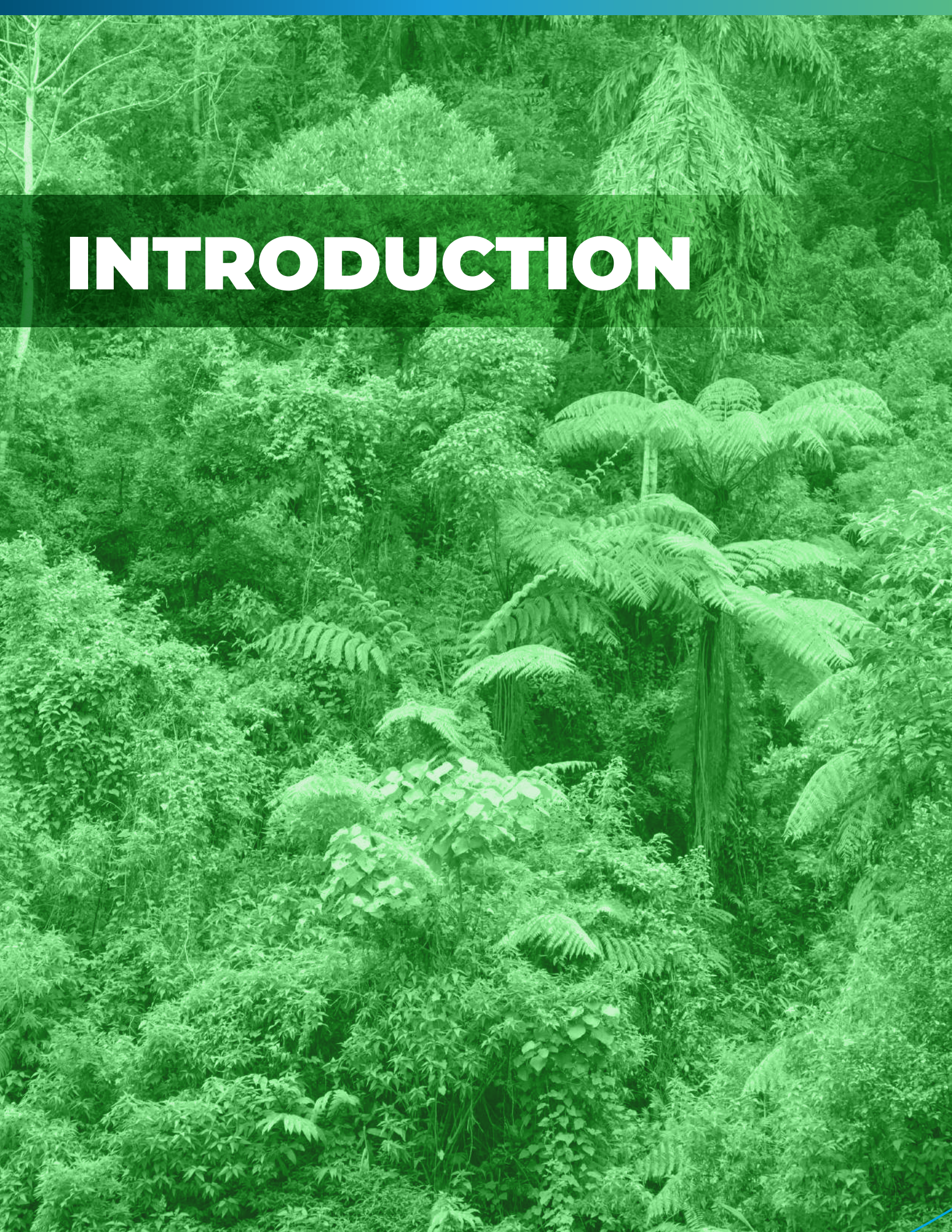
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ACRONYMS

ATCO	Amazon Cooperation Treaty Organization
BASE	Bioeconomy for a Sustainable Amazon
BNDES	Brazilian Development Bank
COICA	Coordinator of Indigenous Organizations of the Amazonia River Basin
ECLAC	Economic Commission for Latin America and the Caribbean
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
IBGE	Brazilian Institute of Geography and Statistics
IC	Indigenous Communities
IDB	Inter-American Development Bank
MDBs	Multilateral Development Banks
MNEs	Multinational Enterprises
MSMEs	Micro, small and medium enterprises
NDCs	Nationally Determined Contributions
NGO	Non-governmental Organization
NTFP	Non-Timber Forest Products
OECD	Organization for Economic Co-operation and Development
PES	Payments for Environmental Services
PPP	Public-Private Partnership
RAISG	The Amazon Network of Georeferenced Socio-Environmental Information
REDD+	Reduced Emissions from Deforestation and Degradation
SPA	Science Panel for the Amazon
TVET	Technical and Vocational Education and Training
UNESCO	The United Nations Educational, Scientific and Cultural Organization
UNICEF	The United Nations Children's Fund
WRI	World Resource Institute



INTRODUCTION

Chapter 01

THE TRILEMMA OF ECONOMIC GROWTH, ENVIRONMENTAL PRESERVATION, AND IMPROVED LIVELIHOODS

Henry Alexander Ballesteros, Rodolfo Benevenuto, Anderson Caputo Silva, Arturo José Galindo, Laura Giles Álvarez, Carolina Lembo, David Margolis & Nadia Rocha



1.1 Introduction: A Culturally and Biologically Rich Area that is Crucial to the Planet

Spanning approximately 8.4 million km^2 (RAISG, 2020)[1] or about 40% of the South American continent (Figure 1.1.),[2] Amazonia is one of the richest and most diverse landscapes in the world, renowned for its rainforest and environmental value (Hanusch, 2023). Yet it is also inhabited by nearly 47.4 million people (RAISG, 2023)[3] - roughly 70% of whom live in urban areas - and possesses an exceptional cultural diversity, encompassing nearly 379[4] identified Indigenous groups, each with distinct languages and customs. Despite its immense potential, its economic and productive importance is often overlooked. Amazonia's rainforest is the world's primary source of natural rubber production (Amazon Rainforest Economic Importance, n.d.). Manaus hosts an electronics industry, with major brands like Sony and Panasonic, and there are scores of other economic sectors that could be responsibly developed.

FIGURE 1.1.

The Amazonia Region Spans 40% of the South American Continent

Geographical Delimitation of the Amazonia Basin



Source: *The Amazon Network of Georeferenced Socio-Environmental Information (RAISG) boundaries on the Amazonia Region.*[5]

[1] The Amazonia limit in this publication includes the biome + administrative regions + river basins. Amazonia spans significant portions of Bolivia, Brazil, Colombia, Ecuador, Peru, and Venezuela, as well as the entire land area of Guyana and Suriname, as defined by The Amazonian Network of Georeferenced Socio-Environmental Information (RAISG).

[2] Amazonia river basins.

[3] Estimating the population of Amazonia is challenging and can vary depending on factors such as the geographical boundaries applied and the method to project population growth. In this chapter, the population estimate is obtained from RAISG (2023), which is based on the territorial definition of the Amazonia Region established by RAISG and applied in the analysis presented here. It is important to acknowledge that other estimates exist. For example, ECLAC & OTCA (2024) report a population of 50.3 million inhabitants based on 2019 data, using a different delimitation of the Amazonia Region. It must be noted that the estimated population may vary depending on the scope and focus of each chapter in this book. However, the source employed will always be specified.

[4] There is no single agreed upon figure for the number of Indigenous groups in Amazonia. Based on national censuses and other national and international reports, 379 groups have been identified (see Annex 3). The figure can vary depending on the source. For example, the Coordinator of Indigenous Organizations of the Amazonia River Basin (COICA) reports 511 groups, while RAISG reports 410.

[5] The layer of the Amazonas boundaries is available here.

1.2 The Region's Trilemma

Amazonia today faces a trilemma, however: how to create economic growth while at the same time preserving the environment and improving local livelihoods (Figure 1.2.). Historical evidence shows that protecting forests has been difficult when seeking to achieve economic prosperity in Amazonia. Researchers have pointed out that unsustainable production, population growth, and the indiscriminate expansion of infrastructure have triggered rapid deforestation that could lead the region to a tipping point. Yet there has been less discussion about what is needed to create shared prosperity and promote sustainable growth, while, at the same time, protecting ecosystems (Cheston et al., 2023).

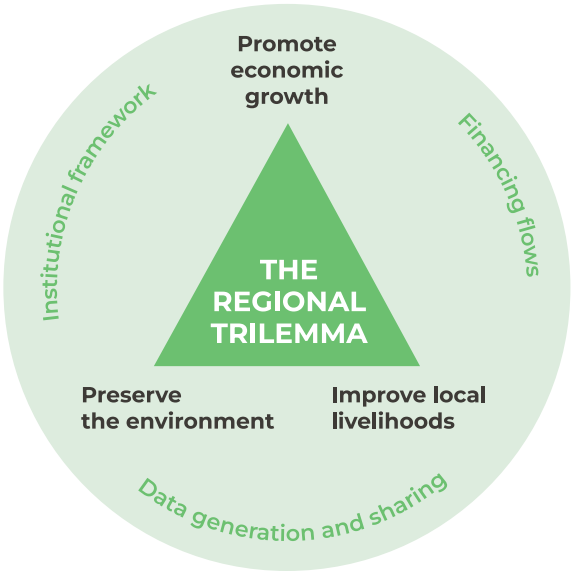
FIGURE 1.2.

Amazonia's Trilemma: How to Create Economic Growth While at the Same Time Preserving the Environment and Improving Local Livelihoods

Low economic diversification and complexity, limit Amazonia's contributions to its nations' GDPs: **the region contributes less than 1% of GDP in Colombia** for e.g.

Primary economic activities in the region are **agriculture and mining**, which have had a significant impact on the environment.

Between 2001 and 2020, Amazonia **lost almost 9% of its forests.**



The estimated **poverty rate** in Amazonia is **37%** - 6.6 p.p. higher than the average across Amazonian countries.

Ethnic groups have lower access to basic services. Only **39% of Amerindian households in Guyana have access to improved water and sanitation** vs. 95% nationally.

The Amazonas River Basin is **approaching an ecological tipping point.**

Source: *Authors' elaboration*

The first factor of the trilemma is preserving the environment. Amazonia has the largest rainforest in the world, with an estimated area of 5.5 million km^2 of dense tropical forest and a wide range of transitions into other biomes (including the Andes, the Cerrado, the Chaco, and the Pantanal).[6] It is also one of the most biologically important regions, home to 30% of the planet's biodiversity and a key source of water and carbon sequestration (approximately 120 billion metric tons of carbon are stored in the region). Yet environmental degradation via deforestation, mining, and other environmentally exploitative practices is undermining this natural capital. Global Forest Watch data indicates that 67 million hectares of forest were lost in Amazonia between 2001 and 2024, an area about the size of France

[6] More information available here.

(Figure 3.1). There is growing scientific consensus that the Amazonas River Basin is approaching an ecological tipping point, where the rainforest loses its ability to sustain itself and, as a result, the planet is deprived of a crucial climate regulator (IDB, 2023). Although environmental policies have been bolstered substantially in recent decades to prevent this from happening, there are still areas at risk from deforestation that would benefit from expanding or reinforcing protections. Yet despite the creation of vast protected areas, many such areas still suffer from ecological disturbance, particularly along the Arc of Deforestation, (Giles Alvarez et al., 2025).[7] Protected areas in the north around Boa Vista, as well as between Macapá in the north, Cochabamba in the south, and west to Pucallpa, have been negatively affected at rates similar to those of unprotected areas in the same region.

The second factor of the trilemma relates to promoting economic growth. The Amazonia Region is of essential importance to the economies of the countries that host it, both because of its size, as well as its vast resources and natural wealth. By some estimates, 70% of the South American continent's gross domestic product (GDP) is produced in areas that receive water from the Amazonia forest (IDB, 2023).[8] The region's natural wealth, if managed sustainably and responsibly, could boost livelihoods and wellbeing. But its primary economic activities, largely based on agriculture and mining, are not always aligned with sustainable practices that ensure long-term environmental resilience (Giles Alvarez et al., 2025). Indeed, in many cases, they have been contributors, rather than inhibitors, of destructive practices. Low economic diversification and complexity have also limited Amazonia's contributions to its nations' GDPs to varying degrees depending on the country (Bustos et al., 2023). And gaps in the provision of critical infrastructure, including infrastructure for service provision and connectivity, restrict mobility, and in the process, reduce efficiency and economic activity, hampering the region's potential (Giles Alvarez et al., 2025).[9]

The third pillar of the trilemma involves improving local livelihoods. With a population estimated at almost 47.4 million inhabitants, the Amazonia Region is home to a large and diverse population. There are mixed-race, white, and Maroon populations living in the region, some 18 million Afro-descendants (ECLAC & ACTO, 2024) and 7 million Indigenous people (see Chapter 8). Among Indigenous Peoples, there are around 379 identified groups, excluding approximately 136 Indigenous groups that live in voluntary isolation. More than 240 languages are spoken (RAISG, 2023).[10] Many of these ethnic groups have lived in the region for generations and have unique cultures and traditions. Moreover, they possess an intricate knowledge of the rainforest and its resources, key to the fight against deforestation and the implementation of sustainable development models. Yet, ethnic and minority groups still grapple with higher levels of poverty and lower access to basic services than other populations. For example, only 39% of Amerindian households in Guyana have access to improved water and sanitation, versus 95% nationally. In Ecuador's Amazonia, only 32% of the Indigenous population has access to piped sewage systems and 86% to electricity, compared to 73% and 99% among non-Indigenous groups, respectively. The estimated poverty rate in Amazonia, meanwhile, stands at 37% - 6.6 percentage points higher than the average across Amazonian countries - and is even higher in some rural, ethnic communities and among some social groups. In Bolivia's Amazonia, the poverty rate among Indigenous Peoples is 20 percentage points higher than that of non-Indigenous populations (National Institute of Statistics of Bolivia, 2016–2021), and in Brazil's

[7] Arc of Deforestation refers to the westward encroachment of deforestation in the eastern half of the Amazonia Region, from Macapa in the north to Porto Velho and Cobija. Forest at risk of disturbance are areas with current tree cover that is near deforested areas, making them vulnerable to deforestation.
[8] Primary forest extent and tree cover extent of the world's major rainforest regions in 2020. Available here.
[9] The Amazonia Region's transportation system relies heavily on the fluvial network as an alternative to roads. Connectivity analyses in this study, however, are limited to road infrastructure due to regional data constraints.
[10] These numbers can differ substantially. COICA has an estimate of 511 Indigenous groups.

Amazonia Region, 61.8% of the Indigenous population lives in poverty, compared to 36% in the rest of the country (IBGE, 2023).[11]

Although the challenges in all trilemma factors are widespread across the region, their incidence is not homogeneous across the territory. To provide a more disaggregated, region-wide perspective on these three issues, Giles Alvarez et al. (2025) conduct a geospatial gap analysis to estimate the incidence of development gaps across 20 sectors and three broader multisector themes (multigap analyses).[12] This is only one of many studies being conducted at institutions like the Inter-American Development Bank (IDB) to provide more disaggregated insights into development challenges that can develop into more concrete and context specific actions (further examples can be found in Chapters 6, 7, 8 and 9 of this publication).

The multigap analyses reveal patterns in which sectoral gaps, relating to the three key issues relating to the trilemma—human development, economic well-being, and environmental conservation—overlap within a specific territory.[13] They portray development challenges as being complex and interconnected across multiple sectors. These estimates indicate that over 760,000 people inhabit areas with a substantial concentration of environmental conservation gaps (more than five concurrent gaps); around 661,000 people live in areas with a high concentration of economic well-being gaps (five or more concurrent economic gaps); and approximately 6 million people reside in 23 critical areas with high concentrations of human development gaps (six or more concurrent human development gaps) (Figure 1.3. provides further insights into each of these three multisector gap analyses). Furthermore, environmental conservation gaps appear to be concentrated in the central areas, particularly around the Amazonas River and the border between Brazil and Bolivia, while gaps in economic well-being and human development are prevalent in the southeastern and northern segments of the region. Directing dialogue and analyses towards these key areas could promote a more targeted and comprehensive approach to addressing compounded needs (Giles Alvarez et al., 2025).



[11] The poverty line is defined as a per capita monthly household income of R$665, equivalent to approximately US$275 in 2022 PPP dollars. IBGE. Continuous National Household Sample Survey (Pesquisa Nacional por Amostra de Domicílios Contínua), Annual Edition, 2023.

[12] A development gap is defined as an area or population group that experiences a measurable disparity in terms of an adequate level of access to a service or outcome in a sector. Living in an area with a gap can therefore signify: (i) limited access to services or infrastructure based on time-of-travel standards; (ii) a suboptimal outcome based on performance results; or (iii) deficiencies in the application of policies in a specific territory. An adequate level of access or outcome is determined by a benchmark, which is selected for each sector based on available benchmarks for the region or comparable regions and populations. The results of this exercise, of course, are sensitive to the selection of the benchmark and can change a lot based on the benchmark used.

[13] While the authors acknowledge that multisector challenges are complex and interrelated in different ways, this approximation provides initial insights relating to the presence of more than one sector gap in a given territory.

FIGURE 1.3.

Multisector Gaps are widespread in the region

Results from the multisector gap analysis in conservation, economic well-being and inclusion

ENVIRONMENTAL CONSERVATION



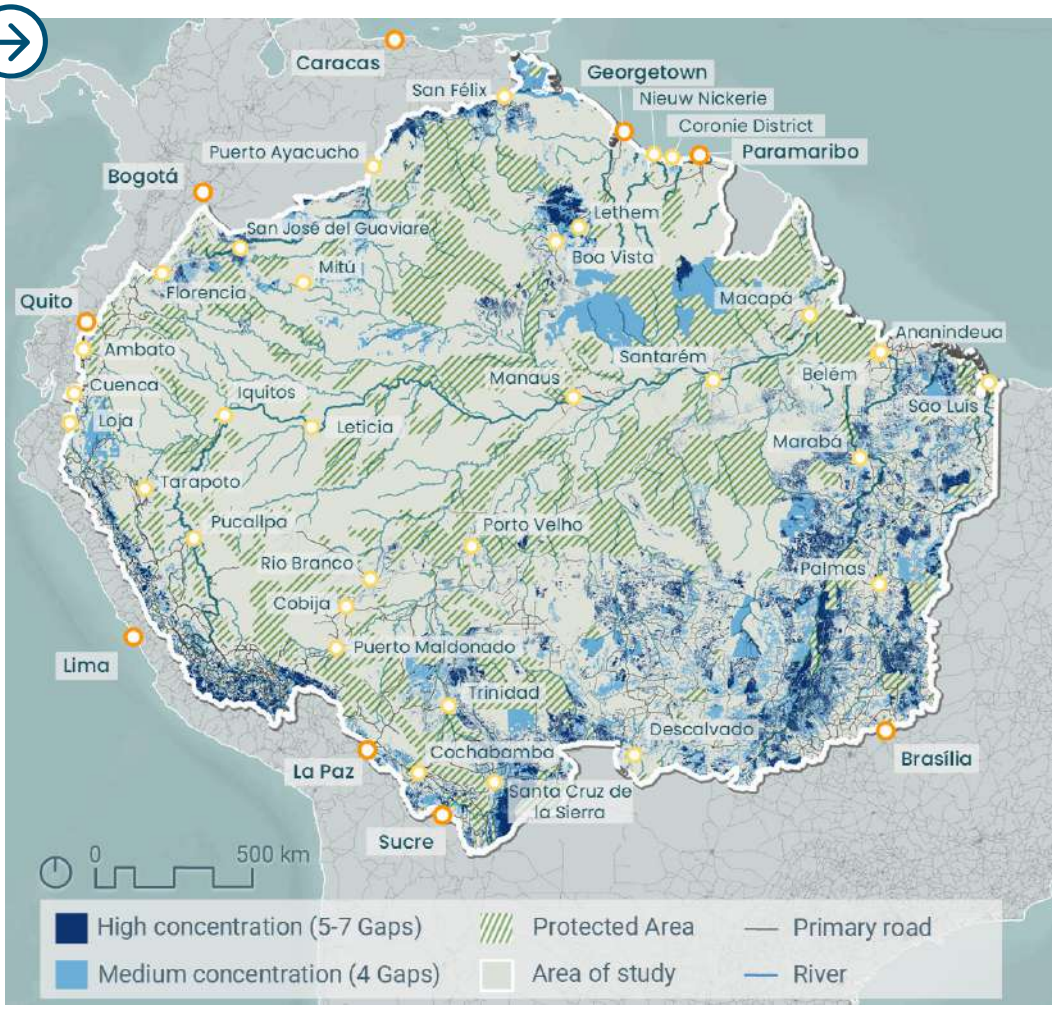
6.6 million km² of the region's area, with over 39 million people living in it, has at least one conservation gap.[14]

Nearly **243,000** km² and over 760,000 people face a high concentration of gaps (five or six concurrent gaps).

There are nine key areas of high gap concentration, facing five or six conditions where environmental resources are high and imminently vulnerable. These areas are concentrated south of Boa Vista in Brazil, along the main stem of the Amazonas River, near the mouth of the Araguaia River, and in the vicinity of Cobija, Bolivia, and Rio Branco, Brazil.

[14] Four sector gaps are considered in this multisector gap analysis: limited investment in climate resilience and adaptation, areas for protection of biodiversity, areas for management of the water supply, and areas for protection of ecosystem services. In addition, two supplemental information layers considered relevant to addressing the main environmental challenges confronted by the Amazonia Region are applied: forests at risk of disturbance, and deforestation.

ECONOMIC WELL-BEING



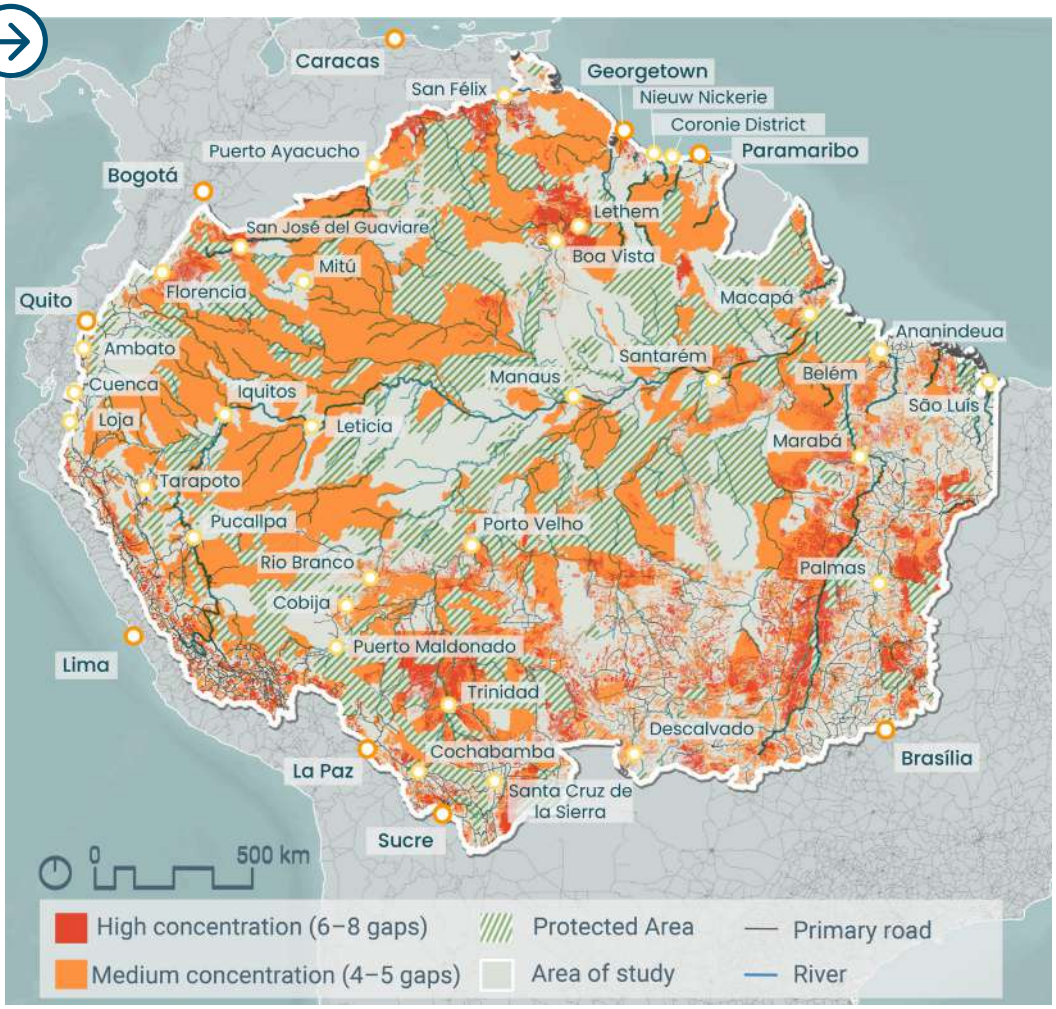
Approximately **40.2 million people** are estimated to live in areas that have at least one economic well-being gap.[15]

Nearly **661,000 people** face five or more concurrent gaps, 64% of whom are of working age and 49% of whom are women.

There are 16 key areas of high gap concentration that are marked by five or more of the seven gaps in inputs. These areas are concentrated north of Boa Vista, along the Andean crest, south of Santa Cruz de la Sierra, and in the eastern portion of the study area. Over 661,000 people live in areas facing five or more lagging factors, and nearly 1.6 million people are estimated to live in areas that face four lagging factors.

[15] This multisector gap analysis consists of five gaps: limited access to secondary roads, limited digital connectivity, limited agricultural efficiency, limited green and sustainable activities, and limited investment in Indigenous territories. The analysis also incorporated two additional layers of information— non-biodiverse areas and areas without green and sustainable development potential—to supplement the intersection of the five gaps.

HUMAN DEVELOPMENT



Up to **23.9 million people** live in areas with at least one human development gap.[16]

Nearly **6 million people** live in areas with six or more concurrent gaps.

Up to **1.8 million school-age children** live in high-gap areas, impacting their well-being and development opportunities.

Up to **3.9 million working-age people** *live in high-gap areas. This affects their well-being and economic potential.*

There are 23 key areas of high gap concentration (areas with six or more concurrent human development gaps). These areas are especially present around the Andean crest, the western bank of the Araguaia River, Trinidad in the south, and around Boa Vista.

Source: *Giles Alvarez, L. et al. (2025).*

The issues portrayed above challenge traditional development models and highlight the need for a multisectoral and territorial approach to tackle them. The fundamental question that arises from the unique balance required of the three

[16] This multisector gap consists of eight human development sectoral gaps: limited access to potable water, limited access to electricity in urban and rural territories, limited access to sanitation services, limited access to health centers in urban and rural territories, limited access to education centers in urban and rural territories, limited access to primary roads, limited access to secondary roads, and limited digital connectivity.

trilemma factors in the region, and which many organizations such as the IDB strive to address is: How can we promote an inclusive, sustainable development model that at the same time protects the environment and the natural capital of the Amazonia Region?

1.3 Institutions and Financing Flows: Key to Any Solution

Closing the development gaps portrayed above and promoting actions in all trilemma factors will require vast resources. Just maintaining 80% of the Brazilian Amazonia under protection, to cite one example, would cost an estimated $1.7 billion to $2.8 billion per year (Cardoso da Silva et al., 2022). Billions more would be needed for the conservation of the entire Amazonas River Basin. That, of course, does not include funding to provide basic services, such as water, sanitation, access to the Internet, and better transport infrastructure. Closing these social, economic, environmental, and multisector gaps highlighted in Figure 1.3. will require trillions in financing.

There are substantial financing flows to the region. For example, according to a study by the Green Coalition, $19.4 billion were allocated in 2023 to Amazonia by more than 15 first-tier public development banks in Bolivia, Brazil, Colombia, Ecuador, Peru, and Suriname. Between 2022 and 2024, the IDB directed nearly $3.2 billion for Amazonian programs, and bilateral financing for sustainable development in Amazonia was estimated at $1.2 billion (see Annex 1 for more information on financing flows). Yet the large range and complex set of actors in the region and the different spheres in which they work make it extremely difficult to provide a complete picture of financing flows in Amazonia (Juelsgaard, 2024). On the positive side, efforts to map and analyze such flows have picked up in recent years. This has been the result of work by organizations such as the IDB, the World Bank, and the Organisation for Economic Co-operation and Development (OECD), as well as efforts like the Aid Transparency Initiative. Such information has also allowed for more effective coordination between financing agents, promoting greater effectiveness and efficiency. The development and implementation of new and innovative financing schemes, such as thematic bonds, public-private partnerships (PPPs), and public bank coalitions, among others, have also increased financing potential and allowed different actors to engage more effectively (for further details, see Annex 1). The IDB has been actively supporting some of these initiatives with promising results, including the development of investment guidelines for Amazonia bonds (Box A.1.) and the EcoInvest program (Box A.2.).

For all the benefits of these diverse initiatives to boost funding for sustainable development in Amazonia, however, the large financial flows are still far too few for the monumental task of closing the immense development gaps of the region and guaranteeing the conservation of its natural patrimony. A complex and vast institutional framework only exacerbates the challenge, often leading to inefficiencies and duplication that render policies and programs less effective and

complicate the mission of channeling funding to common development initiatives throughout the region.

To overcome these challenges, better coordination mechanisms are required to increase the effectiveness and efficiency of Amazonia's institutional framework and ensure that financing achieves its maximum impact. There are already some promising initiatives in place.

At the supranational level, the Amazon Cooperation Treaty, signed in 1978 by eight Amazonian countries, led to the creation of the Amazon Cooperation Treaty Organization (ACTO) in 1995 as the main platform for regional political dialogue and technical cooperation. Although its non-binding nature sometimes limits its impact, recent efforts - such as the 2019 Leticia Pact and the 2023 Belém Declaration - have strengthened cooperation by emphasizing ACTO's institutional capacity, cross-border environmental coordination, and the promotion of technical assistance for sustainable agriculture and socio-biodiversity products.[17]

At the national and subnational levels, coordination mechanisms also exist. For instance, in Colombia, the Regional Autonomous Corporations serve as regional public autonomous agencies responsible for environmental management. Each of the 33 corporations (including those covering departments in Amazonia) has a board of directors that includes a representative of the IC or the ethnic groups traditionally settled within their jurisdiction.[18] As a result, the Regional Autonomous Corporations serve as important coordination mechanisms between the different actors in the country's institutional framework. Similarly, Peru's 2023 Executive Board for the Development of the Peruvian Amazon brings together stakeholders at both national and subnational levels to foster inclusive, sustainable growth.

In addition to better coordination, the institutional framework and system of financing flows would benefit from greater capacity building from both a territorial and multisectoral perspective. This would help generate a systemic vision and approach that recognizes the different contributions required from each sector for addressing the complex development challenges presented in this chapter. This joint vision should be reflected in actionable plans with clear goals and the identification of those responsible. Finally, given the wide range of treaties, agreements, and legislation that affect policymaking in Amazonia, efforts to streamline, systematize, and simplify them would be beneficial. So would a clearer understanding of implementation capacities.

Supporting Sustainable, Inclusive, and Green Development

In this publication, we highlight how achieving the goal of environmental conservation and protection does not imply giving up on other goals. Instead, opportunities can be considered in all three dimensions, with actions in one area potentially having beneficial effects on the others, in line with Giles Alvarez et al. (2025), Hanusch (2023), and IDB (2021).

This publication seeks to translate knowledge into action for Amazonia by bringing together diagnostics, evidence, and recommendations in one unified space. It recognizes that the region's unique social, economic, and environmental challenges require innovative, non-traditional solutions. And it offers a holistic view

[17] See here for more information.
[18] See article 26. Law 99 of 1993.

to support more integrated, cross-sector interventions through programs such as Amazonia Forever (IDB's flagship program for the Amazonia).

Specifically, it: (i) offers an overview of the key productive, social, and environmental challenges in the Amazonia Region; (ii) delves into key factors driving these challenges; (iii) discusses policy options to address them and (iv) showcases key IDB Group projects that implement some of these policy options. The publication is divided into five sections and 12 chapters.

Chapter 2 describes the IDB's Amazonia Forever program. This is an initiative aimed at encouraging coordination and collaboration to promote the sustainable, inclusive, and resilient development of Amazonia by capturing the multisector and territorial approach required in the region. Chapter 3 looks at deforestation patterns, their underlying causes and how these can be addressed to reduce environmental destruction in the region. Chapters 4 and 5 focus on topics related to production, discussing how the bioeconomy, entrepreneurship, innovation and access to finance can be promoted to foster a growing and greener private sector. Chapters 6, 7, and 8 then focus on education and social protection and how these could be reinforced, providing an overview of diversity in the region and ways in which the lives of ethnic groups can be improved. Chapters 9, 10 and 11 offer an analysis of the state of cities and infrastructure and the means by which better regional integration and effective value chains can reap important gains. Chapter 12 further examines the state of current agriculture and the potential that a sustainable, regenerative and resilient sector has for production and people.

Each chapter in this publication provides specific recommendations and draws lessons from interventions that have been conducted in each of the different sectors covered. Overall, the following conclusions emerge:

Overarching enabling opportunities: institutional strengthening, coordination, and data.

As discussed throughout the publication, institutions and other actors working in the region can foster greater trust, co-creation, and coordination mechanisms and platforms. This can reduce duplication and maximize the impact of interventions. An underlying strategy is required to foster greater institutional strength, reinforcing processes and mandates, and providing clear rules for all the actors involved in the region while ensuring that actors at all levels (from cities to supranational actors) are engaged and supported. There is great potential for the use of innovative data sources that complement qualitative work on the ground in developing evidence-based policy and dialogue. These should be harnessed and promoted, particularly among think tanks and donors that promote research. Additional efforts to increase the availability, frequency, and granularity of data would further develop the kinds of analyses like the one presented in this chapter and provide more detail on specific regions, population groups, and sectors. Such evidence should also be considered to reinforce monitoring and evaluation mechanisms as well as program and policy design and knowledge creation.

Fostering environmental protection.

As discussed in Chapters 3, 7, 8, and 12, protected areas ought to be strengthened. This should be done through programs that offer financing for environmental services, as well as through conservation and poverty reduction initiatives. Supporting both regulation and enforcement is essential, with help from better data and improved cadastral systems. So are actions to mitigate and adapt to climate change, particularly among poorer and more vulnerable populations. IC and other population groups must be involved in these initiatives, and their ancestral knowledge and traditional practices should be integrated into the search for solutions.

Promoting human development.

As discussed in Chapters 6, 7, and 8, policies must respond to the diversity of populations in the region. Access to services, including schools, technology, water and sanitation, and transport, among others, ought to be expanded. This should be done considering both human development needs and possible alternatives that can increase access without harming the environment. For example, teacher training, inclusive education, and policies to reduce desertion can enhance educational outcomes. Service provision should also be adapted to rural and urban population needs, making the most of economies of scale that urban centers offer and striving to increase access for more remote populations. In the case of social protection, shock-responsive systems can provide coverage for those most vulnerable to growing climate threats.

Harnessing economic and productive growth.

Finally, as discussed in Chapters 4, 5, 9, 10, and 11, policies that harness economic and productive growth stem from strategies to foster innovation, connectivity, and access to finance. Research and development investment and entrepreneurial support are essential for triggering context-specific innovations that can bring sustainable growth and wealth to the region. Innovations, however, require adequate connectivity and integration to generate export markets and trade that can open up new opportunities, particularly considering urban centers that are central to the region's growth. Multimodal connectivity is key to these endeavors. Access to finance that is equitable and adapted to people's cultural backgrounds and needs is also essential.





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Chapter 02

AMAZONIA FOREVER REGIONAL PROGRAM

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2.1 The Challenge in Amazonia

The undervaluation of Amazonia's natural diversity and the misconception that nature acts as a barrier to economic development has led to profound structural changes throughout the region. Amazonia's ecological, cultural, and economic significance cannot be overstated. However, inconsistent public policies, illicit economic activities, and commodity demands have shaped the development pathways in Amazonia, resulting in market mispricing of natural forests and a plethora of disincentives to sustainable production. As a result, deforestation has become economically rational in many Amazonian regions and has given rise to a complex web of environmental, social, and economic challenges that persist to this day (Carrero et al., 2020; SPA 2021; Mazzucato and Braga 2024).

Unsustainable development patterns have not only undermined the region's economic potential. They have also left Amazonia increasingly vulnerable to the intensifying impacts of climate change. Amazonia faces a future defined by extremes. The symptoms of an unprecedented drought are currently gripping the rainforest with abrupt decreases in water, cutting river communities off from essential supplies, including food (Rodrigues, 2023). But that is not all. Severe droughts, intense flooding, and massive wildfires are becoming the new normal, posing profound challenges with cascading impacts on the region's human, physical, and natural systems (Rodrigues, 2023; Ferreira et al., 2025; Santos de Lima et al., 2024).

Environmental pressures also increase vulnerabilities that are particularly pronounced in Amazonia's rapidly growing urban areas. Amazonia is not only home to important ecosystems; it is also highly urbanized with nearly 70% of its inhabitants living in cities. Geographic isolation and limited infrastructure, however, significantly reduce connectivity across the region, restricting access to basic and affordable services, such as electricity, water, sanitation, healthcare, and education. These limitations result in poverty rates and food insecurity that often exceed national averages, contributing to persistent and structural inequalities among populations in the region.

It is globally recognized that the Amazonia rainforest, a cornerstone of global biodiversity and climate regulation, is approaching a critical and irreversible state of degradation (Lovejoy & Nobre, 2019). Gaining a more nuanced understanding of the diverse drivers of deforestation and their evolving trends across and within Amazonian countries is essential, particularly at subnational and local levels. Such insight is crucial for informing both public and private policy strategies, guiding effective action, monitoring implementation, and evaluating the impact of efforts to halt deforestation (WWF 2023a; Ministry of Environment and Climate Change, 2024). Understanding the productive role of Amazonian cities is also important, as this role has been historically left behind in the endeavor to explain ecosystem and biodiversity loss.

Such understanding is essential for the future. Fostering sustainable and resilient socio-economic development in Amazonia, while preserving the integrity of its natural forests and ecosystems is a delicate balancing act (Hanusch, 2023).

Public and private sector actors are increasingly demanding financial products from multilateral development banks (MDBs). This requires increasing innovation

in financial instruments and mechanisms, as well as a robust strategy for resource mobilization anchored in strengthened partnerships. Through the Amazonia Forever Regional Program (Box 2.1. and Box 2.2.), the IDB is at the forefront of this process, deploying sustainable investment initiatives to help maintain Amazonia within a safe space for future generations.

BOX 2.1.

Amazonia Forever: From Initiative to Regional Program

To respond to Amazonia's challenges, the IDB established the Amazonia Forever Regional Program. The evolution of Amazonia Forever from initiative to regional program represents an important cornerstone in the IDB Group 's approach to regional development, establishing the Bank as the first MDB to create a dedicated territorial regional coordination program for Amazonia. This approach emerged from the recognition that the region's interconnected challenges required methodologies that transcended traditional country-focused development models and financing beyond the MDBs balance sheet.

It all began in 2021 when the IDB approved the Amazon Initiative in response to a request from the eight Amazonian countries for a focused effort aimed at promoting sustainable development models based on the region's human capital, biodiversity, and cultural heritage. The IDB provided $20 million in seed capital and then established the Amazonia Coordination Unit to lead the initiative, creating dedicated capacity for territorial programming that could operate across multiple countries and sectors simultaneously.

The mandate for expanding the initiative into a comprehensive regional program emerged during the IDB's 2023 annual meeting in Panama, where governors signaled their approval for a more ambitious endeavor. In June of that year, the Amazonian governors signed the Amazonia Forever São Paulo Declaration, a joint statement in support of transforming the initiative into a holistic umbrella program.

In 2023, this evolution culminated in the formal launch of Amazonia Forever, a regional coordination program that aims to accelerate sustainable development in three lines of action: expanding innovative financing, boosting knowledge exchange, and facilitating regional coordination among the eight Amazonian countries.

Amazonia Forever has emerged as the leading platform for coordinating international donor financing across Amazonia. It is backed by a coalition of more than nine bilateral and multilateral partners and several climate funds that work in concert throughout the region. The platform's cooperative model is grounded in a multi-level coordination mechanism between the IDB Group and its donor partners, featuring structured dialogue and knowledge-sharing channels at the national, regional, and global levels.

To strengthen institutionality and to maximize regional impact and coordination, Amazonia Forever has also established strategic institutional partnerships.

BOX 2.2.

Amazonia Forever in Figures

IDB's work in Amazonia has expanded to $5.3 billion across eight countries since 2021. The IDB Group is supporting, as of June 2025, a portfolio of 285 projects across loans, technical cooperation, and investment grants, 94 of which are in the preparation stage and 191 under execution.

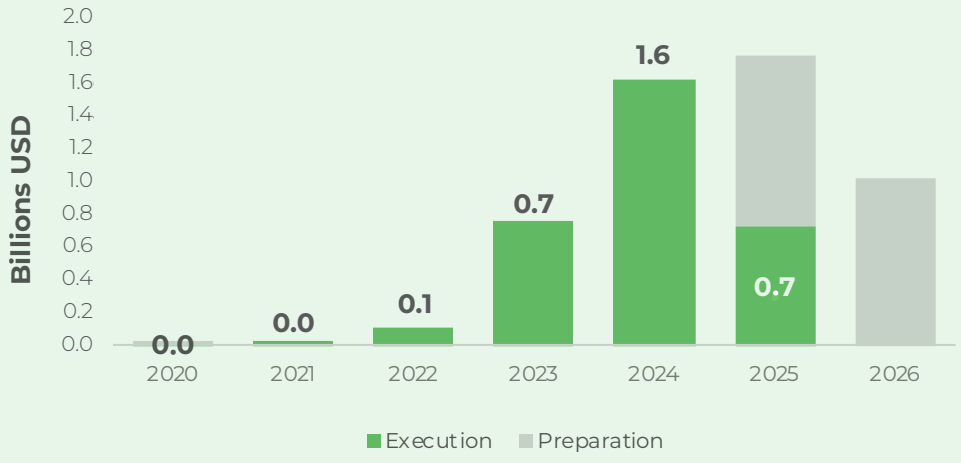
The IDB's Amazonia Forever Program, meanwhile, has been instrumental in leading the financial mobilization capacity in the region, mobilizing $1.2 billion overall. This has included the IDB's ordinary capital to support the Bank's operational programming through the Strategic Development Program for Sustainable Development in the Amazon and concessional climate finance resources mobilized for Amazonia (i.e. of the Green Climate Fund and the Climate Investment Fund). It has also included donor funding, both for the public sector and the private sector (e.g. the Amazonia Multi-Donor Trust Fund with Germany, Italy, Switzerland, the Netherlands, and the United Kingdom, and individual contributions from Wallonia and Spain).

There has been a steady and progressive growth in the volume of resources deployed under the program in recent years. Since 2024, its portfolio has stabilized at approximately $1.5 billion annually, with a current pipeline of roughly $1 billion for 2026, demonstrating both the maturity of the initiative and strong interest from countries, partners, and donors. This upward trend underscores the importance of coordinated efforts, both within the IDB Group and among external stakeholders, to ensure impactful, aligned, and scalable solutions for the region's environmental, social, and economic challenges.

FIGURE 2.1.

IDB's work in Amazonia has expanded to $5.3 billion across eight countries since 2021

Resources under Amazonia Forever by Project Status (USD)



Source: Amazonia Forever Regional Program, July 2025

2.2 A Territorial Approach that Fosters Collaboration and Generates Territorial Intelligence

Amazonia Forever is anchored in a territorial perspective that represents a fundamental strategic shift for the IDB from conventional country-by-country development models toward integrated regional programming. This approach acknowledges that Amazonia's 8.4 million km^2, almost twice as large as the European Union and equivalent to the world's sixth largest country, constitutes a territorial reality that requires deft responses to regional issues.

While each nation faces unique developmental hurdles, the region's interconnected river systems, transboundary ecosystems, shared Indigenous territories, and cross-border economic dynamics create territorial realities that cannot be adequately addressed through purely national approaches.

Central to this approach is the facilitation of multi-country, multi-sector, and multi-stakeholder dialogue that creates synergistic responses to shared territorial challenges. This multilevel approach enables direct collaboration among stakeholders who share common territorial interests across national boundaries or sectoral mandates. This includes Indigenous organizations with territories spanning multiple countries, research institutions studying transboundary ecosystems, private sector actors engaged in regional value chains, and government agencies addressing cross-border challenges. This multi-stakeholder architecture ensures territorial programming that reflects diverse perspectives while mobilizing complementary capacities from government, private sector, civil society, and academic institutions.

Amazonia Forever's approach to sustainable development is anchored in a comprehensive agenda that enhances impact and scale by scaling up financing, strengthening and leveraging collaboration, and facilitating the flow of knowledge among diverse initiatives and stakeholders. The approach recognizes that the vast and complex nature of Amazonia, coupled with the multitude of diverse actors operating within it, requires the systematic management of knowledge to maximize the effectiveness of regional interventions and investments.

The concept of territorial intelligence is fundamental to this strategic framework. It represents the comprehensive understanding of Amazonia's environmental, social, economic, and institutional dynamics within their spatial context, enhanced by advanced analytical capabilities that transform territorial data into actionable insights. Diverse forms of knowledge are integrated - including scientific data, sectoral and operational insights at local and regional scales, and Indigenous and local practices - with sophisticated geographic information systems and spatial analysis to support evidence-based decision-making across multiple scales and sectors.

A critical challenge emerges from the fragmented nature of territorial information across the region. Amazonia Forever addresses this challenge by democratizing access to territorial intelligence through **AmazoniaForever360+**,[19] a central

[19] https://beta.amazoniaforever360.org/en

platform that consolidates and makes this data and knowledge available. Launched in beta version in March 2025, the platform transforms sophisticated territorial analysis into accessible insights through a tiered set of tools specifically designed for users with varying levels of technical expertise.

Strategic **institutional partnerships** are key to amplifying the platform's capacity to generate and share knowledge and territorial intelligence. The future interoperability of the platform with the ACTO's Amazon Regional Observatory creates a unified knowledge ecosystem that combines technical capabilities with institutional networks across all eight Amazonian countries. Technical partnerships with institutions like the RAISG, MapBiomas, the European Space Agency, and the Development Data Partnership will ensure comprehensive, validated territorial intelligence that supports evidence-based collaboration across the region.

2.3 A Multi-Sectoral Agenda that Responds to the Needs and Priorities of Amazonia

The compound and complex array of challenges in Amazonia require **multisectoral and integrated responses** that address the different dimensions of sustainable and resilient development in the region. These challenges are deeply rooted in economic, social, and institutional dynamics and require a comprehensive understanding and an effective action agenda. For those reasons, Amazonia Forever is anchored in a framework composed of five thematic pillars and three transversal areas of action required to maximize impact.

Maintaining and promoting healthy ecosystems in Amazonia depends on dynamics occurring at multiple levels and sectors of national and local economies. Recent examples of deforestation reduction rates in Amazonian countries, for example, reveal promising development pathways linked to ambitious climate change and biodiversity commitments. This first thematic pillar of combating deforestation provides evidence to inform practices and policies to overcome the most pressing **challenges driving deforestation and ecosystem degradation**, as well as examining the extent to which these drivers undermine competitiveness and productivity in key Amazonian territories. Through strategic selectivity, the IDB can support territories that require particular attention given their multi-dimensional vulnerability and fragile conditions, with a particular attention to border territories.

Environmental crime and territorial/human security also require attention through a comprehensive understanding of the vicious cycle between illegal activities, environmental crime, insecurity, deforestation, and ecosystem degradation. The most violent, socially and ecologically damaged territories in Amazonia are probably those impacted by the effects of illegal gold mining, a

phenomenon that has turned the region into an epicenter of environmental crises with global implications. To respond to these challenges, this pillar addresses the illicit activities and markets in Amazonia that prevent public and private investment in sustainable development. It explores ways to disrupt harmful activities while seeking sustainable alternatives that protect the most vulnerable populations.

The second thematic pillar seeks to foster the **bioeconomy** as a pathway to value the natural capital of Amazonia through economic activities that are climate-, biodiversity- and nature-positive. It promotes sustainable land-use practices that enhance ecosystem integrity, generate net gains in natural capital, and strengthen the climate resilience of both vulnerable populations and ecosystems. It also highlights the opportunities presented by creative economies,[20] which can complement and reinforce bioeconomy development in Amazonia. While still an evolving and fluid concept, bioeconomy is increasingly recognized in policy agendas across Amazonian countries as a powerful lever for climate resilience and sustainable development. In 2024, Brazil's G20 presidency marked a milestone by adopting the High-Level Principles on Bioeconomy that stressed the importance of biodiversity conservation, sustainable resource use, responsible innovation, and climate action. Amazonian countries are now beginning to translate these high-level commitments into action.

The **creative economy**, based on creative goods and services, has become one of the fastest-growing sectors of the global economy, not only in employment generation but also in export earnings. In Amazonia, it has the potential to boost other sustainable economies, by valuing the region's cultural and creative production. Amazonia Forever seeks to identify and maximize the potential of cultural and creative assets, connect local creatives, and unlock the potential of these industries as pillars of economic resilience and social inclusion (Inthamoussu et al., 2024).

Investing in **people and human capital development**, the third thematic pillar, can address multiple challenges including equitable access to services, systemic barriers, and the sustaining of long-term impacts. Financial sustainability and the strengthening of permanent institutions also depend on enhancing human capital in Amazonia.

Improving access to **essential services** in Amazonia can yield significant impacts, particularly in areas like early childhood development and **education**. Persistent disparities in access to quality education, especially in rural or underserved areas, and the needs of children from disadvantaged backgrounds, remain major concerns. Extreme heat conditions, expected to become more frequent and intense in Amazonia, can also affect the number of out-of-school children and youth and lead to late and disrupted educational trajectories, affecting learning in Amazonian territories and generating a need for investment in heat-resistant educational infrastructure.

In the **health sector**, addressing infrastructure gaps, overcoming shortages of healthcare professionals, and ensuring that services are culturally appropriate and reach remote populations are critical priorities. Amazonia Forever is supporting innovative and resilient health service models to reach remote and IC. It is strengthening emergency response and management systems; expanding hospital, maternal and neonatal care infrastructure, capacity and services;

[20] Creative economy has no single definition. The United Nations Trade and Development Organization refers to creative economy as a concept which builds on the interplay between human creativity and ideas and intellectual property, knowledge and technology. It is the sum of all the parts of the creative industries, including trade, labor, and production.

enhancing primary care to improve service integration and quality for vulnerable groups; and investing in Digital Health and Point-of-Care diagnostics.

Nature- and climate-related risks in Amazonia are so frequent and severe that current response strategies fall short. Countries need to integrate disaster risk management into their social protection systems. Adaptive **social protection**, combining traditional support with climate resilience, is gaining traction as a tool for poverty reduction measures and the strengthening of institutional capacity to manage emerging climate risks. Amazonia Forever is supporting the expansion and efficiency of targeting and digital payments in social protection systems and assessing and strengthening countries' social protection systems' preparedness for disasters via maturity models,[21] better social registries, payment systems, and program adaptability, including in high-risk areas of Amazonia.

Human capital is the region's most valuable asset. Yet individual incomes are 30% below national averages, largely due to lower **educational and skill** levels (Attanasio et al., 2025). Unlocking the region's socio-bioeconomy potential requires investing in job and skills creation and youth skills. Amazonia Forever supports Technical and Vocational Education and Training (TVET) through hybrid programs tailored to local economies and green sectors. These efforts are guided by labor market diagnostics, including the promotion of pilot projects for job training, youth employability, and productive inclusion for vulnerable youth.

The thematic pillar involving **cities, connectivity and resilient infrastructure** focuses on how sustainable and climate resilient infrastructure in Amazonia can enhance access to services and connectivity for the most vulnerable populations and raise the productivity and competitiveness of urban and peri-urban areas. Through Amazonia Forever's support, efforts are underway to strengthen a collective understanding of the role cities play and how urban growth influences sustainable development. Consideration is given to the policies, institutional reforms, and governance innovations needed to increase the resilience of Amazonian cities to achieve related environmental and fiscal benefits.

Amazonia Forever's territorial approach emphasizes that the net-positive impacts of transport interventions, particularly those related to connectivity, trade, logistics, integration, and the social fabric, should be assessed on a case-by-case basis. The justification for enhancing integration, connectivity, and access must be aligned with the scale and scope of each intervention. In this context, decoupling infrastructure development from deforestation and ecosystem loss is essential. Among transport modes, fluvial transport is increasingly vital for riverine communities, but recent prolonged droughts have disrupted navigation, highlighting the need for resilient transport strategies (Santos de Lima et al., 2024).

Investing in energy infrastructure in Amazonia is also critical. Despite its vast natural resources, the region still faces a significant deficit in energy access, as around 3.5 million people currently live without electricity. Closing this gap will require nearly $2.2 billion in investment (WWF, 2023b; RAISG, 2022). Through Amazonia Forever, efforts are focused on expanding access to clean energy, promoting off-grid solutions, and supporting decarbonization and energy efficiency aligned with Just Transition principles. Key challenges remain in reaching underserved populations and remote territories. But there are growing opportunities to implement innovative, locally led solutions that can provide clean, reliable, and affordable energy while

[21] The maturity model is an assessment tool that seeks to measure the capacity of social protection systems to enhance the ability of impoverished and vulnerable households to withstand and recover from various shocks, such as those associated with climate change (Beazley et al., 2024).

generating socio-economic benefits. Regional policy frameworks and collaborative dialogue can help guide these efforts, promote integration, and ensure that energy transitions in Amazonia are inclusive, climate-resilient, and equitable.

Boosting sustainable and low-carbon agricultural production and the transition to sustainable models of livestock management that are integrated with forest protection is the main objective of the program's fifth thematic pillar. Deforestation in Amazonia is largely driven by competition for land-based resources, particularly crop production and livestock. Agricultural diversity also holds great potential to make food systems more nutrition-sensitive and enhance food security, especially for the most vulnerable populations in Amazonia. The social and ecological diversity of food systems in the region can play a critical role in strengthening local and regional economies while supporting healthy, resilient ecosystems.

This pillar also addresses the need for agricultural and food systems to transition from being a source of environmental degradation to becoming one of the most powerful tools for climate action. They must, in the process, support people and their livelihoods and be consistent with new international commodity trade policies (e.g. the Europea Union Deforestation Regulation). Sustainable, resilient, and low-carbon agriculture and livestock practices can offer opportunities to restore degraded areas through the adoption of technological innovations and land-use systems that align with biodiversity conservation goals. Decarbonizing the livestock sector, one of the main sources of greenhouse gas emissions in the region, requires the mobilization of both public and private resources through tailored incentives. Operations aligned with Amazonia Forever are testing which livestock production systems can both reduce emissions and improve the livelihoods of producers. Scaling these efforts will require targeted decarbonization policies, supportive regulations, and strong institutional frameworks. In this context, private investments can be leveraged to promote low-emission livestock practices and more sustainable commercialization pathways. Fisheries and aquaculture are also contemplated as opportunities for sustainable development at the local level.



2.4 Strengthening IDB's engagement with Indigenous Peoples, Traditional Communities, and Afro-Descendent Organizations

Less than 1% of international climate finance was directed toward issues related to land tenure and forest management for IC between 2011 and 2020 (Hatcher et al., 2021). Indeed, most conservation efforts fail to recognize the critical role of Indigenous Peoples and their territories for preserving biodiversity and ecosystems (Nóbrega et al., 2023), despite recent data indicating that their lands are associated with a 29%–55% reduction in forest loss when compared to other areas (Sangat, et al., 2025). The development of Indigenous projects requires high levels of intra- and inter-community participation, multilevel engagement, and self-directed planning. Traditional knowledge must be integrated as an essential resource. These approaches often do not align with the highly technical frameworks used by external decision-makers and funders, making them difficult to interpret. As a result, Indigenous Peoples remain dependent on third party organizations or other intermediaries for fund-seeking and management or are integrated in the financial sphere, for example, through niche financial institutions (IDB, forthcoming). At the same time, there is a growing demand from Indigenous Peoples, Afro-descendants and Traditional Communities for direct financing mechanisms that emphasize capacity building and autonomy in designing and implementing projects. Research consistently shows that when communities are actively involved in project design and implementation, they are more likely to take ownership of both the process and its outcomes, significantly enhancing the sustainability and long-term impact of development initiatives.

To close the funding gap and reduce the dependency on technical mediation, an innovative strategy to work directly with Peoples, Afro-descendants and Traditional Communities organizations was launched to start direct financing through Amazonia Forever. The strategy is composed of three key elements:

1. MINGA[22]

Consists of a team of professionals, most of whom are Indigenous, who work at the IDB. The team works hand-in hand with Peoples, Afro-descendants and Traditional Communities organizations to co-design projects, identify financing in a participatory manner, include these organizations in the IDB's pipeline, and provide support in executing and monitoring the projects.

2. Inclusive Project Co-Design with Peoples, Afro-descendants and Traditional Communities Organizations

Collaborating with all regional and national Peoples, Afro-descendants and Traditional Communities organizations in Amazonia to co-design development projects, prioritizing those that will be executed directly by the organizations through direct financing.

[22] Stands for 'collaborative work' in Kichwua.

3. The Amazonia for Life Fund

The fund was launched in 2023 with an envelope of $10 million for financing developing projects that exclusively benefit Indigenous Peoples in Amazonia. It was announced during COP28 (2023) and was established in coordination with COICA.

The core mission of this strategy and its three components is to promote empowerment, self-determination, and self-sufficiency through projects that are designed and proposed directly by national Indigenous organizations. The combination of Amazona Life Fund with MINGA ensures that initiatives are culturally relevant, sustainable, and rooted in the priorities of the communities themselves. Direct implementation by Indigenous organizations enables capacity building. It promotes consultation, participation, and the use of Indigenous decision-making mechanisms and traditional knowledge to ensure that the voices of the communities are heard and respected. A gender and generational approach is also applied, highlighting the talents of Indigenous youth.

The IDB and COICA are technically supporting the entire process to ensure proper project design, execution, and monitoring. Projects under Amazona Life Fund are financed by different funding sources under Amazonia Forever.[23] In addition to these funding sources, the IDB supports Amazona Life Fund through technical cooperations that benefit Indigenous organizations directly. All resources are managed in accordance with IDB policies and are channeled to the executing agencies, which are the national Indigenous Organizations responsible for implementing each project.

The first project under this innovative strategy is currently being implemented by the Interethnic Association for the Development of the Peruvian Rainforest in the Peruvian Amazonia. Approved in 2024 by the IDB, this investment grant will improve bio-enterprise management capabilities and the quality of production of Indigenous enterprises. It will also support the execution of Indigenous Life Plans, upholding, in the process, Indigenous perspectives on economic development, food sovereignty, and territorial protection.

2.5 Fostering Regional Collaboration Through Collective Effort, Co-creation, and Ownership

Amazonia Forever hinges on a deeply collaborative implementation approach, one that is rooted in collective effort, co-creation, knowledge transfer, and shared ownership. The program has activated a set of regional and thematic networks and partnerships to address critical gaps, scale up financing, boost knowledge, and support the implementation of different treaties, declarations, and action plans. These efforts aim to reduce persistent social, ecological, and economic disparities across the region, using a territorial approach.

[23] See here for more information.

Serving as both an articulator and contributor, Amazonia Forever plays a central role in convening and strengthening these networks and strategic partnerships to maximize the reach and scope of the program. Those networks and partnerships serve as vehicles for dialogue, coordination, and innovation, enabling the alignment of national priorities with shared regional goals while fostering a more integrated and resilient Amazonia. Since its establishment in 2023, Amazonia Forever has expanded so that there are now 12 such partnerships and networks with which it coordinates, exemplifying the IDBs role as both a financial and knowledge partner.

REGIONAL POLICY NETWORKS:

- **The Network of Ministers of Finance and Planning.** This network and a technical group were established in 2023 by the IDB governors of the Amazonian countries, committed to joining efforts for the sustainable development of the region. They oversee **Amazonia Forever's** progress on economic and financial matters, including scaling up financing, joint taxonomies, and innovative financing instruments.
- **The Amazonia Network of Ministers of Education.** This network is committed to accelerating and intensifying efforts to improve access, quality, and the territorial relevance of education in urban and rural areas while focusing on inter-cultural education.
- **The Amazonia Working Group of the Forum of Ministers and High Authorities of Housing and Urban Development.** For the first time, the forum has a working group of the eight Amazonian countries, focused on fostering regional cooperation, knowledge exchange and collaboratively developing a strategic framework for sustainable urban development.
- **Alliance for Sustainable, Resilient, and Integrated Transport in the Amazon.** This alliance is a joint initiative led by the IDB, the World Bank, federal and subnational governments, and international and local stakeholders to support initiatives and projects that transform transport infrastructure and services in the Amazonia Region.

SUBNATIONAL AND LOCAL GOVERNANCE NETWORKS:

- **The Amazon Cities Forum.** This city-led initiative brings together 44 cities across the eight Amazonian countries to develop a shared strategic agenda for sustainable urban development in the region. It promotes knowledge exchange, provides technical assistance to member cities, and implements pilot projects on climate resilience. The Forum also positions the debate on urbanization in Amazonia and the role of local governments within the global sustainable development and climate governance arenas.
- **Consortium of Brazilian Amazonian States.** The program supports and fosters synergies that promote and reinforce the actions of the Interstate Consortium for Sustainable Development of the Legal Amazon (Consórcio Interestadual de Desenvolvimento Sustentável da Amazônia Legal) in land regularization processes, bioeconomy, fiscal diagnoses, and the sharing of knowledge and experiences with strategic stakeholders.

FINANCE NETWORKS:

- **The Green Coalition.** The alliance, comprising 20 public development banks from the Amazonia Region, aims to mobilize resources, identify and finance projects, and build capacity to boost investments in conservation, renewable energy, and green infrastructure across the region.

- **The Amazonia Finance Network.** In late 2023, IDB Invest and the International Finance Corporation launched this network. As of June 2025, it comprises 59 private financial institutions, working together to coordinate and mobilize resources and finance pilot projects that promote sustainable investments in the Amazonia Region.

KNOWLEDGE AND RESEARCH NETWORKS:

- **The AmazoniaForever360+.** This territorial intelligence platform was launched in beta version in March 2025, making advanced territorial analysis more accessible by delivering user-friendly insights tailored to varying levels of technical expertise, while enhancing access to data and knowledge about the Amazonia Region (See Section 2.2.).

- **The Amazonia Forever Partners Platform.** Currently in the development stage, the platform is working to provide a comprehensive vision of the origin and destination of financial flows— from donors, private investors, and domestic public resources—to facilitate stronger coordination among partners seeking greater impact in Amazonia.

- **The BioAmazonia Network.** This is a leading network and global reference in biodiversity research and innovation under interdisciplinary, transdisciplinary, and transboundary collaboration schemes between institutes, governments, companies, and communities.

- **PanAmazonia Network for Bioeconomy.** This multisectoral alliance is committed to promoting a locally led sustainable bioeconomy across Amazonia, focusing on an economic pathway that prioritizes the conservation of standing forests, the rich biodiversity of the region, and the well-being of its population.

MULTILATERAL PARTNERSHIPS:

- **Partnership with ACTO.** The IDB is providing targeted technical assistance to ACTO as part of its commitment to strengthening regional governance in Amazonia. This collaboration is particularly significant in the context of the Declaration of Belém, a landmark agreement adopted by Amazonian countries in 2023 to promote coordinated action on climate change, biodiversity, Indigenous rights, and sustainable economic development.

- **Partnership with the World Bank.** The World Bank and the IDB signed a four-year partnership agreement through which the organizations combine their expertise to support countries transitioning to net-zero-deforestation. Under the agreement, the World Bank's Amazonia Viva initiative works under the

Amazonia Forever umbrella to develop innovative financial instruments such as Amazonia Bonds and the Amazonia Finance Network. The latter was launched with the International Financial Corporation.

2.6 Scaling Up Financing Through the Provision of Specialized and Tailored Funding Support

The sustained growth in resources managed by the IDB under the technical coordination of Amazonia Forever reflects a strengthened capacity to finance transformative interventions across the region. As of March 2025, Amazonia Forever coordinates about $1.2 billion in resources mobilized from ten international donors and partners and contributions from the balance sheet of the IDB, including:

The Seed/Transitory Ordinary Capital Strategic Development Program for Sustainable Development in the Amazon

Established in 2021, this is an allocation of $20 million from IDBs ordinary capital for a period of five years aimed at providing strategic technical support to clients for the ideation, preparation, and execution of IDB lending operations across all the thematic areas mentioned above. A mid-term evaluation conducted in 2024 highlighted the Seed Funds' positive impact in addressing climate change and advancing the Sustainable Development Goals through a combination of direct interventions in critical areas, effective project management practices, and a strong focus on inclusive and sustainable development principles.

The Amazon Bioeconomy and Forest Management Multi-Donor Fund

Established in 2021, this supports national, subnational, public, and private entities in Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela in planning, designing, and implementing investments in support of sustainable agriculture; livestock and forest management; and bioeconomy. It also supports the integration of three transversal issues: forest conservation; gender and diversity; and institutional strengthening. The fund receives contributions from Germany, the Netherlands, Switzerland, the United Kingdom, and Italy.

The Amazon Bioeconomy Fund

Is a seven-year program initiated in 2022. It supports private investment in bio-businesses with a catalytic investment of $279 million from the Green Climate Fund. The investments include sovereign investment loans, green bonds,

investment grants, risk capital investment (equity), and technical assistance to encourage private investment in targeted value chains.

The Agence Wallonne à l'Exportation et aux Investissements Etrangers of Belgium

Has contributed $2 million to Amazonia Forever since 2021 to support high impact interventions in the region with a focus on innovation, digitalization, and entrepreneurship.

In 2024, the IDB and the Swedish International Development Cooperation Agency

Enhanced their pioneering efforts in utilizing credit-substitution guarantees, a key instrument in the IDBs' balance sheet optimization strategies, enabling the IDB to increase its lending capacity for Amazonia by $469 million. This additional capacity will facilitate expanded investments in forest conservation, sustainable forest management, resilient landscapes, and the bioeconomy in Amazonian countries.

The Spanish General Cooperation Fund

Has provided support to private sector development in Amazonia by bolstering sustainability in bioeconomy and commodities supply chains with EUR 4 million in contributions since 2022. It adds to the Spanish Agency for International Development Cooperation's contribution of EUR 2 million to support the "Amazonia Bonds" initiative.

The Amazon Clean Energy Accelerator

Was established with resources from the Climate Investment Funds amounting to $215 million in reimbursable and non-reimbursable resources to support eligible Amazonian countries in achieving a just energy transition. The focus is on universal access to clean energy, the decarbonization of electricity systems, clean cooking, and the expansion of emerging clean technologies and solutions in Amazonian regions. The program also addresses financial needs in other crucial areas, such as sustainable transportation.

Finally, the Improving Climate Resilience by Increasing Water Security in the Amazon Basin Program

Aims to enhance climate resilience in water resources management by improving the preparedness and response of water, sanitation and waste services to extreme climate events. The program was approved by the Green Climate Fund Board in 2025 and will benefit from a $162.15 million contribution from the Green Climate Fund.

Key achievements include the approval of three loans under the Green Climate Fund's Amazon Bioeconomy Fund in Suriname (2024), Brazil (2025) and Ecuador

(2024), and the combining of loans, guarantees, and technical assistance to expand credit for bio-businesses. These initiatives will benefit 14,000 micro, small and medium enterprises (MSMEs) and producers with a focus on women-led and Indigenous-led enterprises. A milestone was attained in 2025 through ProAmazonia, a $900 million program with the Brazilian Development Bank (BNDES). This initiative supports productivity and job creation among MSMEs in the Brazilian Amazonia by promoting productive investments in sustainable economic activities under zero-deforestation conditions. Another milestone is a $45 million loan to provide villages in rural areas of Suriname with reliable access to renewable-energy-based electricity, potable water, and telecommunication systems, with a focus on fostering the development of the bioeconomy with a gender and diversity perspective.

2.7 Financial Innovation at the Core of Our Operations

Amazonia faces a funding gap measured in billions, far beyond the reach of any single development bank. Amazonia Forever places financial innovation and mobilization at the center of its strategy.

Scaling up financing and the provision of specialized and tailored funding support illustrates that **the IDB Group's synergies** can leverage strengths, resources, expertise, and effort through a public-private continuum that allows for the mobilization of private sector resources and the delivery of development outcomes. In this sense, IDB Invest activities in Amazonia experienced an extraordinary leap forward in 2024.

The **IDB Invest Amazonia Forever Roadmap** (2024) presents a strategy for increasing the number and volume of projects across all Amazonian countries, build capacity and generate knowledge around new business models and practices, and create regional action networks with partners such as firms and investors. The roadmap incorporates the need to leverage business expertise in urban areas to address the challenges of delivering essential services. It also incorporates the need to scale sustainable agribusinesses practices and expand energy and broadband access, while promoting nature-based and bioeconomy solutions in non-urban areas.

The **IDB Lab,** the innovation and venture capital arm of the IDB, has a strategy for Amazonia that is also guided by Amazonia Forever's thematic pillars. The IDB Lab focuses on unlocking early-stage solutions that can transform local economies and protect natural ecosystems. In Amazonia, it supports inclusive and regenerative models. These initiatives include Amazon BeEco, which provides training, technical assistance, and connections to markets and finance; support in Colombia for Pantera Makers, the first private accelerator in Amazonia to strengthen local bio-entrepreneurs and connect them with investment opportunities; and NaturaTech,

which co-creates digital and financial tools with Indigenous and local leaders to enhance conservation rooted in ancestral knowledge and regenerative justice.

Mobilizing private investment is notoriously difficult in frontier markets such as Amazonia, where market and non-market barriers restrict access to scale. The IDB, with support from Amazonia Forever Funds, is spurring innovative financial instruments, from risk-mitigation tools and concessional capital to liquidity solutions, that are designed to overcome these obstacles.

From Amazonia Bonds to Debt for Nature Swaps

Seeking to assist issuers in the issuance process for Amazonia Bonds and attract private investors, the IDB, in collaboration with the World Bank, developed the Amazonia Bond Issuance Guidelines. These are aligned with the Green Bond Principles, Social Bond Principles, and Sustainability Bond Guidelines of the International Capital Market Association. They provide suggested, region-specific adaptations to align investments, thus addressing the unique challenges and priorities of the Amazonia Region and helping the local population pursue better livelihoods (Box A.1.).

At the sovereign level, Ecuador is demonstrating how nature conservation and debt management can work in tandem through a debt-for-nature swap supported by the IDB. This transaction refinances commercial liabilities while directing conservation funding to support the Amazon Bio-Corridor Program in the Ecuadorian Amazonia. It is the first terrestrial debt swap of its kind, aiming to improve the management of 4.6 million hectares of already existing protected areas, establish new protected areas over 1.8 million hectares of forests and wetlands, and protect 18,000 kilometers of rivers. The deal is expected to generate over $800 million in debt-service relief over 11 years and unlock $460 million for terrestrial and freshwater conservation over the next 17 years. Most of the funds will be disbursed through grants by the newly established Amazon Biocorridor Fund, an independent conservation trust focusing on the Ecuadorian Amazonia and governed by a local board that includes representatives from government, Indigenous groups, local communities, academia, finance, sustainable development organizations, and private enterprise.

Turning the Local-Currency Challenge into Opportunity

Doing business in Amazonia almost always means dealing in local currency. Yet most concessional finance arrives in United States dollars or Euros. Currency mismatches can erode the concessionality that those funds are meant to provide. To address this challenge, the IDB partnered with the Government of Brazil to launch Eco Invest. Since the first auction, Eco Invest has been providing catalytic capital to leverage private investments at scale to address challenges in Amazonia. Meanwhile, the IDB has been working to develop and support the launch of a dedicated auction for the region. Among other core offerings, it offers a contingent credit line that provides rapid bridge financing when exchange rate thresholds are breached. This protects eligible Amazonian projects with local currency inflation-indexed revenues from cash stress through financing in hard currency. By offering a credible safety net, the facility increases lender confidence and enables more

competitive foreign currency financing for projects, making it a cost-effective, alternative, foreign exchange risk management tool (Box A.2).

Deploying Blended Finance for Nature-based Solutions

Lack of access to capital is one of the main barriers to accelerating paradigm shifts in business models and technologies that sustainably use natural capital and forest assets. Amazonia Forever has been a pioneer in the use of blended finance for nature-based solutions and investments in the bioeconomy. With projects in Brazil, Ecuador, Peru, and Suriname, the IDB has been testing a mix of financial instruments—sovereign investment loans, reimbursable investments grants, risk capital investments (equity), and guarantees—in order to de-risk bio-businesses in Amazonia and accelerate market expansions.

Expanding Lending Power through Guarantees

To stretch the finite headroom of MDBs´ balance sheets, Amazonia Forever has pioneered external credit-substitution guarantees with partners such as the Swedish Development Agency. These donor-backed guarantees free up IDB capital for additional climate-smart lending across landscapes, forestry, and the bioeconomy. The program also explores cross-guarantees among multiple development agencies so they can jointly shoulder risk for high-impact operations that spill across national borders.

Reducing Political Risk for Private Sector Mobilization

The IDB has also assisted the development of Brazil's first forest concession focused on ecological restoration, supporting the project design and political risk guarantee to de-risk a concession model that transfers restoration responsibilities to the private sector. This enables the recovery of 9,980 hectares of degraded forest via assisted natural regeneration, native species planting, and maintenance.

New Frontiers: Biodiversity Credits and Results-Based Pricing

Where markets undervalue ecosystem services, Amazonia Forever is testing biodiversity and high-integrity forest credit schemes that monetize habitat protection, drawing lessons from past payment-for-ecosystem-services programs while insisting on stronger impact verification. These pilots are expected to be scaled-up through outcome-based bonds and other forms of results-based pricing.

By blending new incentives, bespoke risk-sharing, local-currency swaps with performance-based incentives, and thematic capital-market instruments, the program shows how effective design can accelerate innovative finance in Amazonia. By pairing the instruments with upstream and downstream technical assistance resources, it is constructing an integrated toolbox capable of mobilizing public, philanthropic, and, most importantly, private capital at the speed and magnitude the Amazonia rainforest requires.

2.8 Conclusion: An Evolving Sectoral Agenda

Amazonia Forever is structured around a flexible framework that enables the swift integration of prospective and innovative themes. As a regional knowledge hub, it seeks to identify emerging challenges and innovative responses and is currently advancing a series of emerging action agendas.

Strengthening Citizen Security and Justice in Amazonia

Organized crime continues to expand across remote areas of Amazonia, fueling illicit activities such as drug trafficking, illegal mining, and deforestation. Strengthening prevention and response mechanisms is critical to protecting vulnerable communities, upholding the rule of law, and safeguarding the region's ecological and social integrity. The Alliance for Security, Justice, and Development, established in December 2024 with support from the IDB, offers an opportunity to strengthen security in Amazonia through the following areas of work: protecting the most vulnerable populations and communities, strengthening security and justice institutions, disrupting financial flows, and containing illicit markets.

Gastronomy and Resilient Food Systems

TasteAmazonia is a transformative initiative that unlocks Amazonia's biodiversity potential through gastronomy. Addressing the critical underutilization of the region's biodiversity, the initiative operates through four components: entrepreneurial ecosystem development; innovation and knowledge sharing through the TasteAmazonia Hubs Network; regional food security and climate adaptation; and market systems and sustainable trade development.

Food Security and Population Migration

Food security plays a crucial role especially during early child development, with lasting impacts on adult health (Buritica et al., 2024). However, malnutrition remains a persistent challenge in Amazonia, exacerbated by climate-related disruptions to food access and availability. There is a growing need to understand how these environmental stressors intersect with migratory and population dynamics in Amazonia (i.e. rural to urban), as these dynamics influence food preferences, patterns, and dietary demand (e.g. Chaves et al., 2024).

De-Risking Amazonia

This initiative, currently under development, addresses integrity risks that create barriers to bioeconomy investment in Amazonia, a region where complex challenges, including drug trafficking, other illegal activities, unclear land tenure, and weak institutional capacity, deter private sector engagement.

Alluvial Gold Mining

Around 40% to 50% of alluvial, artisanal and small-scale gold mining operations take place in protected areas and their buffer zones, as well as in local communities and Indigenous territories in Amazonia. Restoring degraded lands and ecosystems affected by these activities remains a critical yet costly endeavor. There is an urgent need to advance scalable restoration models, strengthen regulatory frameworks, and promote inclusive approaches that respect Indigenous rights and territorial governance.

The Restoration of Ecosystems

Requires planning, high up-front investment with slow returns, monitoring, and strong government commitment. Greater ambition in terms of climate commitments creates an opportunity for collaborative effort. For example, Brazil has committed to restoring 12 million hectares of forests by 2030 in its revised nationally determined contributions (NDCs). Engaging local communities in restoration projects is equally important. It can diversify income sources and strengthen local markets through agroforestry, ecotourism, and the harvesting of non-timber forest products (NTFPs) while creating job opportunities. However, there are still significant information gaps and a lack of practical understanding as to how to effectively foster restoration in Amazonia to achieve impact at scale.

The Most Vulnerable Populations in Amazonian Cities

Urban expansion and the poor condition of urban infrastructure, including mobility and sanitation services, worsen living conditions. Vulnerable groups such as women, Indigenous Peoples, and Afro-descendants are more likely to live in informal settlements. Ensuring their access to documentation that regularizes their status and validates their qualifications is essential for enabling their entry into the labor market and achieving their quality integration.

Waste and the Circular Economy

Many parts of Amazonia are increasingly urban and suffer from a lack of basic urban services, such as waste management. Health-related problems caused by inadequate or inexistent waste management systems are exacerbated during the flooding season. The design of new development pathways based on the principles of the circular economy—moving beyond the traditional take-make-consume-dispose model (linear economy) —offers a promising alternative approach that can align biodiversity conservation and changes in the urban setting.

Financial Protection Against Disasters

Addressing the lack of financial protection mechanisms against extreme climate events, such as floods and droughts, in Amazonia is critical. While building resilient infrastructure can help reduce the damage caused by disasters, some impacts remain unavoidable. Risks cannot be fully eliminated, at least not in a cost-effective

way, and extreme events will probably cause acute damage and disruption to some services and infrastructure, potentially undermining incentives for preventive action. Innovative risk transfer/pooling solutions could provide municipality-level financial protection for vulnerable Amazonian communities and existing assets. This, in turn, would enable the conditions for further investments in sustainable and climate-resilient infrastructure.

Considerations for the Present and Future

Through the Amazonia Forever Regional Coordination Program, the IDB has pioneered a new approach to working in complex territories where social and environmental systems are deeply intertwined and hold significance not only at the local and regional levels, but globally. By prioritizing territorial intelligence and the need for collaborative action, the program has reshaped the way the IDB engages in regional integration. The program exemplifies the evolving role of MDBs, highlighting the importance of spatially grounded knowledge, innovative financing instruments, and strong, trust-based partnerships with Indigenous Peoples, Afro-descendent communities, local populations, the private sector, and other financial actors. As such, Amazonia Forever has provided experience and a model for the design and strategic direction of other IDB regional initiatives by demonstrating the value of integrated, multisectoral approaches rooted in territorial and cultural specificity, such as ONE Caribbean, South Connection, and “América en el Centro.” This integrated approach offers a new pathway for sustainable and inclusive development that delivers impact at scale.



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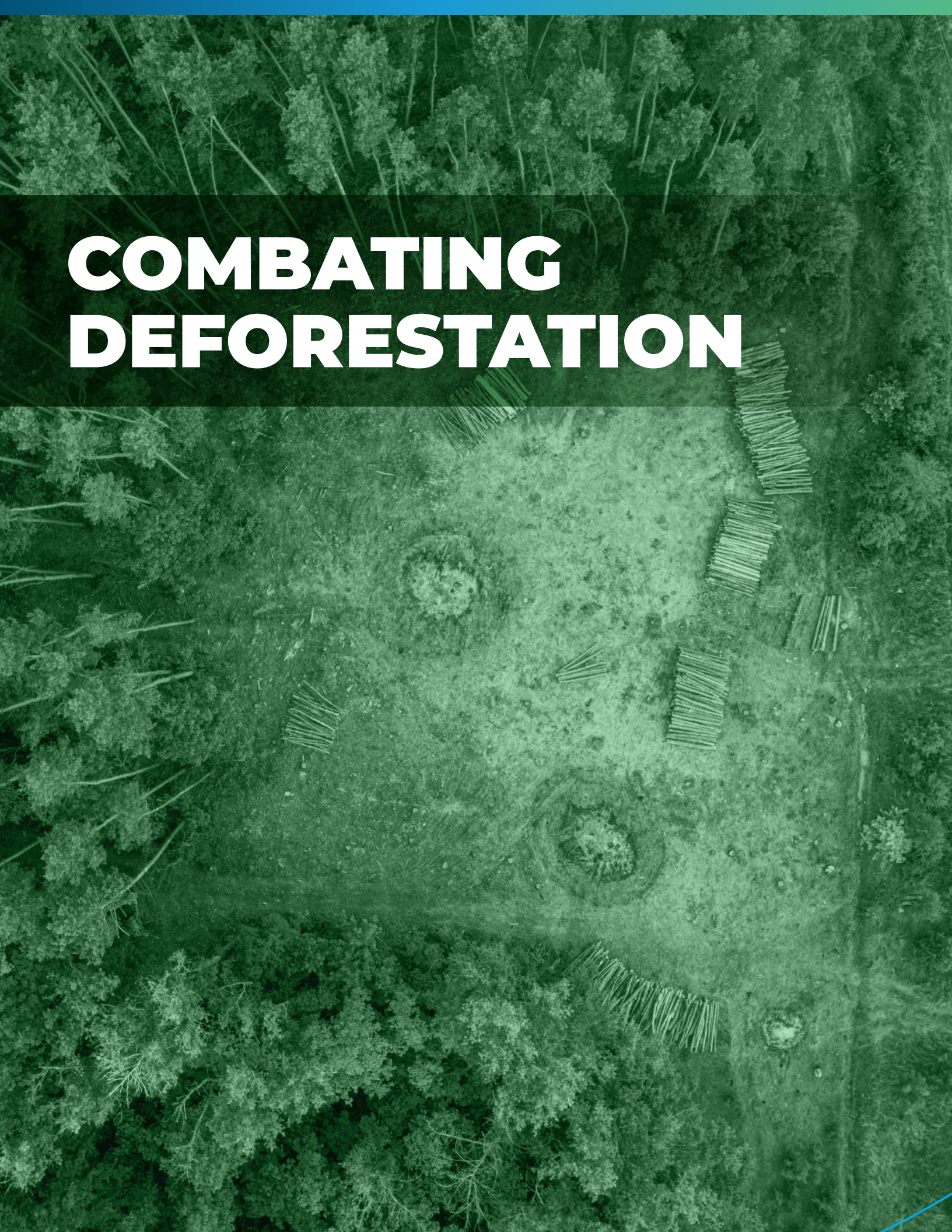
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COMBATING DEFORESTATION

Chapter

03

CONSERVING FORESTS

Allen Blackman, Rodrigo Serrano Berthet & Brent Sohngen



3.1 Introduction: Hope Amid Forest Loss

The vast forests of Amazonia provide critically important ecosystem services to both the region and the world. They store carbon, harbor countless plants and animals, and cycle water and nutrients. They also provide valuable cultural services to Amazonia's inhabitants .

Nonetheless, Amazonia's forests are often taken for granted. Human encroachment has grown steadily over time, converting large forest expanses into land for animal and crop agriculture, mineral and energy extraction, and degraded lands.

Despite mounting concern that forest loss will be exacerbated by a rapidly expanding transportation network, growing demand for food, newly discovered minerals, illegal land use, and lagging investments in climate mitigation, there is hope. The countries of Amazonia and their national and international partners have invested considerable resources to address forest loss and degradation. Their toolbox includes a range of interventions, such as designating areas as officially protected or under the control of local IC, strengthening regulatory enforcement, developing short-term sustainable use rights in the form of forest concessions, and encouraging payments-for-environmental-services (PES) programs.

This chapter provides an overview of the issues and challenges related to forest loss and degradation in Amazonia. It also reviews leading approaches and efforts that are being used to slow deforestation and encourage forest restoration.

3.2 Measuring Deforestation and Forest Degradation

Our ability to monitor and measure land use change has improved significantly over the past half-century due to advances in satellite and computational technology (Hansen et al., 2013). More and more high-resolution land use change data are publicly available. Among the most widely used are the World Resources Institute (WRI) Global Forest Watch data (World Resources Institute, 2025). With a spatial resolution of 30m2, these data enable analysis of forest loss at the level of regions such as Amazonia. Other sources of data on deforestation, like those from the Food and Agriculture Organization of the United Nations (FAO, 2020), are produced at the country-level and measure net deforestation (the difference between forest loss and gain).

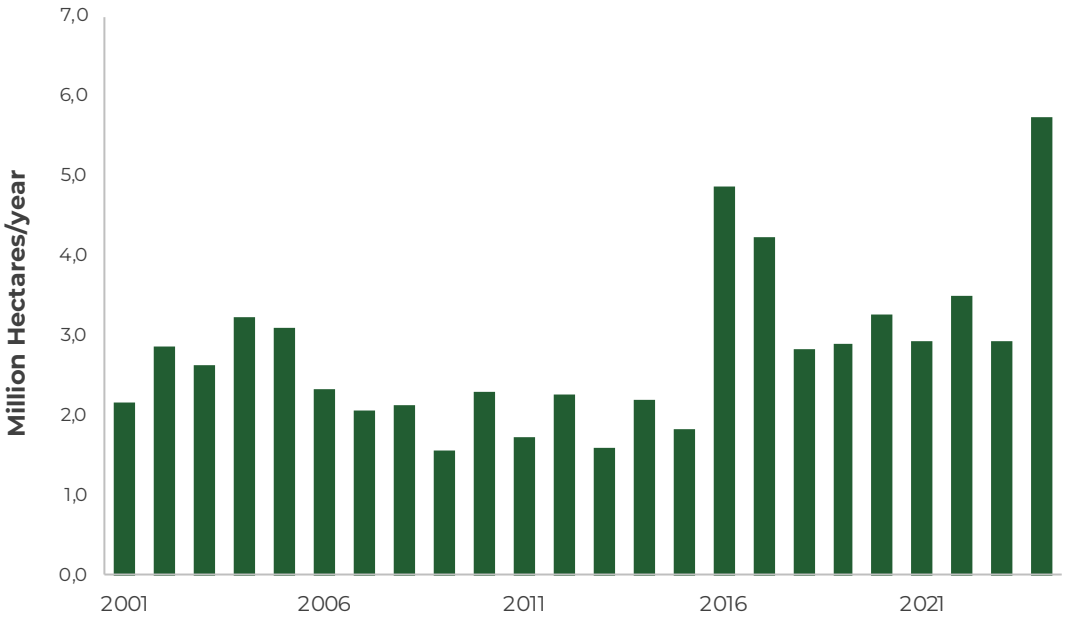
The Global Forest Watch data indicates that 67 million hectares of forest were lost in Amazonia between 2001 and 2024, an area about the size of France (Figure 3.1.).

Losses averaged 2.1 million hectares per year from 2005 to 2015 but rose sharply in 2016 and have continued at a pace of around 3 million hectares per year. Since 2001 nearly 75% of the forest losses have occurred in Brazil, with the next biggest losses in Bolivia, followed by Peru and Colombia. Data suggest a large increase in 2024, attributed mostly to more forest fires, some of which will lead to permanent conversion of forest land to other uses.

Other sources of data, such as the MapBiomas project, also point to significant destruction.[24] Brazil's National Institute for Space Research generates spatial data on deforestation in the Brazilian part of Amazonia (National Institute for Space Research, 2025). These data measure forest loss differently than Global Forest Watch, capturing longer-term losses for larger parcels (>6.25 hectares in size). The Brazil's National Institute for Space Research data do not count as forest loss changes in tree cover that occur when plantations and other managed forests are harvested. As a result, compared to the Global Forest Watch data, the Brazil's National Institute for Space Research data estimate approximately 42% less total forest loss over the post-2000 period for the Brazilian Amazonia. Nonetheless, both data sets show a reduction in forest loss after 2004, and an increase after 2015, with the Global Forest Watch data revealing a larger increase.

FIGURE 3.1.

The Loss of Forest Cover has Increased in Recent Years
Forest Cover Loss in All Eight Countries of Amazonia



Note: *Forest cover is defined as >30% canopy cover.*
Source: *Data based on Global Forest Watch data (WRI, 2025).*

Forest degradation refers to a reduction in the quality of forest and its capacity to provide ecosystem services, as opposed to outright forest loss. It is also widespread

[24] See here for more information.

in Amazonia, with up to 250 million hectares of forest (38%) considered degraded (Lapola et al., 2023). Degradation leads to lower carbon stocks and the possibility of lower levels of ecosystem integrity. It is caused by many factors, including edge effects (e.g. nearness to deforestation), wildfires, timber extraction, and drought. Of these factors, drought has had by far the largest impact, followed by edge effects (near roads and agricultural fields), timber extraction, and fire. If drought were to be dropped from the estimates, the area degraded would fall from 38% to 6%.

Drivers of Deforestation

The drivers of deforestation in Amazonia are diverse, ranging from population increases and infrastructure development to markets, trade, and technology. In the last few decades, climate change has also become an important factor. Mounting evidence suggests that climate change, along with land conversion, may push Amazonia's rainforest past a tipping point at which rainforests can no longer be sustained (Cox et al., 2004; Lovejoy and Nobre, 2019). That, in turn, would lead to significant adverse economic and ecological consequences for people in Amazonia (Box 3.1.).

BOX 3.1.

The Economic and Environmental Fallout of an Amazonian Tipping Point

To date, roughly 17% of Amazonia's rainforest has been cleared. An emerging consensus holds that once 20–40% has been lost, vast swaths of the rainforest will transition to dry savannah, an irreversible event with dire ecological and socioeconomic consequences (Lovejoy and Nobre, 2019; Spracklen and Coelho, 2023). This potential change has to do with the relationship between trees and rain. The rainforest generates rainfall via evapotranspiration. As a result, when trees disappear, rainfall decreases. That reduction, in turn, boosts tree mortality, which exacerbates forest loss, a negative feedback loop that generates a non-linear relationship between forest loss and local rainfall.

To assess the economic and environmental fallout that would ensue, Banerjee et al. (2021) leverage a computable general equilibrium model called the Integrated Economic-Environmental Modeling Platform, linked with high-resolution spatial land use and land cover change and ecosystem services modeling. This system generates estimates of the effect of policy scenarios on a range of outcomes, including GDP, employment, and poverty, other metrics of wealth, sustainability, natural capital stocks, and the supply of ecosystem services. The study finds that the adverse economic impacts of reaching a tipping point and the policies to avert it vary by country. But a conservative estimate of the cumulative regional cost through 2050 holds that $257 billion in GDP would be lost, with Brazil losing the equivalent of $184 billion. Policies that could avert a tipping point—by, for example, avoiding deforestation - include adopting climate-smart agriculture and improving fire management, which could together generate $339 billion in additional wealth.

Although climate change contributes to forest loss in Amazonia, agriculture, mining, and other human activities have been more important drivers (Albert et al., 2023b). These activities are influenced by local and global growth in population and income (Sohngen and Southgate, 2024). The importance of global trends cannot be overstated: economic activity in Amazonia has long been linked to global markets through international trade, especially in food and raw materials. Brazil, for example, is the world's largest exporter of soybeans, which account for around 60% of its total exports. It is also the second largest exporter of maize. A large share of these commodities is traded to China, meaning that demographic and economic trends in Asia exert a strong influence on land use decisions in Amazonia.

Agriculture is the most important driver of deforestation in Amazonia, responsible for about 82% of the deforested area. Of this converted area, 89% is being used as pasture, and 11% for crops (Albert et al., 2023a), the most significant of which are soybeans. Since 2000, the land area dedicated to soy in the Brazilian Amazonia has increased from less than 1 million to more than 4.6 million, with additional growth in Bolivia (Song et al., 2021). Together, Colombia, Peru, and Bolivia have boosted agricultural production in Amazonia by an additional 10 million hectares of grazing and crop land, although changes in those countries are modest compared to those in Brazil. The fact that agriculture is the leading driver of forest loss in Amazonia implies that efforts to stem deforestation could have adverse effects on food security, depending on how they are designed and implemented (Ortiz et al., 2013).

Population growth is another important driver of forest loss. While it continues to exert an effect on deforestation - through demand for food and other resources - its effects may be receding. Population growth peaked in Latin America as a whole in the 1960s (Bolt et al., 2018), and in Amazonia, in the 1980s. The most significant growth occurred in Brazil and Bolivia (Killeen, 2023). However, while population growth in Amazonia continues to outpace rates elsewhere in each country, trends have shifted since the turn of this century as rural residents moved to urban areas (Killeen, 2023) (see Chapter 9 for more information). If current trends continue, population growth in the region will have smaller implications for deforestation in the future.

Advances in agricultural technology have contributed to and detracted from the expansion of food production in Amazonia (Kaimowitz and Angelsen, 1998). On the one hand, technological improvements can make farming in difficult places profitable, thus encouraging the expansion of food production into new areas. On the other hand, increased food production can lower crop prices, rendering new production less profitable. The form of technological improvement also matters. For instance, when improvements are mechanical in nature, they can encourage agricultural expansion by raising labor productivity. In Brazil and Bolivia, the expansion of crops into more distant parts of Amazonia is undoubtedly assisted by mechanical means. However, more recently, yields have improved as a result of better biotechnology, nutrients, and pest control.

Mining also contributes to deforestation in Amazonia, although over a smaller area than agriculture. Gold mining, for example, is estimated to have caused around 168,000 hectares of deforestation in Amazonia over a 10-year period in the early part of this century (Alvarez-Berríos and Aide, 2015). Inputs into mining, such as roadbuilding or housing, may impact land use even more. A recent study suggested that around 9% of all deforestation in the Brazilian Amazonia resulted

from mining, with much of this loss related to mining infrastructure and other collateral damage (Sonter et al., 2017).

Criminal activity, sometimes tied to agriculture and mining, also plays a prominent role. It has been estimated that illegal exports tied to deforestation on a global level generate approximately $61 billion annually and account for an estimated 25% of worldwide tropical deforestation (Devine, 2021). Even when cut illegally, timber can be marketed through legal channels, with a low risk of detection (Barber et al., 2025; United Nations Office on Drugs and Crime, 2025). A recent assessment found that 88% of deforestation linked to commercial agriculture in Latin America violated local laws (United Nations Office on Drugs and Crime, 2025).

Illegal logging and forest clearing are often organized crime groups' first step in establishing territorial control in remote and weakly governed areas. Other illicit ventures like gold mining, coca cultivation, and clandestine airstrips are developed afterwards (United Nations Office on Drugs and Crime, 2023). In Colombia, for example, such criminal dynamics resulted in the loss of more than 88,900 hectares of forest between October 2024 and March 2025, primarily in protected areas like Chiribiquete National Park and Indigenous territories in Caquetá and Putumayo (Procuraduría General de la Nación, 2025). Illegal exploitation of resources finances approximately 38% of the income of organized criminal groups, surpassing drug trafficking (28%) (Nellemann, et al., 2018).

It is estimated that 30% to 60% of land clearing in Amazonia is tied to land grabbing by criminal groups. When repurposed for cattle ranching or commercial agriculture, clearing contributes to long-term land-use change (Carvalho et al., 2019; United Nations Office on Drugs and Crime, 2025). Agricultural production can also serves to launder proceeds from criminal activities, particularly drug trafficking, while allowing groups to exert socio-political influence (United Nations Office on Drugs and Crime, 2025). Legal businesses may be extorted, "protection fees" may be imposed, and some services typically offered by the state may instead be offered by the criminal groups (Torres and Collyns, 2024; United Nations Office on Drugs and Crime, 2023), extracting a significant human toll that is often disproportionately borne by Indigenous groups and women (Box 3.2.). Illegal land clearing undermines sustainable investment and citizen security, creating a vicious circle of illegality, insecurity, and environmental degradation. Because criminal activity is often, if not typically, multinational, multinational cooperation is needed to address it.

BOX 3.2.

Violence and Illicit Activities

The presence of organized crime is frequently accompanied by violence, which is used to enforce control and is a symptom of contested territories, with rival groups clashing over access to land, transport routes, and extractive opportunities. An analysis using a panel dataset covering municipalities in the Brazilian Amazonia between 2000 and 2022 found that a 1% increase in annual forest cover loss is associated with a 7.6% increase in the expected homicide rate (Veneri et al., forthcoming). Between 1999 and

2019, over 12,600 excess homicides (additional compared to what would be expected) were reported in small Amazonian towns (pop. <100,000), with 70% of these killings linked to illegal activities such as land grabbing, illegal logging, and gold mining (Brazilian Public Security Forum, 2022). More recent data from 2023 shows a homicide rate in Amazonia of 32.3 per 100,000, 41.5% above Brazil's national average (Brazilian Public Security Forum, 2024).

Social and Gendered Consequences of Deforestation

Indigenous populations are among the groups most affected by deforestation in Amazonia, as their livelihoods depend closely on land and natural resources. Structural vulnerabilities, such as high poverty and limited access to basic services, reduce their capacity to cope with the impacts of environmental degradation and climate change. For instance in Ecuador, the poverty rate in Amazonia, based on unsatisfied basic needs, was 76.4% among Indigenous people, compared to 29.5% among the non-Indigenous (Instituto Nacional de Estadística y Censos, 2022). Women, particularly Indigenous and rural women, also face high risks and vulnerabilities linked to deforestation and climate change due to intersecting inequalities and the resulting impact on resource availability, which can undermine families' food security. In Brazil's Amazonia, for example, food insecurity affects 44.3% of women, compared to 33.3% of men (IBGE, 2022).

Deforestation exposes women to heightened risks, particularly through various forms of violence that affect many aspects of their lives. These risks are especially severe for women environmental defenders who take on leadership roles in opposing illegal mining, land grabbing, and agribusiness. Their involvement often results in threats, physical and sexual violence, defamation, and other forms of harm. In Madre de Dios, Peru, where gold mining is one of the main economic activities, women face acute dangers, including harassment, human trafficking, and femicide.

Psychological violence directed against women environmental defenders remains one of the most common yet often overlooked forms of abuse. Fear of reprisals and concern for their families' safety are persistent sources of distress. In addition, many women experience economic violence, including limited access to education, employment, and property. Feeling threatened or unsafe, some are forced to abandon in-person classes, restrict their mobility, or reduce their participation in work and community life.

Activism often results in reputational harm, a factor that deepens the exclusion of women from political spaces and diminishes their social standing. Further, harassment and stigmatization discourage many women from taking on leadership roles. This marginalization is evident in women's limited political representation. In the Colombian Amazonia (2023), only 2 out of 39 elected mayors were women, while in Bolivia's Amazonian municipalities (2021), just 13 out of 168 mayors were women (Registraduría Nacional del Estado Civil and Consejo Nacional Electoral, 2024; Organo Electoral Plurinacional, 2021)

3.3 How Effective are Forest Conservation and Restoration Policies?

Numerous interventions have been developed and implemented to slow deforestation in Latin America. As a result, this region has witnessed both successes and failures in conservation effort. This section examines evidence from the literature on the effectiveness of these policies and discusses barriers to and opportunities for boosting their impact.

Protected Areas

Perhaps the most widely recognized conservation tool remains the establishment of protected areas in which land use and land cover change are restricted by law. In Amazonia and globally, protected lands have increased over the last 20 years (FAO, 2020). Just over 23% (197 million hectares) of Amazonia currently has some sort of protected status (Finer et al., 2023).

The success of protected areas in slowing or preventing deforestation, however, has been debated. On the one hand, some studies have found that they are not particularly effective in certain geographical settings (e.g., Andam et al., 2008 for Costa Rica). The reasons for this include weak enforcement, stemming from a lack of funding and political will; the siting of protected areas in remote locations where deforestation pressure is low (Joppa and Pfaff, 2009); and other factors (Blackman et al., 2015; Wittemyer et al., 2008). On the other hand, other studies have found that protected areas can be effective in reducing forest loss (Bebber and Butt, 2017; Nolte et al., 2013). Nolte et al. (2013) for example, find that all types of protected areas in the Brazilian Amazonia slow deforestation, but location and the type of protection matter. Strict protection, according to the study, leads to larger reductions in forest loss than areas designated for sustainable use (e.g., Indigenous management). A recent study of protected areas in Amazonia by Soares-Filho et al. (2023), found that strict protection and sustainable use areas both slowed deforestation. However, the provision of external programs to assist with management increased benefits, particularly in sustainable use areas. A study examining the Peruvian Amazonia found that protected areas generally slowed forest loss and disturbance, with older areas having stronger effects (Miranda et al., 2016). A different study in Peru found that protected areas, conservation concessions, and Indigenous territories all slowed deforestation compared to unprotected areas (Schleicher et al., 2017). However, these areas did not slow deforestation or improve conservation as much as logging and mining concessions.

Indigenous Management

In recent decades, the territory designated for Indigenous Peoples in Amazonia has increased. Both in Amazonia (Box 3.3) (Nolte et al., 2013; Walker et al., 2020)

and across Latin America, the evidence suggests that Indigenous and community forestry areas reduce pressure for land use change and, as a result, have a beneficial effect on deforestation (Alix-Garcia, 2007; Blackman, 2015; Blackman et al., 2018; Burivalova et al., 2019; Fortmann et al., 2017)

BOX 3.3.

Indigenous Communities (IC) Help Cut Deforestation and Carbon Emissions in Amazonia

The 7 million Indigenous people living in Amazonia play a critical role in managing its forests and forest carbon and collectively control 29% of the land area of the bioregion, (RAISG, 2023). Almost half of these Indigenous lands are in Brazil.

Studies most often find that rates of deforestation within Indigenous territories are lower than on lands outside them (Ding et al., 2016; Nepstad et al., 2006; Oliveira et al., 2007; Stevens et al., 2014). For example, Stevens et al. (2014) find that between 2000 and 2012, deforestation rates inside IC' lands in the Brazilian Amazonia were seven times lower than rates outside them, and that rates on IC lands within the Colombian Amazonia were three times lower.

But such inside-outside comparisons do not necessarily mean that ICs are responsible for these relatively low deforestation rates because ICs tend to be located in remote, inaccessible areas where rates of deforestation are low to begin with. To assess the efficacy of ICs in stemming deforestation, we need counterfactual analyses that compare rates of deforestation inside ICs with rates in similarly inaccessible areas.

The good news is that such studies typically confirm that even after controlling for geophysical land characteristics that affect deforestation risk (such as proximity to population centers), IC management is correlated with reduced deforestation (Blackman and Veit, 2018; den Braber et al., 2024). Blackman and Veit (2018) use propensity score matching and regression to analyze the effects on deforestation and forest carbon emissions of ICs in the Amazonian regions of Bolivia, Brazil, Colombia, and Ecuador. They find that ICs reduce deforestation and forest carbon emissions in Bolivia by 42% to 66% respectively and in Brazil by 49% to 92%, though results for Colombia and Ecuador are less conclusive.

These findings suggest that policies that support IC management can help cut deforestation and help combat climate change. Such policies in Amazonia might include providing the financial, technical, regulatory, and political support ICs need to address threats to land rights from the expansion of commercial mining, energy exploitation, and agriculture.

Forest Concessions and Forest Certification

Forest concessions provide limited rights to private parties to manage a given area of forests controlled or owned by the government. They include both large-scale industrial operations in extensive areas and smaller-scale concessions for community-based or small- to medium-sized enterprises (van Hensbergen, 2018).

In some regions, output in concessions has experienced marked growth. For example, in Brazil it has increased from under 40,000 cubic meters in 2011 to 375,760 cubic meters in 2023. This sustained increase has driven revenue gains, with fiscal receipts reaching approximately $6.4 million in 2023. These revenues are allocated 30% to state governments, 30% to municipal administrations, and 40% to the National Forest Development Fund, underscoring their important role in delivering economic and social benefits for local communities (Barbier et al., 2010).

Across the region, concession agreements vary greatly in terms of scope, responsibilities, duration, and fee structures. Generally, agreements limit how much can be logged over time and/or space, and they often require a stumpage or rental fee. In most cases, the land cannot be converted to other uses besides growing forests.

To date, a modest amount of forest in Amazonia, around 25 million hectares, has been designated as concessions. While Brazil allows timber concessions on 14 million hectares of land (Azevedo-Ramos et al., 2015), only around 1.6 million hectares have been leased to date, compared to 8 million hectares in Peru (Anderson et al., 2019) and 6 million in Bolivia (Conservation Strategy Fund, 2023). Colombia, Venezuela, and Ecuador do not have significant areas of forestry concessions. But Guyana, Suriname, and French Guiana each designate forests in forestry concessions, with Guyana allocating a relatively large proportion, 42% (or 5.3 million hectares), as either short- or long-term wood harvesting leases (Liu et al., 2024).

The net impact of forest concessions on forest loss and degradation is complex. On the one hand, concessions, by their very nature, involve cutting down trees and other extractive activities that damage ecosystems. On the other hand, some scholars maintain that concessions can help protect forests by incentivizing and empowering individuals to safeguard forests so as to maintain a long-term stream of profits. According to this hypothesis, concessionaires help spot forest incursions and work with local authorities to stop them from spreading.

The empirical evidence in Latin America is thin and mixed. A study from the Peruvian Amazonia shows that concessions may have slightly reduced forest loss by “shifting peaks of deforestation pressure” (Rico-Staffon et al., 2023). In particular, granting land concessions to IC has been shown to reduce deforestation rates (see Chapter 8). However, Liu et al. (2024) find that compared to state-owned but unallocated land, most concessions in Guyana have exacerbated both deforestation and degradation. In Mexico, Blackman and Villalobos (2021) show that providing timber harvest permits to the community organizations that control the majority of the country’s forest land does not have a significant effect on forest loss.

Other efforts to increase protections by encouraging supply chain actions, such as certifications from the Forest Stewardship Council or the Programme for the Endorsement of Forest Certification could provide added benefit. But here too, the evidence is mixed as to whether these approaches actually slow deforestation

(Anderson et al., 2019; Blackman et al., 2018; Rana and Sills, 2018). While most places allow forestry concessionaires to determine on their own whether to pursue certification, Bolivia passed legislation in the 1990s to require it. Despite this, the Forest Stewardship Council and the Programme for the Endorsement of Forest Certification have had fairly limited success increasing their coverage in Latin America, with a modest area of forests under certification (MacDicken et al., 2016).

Overall, the accumulated evidence suggests that the net effect of forest concessions on land use and land cover change is highly dependent on local socioeconomic, environmental, and institutional contexts (Barbier et al., 2010). Key determinants include governance quality, land tenure, enforcement capacity, and the economic value of timber. As the number of and type of concessions in the region increases, however, policy makers should support additional research to examine their effectiveness at delivering environmental and economic benefits.

Brazil's Forest Code: An Example of Regulation

When Brazil's Forest Code was enacted in 1965, it was one of the first mandates for private land conservation in the world. It initially required private landowners in the Legal Amazon to maintain 50% of their property in natural vegetation. This was increased in the 1990s to 80%. Unfortunately, for many years private landowners did not always comply, and the government failed to enforce the regulations. However, in the early 2000s, the Brazilian government began enforcing the legal requirements of the Forest Code and implementing other approaches to slow deforestation. Those efforts, especially those directed at legal enforcement, are credited with helping to slow deforestation rates (Arima et al., 2014; Hänggli et al., 2023; Nepstad et al., 2006).

Brazil then introduced a georeferenced registry in 2012, the Rural Environmental Registry (Cadastro Ambiental Rural), as a way to more accurately track the requirements of the forest code for individual properties. To date, several studies have examined whether the Rural Environmental Registry has been successful at slowing deforestation. Alix-Garcia et al. (2018) found that enrollment in the Rural Environmental Registry reduced deforestation by 10%, but Azevedo et al. (2017) and L'Roe et al. (2016) found that enrollment had little overall effect. Jung et al. (2022) suggest that these mixed findings are at least partly attributable to the fact that deadlines for compliance with the 2012 Forest Code were extended several times and access to the data needed to evaluate the Rural Environmental Registry was limited.

Voluntary Corporate Programs

Private corporate approaches also took off in the early 2000s. For Amazonia, these included the soy and cattle moratoria, in which participating companies agreed not to purchase soy or cattle from recently deforested parcels of land. These agreements required not just a willingness to adjust purchasing habits, but also new monitoring systems to determine how soybeans and meat are produced. Current research has shown that these approaches contributed to reduced rates of deforestation in the early part of the 21st century (Gibbs et al., 2015; Heilmayr et al., 2020; Nepstad et al., 2014), although spillover effects were also apparent (Alix-Garcia and Gibbs, 2017; Moffette and Gibbs, 2021). These spillovers include the potential movement of livestock or soybean operations into uncontrolled areas, such as the Cerrado.

Payments for Environmental Services (PES)

PES are payments to landowners or land managers on the condition that they help ensure the provision of environmental services (including habitat, carbon storage, hydrologic services, or NTFPs). PES programs have expanded globally and today exceed $42 billion per year (Salzman et al., 2018).

Over the years, considerable thought has gone into how to design PES programs to make them more effective at stemming forest loss and degradation (Wunder, 2005). These approaches include strengthening the monitoring and enforcement of conditionality, the requirement that participating landowners conserve or restore forests. Other approaches to boosting efficacy include targeting payments to lands at significant risk of deforestation and finding ways to strengthen land managers' incentives to conserve and restore forests. One example of an approach to PES in Amazonia that incorporates several best design practices is the Pará State Payment for Environmental Services Program (Box 3.4.).

BOX 3.4.

PES in Pará, Brazil

PES are an important tool for creating financial incentives for forest conservation in regions facing high deforestation pressures. Pará, a state in the Brazilian Amazon, offers an example. By combining incentives for smallholder conservation and restoration with mechanisms that reinforce the territorial rights and forest governance of traditional communities, Pará's PES program tackles multiple deforestation drivers simultaneously. The Pará State Payment for Environmental Services Program is supported by innovative financing structures and anchored in a robust environmental monitoring system.

Between 1990 and 2021, Pará, among all Brazilian states, was the leading source of greenhouse gas emissions. Eighty-five percent of the state's emissions stemmed from land-use change associated with agricultural and livestock expansion. To date, Pará has preserved 78% of its native vegetation, but the state continues to experience significant pressure from illegal logging, land grabbing, and the expansion of agricultural frontiers.

PEPSA-PA was designed to curb deforestation by financially rewarding landholders and communities for actions that maintain or restore forest cover. The program is structured into two complementary modalities: (i) incentives aimed at getting small landholders to restore private lands and (ii) support for traditional communities so they can better protect large collective territories.

Private Lands Modality:
Reducing Agricultural Expansion through Positive Incentives

The Private Lands modality addresses economic incentives to deforest land by offering payments that compensate for the opportunity cost of

conserving or restoring forest areas. Farmers receive financial support for initiatives aimed at things like the natural regeneration of degraded lands, the establishment of agroforestry systems, and the protection of remaining forest patches. Evidence from the Valuing Sustainable Territories (Valoriza Territórios Sustentáveis) pilot project, implemented across five municipalities, shows that 73% of participating farmers were willing to engage in restoration activities when provided with financial incentives and technical assistance.

Collective Territories Modality:
Strengthening Traditional Stewardship of Forests

Traditional and IC have historically acted as de facto guardians of some of Pará's most intact forests. The Collective Territories modality provides financial recognition for the environmental services communities deliver by channeling payments to collective governance structures. This enables communities to invest in territorial protection, sustainable livelihoods, and the maintenance of forest integrity. The alternative income stream reduces vulnerability to external pressures and enhances community resilience.

As widespread as PES is in Latin America generally, and Amazonia in particular, the evidence as to its success in combating deforestation is inconclusive. In Ecuador, the Socio Bosque program, in operation since 2008, pays private landowners and IC to protect forests. The program is widely hailed for its innovation. But research suggests it provides only modest levels of additional protection, as those most likely to adopt the program are large landowners who were more likely to preserve their forests anyway (Mohebalian and Aguilar, 2016). The issue with additionality (i.e., whether the PES program provided new reductions in deforestation relative to business as usual without the PES program) is fairly widespread in PES programs. This includes the Bolsa Floresta program in the state of Amazonas in Brazil, which provides resources to families living in sustainable use protected areas (Cisneros et al., 2022). Despite additionality problems, Giudice and Börner (2021) report that the Programa Bosques PES provided modest reductions in deforestation in Peru.

Although Reduced Emissions from Deforestation and Forest Degradation (REDD+) programs are not conventional PES programs, they have much in common with them. Developed as part of the United Nations Framework Convention on Climate Change to help reduce deforestation in tropical forests, REDD+ projects in Amazonia have included both jurisdiction-based efforts and project-based initiatives. Jurisdiction-based approaches work at the governmental level, such as a state or a country, with donor countries providing funds to countries to slow deforestation. Project-based approaches, by contrast, involve payments to entities to slow deforestation in specific forests. Early evidence from project-based efforts in Amazonia suggests that REDD+ had a positive effect reducing deforestation by nearly 50% (Simonet et al., 2019). However, more recent studies have found similar additionality problems with REDD+ projects as with other PES programs (West et al., 2020).

Jurisdictional REDD+ programs have also been developed in Amazonia. These

include state-wide efforts by the Brazilian states of Acre, Mato Grosso, and Pará and efforts by Peru and Guyana using international funding. While there is generally less analysis of the effectiveness of jurisdictional REDD+, an analysis of the program in Guyana indicated that it slowed deforestation (Roopsind et al., 2019).

BOX 3.5.

Peru's Forest Investment Program: Catalyzing Conservation Through Economic Incentives

The Peruvian Amazonia faces critical deforestation threats, losing approximately 120,000 hectares annually. To address this challenge, the IDB launched the Forest Investment Program in 2018 with a comprehensive approach to reduce deforestation-related emissions while supporting sustainable development. Operating in strategic corridors—Tarapoto-Yurimaguas (San Martín and Loreto) and Puerto Maldonado-Iñapari (Madre de Dios)— the Forest Investment Program implements a dual strategy: strengthening institutional forest conservation capacity and promoting sustainable use of forest resources through economic incentives that make standing forests more valuable than cleared land.

The program's cornerstone is its Conservation Incentive Fund, which finances business plans for native communities and small forest users who commit to forest conservation. By December 2024, the Forest Investment Program had approved 45 business plans for native communities and 54 for small forest users, securing commitments to conserve over 411,946 hectares of Amazonian forest. These initiatives span agroforestry (cacao, coffee), NTFPs (Brazil nuts), ecotourism, and sustainable timber harvesting.

The Forest Investment Program has also strengthened environmental governance through regional and municipal environmental commissions and prioritized gender inclusion, with women comprising up to 44% of beneficiaries. The program's monitoring component has equipped 11 regional governments with advanced forest monitoring technologies and trained over 300 officials. As it moves toward completion in 2027, the program offers a replicable model for forest conservation initiatives throughout Latin America and beyond, proving that economic incentives can effectively drive environmental protection while improving livelihoods for forest-dependent communities.

Subsidy Reform

For years, development in Amazonia has been promoted by government programs such as the Bank of Amazonia via infrastructure investment, subsidized credit programs, and export subsidies. This support has sometimes been given without fully considering the implications for land use and land cover change. In the late 1960s, for example, Brazil initiated the Superintendency of Development for the

Amazon, a government program intended to boost development in the region through road construction and other approaches. Numerous studies, however, provide strong evidence that proximity to roads increases forest loss (Busch and Ferretti-Gallon, 2023).

Recently, interest has grown in efforts to roll back some types of subsidies, especially in the agricultural sector. Analysis by Assunção et al. (2020) suggests that efforts to reform some subsidies in Brazil could slow deforestation. However, rigorous evidence on the conservation benefits of subsidy reform is thin, particularly in Amazonia. More evidence is needed.

3.4 Conclusion: The Imperative of Curbing Deforestation

This chapter examines forest conservation in Amazonia. For years, the region has experienced high levels of forest loss and degradation. Although concentrated in Brazil, these phenomena are happening in all eight countries of the region. The causes vary from place to place, but population growth, infrastructure development, and technology all play a role. Over the past few decades, climate change has also become an increasingly important driver.

Evidence suggests that the role of population growth, while still important, is diminishing as a cause of these phenomena. Latin America and Amazonia are well past peak population growth, and in Amazonia, there is emerging evidence of rural to urban migration, which over time, could help slow deforestation. Other factors, however, could have a countervailing effect. These include growing demand for agricultural products and improved technology in the agricultural or forestry sectors, as well as the illegality associated with drug and other criminal activity.

Considerable time, effort, and resources have gone into designing and implementing policies and programs to slow forest loss and degradation. Evidence on the efficacy of these initiatives, however, has delivered mixed results, varying across geographical, institutional, and economic contexts. The oldest and most prominent conservation approach has been to establish protected areas. Recently, more effort has gone into protecting forests in ways that allow for sustainable use. For instance, significant extensions of land have been set aside in Brazil and elsewhere giving IC exclusive use rights. Some studies have found that these approaches can have positive effects on maintaining forest cover.

Evidence on the efficacy of other conservation strategies, including forest concessions and voluntary approaches, as well as land use and land cover restrictions on private lands, is also varied. In some cases, voluntary approaches such as the soybean and cattle moratoria implemented in Brazil, appear to have been effective in stemming deforestation. In Brazil strict adherence to the Forest Code that regulated land use on private properties after 2004 slowed deforestation.

More recent changes to the Forest Code in 2012, however, may have increased deforestation rates modestly. Finally, some PES programs in Latin America appear to have modestly reduced forest loss.

The mixed track record of policies and programs aimed at stemming forest loss and degradation in Amazonia reflects the fact that efficacy depends critically on local enabling conditions, such as the intensity and source of deforestation pressure and the political, human, and financial capital invested in slowing it. Because place-based factors play such an important role, one-size-fits-all approaches are unlikely to be effective. Instead, targeted and tailored strategies are called for. Policymakers need not focus on one policy at a time in any given locale. Rather, they can mix and match initiatives to leverage synergies and complementarities (Lambin et al., 2014). For example, because public-sector approaches rely on often insufficient financing, combining them with voluntary mechanisms that aim to stem deforestation on private lands (e.g., the soy and cattle moratoria), may increase prospects for success. Holistic region-wide conservation initiatives, like the IDB's Amazonia Forever program, can provide an institutional underpinning for such efforts.



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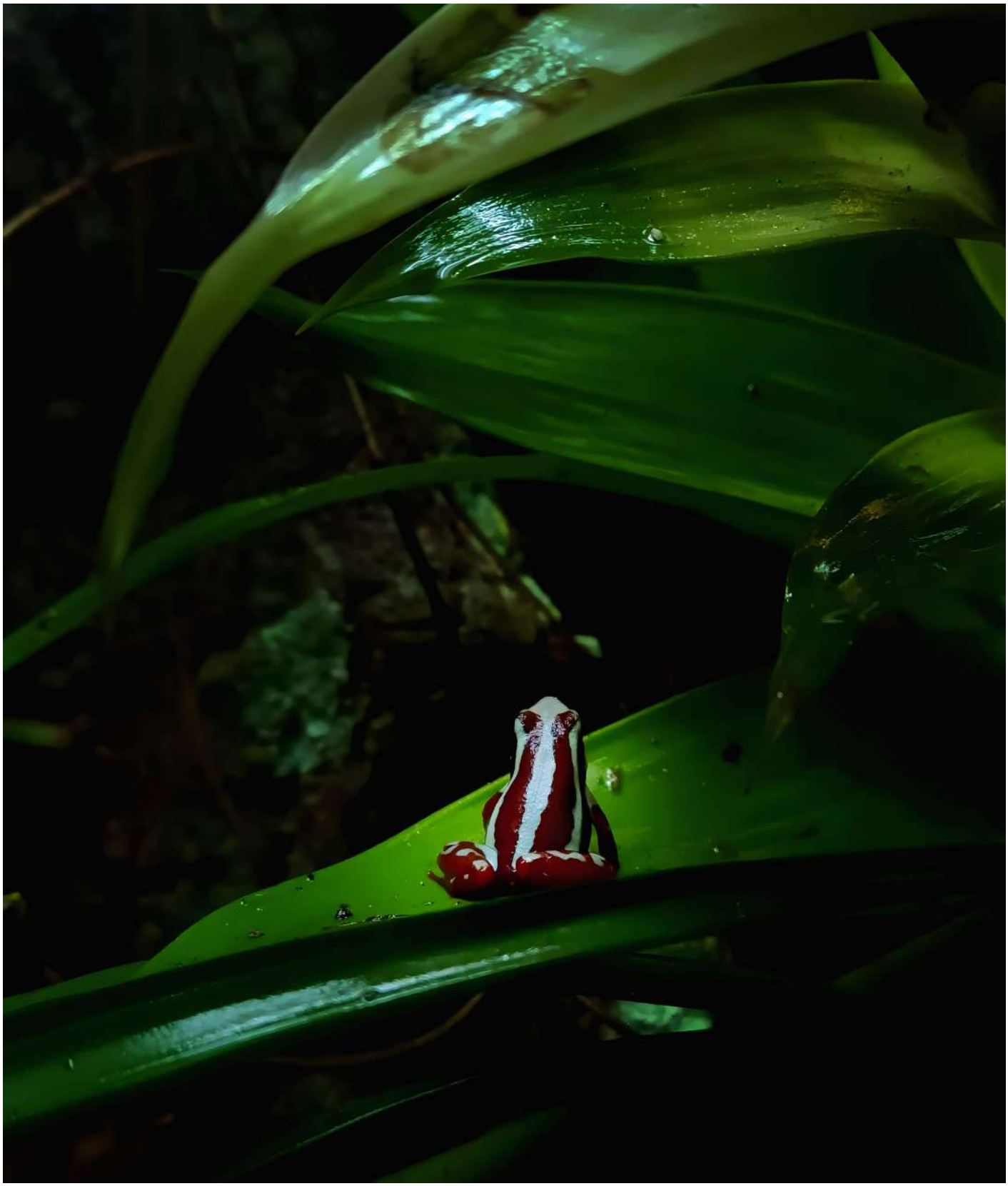
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BIOECONOMY AND CREATIVE ECONOMY

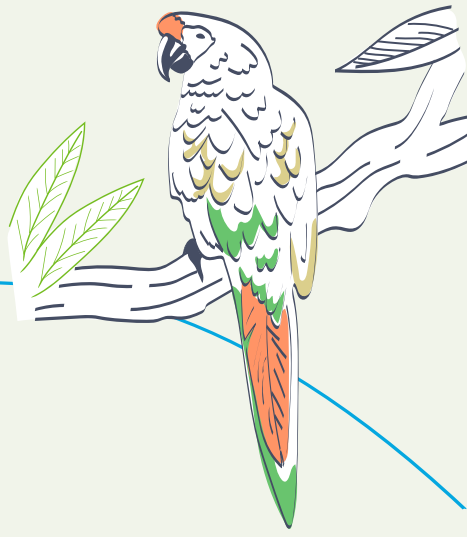


Chapter

04

BIOECONOMY, ENTREPRENEURSHIP, AND INNOVATION

Rafael Anta & Matteo Grazzi



4.1 Introduction: Framing the Bioeconomy Through a Science- and Innovation-Based Approach

In a forested region of Colombia, the monkey-pot tree—*Lecythis minor*—stood mostly unnoticed. Its seeds, toxic and misunderstood, led locals to fell the trees for wood, pushing this endemic species closer to the brink. Everything changed when a curious scientist discovered that the nuts of the Lecythis minor contained high levels of seleniometionina—an organic form of selenium absorbed from the mineral-rich soil. This finding sparked a quiet revolution. An engineering firm, captivated by the discovery, invested in research and development to develop sustainable methods for extracting the selenium-rich oil. The company also turned to the local community, recruiting and training women in the delicate work of nut collection, cleaning, sorting, and classification—creating jobs and restoring pride in the local ecosystem. Today, this once-threatened species is protected by the very communities that once overlooked it. Its selenium oil, prized in high-end cosmetics for its potent antioxidant and regenerative properties, is a symbol of how science, innovation, and local stewardship can rewrite the story of Amazonia.

While this example takes place in the lower Magdalena River, nearly 400 miles from the Colombian Amazonia, it powerfully illustrates a broader truth central to the Amazonia bioeconomy: that the untapped value of biodiversity often begins with scientific discovery. The transformation of Lecythis minor from a misunderstood and threatened species into the foundation of a sustainable value chain shows how research can unlock economic opportunities, mobilize investment, and engage communities in conservation. It captures the essence of the bioeconomy, demonstrating how scientific insight, when paired with entrepreneurial vision and community engagement, can drive both biodiversity conservation and socioeconomic development. By turning a threatened species into the base of a sustainable value chain, the initiative generated income—especially for women—while preserving a unique ecosystem and positioning a local resource in global markets. If initiatives like this were replicated at scale, the bioeconomy could become a transformative force for sustainable and inclusive development across Amazonia, one that generates value while protecting the ecosystems and communities that sustain it.

The concept of bioeconomy is broad and interpreted in different ways across countries and regions. While definitions vary, most perspectives share a common foundation: the sustainable valorization of renewable biological resources.[25] This chapter adopts a specific lens grounded in science, technology, and innovation. Here, **bioeconomy refers to economic activities based on the sustainable use and transformation of biological resources into products and services.** This approach, sparked by scientific discovery and powered by technological innovation, prioritizes the generation of economic and social value in a sustainable way, while ensuring the conservation of biodiversity and, when possible, contributing to its restoration. The chapter is organized into five sections: it begins by introducing the concept of bioeconomy through a science and innovation lens; it then presents an analytical framework based on volume, value, and participation; it explores the

[25] Valorization of renewable biological resources refers to the process of generating economic, environmental, or social value by utilizing or transforming these resources to produce bio-based products and services. This goes beyond simply extracting and selling resources as commodities. Instead, it emphasizes the development of differentiated, higher-value outputs through processes grounded in innovation, knowledge, and sustainability.

current state of bioeconomic activities and policies in Amazonia; it outlines the main barriers limiting private sector development; and it concludes with policy recommendations to scale inclusive, innovation-driven bioeconomy pathways in the region.

By narrowing the scope, we aim to offer a deeper, more practical understanding of how Amazonia's extraordinary biological wealth can fuel innovation-driven development. To illustrate this concept more concretely, Figure 4.1. presents a typology of natural products commonly found in biodiversity and the sectors where they are most frequently applied.

FIGURE 4.1.

A typology of natural products commonly found in biodiversity and the sectors where they are most frequently applied

Types of Natural Products in Biodiversity and Their Application Sectors[26]

Natural Components found in Biodiversity	Health	Wellbeing	Food and Beberage	Consumer Products	Industrial & Manufacturing	Environment & Ecosystem	Bioinputs	Bioenergy
Biomolecules (sugars, lipids, amino acids, nucleotides)			■	■			■	
Genes and Genetic Material (DNA, RNA)	■						■	
Proteins and Enzymes	■		■		■	■		
Fibers (cellulose, chitin, lignin)					■	■		
Primary and Secondary Metabolites (e.g. alkaloids, terpenes)	■	■					■	
Oils and Fats		■	■	■				■
Standardized Extracts and Essential Oils		■	■	■		■		
Polysaccharides (e.g. starch, pectin, gums)			■		■			■

Source: *Author's elaboration.*

To better explore the bioeconomy's potential in Amazonia, this chapter adopts an analytical framework built around three key dimensions: **volume, value, and participation.** Together, these provide a practical lens for understanding the opportunities and challenges of bioeconomic activities:

VOLUME refers to the amount of biological raw material (input) used in a given process and helps assess the scale and intensity of resource use. While especially relevant for bio-based products, it applies less to services. Rather than relying on precise figures, the framework supports qualitative assessments of whether an activity is low, medium, or high volume. For

[26] Examples of applications by sector: Pharmaceuticals and diagnostics in Health; food, beverage, pigments, colorants, and flavors in Food & Beverage; biochemicals, biomaterials, biomanufacturing, fabrics and textiles in Industrial & Manufacturing; bioremediation and restoration services in Environment & Ecosystem.

example, some pharmaceutical applications involving small, well-characterized molecules may require only trace amounts of biomass, as these compounds can often be synthesized at scale. However, pharmaceutical and therapeutic products based on complex natural molecules, secondary metabolites, or biologics depend directly on biomass inputs, as synthesis is either not feasible or not cost-effective. Cosmetics and food ingredients typically use medium volumes, while bioenergy production, like bioethanol or sustainable aviation fuel, demands very large quantities of biomass.

VALUE captures the market price per unit of the bio-based output (e.g., dollars per liter or kilo). It reveals the economic dynamics across applications. Comparing output and input values serves as a proxy for the level of transformation or innovation applied to the resource. This helps differentiate between extractive and knowledge-based, value-added uses. Like volume, the focus is on identifying relative levels—high, medium, or low. Pharmaceuticals and cosmetics are usually high-value; food ingredients, nutraceuticals, and bioinputs tend to be medium-value; and bioenergy applications are generally low-value. In general, low-value activities are often commoditized, infrastructure-intensive, and detached from local knowledge.

PARTICIPATION considers who is involved in bioeconomic ventures, particularly the extent to which local and IC contribute to and benefit from them. This includes roles not only in the value chain, but also in ownership, decision-making, integration of traditional knowledge, and innovation. Understanding the depth and quality of participation is essential for assessing the inclusivity of Amazonia's bioeconomy.

4.2 A Bioeconomy with Great Potential

Despite its ecological and cultural significance, Amazonia remains underutilized as a platform for knowledge-driven development. Studies have attempted to quantify the value of its ecosystem services. For instance, a meta-analysis by Strand et al. (2022) estimates that Brazil's standing forest alone provides over $317 billion annually in benefits such as carbon sequestration, water regulation, biodiversity, and recreation. While these figures highlight Amazonia's global importance, to capture the dynamics of a science- and innovation-based bioeconomy, such as the value of bio-based value chains, product innovation, or inclusive business models rooted in sociobiodiversity.[27] In fact, to date, no comprehensive, regionally grounded estimate exists for Amazonia's bioeconomic potential.

Rather than offer speculative valuations, this section explores three interrelated factors that underpin this potential: biomass productivity, biodiversity and genetic wealth, and talent for science, innovation, and entrepreneurship, complemented by traditional knowledge. Together, they show how Amazonia could contribute to

[27] According to Brazilian law, sociobiodiversity is generally defined as: "The set of goods and services derived from biodiversity and associated traditional knowledge, used in the cultural, social, and economic practices of Indigenous peoples, traditional communities, and small-scale farmers."

a climate-resilient, inclusive development path, positioning bio-based solutions as viable alternatives to fossil-based systems.

High Biomass Productivity

Amazonia is one the most productive biological machines on Earth. According to Brazil's National Institute for Space Research (2023), the Brazilian portion of Amazonia averages 174 metric tons of above-ground biomass per hectare. Only a fraction of this is suitable for economic use, as most supports vital ecological functions. Yet even a small, well-managed share, drawn from fast-regenerating species, aquatic biomass, fungi, or forest residues, could power new low-carbon, regenerative industries. This extraordinary level of biomass productivity highlights the Volume dimension of the framework, offering a foundation for scalable, resource-based industries, provided that use is sustainable and well-managed. These include industries based on bioenergy, bioplastics, natural fibers, and bio-based construction materials, some of which can contribute to carbon sequestration or support the restoration of degraded areas through regenerative land use practices. Unlocking this potential requires science-driven approaches that align economic activity with ecological logic—creating value through regeneration, not depletion.

Biodiversity and Genetic Wealth

Amazonia harbors more species of plants, animals, fungi, and microorganisms than any other terrestrial ecosystem (SPA, 2021). This biodiversity is not only a global asset; it is also a reservoir of bioactive compounds, enzymes, and genetic codes with potential for novel applications. From pharmaceuticals to synthetic biology, Amazonia's biological wealth can inspire a new generation of medium- to low-volume, high-value products, directly reflecting the Value dimension, which emphasizes the role of scientific discovery and innovation.

To harness this potential, a shift from extractive to knowledge-based strategies is essential. Traditional bioprospecting is slowly evolving through bio-libraries,[28] high-throughput screening,[29] digital sequence repositories,[30] and AI-enabled discovery. These tools accelerate research while improving traceability and benefit-sharing (Desmarchelier, 2024).

Fusing Scientific and Entrepreneurial Talent with Traditional Knowledge

A third factor is the growing pool of scientific and entrepreneurial talent advancing the bioeconomy. Though still modest in size, it is expanding, particularly in Brazil and increasingly in Colombia and Peru, as researchers and innovators engage more directly with regional challenges.

Around this talent, a supportive ecosystem is emerging. Universities and research institutions are focusing on biodiversity valorization, sustainable production, and inclusive innovation. New initiatives are helping translate scientific capacity into early-stage ventures, often grounded in local knowledge.[31] This human capital is key

[28] Bio-libraries: Collections of biological samples—such as plant extracts, microorganisms, or purified compounds—systematically cataloged and preserved for scientific research and bioprospecting. They allow researchers to screen for biological activity and discover new compounds of interest.
[29] High-Throughput Screening: A laboratory technique that uses automation and miniaturized assays to quickly test thousands of biological samples for specific properties, such as enzyme inhibition or antimicrobial activity. High-Throughput Screening accelerates the discovery of new bioactive compounds.
[30] Digital Sequence Repositories: Databases that store genetic information in digital form, such as deoxyribonucleic acid and Ribonucleic acid sequences. These repositories are essential for research in genomics, synthetic biology, and biotechnology, enabling virtual access to biodiversity without requiring physical samples. It is important to note, however, that the use of Digital Sequence Information remains a subject of international debate. Questions around benefit-sharing, regulatory frameworks, and fair compensation for countries and communities that are the sources of genetic resources are still unresolved. As global negotiations continue, particularly under the Convention on Biological Diversity, it is essential that efforts to promote innovation using DSI are accompanied by mechanisms that ensure equity, transparency, and biodiversity protection.
[31] For example, the IDB Group has launched programs such as the Amazonia BioBuilders and the Amazonia BioStartups initiatives that support the development of early-stage ventures based on biodiversity and local knowledge.

to shifting from a commodity-based model to one driven by innovation.

Traditional knowledge may also play a vital role, not only by accelerating discovery and guiding the development of culturally relevant, sustainable applications, but also by offering time-tested insights into species properties and resource stewardship. Its inclusion on a fair basis is essential, not just ethically, but strategically, as it can enhance the quality and legitimacy of bioeconomic innovations. This underscores the importance of the Participation dimension in building an inclusive and resilient bioeconomy.

A New Development Model

Biomass productivity, biodiversity and genetic wealth, emerging talent and traditional knowledge could all form the basis for a new development model in Amazonia. Unlike extractive systems, the bioeconomy offers a path toward low-carbon, inclusive growth aligned with global sustainability goals.

To realize this vision, policy, investment, and research must converge around a shared commitment: to view Amazonia not only as a biome to protect, but as a living laboratory for redefining the relationship between nature, society, and the economy. The challenge is to identify bioeconomic pathways that balance innovation, sustainability, and local value creation.

In particular, the region's future hinges on its ability to support **small- and medium-volume applications with medium to high value.** These are better suited to local supply chains and decentralized production and more compatible with the region's ecological and social realities. They can enhance community participation, support entrepreneurship, and integrate traditional knowledge into new bio-based products and services.

Developing low-volume, high-value applications—like pharmaceuticals or advanced biotechnologies—is complex and often led by institutions outside the region. Nonetheless, it is in the interest of Amazonian countries to create the legal and technical conditions for these innovations to emerge. When designed with fairness and transparency, they can generate local value through access and benefit-sharing mechanisms aligned with the Nagoya Protocol.[32]



[32] The Nagoya Protocol is an international agreement under the Convention on Biological Diversity (CBD) that aims to ensure the fair and equitable sharing of benefits arising from the use of genetic resources, including access to those resources and associated traditional knowledge. It establishes rules to promote transparency, legal certainty, and mutually agreed terms between users and providers of biodiversity.

4.3 The State of Bioeconomic Activities and Innovation in Amazonia

This section examines both the current state of bioeconomic activities and innovation in Amazonia and the factors that enable or limit their development. While the first part highlights gaps in visibility and coordination, the second identifies key internal and external determinants. These factors relate closely to the dimensions of volume, value, and participation introduced earlier.

Amazonia's potential for a thriving, science-based bioeconomy is drawing increasing interest from researchers, entrepreneurs, and policymakers. Yet current bioeconomic activity in the region remains fragmented, under-documented, and unevenly distributed. No centralized system exists to track the scale, diversity, or socio-economic impact of bioeconomic initiatives there.

Still, momentum is building. This is especially true in Brazil, Colombia, and Peru, where programs are beginning to move beyond conservation toward models that combine scientific research, innovation, and economic inclusion. Many initiatives remain early-stage or localized, but national strategies and plans, startup incubators, venture builders, and applied research and development centers are gaining ground. Together, these developments reflect both the region's existing capabilities and a growing opportunity to scale knowledge-based development. They also signal a shift in perception, in which Amazonia is seen not just in conservation terms but as a platform for sustainable and inclusive value creation.

A Fragmented Policy Landscape

Bioeconomy is increasingly recognized as a strategic axis for sustainable development across Latin America, particularly in biodiversity-rich countries. This growing interest reflects both environmental imperatives and economic opportunities, especially in regions like Amazonia where biological resources are abundant but underutilized. Across the Amazonas River Basin, public policies and plans for developing a sustainable bioeconomy are beginning to emerge, though their maturity and implementation vary widely. Based on the Amazonia Bioeconomy Country Profiles (Lesenfants, 2024a), the following overview highlights current efforts in six countries:

- **BRAZIL** stands out for its relatively advanced bioeconomy policy architecture. In 2023, a National Bioeconomy Secretariat was created within the Ministry of the Environment, comprising three departments focused on bioeconomy promotion, fisheries governance, and genetic heritage. This new body aims to harmonize fragmented efforts across ministries and lead the formulation of a national bioeconomy policy. Earlier initiatives, such as the Bioeconomy-Sociobiodiversity Program of the Ministry of Agriculture, Livestock and Food Supply in 2019 and the Bioeconomy Production Chains program of

the Ministry of Science, Technology and Innovation in 2020, emphasized sociobiodiversity, sustainable use, and technological innovation. Importantly, Brazil has begun mobilizing public and blended financing mechanisms to support the implementation of these policies. So far, however, most efforts have focused on activities related to sustainable agriculture and the ecological restoration of degraded land, rather than on high-value bioproducts or advanced biotechnology.

- **COLOMBIA** has built a policy ecosystem with long-term goals. Key milestones include its 2018 Green Growth Policy and the Colombia BIO initiative. The Ministry of Science has led initiatives on bioprospecting and biodiversity-based value chains. However, coordination across sectors remains a challenge, and public funding mechanisms are still limited.

- **ECUADOR** has taken preliminary steps toward building a bioeconomy policy. Initiatives like the 2020 National Pact for Sustainable Bioeconomy and Ministerial Agreement 034 (2019) lay the groundwork, and a national strategy is under development. However, a comprehensive financial architecture is still lacking to bring these plans to scale.

- **PERU AND SURINAME** are in early stages. Peru is drafting a national strategy, but few Amazonia-specific policies exist. Suriname's development plan includes elements like forest conservation and NTFPs but avoids the bioeconomy label. Neither country has dedicated financing tools for scaling efforts.

- **VENEZUELA** integrated sustainability and biotrade into its 2008 Biodiversity Law and 2017 National Plan. The Agro-Venezuela Mission promotes bioinputs, though financial support remains limited.

In sum, policy interest in the bioeconomy is growing, but most countries remain in early stages, lacking coordination and sustained funding. Fully leveraging Amazonia's biomass and genetic wealth will require a major shift in public investment toward research and development and innovation—a priority still missing from most agendas.

Progress remains slow, mirroring broader regional trends in science-intensive policy domains. Building a sustainable and inclusive bioeconomy means that countries will have to act with greater urgency and strategic clarity. While designing better policies is an essential first step -the IDB translated the Bioeconomy Strategy Accelerator Toolkit (Izquierdo and Jiménez, 2024), a framework to support the design of bioeconomy strategies, into Spanish and Portuguese -, the greater challenge lies in implementing them effectively. Although most current efforts recognize the importance of meaningfully engaging local communities, few prioritize initiatives that explicitly focus on medium- to high-value applications. As a result, these policies fall short in unlocking the full potential of Amazonia's biodiversity and genetic wealth.

Boosting Scientific Research

Scientific research is essential to unlocking Amazonia's bioeconomic potential. Across the region, more institutions are becoming involved in bioprospecting, biotechnology, agroecology, and natural product chemistry. Yet despite recent

advances, the scientific landscape remains disjointed, underfunded, and often disconnected from public policy and production systems. This challenge reflects a broader regional pattern: across Latin America, investment in research and development remains chronically low, even as the bioeconomy is increasingly recognized as a strategic opportunity (UNESCO, 2024).

- **BRAZIL** leads in institutional capacity, with a strong network of federal universities, research centers, and public agencies such as Brazilian Agricultural Research Corporation and the Ministry of Commerce, Trade and Industry. Institutions like the National Institute for Amazonian Research and Museu Paraense Emílio Goeldi have long contributed to biodiversity studies and ecosystem monitoring in the region. These actors support advanced research in agro-bioeconomy, biodiversity valorization, biotechnology, and natural product chemistry, among other areas— an effort reflected in publication data, with Brazil consistently ranking among the top 10 producers of bioeconomy knowledge (Ordonez Olivo and Lakner, 2023; Gould, Kelleher and O'Neill, 2023). Initiatives like Ministry of Commerce, Trade and Industry's Bioeconomy Production Chains program and research by Brazil's National Center for Research in Energy and Materials on drug discovery from natural products reflect the country's commitment to aligning science with sustainability. Still, much of this capacity is concentrated in Brazil's southeast and central-west, with a limited presence in Amazonia.[33] Greater coordination between research, tech transfer, and commercialization could position the country as a global leader in bio-based innovation. Realizing this potential will also depend on translating scientific discovery into high-value applications and ensuring that innovation systems enable meaningful participation by Amazonian institutions and communities.

- **COLOMBIA** has aligned science and bioeconomy policy through programs led by the Ministry of Science and institutions like the Amazonian Scientific Research Institute SINCHI and the Humboldt Institute. These initiatives are promising but face coordination and financing gaps.

- **PERU** relies on the Peruvian Amazonia Research Institute to drive applied research. However, despite the Peruvian Amazonia Research Institute's presence in the Amazonia Region, much of the country's broader scientific capacity remains centralized in Lima, with limited integration into national innovation systems or bioeconomy agendas.

- **ECUADOR'S** Amazonia remains disconnected from its national innovation system, lacking accredited tech transfer hubs. The National Institute of Biodiversity's work shows potential, but most funding is not tied to bioeconomy priorities. **Bolivia, Venezuela, Suriname**, and **Guyana** also have limited Amazonia-specific research infrastructure, though select institutions like the Center for Agricultural Research in Suriname and Conservation International contribute to biodiversity knowledge.

According to the SPA, scientific output remains too limited and unevenly distributed, with notable gaps between research and policy, and between discovery and commercialization. It calls for more coordination, investment in research infrastructure, and support for local knowledge systems, including Indigenous science.

[33] For a comprehensive overview of the heterogeneous innovation performance in Brazilian states, see data from the Brazil Innovation and Development Index 2024 (National Institute for Industrial Property, 2025) in which Amazonian states consistently rank at the bottom of the ranking.

Beyond underfunding, slow research progress is also an issue. Outside Brazil, most countries still rely on traditional bioprospecting methods. While globally this field now uses High Throughput Screening and artificial intelligence to accelerate discovery, these tools remain largely absent in Amazonia, Brazil being the main exception. To address this gap, the IDB is supporting a regional project to promote the adoption of advanced bioprospecting tools in Colombia, Ecuador, Peru, and Bolivia in collaboration with Brazilian partners (see Box 4.1.).

BOX 4.1.

Accelerating Bioprospecting in Amazonia

In 2023, the IDB launched a pioneering regional initiative to modernize bioprospecting and scale biodiversity research using advanced technologies. It is the first project in Latin America, and one of a few globally, to combine biobanks with High Throughput Screening for systematic analysis of biodiversity.

The program supports four national institutes: Amazonian Scientific Research Institute, the Peruvian Amazonia Research Institute SINCHI, the National Institute of Biodiversity, and the Higher University of San Andrés's Institute of Pharmaco-Biochemical Research (Bolivia). Each institute developed a research proposal based on **three criteria:**

- Establish a pilot biobank for cataloging and preserving extracts and fractions of Amazonia biodiversity.
- Integrate High Throughput Screening platforms into their research protocols.
- Commit to sharing results and lessons with the national scientific community.

The IDB partnered with Brazil's National Center for Research in Energy and Materials, operator of one of Latin America's most advanced High Throughput Screening platforms, to enable scientific collaboration. Three of the four institutes work directly with Brazil's National Center for Research in Energy and Materials.

This project is unprecedented in scope: for the first time, multiple countries are collaborating on a regional bioprospecting strategy that treats Amazonia as a unified biome, rather than as a series of fragmented national territories.

Collectively, the projects will analyze 4,320 samples, including extracts and fractions, from 416 species. High Throughput Screening will be used to test enzyme inhibition activity against *Trypanosoma cruzi*,[34] a major regional pathogen. This initiative offers proof of concept for how emerging technologies and regional cooperation can unlock the socioeconomic value of biodiversity, reshape national priorities, and strengthen scientific sovereignty.

Source: *RG-T4005. Science, Technology and Innovation to Protect the Biodiversity of the Amazonia Basin.*

[34] Trypanosoma cruzi is the parasite responsible for Chagas disease, a potentially life-threatening illness that affects millions across Latin America. It causes chronic cardiac, digestive, and neurological complications, and current treatments are limited in efficacy and availability. The World Health Organization has identified it as a neglected tropical disease requiring urgent research and innovation.

The IDB has also launched the BioAmazonia Network, a collaborative platform linking eight leading research institutes across the region to foster scientific cooperation, share data, and catalyze innovation related to biodiversity in the region (see Box 4.2.).

BOX 4.2.

The BioAmazonia Network: A Regional Alliance for Scientific Collaboration

Initiated in 2024, the BioAmazonia Network is a regional alliance established to foster cross-border scientific collaboration in biodiversity research and the bioeconomy. It was co-designed by the IDB and leading Amazonian research institutes.

The network includes eight institutes from five countries: the National Institute for Amazonian Research, Museu Goeldi, and Instituto Mamirauá from Brazil; Amazonian Scientific Research Institute and Instituto Humboldt from Colombia; the Peruvian Amazonia Research Institute SINCHI; the National Institute of Biodiversity from Ecuador; and San Andrés's Institute of Pharmaco-Biochemical Research's Institute of Ecology from Bolivia.

Backed by $2 million from the Amazonia Bioeconomy Fund (via the Green Climate Fund), the Network operates under the Amazonia Forever Program. A steering committee and technical secretariat coordinate its work, organized into four thematic groups: Bioeconomy; Indigenous Governance and Knowledge Systems; Biodiversity Knowledge and Management; and Environmental Threats and Conflicts.

The BioAmazonia Network is now emerging as a key platform for scientific cooperation, knowledge exchange, and collective action to advance sustainable development in the region.[35]

To build a robust, innovation-driven bioeconomy, Amazonia needs urgent investment and coordination. This means not only strengthening national research and development systems, but ensuring they operate within the region, respond to local needs, and connect with technology transfer and entrepreneurship.[36] Without such progress, Amazonia's vast biological wealth will remain underutilized, both scientifically and economically.

Business Activities and Entrepreneurship

Private sector engagement in Amazonia's bioeconomy remains limited in scale and visibility, especially when compared to the region's vast scientific and biological assets.

Comprehensive data on bioeconomic ventures is scarce, but fragmented sources, like innovation surveys, startup maps, and project databases, offer some insight. These suggest a growing number of ventures focused on biodiversity use, bio-

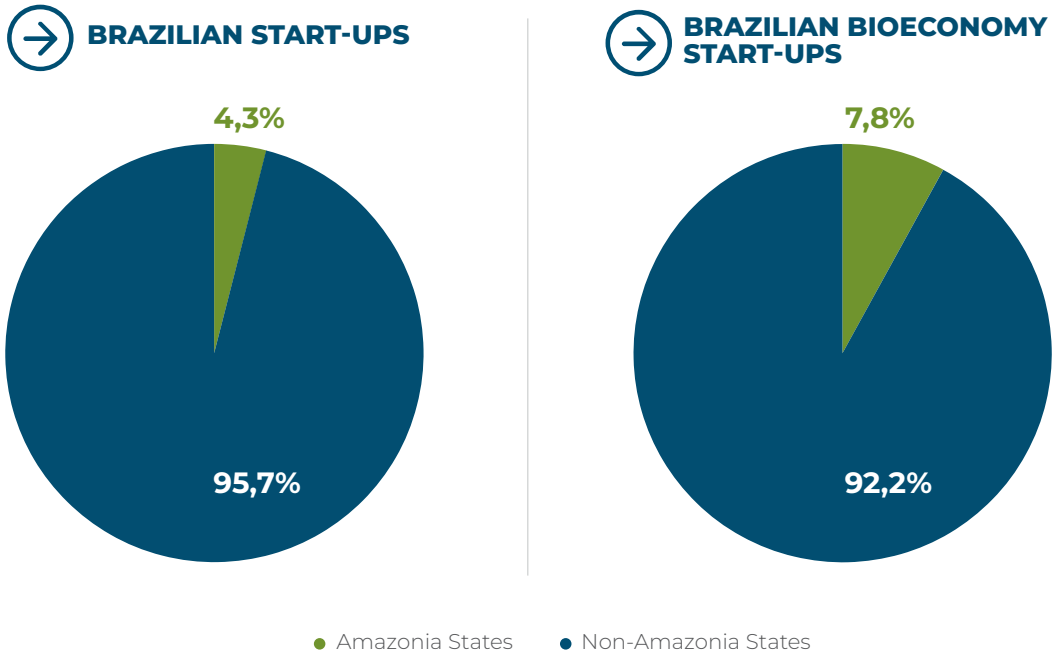
[35] More information available here.
[36] Widespread evidence from Latin America and the Caribbean suggests that public interventions aimed at strengthening national research and development systems —including subsidies for scientific research and research infrastructure, financing of technological institutes, scholarship for the formation of advanced human capital, and support for research organizations — have been effective in increasing the quantity and quality of scientific output and promoting firms' innovation and dynamic entrepreneurship (see IDB, 2022).

based products, and circular value chains. For instance, data from the Brazilian Association of Startups show that while overall startup density in the Brazilian Amazonia is low, the share of bioeconomy startups is nearly double the national average (see Figure 4.2.).

FIGURE 4.2.

Bioeconomy startups in the Brazilian Amazonia, as a share of startups, are more prevalent than general start-ups

Distribution of Startups in Brazil



Source: *Author's elaboration based on data from the Brazilian Association of Startups.*

Similarly, the Colombian Amazonia has a business density substantially lower than the national average, hosting about 10% of the country's firms. However, when considering green businesses,[37] this percentage rises to 14% (Echeverry et al., 2024). These figures may signal an emerging, albeit still incipient, niche specialization or comparative advantage in bio-based activities, driven by the Amazonia Region's natural resource endowments and growing research.

This section shares examples drawn from recent operational experience and IDB-supported initiatives that offer a snapshot of the types of ventures emerging in the region. While not exhaustive, they reflect concrete efforts to promote entrepreneurship and private investment in Amazonia, rooted in science and sustainability.

Box 4.3. describes the Amazonia BioStartups Program, which supports ten early-stage ventures across four countries working on bioinputs, biomaterials, food tech, and other bio-based products linked to biodiversity in Amazonia.

[37] Green businesses aim to promote economic activities that generate a positive environmental impact and incorporate good environmental, social, and economic practices. However, not all of them fall within the scope of the bioeconomy.

BOX 4.3.

The Amazonia BioStartups Program

Launched in 2023, the Amazonia BioStartups Program supports early-stage science- and technology-based ventures that either use, transform, or restore Amazonian biological resources. Funded by France's government through the IDB Natural Capital Lab, it focuses on Colombia, Ecuador, Peru, and Bolivia.

Each selected startup receives up to $80,000 in non-dilutive funding for talent, equipment, input sourcing, business modeling, and intellectual property protection. Selection criteria included a minimum technological readiness level (TRL 3), impact potential, and sustainability. Ten startups are currently being incubated, working in sectors such as bioinputs, bioremediation, sustainable textiles, bioplastics, food tech, and nutraceuticals—often in collaboration with Amazonia communities (Anta, 2024).

TABLE 4.1. | Key Startups by Country and Sector

Startup	Country	Sector	Species	Product or Service
Quassia Labs	Peru	Bioinputs	Marupa	Biopesticide for thrips and mites.
Foreslab	Peru	Reforestation	Several	Scalable native plant propagation.
Ecoproducts	Peru	Bioremediation	Several	Palm fiber filters for wastewater reuse.
Biojorvial	Peru	Biomaterials	Cassava, Pituca	Bioplastics for bags and cutlery.
NeoFibers	Peru	Textiles	Aguaje, Bombonaje	Luxury textiles from Amazonia fibers.
BioIngred Tech	Colombia	Food ingredients	Several	High-nutrient flours for food/ beverages
NanoMOF	Colombia	Biomaterials	Cocoa	Advanced biomaterials.
Symbiont	Colombia	Nutraceuticals	Fungi	Controlled cultivation of mushrooms.
Awa Nutrition	Ecuador	Food ingredients	Sacha Inchi, Chocho	Plant proteins for sports nutrition.
Swebol Biotech	Bolivia	Beverage	Quinoa, Açaí	Nutrient-rich functional drinks.

This program offers a new model for Amazonia entrepreneurship, combining scientific rigor with biodiversity use, and shows how bio-based startups can deliver economic, environmental, and social impact.

Box 4.4. features Natura's issuance of a $240 million (R$1.32 billion) sustainability-linked bond, supported by IDB Invest, to expand its Amazonia bioingredients portfolio and strengthen forest-based supply chains.

BOX 4.4.

Financing the Bioeconomy through Sustainability-Linked Bonds

IDB Invest and other impact investors supported Natura Cosméticos S.A. in a debenture issuance of a sustainability-linked bond for $240 million (R$1.32 billion).

A key commitment is expanding Natura's Amazonian bioingredients portfolio, which currently includes 44 ingredients and supports over 10,000 local families. Over the past 25 years, the company's model has helped preserve 2.2 million hectares of forest. The goal is to reach 49 bioingredients by 2027.

IDB Invest's participation promotes sustainable capital markets in the region. Supported by the Amazonia Forever program, this transaction strengthens agroforestry-based supply chains and contributes to the Amazonia bioeconomy while advancing forest conservation.

These examples highlight the growing diversity of business models in the Amazonia bioeconomy, from local startups to global firms, and indicate a strong potential for expansion. Still, private sector activity remains modest in scale. Unlocking Amazonia's full potential as a hub for sustainable bio-based innovation will require targeted policies, investment, and support structures. Just as importantly, it will require new collaboration models that place local communities, ecosystems, and knowledge systems at the center of innovation efforts.

4.4 Barriers to Private Sector Participation

Despite growing recognition of Amazonia's bioeconomic potential, several systemic and structural barriers still hinder private sector development. This section highlights four particularly critical barriers, based on two criteria: (1) the extent to which each barrier limits private investment, innovation, and growth in bioeconomy ventures, and (2) the degree to which it excludes Amazonia's territories and communities from these emerging value chains (Lesenfants et al., 2024b; SPA, 2021; OECD, 2019; World Bank, 2023).

Fragmented and Weak Research and Development and Entrepreneurial Ecosystems.

Scientific and entrepreneurial capabilities exist across the region but remain modest in scale and concentrated in national capitals or cities outside Amazonia. Most Amazonian territories lack core infrastructure, such as applied research centers, tech transfer hubs, incubators, and accelerators. As a result, research is often done on Amazonia, not from or with it, limiting early local participation in research and innovation. Value creation tends to occur downstream, far from the biodiversity source. A major additional gap is the lack of pilot plants and shared manufacturing facilities—critical for startups to validate technologies and products, comply with regulations, and attract investment. Brazil has made progress and Colombia is advancing, but gaps persist in Ecuador, Peru, and Bolivia.

Poor Coordination.

Many agencies—ministries, research bodies, environmental authorities, and development banks— prioritize inclusion within the bioeconomy, but their vision and actions are rarely aligned. Entrepreneurship policies may conflict with biodiversity regulations. Research incentives may bypass tech transfer and commercialization. Financing tools are often mismatched with early-stage or high-risk ventures. Local governments frequently lack the capacity to integrate these agendas territorially. In addition, many public declarations are not supported by dedicated funding, rendering them aspirational. This fragmentation creates policy noise, deters investors, and reinforces silos.

Complex and Restrictive Regulations.

In most Amazonian countries, access to genetic resources and traditional knowledge is governed by legal frameworks aligned with the Nagoya Protocol. These legal frameworks are designed to ensure equity, sovereignty, and benefit-sharing. While these principles are essential, implementation is often administratively burdensome, discouraging collaboration with Indigenous and local communities. Researchers and companies frequently prioritize areas where access is procedurally simpler—typically outside recognized collective territories—to avoid regulatory hurdles. The challenge lies not in the strength of the frameworks, but in their efficiency and clarity. Compliance could be made more predictable and practical without compromising safeguards. Without such improvements, these regulations may undermine participation, reduce investment, and weaken the legitimacy of bioeconomy initiatives among traditional communities. Brazil offers a promising example of a system that maintains oversight while facilitating access.

Mistrust and Lack of Collaboration Among Stakeholders.

Deep-rooted mistrust among governments, scientists, private firms, and communities remains a major obstacle. It stems from legacies of exclusion and extractivism,[38] compounded by cultural and communication gaps. Scientists may struggle to respectfully engage with Indigenous knowledge systems, while entrepreneurs often lack incentives or tools to co-create business models with

[38] In the global context, extractivism typically refers to large-scale, industrial extraction of natural resources, often linked to environmental degradation, commodity dependence, and power asymmetries. In contrast, the term “extrativismo comunitário” in Brazil refers to small-scale, sustainable harvesting of NTFPs (such as açaí and Brazil nut) by traditional and IC. These practices are rooted in territorial stewardship, cultural identity, and ecological balance, and often take place within conservation units.

local actors. Communities, having been marginalized in past development efforts, approach new ventures cautiously. This lack of trust is not separate from the restrictive access frameworks discussed above; it often underpins them. Regulations as safeguards become complex in contexts where power asymmetries and historical injustices remain unresolved. Without platforms for dialogue, co-creation protocols, or trusted intermediaries, collaboration remains rare, limiting the emergence of inclusive ventures and weakening the social legitimacy of bioeconomic innovation. This barrier directly undermines the **Participation** dimension of the bioeconomy framework: without trust and collaboration, genuine local involvement is unlikely and participation is superficial or absent.

While these four barriers are central, they are not exhaustive. Other barriers, such as limited access to finance, lack of early-stage venture support, infrastructure gaps, insecurity, and unclear land tenure, also constrain private sector development. In particular, **insecurity and integrity risks pose serious challenges to investment and operations in Amazonia.** These risks can deter private actors, disrupt business continuity, and undermine trust in regulatory and enforcement systems, making it even harder for bio-based ventures to take root. Tackling the four barriers highlighted here through targeted policy and investment would generate the greatest catalytic effect. They are at the heart of building a bioeconomy that is science-driven, inclusive, legitimate, and truly rooted in Amazonia.

4.5 Conclusion: Policy Recommendations for a Thriving Amazonia Bioeconomy

Unlocking the potential of the Amazonia Bioeconomy will require more than isolated programs or well-meaning pilot projects. It will take a deliberate, long-term effort to reshape the conditions under which scientific discovery, private entrepreneurship, and community participation interact. Based on the barriers described in the previous section, this chapter offers four policy recommendations that address the structural challenges limiting the emergence of a science-based, inclusive bioeconomy in the region.

Invest in research and development and entrepreneurial infrastructure within Amazonia.

Governments should prioritize the creation and strengthening of applied research centers, technology transfer capabilities, incubators, and accelerators located in Amazonian territories. This should include pilot plants and shared manufacturing facilities, which are critical for validating technologies and production processes, meeting regulatory requirements, and attracting investment. These entities must be connected to national and international science networks, yet rooted in the

social, ecological, and economic realities of the region. Strengthening Amazonia-based innovation ecosystems will enable the emergence of local ventures, reduce dependence on external actors, and foster endogenous value creation, including the development of value chains that link biodiversity-based products with regional and global markets.

Streamline and clarify access and benefit-sharing regulations to enable participatory innovation.

Governments should review and simplify access and benefit-sharing frameworks to reduce transaction costs, improve legal certainty, and facilitate the participation of local communities in biodiversity-based innovation. This includes developing standardized protocols, digital platforms, and institutional intermediaries that can ensure compliance while supporting research and commercial partnerships. A more agile and transparent access and benefit-sharing system can align bioeconomic innovation with principles of equity and legitimacy.

Strengthen cross-sectoral policy coordination and back plans or frameworks with dedicated public funding.

The effectiveness of bioeconomy policies depends on their ability to integrate diverse agendas—biodiversity conservation and restoration, entrepreneurship, education, Indigenous rights, and territorial planning—into coherent strategies. This requires not only institutional coordination, but also predictable and sustained implementation funding and access to finance (for more information please refer to Chapter 5). Without public instruments to support early-stage ventures, bio-based innovation in firms, and capacity building, even well-designed policies could remain aspirational.

Create mechanisms for trust-building and co-creation among key actors.

Governments and funders should support platforms that foster dialogue, collaboration, and joint innovation among scientists, Indigenous and traditional communities, and private firms. This includes participatory research models, community protocols, and intermediaries that can bridge cultural and institutional divides. Building trust is not ancillary; it is foundational for scaling inclusive business models and ensuring that the Amazonia Bioeconomy reflects territorial priorities rather than extractive patterns.

Together, these recommendations point to a shift in how bioeconomy approaches are conceived and executed: not as isolated interventions, but as systemic transformations that align scientific, economic, and sociocultural dimensions. By focusing efforts on these enabling conditions, countries can set the stage for a generation of Amazonian ventures that are not only innovative, but also regenerative, inclusive, and resilient.



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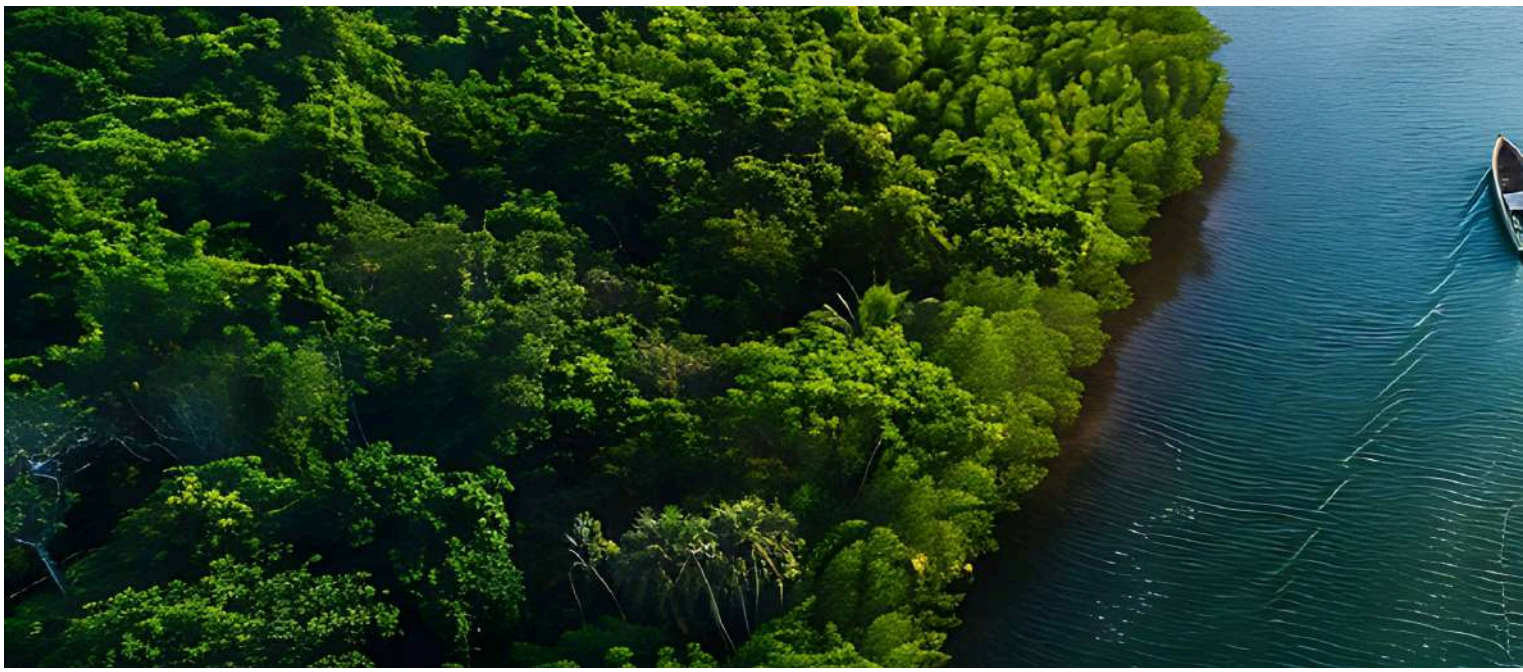
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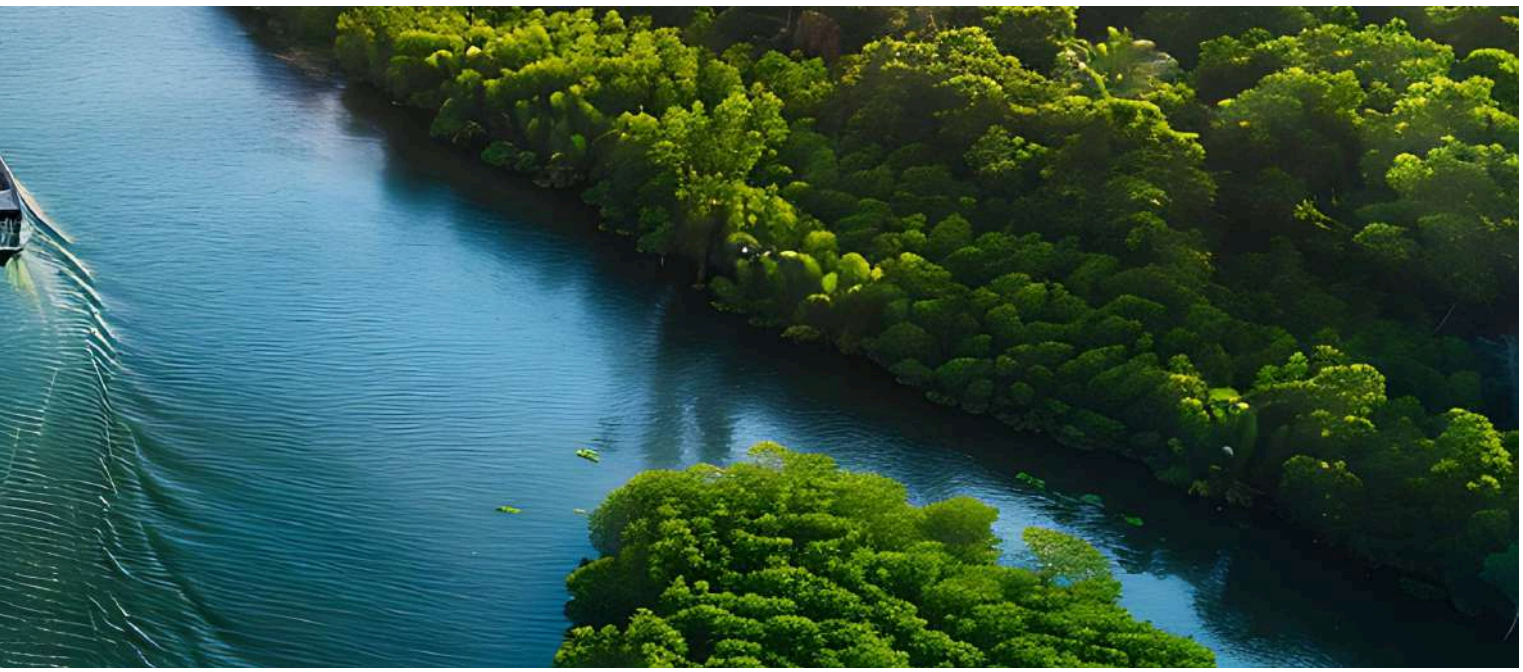
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Chapter 05

ACCESS TO FINANCE

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5.1 Introduction: Using Inclusive Finance to Catalyze Sustainable Development

Inclusive and equitable access to finance can serve as a powerful catalyst for sustainable development in Amazonia, permitting more broad-based interventions aimed at the kind of environmental preservation that would help the region achieve national and international climate goals. Evidence shows that well-designed credit lines can lead to reductions of up to 60% in deforestation in remote, rural regions of Amazonia (Assunção et al., 2020). Greater access to finance can also promote sustainable livelihoods, enhance community resilience to climate change, and improve overall well-being. More access to finance for firms can help them grow and scale, particularly in the case of MSMEs. As demand for financing sustainable investments in the region is projected to rise significantly from $70 billion in 2023 to $102 billion by 2030 (Coalición Verde, 2024), a broader range of financial solutions will be essential to meet this growing need. Although sustainable finance instruments are gaining momentum, their potential in terms of effectiveness and scalability could be more fully realized. This is especially important given the vast geographic expanse of the region and the need for more decentralized solutions to mobilize efforts from firms and individuals to reduce deforestation.

Financial inclusion refers to the availability and use of affordable financial products and services for individuals and businesses, which, in turn, should be provided in a responsible and sustainable manner, fulfilling the users' needs (World Bank, 2025). Access to finance is crucial for households in Amazonia. Without adequate financial resources, communities struggle to invest in climate-friendly practices, adapt to environmental changes, and escape poverty. Access to finance is also an important tool in closing gender gaps. By eliminating obstacles to economic participation, financial services provide women with essential resources to initiate and expand businesses, manage household finances, and invest in their future. This empowerment enhances their influence in decision-making processes that impact them, thereby fostering greater social and economic equality (World Bank, 2025).

Better access to finance for firms, particularly for MSMEs, is also essential to generating local employment and unlocking economic development in the region. MSMEs are the backbone of local economies, especially in places like the Brazilian Amazonia, where they represent the main source of jobs (IDB, 2023a). With greater access and use of capital, local firms and entrepreneurs can invest in productive activities, obtain emergency funds, increase their workforce, and pursue more sustainable and socially inclusive economic alternatives (IDB, 2025a). This could have a transformative impact in places like the Brazilian Amazonia, where over 8 million people are unemployed or engaged in informal work (IDB, 2023a). Strengthening local firms through financial inclusion not only improves livelihoods. It also sets in motion a virtuous cycle of economic activity, helping to stimulate the growth potential of the region, which remains largely untapped and underexplored. For example, the Colombian Amazonia holds a significant potential for agriculture and the sustainable use of biodiversity but represents just 0.2% of national agricultural production and generates only 1% of Colombia's total GDP (IDB, 2024a).

As explored in Chapter 1, while development finance institutions and international agencies have become increasingly engaged in Amazonia, their contributions still represent only a small portion of the investment flows required to meet the region's needs. As a result, local firms and entrepreneurs face financial constraints and remain undercapitalized, limiting their capacity to grow, innovate, and contribute to regional transformation.

This chapter presents the current state of access to finance for both individuals and businesses in the Amazonia Region, exploring the key challenges that limit access and offering some reflections and practical strategies to help address them. It also highlights how the provision of adequate and inclusive financial services for firms, entrepreneurs, communities, and individuals can serve as a powerful catalyst for inclusive and sustainable development, helping to tackle the region's long-standing social, economic, and environmental challenges.

5.2 Financing Productive Investments for Firms and Entrepreneurs

Expanding access to finance for firms and entrepreneurs is a multidimensional challenge. It involves improving both access (such as the share of firms with a bank loan, line of credit, or a deposit account) and usage (how actively firms leverage financial services to fund productive investments, working capital, and other business needs, through bank-sourced financing) (International Monetary Fund, 2020).

Enhanced financial access fosters stronger economic growth by enabling firms to invest, scale operations, and innovate, thereby boosting productivity and generating employment (World Bank, 2021). Yet, firms and entrepreneurs in Amazonia have historically faced significantly lower access to credit, particularly when compared to their counterparts in other regions. For example, although the Brazilian Amazonia accounts for approximately 6% of the country's GDP, firms in the region received only 3% of total credit operations nationwide in 2019 (Pamplona et al., 2021). Similarly, while the region is home to 13% of the country's rural producers, they receive only 6.3% of financed contracts, most of which are granted to individuals rather than firms (Climate Policy Initiative, 2021).

Financial flows tend to favor large-scale extractive sectors—such as mining, timber, soy, and livestock—reinforcing relationships that marginalize regenerative and more sustainable businesses. These extractive sectors, often associated when not managed appropriately, with land degradation and deforestation, continue to receive the largest share of available financing, reinforcing a development model that prioritizes short-term economic returns over long-term ecological resilience. In Brazil, for example, while soy and cattle production collectively receive over $30 billion per year, biodiversity products such as açaí, Brazil nuts, and cocoa get

only $ 0.3 billion per year – 100 times less (Chiavari et al., 2024; IDB, 2025a). The imbalance extends to the size of businesses accessing credit: approximately 80% of BNDES's indirect credit disbursements (those channeled through local financial institutions intended to serve smaller firms) in the Brazilian Amazonia still go to large and medium-sized enterprises, limiting the capital available to smaller, often more green businesses (Climate Policy Initiative, 2022). This systemic financing bias not only constrains the growth of forest-compatible ventures but also inhibits the development of more diversified, inclusive, and sustainable economies. There are some programs, however, that are striving to expand access to credit for MSMEs in the region. One example is the Program to Promote Sustainable Financing in the Amazonia Region in Peru (Box 5.1.).

BOX 5.1.

Credit Access for the Peruvian Amazonia

In Peru, the Program to Promote Sustainable Financing in the Amazonia Region, led by the IDB and the Development Bank of Peru, has supported MSMEs engaged in biobusinesses since 2023. The program blends concessional finance with a trust fund capitalized by the Ministry of Environment to scale ecosystem-based business models. While the program is still ongoing, its key performance indicators include increases in the GDP of the Peruvian Amazonia and the percentage of hectares restored or conserved in the areas occupied by the companies financed. Technical assistance components also aim to strengthen local value chains and promote biodiversity conservation (IDB, 2021a; IDB, 2021b).

Persistent socio-territorial inequalities also continue to undermine financial inclusion across Amazonia regions. Many firms and entrepreneurs lack access to banking services, digital tools, and basic documentation, hampering their integration into the formal financial system. Digital financial services have emerged as a promising alternative, particularly in light of increasing mobile phone penetration in some areas. In Brazil, for example, digital credit fintechs granted approximately $3.8 billion in credit in 2023, a 52% increase over the previous year. Their individual customer base also grew from 25.6 million people in 2022 to 46.7 million in 2023, representing an 82% increase (CrossBoundary, 2024; Pricewaterhousecoopers, 2024). Persistent gaps in digital infrastructure — and financial literacy— however, curb their potential, a problem that must be solved to ensure sustainable financial inclusion in rural and remote parts of Amazonia (Grazzi and Pietrobelli, 2016; Pricewaterhousecoopers, 2024). Moreover, even where public financing tools exist, firms and communities often struggle to access them due to bureaucratic hurdles, high transaction costs, lack of local technical assistance, and limited capacity to navigate funding mechanisms (World Bank, 2023; NESsT, 2024; WRI, 2021).

MSMEs in Amazonia also face persistent barriers when compared to their peers in other segments or regions when it comes to actual usage of financial services. This is due, in part, to the fact that traditional financial institutions do not offer financial services compatible with the region's unique business models, reducing the usage

of available instruments. Many bioeconomy ventures, unlike conventional ones, operate under collective ownership structures, informal governance arrangements, and alternative forms of value creation that are often incompatible with standard underwriting processes. Such businesses confront structural obstacles, and a lack of financial products tailored to their realities, including challenges in presenting formal collateral, a proven track-record, or sufficient credit scores (CrossBoundary, 2024). The structure of local production systems reveals gaps in entrepreneurial skills, restricted access to markets, and persistent barriers to improving competitiveness and fostering innovation (Coalición Verde, 2024).

Higher default risks in remote regions further reduce MSMEs' ability to use credit. Data from the Central Bank of Brazil, for example, reveals that the default rates of credit operations for firms in states within Amazonia were 42% higher than the national average. The hesitancy of lenders and investors to finance projects, particularly in the absence of strong guarantees, is a real problem. Smaller-scale businesses, including cooperatives and community-led initiatives, have trouble getting both equity and flexible debt financing. They frequently face a mismatch between their modest capital requirements and the larger investment thresholds preferred by mainstream investors. This makes it difficult for them to reach the scale or profitability expected by traditional financiers (NESsT, 2024). Unlike companies in more traditional sectors, such as energy, these firms' operations are further constrained by challenges, including insecure land tenure, limited collateral, and the absence of off-take agreements, that reduce their appeal for larger impact investors. Rural producers and local value chains struggle with short repayment terms, unattractive conditions for productive investment financing, and insufficient associated working capital. These difficulties limit their ability to synchronize financial planning with agricultural or extractive production cycles. Without sufficient liquidity, cooperatives and entrepreneurs are unable to purchase inputs in advance or plan for future growth.

To address these issues, de-risking tools like guarantees,[39] insurance facilities, and blended finance[40] should be tailored to Amazonia-specific risks and expanded. Public development banks, for instance, could offer first-loss capital, insurance, or concessional interest rates for accredited bioeconomy projects (GIZ, 2023; CrossBoundary, 2024). The Amazon Bioeconomy Fund, a $600 million investment vehicle co-financed by the Green Climate Fund, was created with this purpose in mind: to de-risk private capital flows into sustainable ventures across the region (Box 5.2.). The IDB's role in channeling this fund and coordinating guarantees with local banks, such as Banco do Brasil, underscores the importance of development finance in overcoming risk perception and unlocking private investment (IDB, 2023b), while also creating mechanisms to ensure full compliance with IDB's environmental and social policy framework (IDB, 2025c).

[39] Guarantees are financial instruments that provide protection against potential losses, helping to reduce risk and encourage investment in certain projects or sectors.
[40] Blended finance is a strategy that combines public, philanthropic, and private sector funding to attract private investment into development projects, particularly in sectors with high social or environmental impact.
[41] The Legal Amazon is a socio-geographic region in Brazil defined by federal law, encompassing nine states in the Amazonia Basin, and created to support regional development and environmental planning.

BOX 5.2.

A Bioeconomy Hub in the Brazilian Amazonia

In March 2024, Banco do Brasil launched the Bioeconomy Financial Hub to support sustainable development in the Brazilian Legal Amazon.[41] The platform facilitates credit access for the bioeconomy, including for products

like Brazil nuts, cocoa, and açaí, and offers technical assistance to improve project design and sustainability. Aligned with national climate policies like ABC+,[42] the Hub promotes partnerships across sectors, with an estimated impact that includes reaching over 2 million people, creating 11,000 jobs, and preserving more than 1 million tons of CO_2 (Banco do Brasil, 2024a).

In June 2024, *Banco do Brasil's* total bioeconomy portfolio in Amazonia reached approximately $2.72 billion, with an outstanding balance of about $280 million. Together with associated REDD+ projects, it has helped preserve more than 670,000 hectares of forest (Banco do Brasil, 2024a; Banco do Brasil, 2024b). In June 2025, the IDB approved the BB Amazonia Program, a $250 million financing package to further support the expansion of the bioeconomy and sustainable infrastructure portfolio in the Brazilian Amazonia. The program also includes a loss-coverage mechanism that leverages the Green Climate Fund's grant resources to enable BB to expand lending to riskier biobusinesses, effectively enhancing their collateral profile and increasing access to credit in the region (IDB, 2025d).

Targeted financing programs can also play a critical role in addressing access and usage of credit by firms and MSMEs. By directing capital toward small businesses, cooperatives, and community-led enterprises, these programs can generate local employment, boost livelihoods, and reduce dependency on extractive activities that often perpetuate inequality (McKillop et al., 2024; Omar & Inaba, 2020). Improved financial inclusion helps reduce social and territorial disparities by enabling greater productive investment in underdeveloped regions, with a particular focus on empowering vulnerable and historically marginalized groups. In this regard, the IDB-BNDES Pro Amazonia Program represents a landmark initiative, mobilizing $900 million to expand financing for MSMEs in the Brazilian Amazonia, implemented under a robust environmental and social management system to ensure full compliance with deforestation safeguards (IDB, 2023a). Of this financing, 30% goes to women-led enterprises, 20% for low-carbon agriculture, and 70% for borrowers in municipalities with below-average Human Development Index scores. Other recent initiatives have also directed resources to women-led MSMEs (Box 5.3.).

BOX 5.3.

Women-Led MSMEs

Women-led MSMEs represent 23.1% of active firms in the Brazilian Amazonia, mainly in the service and commerce sectors. These businesses face credit barriers, including a lack of tailored financial products and limited access to collateral. Targeted financing programs for women-led MSMEs have demonstrated significant potential to foster productive inclusion and reduce gender and territorial inequalities (Women's World Banking, 2023 and 2024).

For example, Banco do Brasil (under the IDB-Banco do Brazil Amazonia Program) reserved at least $45 million specifically for women-led

[42] The ABC Plan (Plano Agricultura de Baixo Carbono) is Brazil's Sectoral Plan for Mitigation and Adaptation to Climate Change in Agriculture, established in 2011 under the National Policy on Climate Change. It was created to promote sustainable farming practices—such as no-till systems, agroforestry, and biological nitrogen fixation—through dedicated credit lines and technical assistance aimed at consolidating a low-carbon agricultural economy.

biobusinesses. Similarly, in 2024, the IDB approved a $400,000 grant to support women's bioeconomy initiatives in the Colombian Amazonia, focusing on leadership, production capacity, and the participation of at least 15 biobusinesses and 50 women associated with bioeconomy value-chains through training and mentorship (IDB, 2025a).

5.3 Financial Inclusion for Individuals and Communities

Financial inclusion can be defined as the delivery of formal financial services at affordable costs for all segments of society, particularly low-income populations (Dev, 2006; Diniz et al., 2012). Widely acknowledged as a critical pillar of poverty reduction and inclusive economic growth, it empowers individuals and businesses to manage risk, invest in productive opportunities, and build resilience to financial shocks. In Amazonia, ensuring equitable access to finance for historically underserved populations—including Indigenous peoples, Afro-descendants, traditional communities, rural workers, women, and informal entrepreneurs—is essential. It not only fosters individual and collective well-being, reducing inequality and strengthening livelihoods. It also unlocks the region's sustainable development potential.

Access, however, remains severely constrained due to deep-rooted structural barriers that isolate large segments of the population—such as rural women and Afro-descendent, Indigenous, and mixed-race populations—from formal financial systems. These obstacles include limited physical infrastructure,[43] vast geographic distances, the digital divide, cultural norms, limited asset ownership, lack of identification or collateral, low participation in formal employment, and insufficient institutional presence. An IDB demand research conducted in selected Indigenous populations in Colombia, Ecuador, and Panama found that there is a lack of adapted supply of financial products, as well as scarce territorial coverage in the areas where Indigenous Peoples live (IDB, 2025e). Financial services—such as credit, savings, insurance, and digital payment platforms—are overwhelmingly concentrated in urban centers, leaving rural and forest-based communities underserved or entirely excluded. According to the World Bank's Global Findex Database 2021, only about 51% of adults in Latin America and the Caribbean have access to an account at a financial institution or through a mobile money provider. In Bolivia, 63% of women have an account compared to 74% of men, a gap of more than 10 percentage points. In Peru, the figures are 53% and 62%, respectively. In Brazil, only 33% of women borrowed from a financial institution in the past year, compared to 48% of men, reflecting persistent gender gaps in financial inclusion.

[43] Other infrastructure limitations that also restrict access to finance will be further addressed in Chapter 10.

BOX 5.4.

Financial Solutions Targeting Indigenous Peoples in Ecuador

In 2024, the IDB launched the $21.3 million Bioeconomy for a Sustainable Amazon (BASE) Program with financing from the Green Climate Fund. The program is implemented with the National Corporation for Popular and Solidarity Finance, Ecuador's second-tier development bank specializing in promoting inclusive finance. At its core, BASE seeks to unlock opportunities for those who are often left behind in access to finance. It combines long-term credit lines tailored for small-scale bio-businesses with a pioneering loan-loss reserve that covers up to 80% of individual losses on loans to Indigenous Peoples and women. Complemented by technical assistance to strengthen the National Corporation for Popular and Solidarity Finance and local savings and credit cooperatives, the program reduces barriers and mitigates risks that often prevent vulnerable groups from accessing finance. By placing IC and women-led small businesses at the heart of its design, BASE not only expands equitable access to finance but also fosters their integration into bioeconomy value chains, helping transform traditional knowledge and small-scale entrepreneurship into sustainable engines of growth for Amazonia.

In Amazonia, account ownership at financial institutions is estimated to be significantly lower, not only among women, but also among youth, and Indigenous groups (Demirgüç-Kunt et al., 2022). Less than 0.2% of Colombia's entire financial infrastructure is located in Amazonia. In its Amazonia Region, departments like Guainía and Vaupés have municipalities with no banking presence at all (Echeverry et al., 2024). In Brazil's Amazonia, Indigenous, mixed-race, and Afro-descendent women have lower mobile phone access than their national averages, at 75.7%, 80.3%, and 82.1% respectively. The widest gap is among Indigenous women, whose access in Amazonia is more than 7 percentage points below the national average (IBGE, 2022). Women are also underrepresented in land tenure, which can often serve as collateral. In 2017, only 18.1% of agricultural landholders in Brazil's Amazonia were women, a figure aligned with the national average for women but reflective of persistent gender inequality (IBGE, 2017). All these factors hinder the financial inclusion of these populations. The lack of access to finance not only undermines households' economic resilience and their ability to manage emergencies. It also restricts their participation in productive and sustainable activities, further deepening cycles of poverty, informality, and dependence on extractive economies.

Many residents struggle to use financial services due to low financial literacy, limited understanding of financial products, and distrust in banking solutions. Alongside expanding access, financial education is essential for promoting inclusion and increasing usage of financial services (Diniz, Birochi, Pozzebon, 2012; Xu & Zia, 2012). The OECD (2025) defines financial education as the awareness, knowledge, skills, attitudes, and behaviors that enable individuals to make informed and smart financial decisions. According to Birochi and Pozzebon (2016), the absence of financial education programs to support microcredit initiatives in Amazonia contributes to the social exclusion of low-income communities, often leading to

insolvency proceedings and negative credit records. Such programs, however, must be context-sensitive and rooted in the daily realities, cultural practices, and economic activities of low-income communities, they argue.

In response to these issues, a growing number of innovative initiatives are expanding access through flexible and community-based financial mechanisms. These include mobile banking solutions and culturally adapted services that can respond to the unique territorial, social, and cultural dynamics of Amazonia. Mobile banking used by rural cooperatives and communities, for example, has proven effective in overcoming geographic barriers and integrating marginalized populations into the formal financial system (Quist-Aphetsi, 2013). Evidence from Peru shows that savings groups[44] enable access to credit, especially in remote and socially vulnerable areas. Participation in these groups has been shown to generate a range of positive outcomes, including increased female labor force participation, increased access to credit among women, improvements in housing quality (such as greater investments in flooring and roofing) and a heightened capacity to cope with financial shocks (Frisancho and Valdivia, 2020). Without such targeted interventions, efforts to foster inclusive development and environmental conservation in the region would remain fragmented and insufficient.

Promoting financial inclusion for these populations, however, requires more than increasing the presence of financial services: it demands rethinking credit risk models, strengthening the role of cooperatives and solidarity-based organizations, and developing flexible, culturally sensitive financial products. Innovative financial approaches, such as the tokenization of natural assets or blockchain-based traceability systems for conservation-linked value chains, offer promising pathways to connect local economies to broader, sustainable markets (IDB, 2018; IDB, 2022a). Research on financial inclusion for Indigenous Peoples (IDB, 2025b) reveals that financial institutions tend to restrict credit to them. Indigenous people also tend not to apply for it. Digital solutions in local languages may reduce access barriers and increase Indigenous participation in formal financial services (Abu-Hassan and Utulu, 2022).

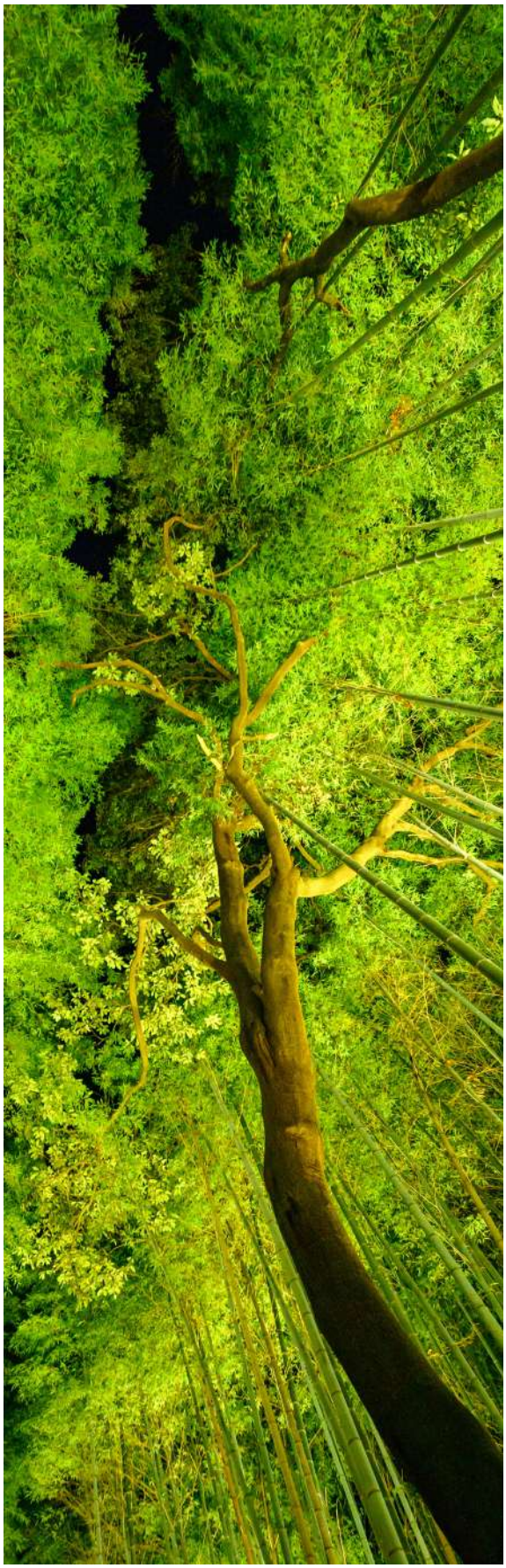
In keeping with these findings, IDB Lab initiatives, such as Amazonia BeEco[45] and the ReGenerate Accelerator,[46] support the goals of financial inclusion and autonomy through technology and innovation. Digital platforms are being developed to facilitate access to information, training, and financial services in Indigenous languages and through culturally appropriate formats (IDB, 2022b). By aligning financial mechanisms with the values, governance systems, and aspirations of Indigenous Peoples and traditional communities, such efforts can foster economic empowerment, environmental stewardship, and social equity. Indeed, these efforts reflect a commitment to co-creation and the recognition of diverse knowledge systems - essential elements for ensuring that financial inclusion in Amazonia lays the groundwork for a more just and resilient future.

Microcredit has proven to be effective for enhancing financial inclusion in Amazonia. But success depends on tailoring services to local realities. Unlike mainstream credit products, which often require formal collateral or extensive documentation, microcredit initiatives can be structured to accommodate informal entrepreneurs and community enterprises. When complemented by technical assistance, financial literacy, effective regulation, and consumer protection, even small loans can meaningfully enhance the financial resilience and autonomy of rural populations (Armendáriz & Morduch, 2010). However, in the absence of adequate safeguards,

[44] A savings group is a community-based financial structure where members regularly contribute small amounts of money to a shared fund. This fund is used for collective savings and can also provide small loans to members. Managed locally without formal banking institutions, savings groups offer a practical solution for financial inclusion in underserved or rural areas.

[45] The BeEco program is an effort to increase family incomes and community biobusinesses in the Amazonian regions of Brazil, Colombia, Suriname, Ecuador, Guyana, and Peru. The project seeks to provide training in sustainable skills to benefit 8,000 families and enable sustainable management of at least 400,000 hectares of land within four years.

[46] The ReGenerate Accelerator and Investment Fund is a fund to invest in bioeconomy companies with high regenerative potential operating in the following Amazonian countries: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, and Suriname. The proposed intervention aims to fill financing gaps, scale businesses, and boost the regenerative economy in Latin America and the Caribbean. Companies already operating with a minimum viable product will receive support in the form of investments to boost their growth.



microcredit can lead to over-indebtedness, often driven by significantly higher interest rates compared to other financial products. As a result, it may ultimately fail to produce lasting poverty reduction (Banerjee et al., 2015; Taylor, 2011). These considerations highlight the critical need to pair financial services with strong oversight, targeted education, and complementary support to ensure that credit serves as a tool for empowerment rather than a pathway to debt traps.

The IDB has played a pioneering role in developing microcredit programs specifically adapted to Amazonian conditions. Since the early 70s, and with the introduction of the Small Projects Program, the IDB has channeled funds and technical assistance to banks, microfinance institutions, and governments to help them expand access to microcredit solutions (Berger et al., 2006). In Amazonia, it has supported the expansion of microfinancing services tailored to hard-to-reach areas (IDB, 2009), and the creation of a new microfinance institution that reached over 5,000 clients within three years (IDB, 2016). More recently, microcredit programs from Banco da Amazonia also offer microfinance solutions for informal entrepreneurs in both rural and urban settings with credit lines up to $3,800 and repayment terms of up to two years (Banco da Amazonia, 2025). By leveraging a fully digital platform and partnerships with specialized microfinance institutions, these programs allow credit assessors to originate loan proposals directly in the field. This approach cuts operational costs and speeds up disbursement, making the system more accessible for remote clients.

Standard credit products—designed for individual borrowers with formal income, collateral, and credit histories—rarely align with the needs of communal landholders or non-monetized economies. But in Peru, a program led by the Interethnic Association for the Development of the Peruvian Rainforest supports IC in implementing their life plans—long-term strategies grounded in self-governance and territorial stewardship. Using resources from the Amazon Bioeconomy and Forest Management Fund and the Green Climate Fund, this initiative includes the implementation of business plans, capacity-building programs, training in project management, and the creation of an incubator for Indigenous enterprises rooted in traditional ecological knowledge (IDB, 2024b). The program also enables direct access to climate finance. Rather than relying on top-down or standardized financial instruments, culturally sensitive finance initiatives like this aim to co-design mechanisms with local actors.

5.4 Conclusion: Overcoming Barriers to Financial Access

This chapter has examined how expanding access to finance can serve as a powerful catalyst for inclusive and sustainable development in Amazonia. The barriers to financial access faced by firms, entrepreneurs, individuals, and local communities are complex and require tailored, context-sensitive financial solutions. The key takeaways from this chapter are closely linked to the financial landscape outlined in Chapter 1. Coordinated efforts are required to mobilize private, sovereign, multilateral, and philanthropic capital toward locally adapted financial solutions. Such collaboration is essential to ensuring that access to finance becomes a driver of social inclusion, economic growth, and environmental preservation. Three main conclusions and associated policy recommendations emerge from this chapter.

Financial inclusion is essential for reducing inequalities and addressing long-lasting social challenges in the region.

Expanding access to finance in Amazonia is critical for reducing deep-rooted social inequalities and promoting inclusive development. Targeted financing programs that support MSMEs, cooperatives, and women-led businesses can create local employment opportunities, improve livelihoods, and empower historically marginalized populations, including Indigenous Peoples and traditional communities. Policies should prioritize culturally sensitive financial services, financial education, and capacity-building initiatives, ensuring that underserved groups can participate meaningfully in the formal economy. Specific financial products for Amazonia should promote the use of alternative credit scoring models that incorporate non-traditional data—such as digital transactions, supply chain relationships, geospatial information, and purchase agreements—into tailored methodologies, building on recent experiences like BB Amazonia and Proamazonia programs. At the same time, operational barriers for local borrowers must be reduced by streamlining credit processes through digital channels, community-based agents, minimal documentation, and scalable, phased approval systems. Tailoring financial products and delivery mechanisms to the region's social realities — such as collective governance and alternative ownership structures — can significantly enhance financial inclusion and promote social equity.

Unlocking the economic growth potential of Amazonia depends on enhanced access to finance for MSMEs and local producers.

Access to finance is essential for promoting Amazonia's economic potential by enabling local firms and entrepreneurs to meet their growing demand for sustainable investment, improving competitiveness, and scaling sustainable business models. Innovative financial programs must address the structural mismatch between local financing needs and the rigid requirements of traditional financial institutions by offering concessional finance, de-risking tools, and flexible

credit products. Strengthening digital finance infrastructure, promoting fintech solutions, and simplifying bureaucratic procedures can also expand outreach and reduce barriers for small and informal enterprises. Financial programs focused on Amazonia should support the development of local technical capacity and entrepreneurial ecosystems by co-financing technical assistance, business incubation, and financial literacy programs. In low-capacity regions, financial institutions can play a key role by fostering entrepreneurship and productivity gains through targeted training in business planning, innovation, and enhanced market access. These efforts should be accompanied by the design of inclusive financial products adapted to the needs of small-scale, informal, or transitioning enterprises. Moreover, rural credit agents should be trained to facilitate access to financial services, from microcredit to more structured credit lines. Agents should be selected from within or near the target communities/people, ensuring strong local ties and greater cultural understanding. When combined with technical assistance and support for innovation, these measures can stimulate more diversified and sustainable economic growth in the region.

Scaling inclusive financial services will also help meet environmental and climate goals.

Inclusive financial mechanisms are pivotal for advancing environmental sustainability in Amazonia by redirecting capital flows toward forest-compatible and biodiversity-based enterprises. De-risking instruments and public-private investment vehicles—such as blended finance and green credit lines—can incentivize bioeconomy projects and discourage extractive, high-emission ones. Mechanisms, such as public guarantees, credit insurance, and first-loss instruments, may reduce risk perception and attract private capital for bio-businesses. By mitigating investor risk, these instruments help unlock private capital for projects that would otherwise be considered too risky or unprofitable. Microcredit funds should also be structured with a territorial focus and small-ticket financial vehicles, with interest rates suited to local realities and the possibility of aggregating projects to dilute risks. Policy-based loan guarantees that mobilize ordinary capital to strengthen biodiversity conservation governance and secure long-term financing can de-risk investments and bolster public policies for biodiversity protection. Credit products should provide extended grace periods and flexible repayment conditions. They should also be aligned with seasonal cycles (particularly for cooperatives and value chains such as açaí, Brazil nuts, and cocoa) as well as ecological realities. And they should support sustainable land use, conservation practices, and climate adaptation. Co-designed mechanisms that integrate Indigenous knowledge and life plans can ensure that environmental finance respects cultural values and enhances local stewardship of natural resources, helping to align financial inclusion with national and global climate goals.

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PEOPLE

Chapter

06

BOOSTING EDUCATION IN AMAZONIA

Andrea Bergamaschi, Joao Cossi Fernandes & Gregory Elacqua



6.1 Introduction: Education Can Support Inclusive and Sustainable Development

Education is a fundamental right at all stages of individual development with significant impacts on well-being, income levels, health conditions, and life expectancy. The construction of a new development model in Amazonia that allows its population to prosper socioeconomically while conserving its ecosystems and cultures thus requires investment in education (Arias Ortiz et al., 2021).

Multiple challenges and barriers affect the quality and accessibility of education in Amazonia. Geographic dispersion, inadequate infrastructure, a shortage of qualified teachers, and a lack of educational relevance in regional and cultural terms limit learning opportunities for thousands of children and youth.

Available data shows that students in Amazonia have higher dropout rates and lower completion rates and that their learning outcomes are lower than the national averages of the countries that make up the region (for the purpose of this publication, Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela). These inequalities are accentuated in the hinterlands of Amazonia and among Indigenous, Afro-descendant, and riverine populations.

Climate change exacerbates the difficulties of education systems in the Amazonia Region. Extreme heat, flooding, and other adverse weather events disrupt learning and increase dropout rates, underscoring the need to strengthen the resilience of those systems through better infrastructure.

Bolstering the retention and quality of teachers and ensuring that they can implement teaching models relevant to the Amazonia context is also essential. Teachers must be able to empower students with the knowledge, values and capacities to confront climate change and contribute to the sustainable development of their communities.

This chapter explores the main challenges and barriers to quality education in the region and proposes a set of concrete solutions that would guarantee the right to education in pursuit of a more inclusive, inter-cultural and sustainable development model.

To identify key challenges, the available educational data on Amazonian areas in each country were compared with the national averages and/ or data on non-Amazonian territories. Specific analyses[47] were conducted to better understand the main challenges, within the Amazonia Region by comparing urban and hinterland areas, as well as Indigenous and non-Indigenous populations. To operationalize this approach, the analyses presented here include comparisons between four units of analysis applied to each of the eight countries in the Amazonia Region: i) national averages,[48] ii) aggregated averages for the Amazonia Region in those countries,[49] iii) hinterlands of Amazonia and iv) Indigenous territories.[50]

[47] Heterogeneous definitions and criteria make it difficult to compare data between countries, complicating the use of educational statistics for the Amazonia Region. In this context, national household surveys are a key source, as they allow for obtaining updated and harmonizable data. However, these surveys have limitations in the coverage of specific populations, such as Indigenous Peoples. Improving the quality and availability of data by combining official sources with alternatives is necessary to strengthen decision-making in educational policies.
[48] National averages refer to the national-level indicators of the eight countries across which Amazonia extends: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela. These serve as a comparative baseline for understanding disparities within the Amazonia Region.
[49] Amazonia in this chapter was initially defined using the concept of the Amazonas River Basin, which is based on hydrological criteria and includes highland areas. However, most of the data in this chapter is based on administrative definitions of Amazonia, due to the sources of data used. Moreover, due to limitations in the availability and disaggregation of educational data at the subnational level, a number of small adaptations were required. Therefore in this chapter, Amazonia includes all of Guyana and Suriname; the states of Amazonas and Bolívar in Venezuela; Amazonas, Caquetá, Guainía, Guaviare, Putumayo, and Vaupés in Colombia; Sucumbíos, Napo, Orellana, Pastaza, Morona Santiago, and Zamora-Chinchipe in Ecuador; Loreto, Ucayali, Madre de Dios, and Amazonas in Peru (excluding San Martín due to linguistic considerations); Beni and Pando in Bolivia; and Amazonas, Acre, Roraima, Rondônia, Pará, Amapá, Tocantins, Mato Grosso, and Maranhão in Brazil.
[50] Indigenous territories comprise about 2.4 million km², equivalent to 28.5% of Amazonia. This may vary in the level of recognition: officially recognized, not officially recognized, Indigenous Reserves or Intangible Zones (reserved for Indigenous Peoples in isolation), and proposed Indigenous Reserves (RAISG, 2023).

6.2 Low Learning and High Dropout Set the Region Back

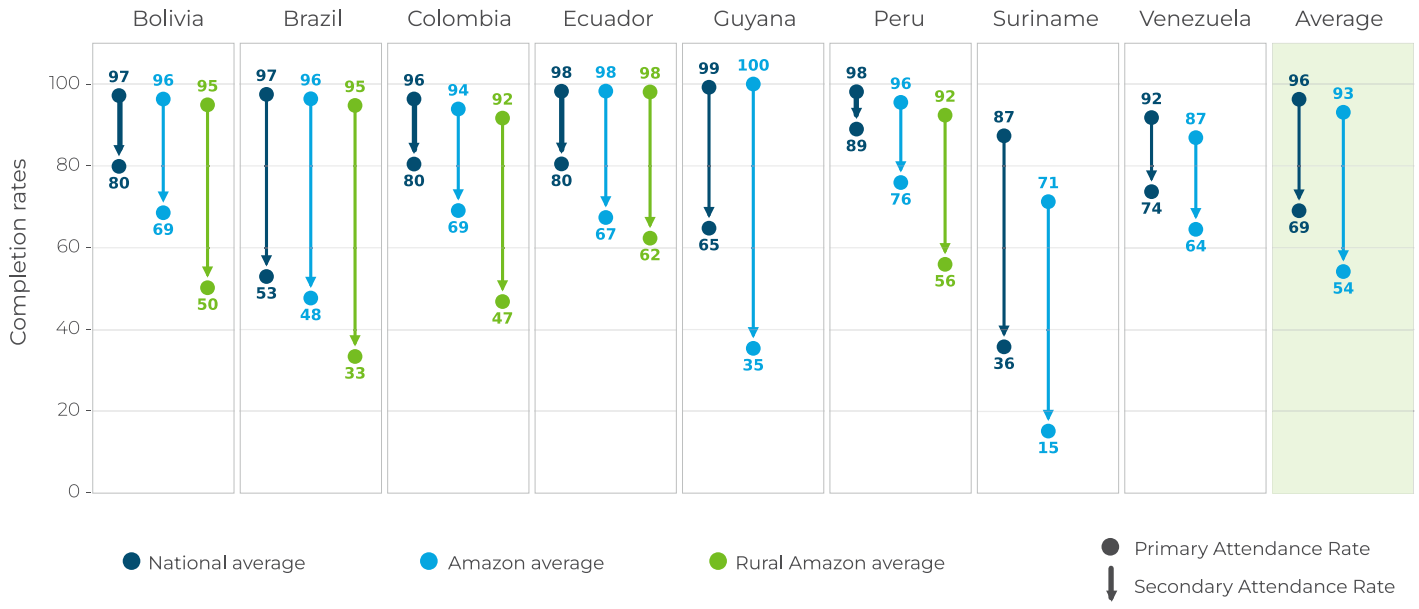
The Amazonia Region faces a number of educational challenges that contribute to insufficient economic opportunity and growth, as well as poorer environmental conditions.

First, students in the region have low completion rates, meaning fewer of them remain in school and complete their educational trajectories at the theoretically expected age. In primary school, completion rates are practically universal. On average in the eight countries analyzed, 96% of children complete elementary school, compared to a 93% average for Amazonian territories (Figure 6.1.). In secondary education, there is a disproportionate reduction, however. On average in the eight countries, 69% of young adults between 18 and 20 years of age have completed secondary education, and that percentage falls to 54% among young adults in Amazonia.

FIGURE 6.1.

Students in the Region have Lower Completion Rates than Students Outside the Region Living in the Same Countries

Education Completion Rates,[51] Hinterlands Circa 2022



Source: *Data from harmonized national household surveys: National Institute of Statistics of Bolivia, Encuesta Continua de Hogares, 2018–2021; IBGE, Pesquisa Nacional por Amostra de Domicílios Contínua, 2021–2022; National Administrative Department of Statistics of Colombia, Gran Encuesta Integrada de Hogares, 2022; National Institute of Statistics and Censuses of Ecuador, Encuesta Nacional de Empleo, Desempleo y Subempleo, 2022; Bureau of Statistics of Guyana, Labour Force Survey, 1st, 2nd and 3rd trimesters 2021; National Institute of Statistics and Informatics of Peru, Encuesta Nacional de Hogares, 2022; Inter-American Development Bank, Suriname Survey of Living Conditions, 2022; Catholic University Andrés Bello, Encuesta Nacional de Condiciones de Vida, Venezuela, 2021. The average is calculated as a simple mean of the national and Amazonia Region rates, except for Venezuela, where the indicator's calculation is slightly different. Data on some rural areas of Amazonia are either unavailable or insufficient for producing statistical significance. In these cases, the data was not presented.*

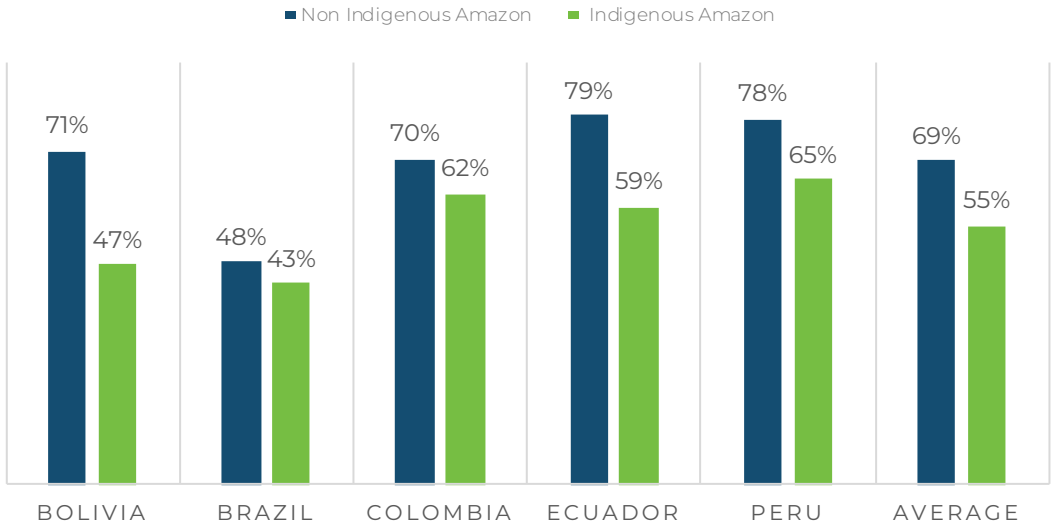
[51] The primary education completion rate is the percentage of people aged 12-14 years who have completed primary education. The secondary education completion rate is the percentage of 18-20-year-olds who have completed secondary education.

The situation is more critical in hinterlands and Indigenous territories. Data from Bolivia, Brazil, Colombia, Ecuador and Peru reveal differences between national averages and the Amazonian hinterlands of approximately 20 percentage points in secondary education completion rates (Figure 6.2). And among Indigenous students in the Amazonia Region, secondary school completion is 14 points lower than that of their non-Indigenous peers there.

FIGURE 6.2.

Secondary School Completion is 14 Points Lower Among Indigenous Students Than Their Non-Indigenous Peers.

Disparities in High School Completion: Amazonian Indigenous and Non-Indigenous Populations, Circa 2022.



Source: *Harmonized data from national household surveys: National Institute of Statistics of Bolivia, Encuesta Continua de Hogares, 2018–2021; IBGE, Pesquisa Nacional por Amostra de Domicílios Contínua, 2021–2022; National Administrative Department of Statistics of Colombia, Gran Encuesta Integrada de Hogares, 2022; National Institute of Statistics and Censuses of Ecuador, Encuesta Nacional de Empleo, Desempleo y Subempleo, 2022; and National Institute of Statistics and Informatics of Peru, Encuesta Nacional de Hogares, 2022.*[52] *The average is calculated as a simple mean of the national and Amazonia Region rates. Data on some rural Amazonian areas are either unavailable or insufficient for producing statistical significance; in these cases, the data were not presented.*

A principal factor associated with low completion rates is late and interrupted schooling. Although overall age-appropriate enrollment rates are high in Amazonia, they are still somewhat lower (93%) than national averages (95%), especially in countries such as Bolivia, Brazil, Colombia, Guyana, and Peru. This, in turn, affects school trajectories.

Many students become disengaged from the classroom throughout their school career. This can be seen in attendance rates. While in primary education, most countries register net attendance rates above 90% in both Amazonian and non-Amazonian regions, the gap between Amazonia (73%) and national averages (77%) widens in secondary education, with difficulties in attendance even more acute in the hinterlands (Figure 6.3). For example, while in Colombia, seven out of ten school-age adolescents attend secondary school, this rate drops to five out of ten

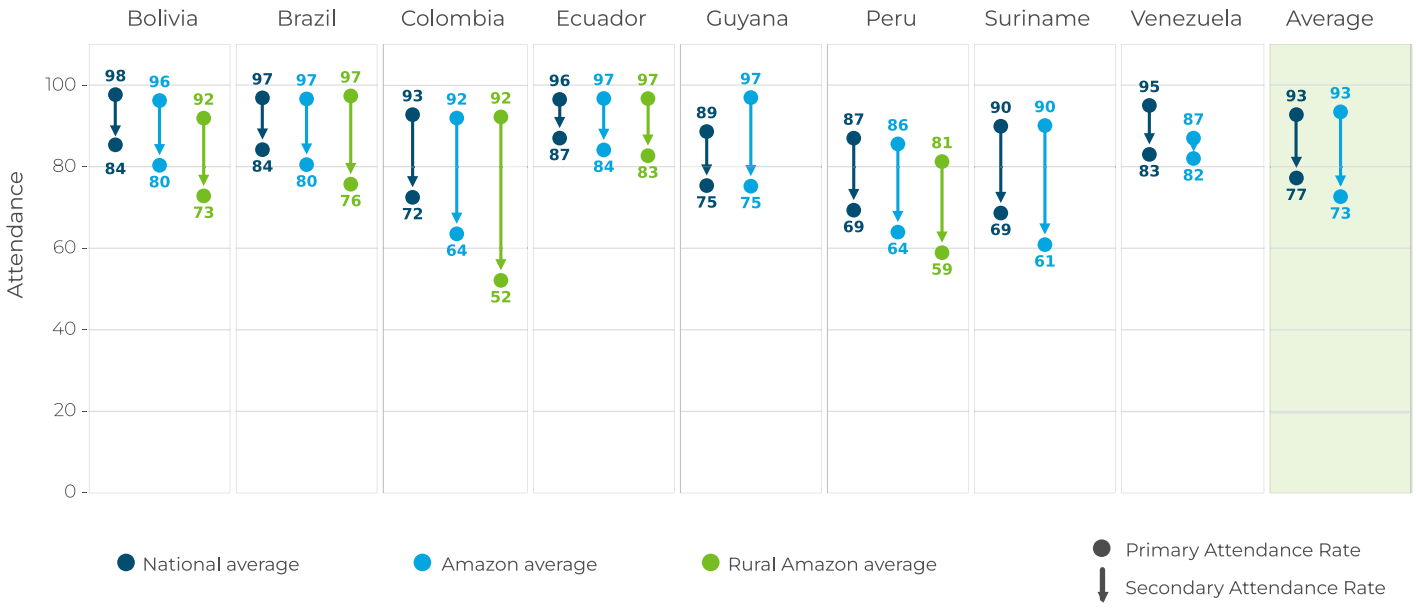
[52] Data on Peru differs from the official statistics provided by the Ministry of Education and the National Statistics Institute, due to age cut-offs and periods. This document presents children's self-reported ages, whereas the Ministry of Education applies a March 31st cut-off according to Ministry regulations. For more information, please see (Giambruno et al., 2024).

for the inhabitants of the Amazonian hinterlands, reflecting the magnitude of the challenge in addressing educational exclusion in the Amazonia Region.

FIGURE 6.3.

Attendance Rates for Students in the Region are Lower Than That of Their Peers Outside the Region.

Net Primary and Secondary Attendance Rates,[53] Hinterlands Circa 2022



Source: *Data from harmonized national household surveys: National Institute of Statistics of Bolivia, Encuesta Continua de Hogares, 2018–2021; IBGE, Pesquisa Nacional por Amostra de Domicílios Contínua, 2021–2022; National Administrative Department of Statistics of Colombia, Gran Encuesta Integrada de Hogares, 2022; National Institute of Statistics and Censuses of Ecuador, Encuesta Nacional de Empleo, Desempleo y Subempleo, 2022; Bureau of Statistics of Guyana, Labour Force Survey, 1st, 2nd and 3rd trimesters 2021; National Institute of Statistics and Informatics of Peru, Encuesta Nacional de Hogares, 2022; Inter-American Development Bank, Suriname Survey of Living Conditions, 2022; Catholic University Andrés Bello, Encuesta Nacional de Condiciones de Vida, Venezuela, 2021.[54] The average is calculated as a simple mean of the national and Amazonia Region rates, except for Venezuela, where the indicator's calculation is slightly different. Data on some rural areas of Amazonia are either unavailable or insufficient for producing statistical significance. In these cases, the data was not presented.*

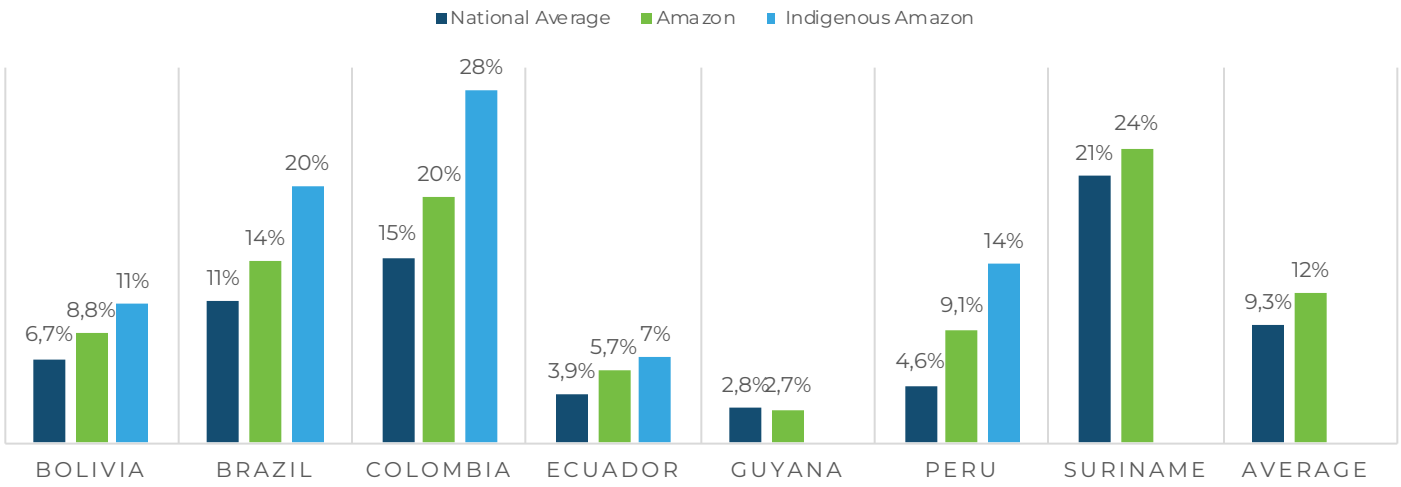
There are several factors that affect school dropout at the secondary level. These include difficulties of access, poverty and a scarcity of basic household resources, child labor, and a lack of parental awareness and encouragement regarding the benefits of education (Barger et al., 2019). High rates of over-age students represent a challenge in all the countries analyzed, a situation that is accentuated in the Amazonia Region, with a difference of almost three percentage points with respect to national averages. This is worse among Indigenous populations who have an early school dropout rate seven points higher than their non-Indigenous peers.

[53] Percentage of children within the officially recognized age range for primary and secondary education who actually attend school.
[54] While data on Venezuela come from the published ENCOVI 2021 indicators, data on the other seven countries come from harmonized datasets. In the case of Venezuela, the published data from ENCOVI 2021 represent attendance rates at educational institutions for children 6-11 and 12-17 years old. For more information, please see (Giambruno et al., 2024).

FIGURE 6.4.

High Rates of Over-Age Students Represent a Challenge in the Region

Percentage of Over-Age Students in Primary and Secondary Education, Circa 2022



Note: *Percentage of over-age students: Percentage of students more than two years older than the theoretical age for their grade.*

Source: *Harmonized data from national household surveys: National Institute of Statistics of Bolivia, Encuesta Continua de Hogares, 2018–2021; IBGE, Pesquisa Nacional por Amostra de Domicílios Contínua, 2021–2022; National Administrative Department of Statistics of Colombia, Gran Encuesta Integrada de Hogares, 2022; National Institute of Statistics and Censuses of Ecuador, Encuesta Nacional de Empleo, Desempleo y Subempleo, 2022; Bureau of Statistics of Guyana, Labour Force Survey, 1st, 2nd and 3rd trimesters 2021; National Institute of Statistics and Informatics of Peru, Encuesta Nacional de Hogares, 2022; and Inter-American Development Bank, Survey of Living Conditions, Suriname 2022. The average is the simple mean of the countries listed in the graph. Data on some Indigenous areas of Amazonia are either unavailable or insufficient for producing statistical significance; in these cases, the data were not presented.*

Among female students, pregnancy also affects educational dropout. In the four countries for which data are available (Peru, Brazil, Colombia and Ecuador), the average teenage pregnancy rate in Amazonia stands at 67 births per 1,000 adolescents, significantly higher than the national average for the four countries, at 43 births per 1,000 adolescents.

Gender-related educational disparities in the Amazonia Region are most pronounced at the basic educational level and in illiteracy rates. In Ecuador's Amazonia, the illiteracy rate for women was 4.2%, compared to 2.4% for men (National Institute of Statistics and Censuses of Ecuador, 2022). In Colombia, women consistently face higher illiteracy rates than men across most departments of Amazonia. The largest gaps were found in Vaupés, where 14.8% of women were illiterate compared to 7.2% of men, and in Guainía, where the rates were 13.1% for women versus 5.4% for men (National Administrative Department of Statistics of Colombia, 2018). In Peru, women in the Amazonia had higher illiteracy rates than men across all ethnic groups, with the largest gender gap among Indigenous populations (9.5 percentage points), followed by Afro-Peruvians (6.8 percentage points) (National Institute of Statistics and Informatics of Peru, 2023).

Low levels of learning are worrisome: The results of learning assessments in science, mathematics, and reading reveal differences of up to 17 percentage points between

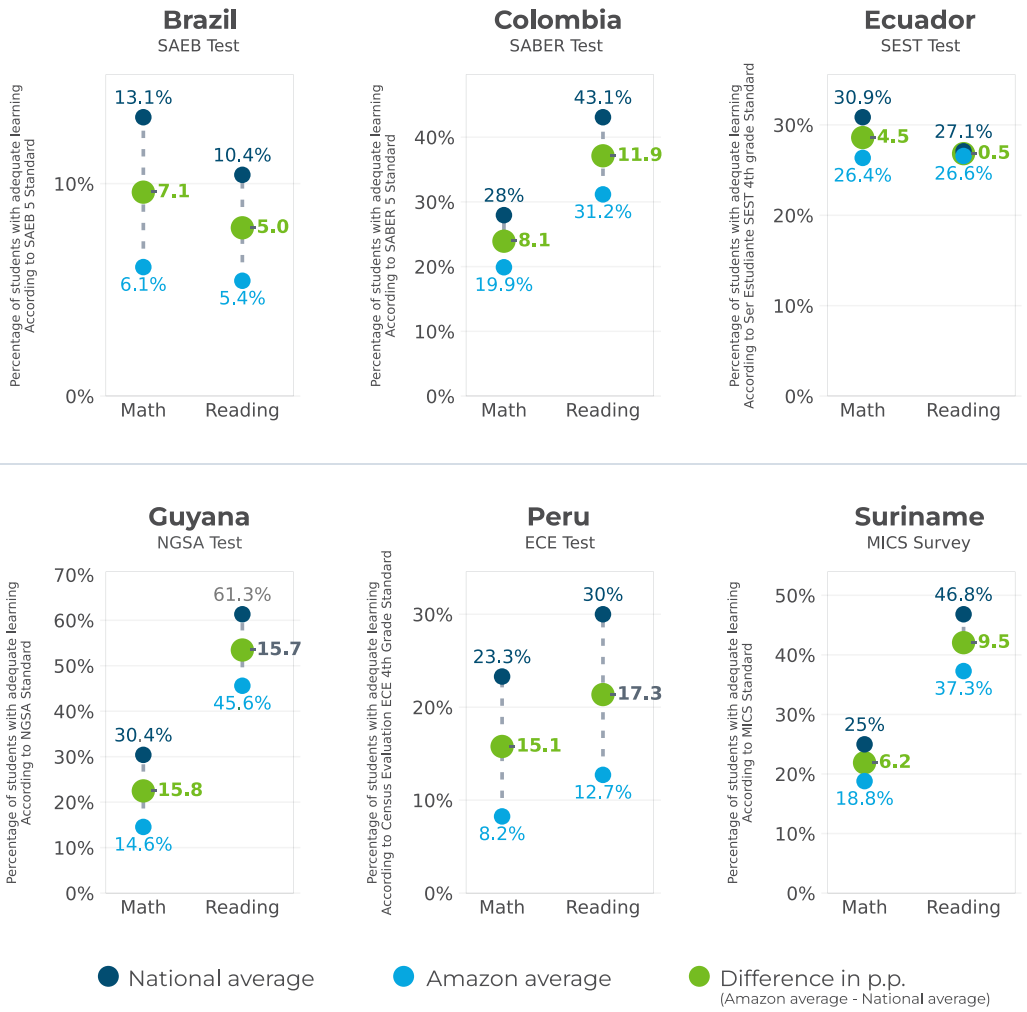
national and Amazonian averages (Giambruno et al., 2024), equivalent to six or seven months of schooling. National assessments in Brazil, Ecuador, Peru, and Suriname also indicate that a lower percentage of Indigenous students reaches the established proficiency levels in mathematics and reading than their non-Indigenous peers, a disparity that reaches 12 and 13 percentage points respectively in Suriname and Ecuador.

FIGURE 6.5.

The Results of Learning Assessments in Science, Mathematics, and Reading Reveal Differences of Up to 17 Percentage Points Between National and Amazonian Averages

Achievements in Mathematics and Reading for Indigenous and Non-Indigenous

Results from different learning assesments **are comparable only within countries, not between them.**



Source: *Brazil, Sistema de Avaliação da Educação Básica, 5th grade, 2021; Colombia, Pruebas Saber 5°, 2017; Ecuador, Ser Estudiante, 4th grade, 2022–2023; Guyana, National Grade Six Assessment, 2022; Peru, Evaluación Censal de Estudiantes, 4th grade of primary education, 2022; and Suriname, Multiple Indicator Cluster Survey, 2018.*

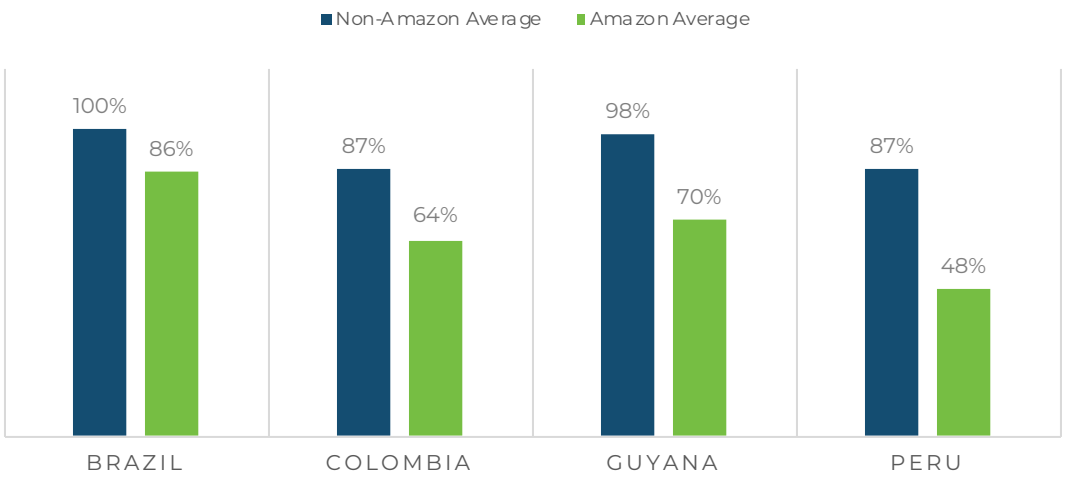
6.3 Transport, Teaching, and Infrastructure Barriers

Difficulties in accessing schools because of physical distances and associated travel costs are among the most significant factors affecting education in Amazonia. Twenty-three percent of primary school-age children live more than five kilometers from the nearest school, equivalent to more than an hour's walk. That figure rises to 29% at the level of secondary education. Though school transportation is the principal means of getting to school, such transport is available to only 12% of students in the region, compared to an average of 23% in other parts of the country. Students tend to get to school using boats and bicycles, rather than cars. But that makes traveling to and from school slower (SAEB, 2019). And while riverboats in the hinterlands pass nearby to students' homes and schools during most of the year, those boats may stop at more distant points during the dry seasons, exacerbating school transport problems. Children on these journeys are usually unsupervised and exposed to numerous risks (UNICEF, 2017). Long travel distances also take their toll, leaving them often fatigued and unable to concentrate in class.

Deficiencies in school infrastructure represent another educational barrier, with access to electricity a key constraint. According to available data, the average number of schools with electricity is lower in Amazonia than outside the region.

FIGURE 6.6.

Access to Electricity is a Key Constraint of School Infrastructure in Amazonia
Schools with Access to Electricity: Amazonia vs. non-Amazonia



Source: *National Institute for Educational Studies and Research Anísio Teixeira, Censo Escolar da Educação Básica 2022, Brazil; National Administrative Department of Statistics of Colombia, Educación Formal 2021, Colombia; Ministry of Education, administrative data, 2023, Guyana; and Ministry of Education of Peru, Estadísticas de la Calidad Educativa 2022, Peru.*

Weather conditions are a significant problem. Evidence shows that extreme heat negatively affects cognitive performance, hindering concentration and knowledge retention (Goodman et al., 2019; Park 2017; Park et al., 2021). Schools are often not prepared for such heat. Data in Brazil, for example, reveal that classrooms in the region have poorer conditions not only in lighting, furniture, and acoustics, but also in ventilation compared to classrooms in the rest of the country (SAEB, 2019). High temperatures, heat waves, storms, floods, and droughts—increasingly prolonged and frequent in recent years—also threaten school infrastructure and educational continuity, causing reductions in the number of school days and the prolonged suspension of classes. With an even greater increase in temperatures expected in Amazonia, these impacts could be intensified without improvements in infrastructure, deepening the vulnerability of students, especially in the most isolated populations.

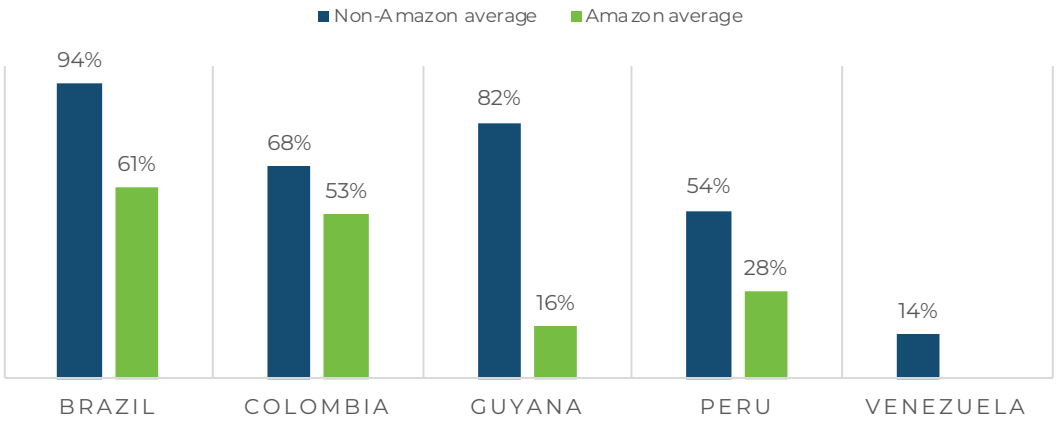
Inadequate infrastructure, such as limited access to water and sanitation, also affects school retention across the region. Girls are particularly impacted by water insecurity, which hinders menstrual hygiene, contributing to absenteeism. In Suriname, for instance, sanitation conditions are alarming. Only 39% of rural schools have adequate toilet facilities, and just 18% meet standards for handwashing with soap. These gaps not only increase health risks but also threaten students' dignity and safety, especially for girls during menstruation.

Digital tools can accelerate learning in remote areas and contribute to educational continuity in emergency situations. They are also fundamental to the development of innovative pedagogical activities. At present, however, internet access is lacking. In the five countries where data are available on internet access in schools (Brazil, Colombia, Guyana, Peru, and Venezuela), school connectivity is lower in Amazonia than in regions outside it.

FIGURE 6.7.

Internet Access is Lacking, and Digital Devices are Insufficiently Accessible in Amazonia

Schools with Internet Access: Amazonia vs. non-Amazonia



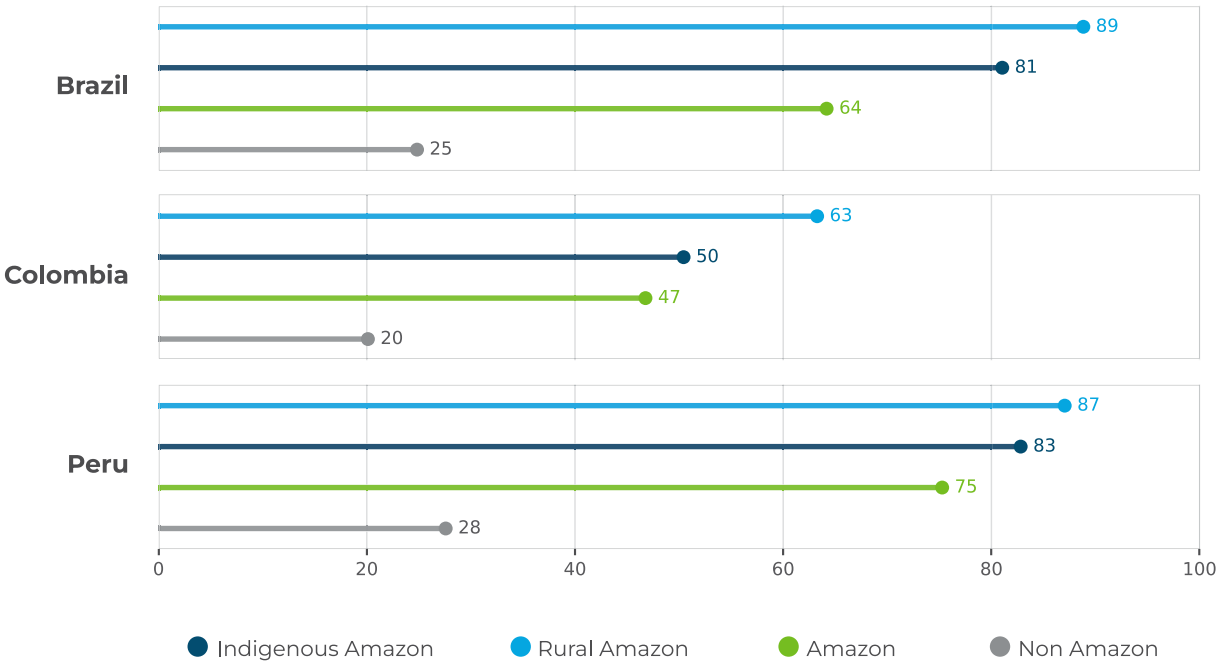
Source: *National Institute for Educational Studies and Research Anísio Teixeira, Censo Escolar da Educação Básica 2022, Brazil; National Administrative Department of Statistics of Colombia, Educación Formal 2021, Colombia; Ministry of Education, administrative data, 2023, Guyana; Ministry of Education of Peru, Estadísticas de la Calidad Educativa 2022, Peru; and Catholic University Andrés Bello, Anova Policy Research, and Devtech Systems, Encuesta Nacional de Establecimientos Educativos 2021, Venezuela.*

Digital devices are in short supply. While between 20% and 30% of schools outside Amazonia lack computers or tablets for students, this figure is much higher in Amazonia, rising to between 50% and 75%, with the figure at 80% in the hinterlands of the region and almost 90% in the Indigenous territories of the Brazilian and Peruvian Amazonia.

FIGURE 6.8.

Between 50% and 75% of Schools in Amazonia Lack Computers or Tablets for Students

Percentage of Schools Lacking Laptops, Desktops or Tablets



Source: *National Institute for Educational Studies and Research Anísio Teixeira, Censo Escolar da Educação Básica 2022, Brazil; National Administrative Department of Statistics of Colombia, Censo Nacional de Población y Vivienda 2018, Colombia; and Ministry of Education of Peru, Censo Educativo 2022, Peru. The term "Indigenous Amazonia" in this graph refers to schools located on Indigenous lands in Brazil and Colombia and to schools serving Indigenous students in the Peruvian Amazonia. The data cover primary to secondary education and include the number of operational laptops, desktops, and tablets available for student use.*

There is also an insufficient number of teachers, particularly in the most remote areas of Amazonia, and of quality teachers, even in non-remote areas. Teacher qualification levels tend to be low, especially in Indigenous territories. In the Peruvian Amazonia, for example, the percentage of teachers with university degrees in education-related fields is inferior to that in other parts of the country (Ministry of Education of Peru, Education Census, 2022). And In Brazil, there are considerably fewer Indigenous and non-Indigenous teachers with higher education degrees in Indigenous territories than outside them (Elacqua et al., 2021).

This at least in part because it is difficult to attract new educational professionals and retain them in Indigenous areas and hinterlands. An illustrative case is Loreto, Peru, where 83% of teacher vacancies do not attract candidates. That stands in

contrast to urban areas where the most attractive vacancies receive more than ten applications per position (Bertoni et al., 2023).

Temporary contracts exacerbate the problem. In Brazil, only 9.4% of Indigenous teachers working in Indigenous schools in the state of Amazonas have permanent contracts, compared to 85.3% of Indigenous teachers in non-Indigenous schools throughout the state. In Guyana, 19% of secondary schools located in the hinterland lack permanent teachers, a figure that drops to less than 1% in other regions (Ministry of Education of Guyana, 2023).

Schools in Amazonia often bring together students of diverse cultures, ages, and learning levels, and require teachers to carry out different activities according to the needs of each group. Added to these demands are the floods, extreme heat, and other climactic factors that contribute to greater burnout, absenteeism, and, ultimately, abandonment of the profession. Yet there is no differentiated remuneration for teachers in the region that take these particularities and challenges into account.

There is also a lack of educational relevance in the curriculum in terms of developing the knowledge, values, and capacity needed to act in favor of the environment and develop locally relevant skills.

Primary and secondary education curricula show a low level of integration of environmental issues. A UNESCO study revealed that only 19% of Latin American and Caribbean countries mention elements related to climate change in their educational plans (UNESCO, 2021a). On the 2006 OECD Program for International Student Assessment tests (OECD, 2008), Latin American and Caribbean students also scored lower in environmental knowledge, with an average of 426 points compared to an OECD average of 495 points.

Teaching more about Amazonia ecosystems—including knowledge about the restoration, preservation, and protection of forest resources, climate change, and the capacity of young people to affect positive change—could generate greater student engagement. It is also of great interest to students in the region. A study in Brazil shows that 50.4% of Amazonian students are interested in studying local biodiversity, compared to 33.1% in the southeast of the country (Franzolin et al., 2020).

At the upper levels of secondary education, TVET can facilitate the development of relevant skills, foster vocations, and support future economic activities in the context of new development models. However, the proportion of students in TVET courses is lower in Amazonia than in other areas of the analyzed countries. In Brazil, for example, only 15% of high school students are enrolled in TVET courses, a figure that drops to about 10% outside Amazonia.

Attention to the educational needs of the Indigenous population in Amazonia is particularly lacking. There are 1.4 million Indigenous people living in the region, 32% of whom are of school age. Most countries allow Indigenous Peoples to study their own curricula and have classes in their native languages. But there is still a significant gap between the laws and their implementation, with insufficient teaching methods and didactic materials adapted to local languages and cultural contexts. The majority of Indigenous youth in Latin America study in educational systems using a language that is not their own, resulting in early school dropout

and lower completion rates (Morrison et al., 2017). In the interior of Suriname, for example, 91% of students aged 7-14 speak Indigenous languages at home. But most of their teachers are only fluent in Dutch (UNICEF, 2018). In the Colombian Amazonia, only 66% of schools located in Indigenous territories operate under an ethno-educational system. And in the Brazilian Amazonia, 20% of Indigenous schools teach only in Portuguese (Instituto Nacional de Estudos e Pesquisas Educacionais, 2023), while in Peru, only 60% of schools in Indigenous territories implement bilingual intercultural education (Ministry of Education of Peru, 2022).

Language is not the only issue, however. Recognizing and incorporating the traditional knowledge of Indigenous and Afro-descendant populations are also key to ensuring culturally relevant education while offering strategies on the use of the territory and the sustainable management of natural resources.

6.4 Conclusion: Novel Initiatives Offer Promising Alternatives

Addressing educational challenges in Amazonia requires a holistic approach that promotes the quality and resilience of educational services and confronts access barriers and gaps. This section presents solutions that have already had a positive impact on the experience of students and teachers either in the region or in similar contexts and serve as a reference for improving learning and completion rates.

Expanding Climate-Resilient Infrastructure

One challenge in expanding and improving educational infrastructure in Amazonia involves decisions as to where to build new schools. The development of UrbanPy, an open-source tool that helps analyze accessibility to essential urban services, is an important innovation in this regard. Developed by the IDB in partnership with the Universidad del Pacífico and the Economic Development Management of the Municipality of Lima, it helps national and subnational governments identify population concentrations in cities and isolated communities and estimate the number of students and age groups in areas of up to 0.7 km^2, among other roles.

Investing in climate-resilient (particularly heat-ready), sustainable and culturally adapted (ethno-engineered) schools is essential. Incorporating climate sustainability strategies in the design, construction, and operation of schools, such as efficient uses of energy and water, cross-ventilation, and energy-efficient materials, advances that agenda. Ethno-engineering, meanwhile, holds that schools should be designed so they reflect the educational traditions of teachers and students in forest or Indigenous areas, including the use of local materials and construction techniques, greater participation by women, and local practices and knowledge (Hess and Strobel, 2013).

BOX 6.1.

Three Outstanding Ethno-Engineering Schools

Aldeia Infantil,[55] Tocantins, Brazil. Refurbished in 2017 with the participation of the educational community and local knowledge, the school uses adobe walls and redesigned spaces. Two residences for students are built around a shared courtyard that encourage sociability and allow temperature and air humidity control. A lake in the central courtyard collects rainwater, and common areas on top of the dormitories boost the size of the educational areas.

Mazaronkiari Indigenous Community,[56] Satipo, Peru. Between 2013 and 2014, the school was expanded to respond to an increase in enrolment, using local materials and modern techniques. The wood and clay brick structure includes movable panels that adapt the space as a classroom, auditorium, meeting point, or cafeteria, optimizing light, ventilation and protection against rain in the process.

Chuquibambilla Secondary School,[57] Pangoa, Peru. Built in 2013 for the Nomatsiguenga community, where students had to walk long distances to get to school, the new infrastructure features modules around a central courtyard. These include classrooms, a library, a computer room, a student residence and spaces for activities that link students with nature and their traditions, with materials that include concrete, local bricks and wooden roofs.

Leveraging Technology

The lack of stable and quality access to both the internet and digital devices represents a major constraint for education in Amazonia. Collecting information on the digital infrastructure and connectivity needs of both schools and homes could help fill some of the gaps in areas with low internet penetration rates and establish if there are alternative connectivity mechanisms being used. Expanding school connectivity could also lead to the implementation of digital technologies that could help provide education in conditions that make it impossible for schools to function normally, as occurred during the COVID-19 pandemic or during extreme drought or floods.

Technology Mediated Education, the use of information technology to improve learning, is one way to compensate for limitations in teacher availability and training. In Brazil, it has been applied in different formats for the provision of basic educational services, including in so-called Media Centers (Centro de Mídias).

[55] Arquitectura Viva (2023). See here for more information.
[56] ArchDaily (2023). See here and here for more information.
[57] IDB (2018). See here for more information.

BOX 6.2.

Media Centers in Brazil

Media Centers have transformed Technology Mediated Education, bringing basic education to remote areas. The first Media Center was created in 2001 by the State University of Amazonas to train teachers. In 2007, the Amazonas Department of Education opened an MC for high school students. Initially focused on broadcasting previously recorded content, it has evolved into a synchronous live-teaching model with webcasting. This has improved teacher-student interaction. Over 16 years, Amazonas Department of Education has impacted 60 municipalities and 26,830 students. Currently, there are more than 1,800 transmission points reaching 2,000 classrooms, with an average of 13 students per classroom. The Media Center was one of the policies implemented by IDB's first program with Amazonas Department of Education. It helped the state increase the share of students attending high school on time by 5 percentage points and decrease the share of over-aged students in high school by 17 percentage points. It also helped significantly increase learning in Portuguese and mathematics in both middle and high school. Similar interventions have been implemented in other regions with significant results.

These are viable solutions. Their quality, however, could be improved with greater bandwidth for accessing digital content and platforms; paired teaching to increase teacher-student interactions and strengthen tutor training; and an emphasis on ensuring proper equipment, maintenance, and follow-up to reduce dropout rates.

Digital education platforms offer another alternative for expanding learning opportunities in regions with limited teacher availability. But leveraging them depends on access to the Internet and devices. One possible solution is the use of offline or asynchronous platforms, as have been implemented in Tanzania, Malaysia, and Indonesia.[58] The closest experience comes from Honduras, where the Kolibri platform was used to reduce learning losses among vulnerable students during the COVID-19 pandemic. To date, Kolibri has not been implemented in Amazonia, but serves as a good example of what could be done in the region.

BOX 6.3.

Kolibri Platform in Intibucá, Honduras

Kolibri is an open-source educational platform created by the Learning Equality Foundation that allows access to quality content without an Internet connection. In Honduras, it was used in Intibucá to mitigate learning losses due to the COVID-19 pandemic, benefiting students from the 7th to 9th grades in 102 schools, half of which were part of the "treatment group". The schools received technological equipment with the platform

[58] UNICEF Tanzania, Accelerating Digital Learning, press release, UNICEF, See here for more information; UNESCO, Technology in Education: A Case Study on Malaysia, UNESCO, See here for more information; UNICEF Indonesia, Digital Learning Landscape Report, UNICEF, See here for more information.

preloaded, and teachers were trained to assign materials and homework. Although quantitative results are not yet available, caregivers—such as parents, guardians, or other adults responsible for the care of children at home—valued the program positively for expanding access to materials and motivating students (Abizanda et al., 2022).

Improving Teacher Selection, Training, and Retention

Comparative experience shows that scholarships aimed at young people with a teaching vocation are effective in increasing enrollment in teaching careers. The Teacher Vocation Scholarship in Chile and free teacher training in China have both increased enrollment in education careers and improved graduation rates (Pérez-Núñez, 2020).

For these policies to be successful in Amazonia, however, young people from local communities must be prioritized, as they are more likely to be rooted in their communities and interested in staying at local schools once they graduate. Scholarships in Amazonia should be accompanied by vocational guidance strategies starting in high school. The Quiero Ser Profe program of the Chilean NGOs Elige EDUCAR, for example, connects students with mentors who provide guidance on teaching careers.

While that program has had promising results, its expansion has been limited by a shortage of mentors (Ajzenman et al., forthcoming). A recent innovation promoted by the IDB in conjunction with Elige EDUCAR, provides one solution. It offers virtual mentoring using artificial intelligence (AI), like the chatbot "Kai", which offers vocational guidance through WhatsApp. In its most recent version, Kai interacts in natural language, answering questions about career and application processes (Ajzenman et al., forthcoming). This is especially useful in the hinterlands of Amazonia where face-to-face programs are difficult to implement at scale.

Teachers must also be retained. Greater monetary incentives in the hinterlands have proven to be an effective tool, reducing turnover and attracting teachers to areas that are less in demand. Experiences in Chile, Peru, and Brazil indicate that bonuses equivalent to 25-30% of the base salary can increase retention by up to 21 percentage points (Elacqua et al., 2021, Chile; Bobba et al., 2021, Peru; Elacqua and Rosa, 2025, Brazil), though their high cost requires careful evaluation in terms of territorial targeting and fiscal sustainability. Complementary, non-monetary incentives such as access to housing, transportation, and internet connectivity, may also be considered.

As many teachers in Amazonia do not have a university degree or training in intercultural and multilingual education, training programs should prepare young people from the region to teach in their own communities with curricula adapted to the Amazonia context, including training in bilingualism, ethno-education, climate change, and multi-grade methodologies.

Teachers need support. Many new teachers leave the profession because they do not have it. Here again, technology can be an ally. The chatbot "Profe Gabi," implemented

in Chile by the Ministry of Education with support from the IDB, offers personalized virtual mentoring to teachers in their first year, with content on emotional well-being, pedagogical strategies, and professional development. It operates through WhatsApp, with 24/7 availability, and has shown promising results in reducing isolation and improving teacher self-confidence (Elacqua et al., forthcoming).

Developing Students´ Skills

Ensuring educational relevance is key to improving learning outcomes, especially in contexts such as Amazonia, where local needs and realities are not always reflected in curricula. An education that transmits relevant skills not only increases students' interest. It also strengthens their ability to apply what they learn to the environment and the sustainable development of their communities.

The training of "green citizens" in schools is a central aspect of this process. With a curriculum adapted to encompass learning about biodiversity, climate change, and sustainable resource management, it can encourage environmental responsibility in students, help them integrate their lives more with nature, and equip them to be agents of positive change (Bos and Schwartz, 2023).

BOX 6.4.

Environmental Education in Amazonia

In Brazil's state of Amazonas, the Interinstitutional Commission for Environmental Education, created in 2005, leads the planning and monitoring of environmental education. Since 2007, the State Policy on Climate Change has promoted awareness of global warming in vulnerable communities and public schools. In 2024, the state of Pará implemented a mandatory curriculum on sustainable education for students from 1st to 12th grade, with additional resources and awards and certifications for high achievement.

TVET plays a key role by teaching skills that allow young people to integrate into sustainable productive sectors, such as natural resource management and the development of local value chains. Such training can be of great benefit to society as a whole, reducing exploitative relationships between traders and producers and the unequal distribution of benefits (Bulgarelli Labronici, 2021).

TVET and apprenticeship and scholarship programs can also empower women and youth, increasing their employability (Haan et al., 2020; Dales and Ramasamy, 2019; Potter and Lupilya, 2016). Examples such as the Açaí processing course in Brazil and the Sandbox program in Colombia for entering the audiovisual industry stand out.

BOX 6.5.

Program Examples

Technical Training in Açaí Processing

In Pará, Brazil, where almost 90% of the country's açaí is produced, a Technical Training Course in Açaí Processing was developed in 2022. Promoted by the IDB under its Amazonia Forever Program as well as by the state of Pará and Itaú Educação e Trabalho, the course combines theoretical and practical elements with 800 hours of training in environmental conservation and responsible natural resource management aligned with the demands of the local market.

Solar Energy and Tourism Training

An IDB project, it invests in training the workforce that drives the environmental agenda in the urban centers and remote territories of the Colombian Amazonia. The initiative supports the National Apprenticeship Service, Colombia's leading TVET institution, which has a strong presence in Amazonia and serves more than 6 million people per year.

In the six departments of the Colombian Amazonia, between 70% and 100% of electricity still depends on diesel. So the government has begun to invest in solar-powered communities to meet the urgent need for cleaner energy. Without qualified personnel, however, this initiative risks failure. This is why the project is supporting the modernization of the National Apprenticeship Service's solar photovoltaic technical program that trains the technicians who make the energy transition possible. To facilitate access in remote areas, a mobile classroom equipped with adapted technology and teaching kits is being developed. Instructors are also being trained, both in technical and pedagogical areas, with a special emphasis on training women.

Another initiative, financed by the IDB's Amazonia Forever program and the Climate Investment Fund, invests in the training of tour operators for sustainable tourism with an ethnic focus. In 2022 alone, the Colombian Amazonia received more than 220,000 visitors but lacked trained tour operators. To respond to this demand, the National Apprenticeship Service 's technical program in tourism was updated for the first time in 20 years, incorporating cultural tourism standards, validated with IC, to expand access for both trainees and trainers.

The initiative invests in curricular innovation, teacher strengthening, virtualization of programs and the use of mobile classrooms adapted to the Amazonia context to train more than 3,000 apprentices per year, connecting local talent with green and sustainable jobs in the process.

Technical Training in Audiovisual Production

In Colombia, the Sandbox Program, begun in 2022, has provided technical training in audiovisual production to 1,500 Afro-descendants, Indigenous people, women, migrants and LGBTQ+ people between 18 and 30 years of age in the department of Putumayo and five other regions of the country. In total, 625 young people have completed the course, including online training, internships at companies, and a mentoring program. The project was led by the IDB, with support from Netflix and the Colombian Ministry of Culture.

The main provider of TVET in the Colombian Amazonia is the National Apprenticeship Service, which offers a broad portfolio of programs ranging from short courses to technical training and higher education technology curricula, with various offerings focused on environmental issues. While free and encouraging of inclusion, it faces significant challenges in keeping its programs up to date and ensuring continuous and relevant training for its instructors. In this context, IDB support is strengthening its institutional capacities.

Intercultural Bilingual Education also plays a key role, ensuring access to an inclusive and relevant educational experience for Indigenous students from communities with distinct languages and cultures who may face difficulties in traditional educational settings. Investing in Intercultural Bilingual Education has shown positive results in Latin America, such as a decrease in grade repetition in Bolivia and increased enrollment levels for girls in Peru. In Bolivia, a longitudinal study showed that students in Intercultural Bilingual Education schools also improved their self-esteem (Abram, 2004).

BOX 6.6.

A Bilingual Mathematics Program in Panama

JADENKÄ, an innovative math program developed in Panama for the Ngäbe-Buglé comarca, uses bilingual (Spanish and Ngäbe) audio lessons to strengthen intercultural learning in preschool education. Through an inquiry-based, problem-solving approach, students solve math challenges in groups, guided by their teacher, while singing and dancing to reinforce concepts such as numbers, shapes, and spatial relationships. Eighty-three percent of students in the comarca previously had a low or very low level in mathematics. That compared to a 49% national average (Ministry of Education of Panama, 2018). Without increasing class time, the JADENKÄ program improved students' knowledge of their own culture, in addition to ethnomathematics and Western mathematics. In the second year of its implementation, the learning of Western mathematics by the students showed an improvement of 0.24 standard deviations, equivalent to more than half an academic year of additional learning (Näslund-Hadley et al., 2022). Based on this model, Peru launched MateRaymi in 2024 to teach

mathematics in Quechua. Venezuela will develop a version for Amazonian families in 2025. These programs demonstrate the potential of audio instruction to reduce language and cultural barriers, expanding access to quality education even in the absence of native teachers.

Culturally Relevant Education for Environmental Resilience

Amazonia faces complex educational challenges, including high dropout rates, low secondary school completion rates, and low educational achievement, with significant gaps between Indigenous and non-Indigenous students. Environmental conditions, exacerbated by climate change, negatively impact learning and educational continuity. Significant barriers persist, such as a lack of access to schools, poor and inadequate infrastructure, and a shortage of qualified teachers in remote areas. The absence of relevant education that responds to the region's environmental and socio-cultural challenges further aggravates the situation.

In this scenario, investing in educational policies that are territorially anchored is key to improving education and promoting sustainable and resilient development in a region exposed to the climate crisis. The imminence of an ecological tipping point in the Amazonas River Basin makes the implementation of a new development model imperative. This new model must preserve the integrity of ecosystems and promote environmental awareness, generating new sustainable economic opportunities for local communities. To achieve this, educational policies must strengthen the relevance of education, so that local inhabitants understand the importance of the region in which they live and the need to preserve it, while having the information and skills to do so. Such policies must involve an open and constant dialogue with traditional peoples, respecting their knowledge, needs, and ways of life.

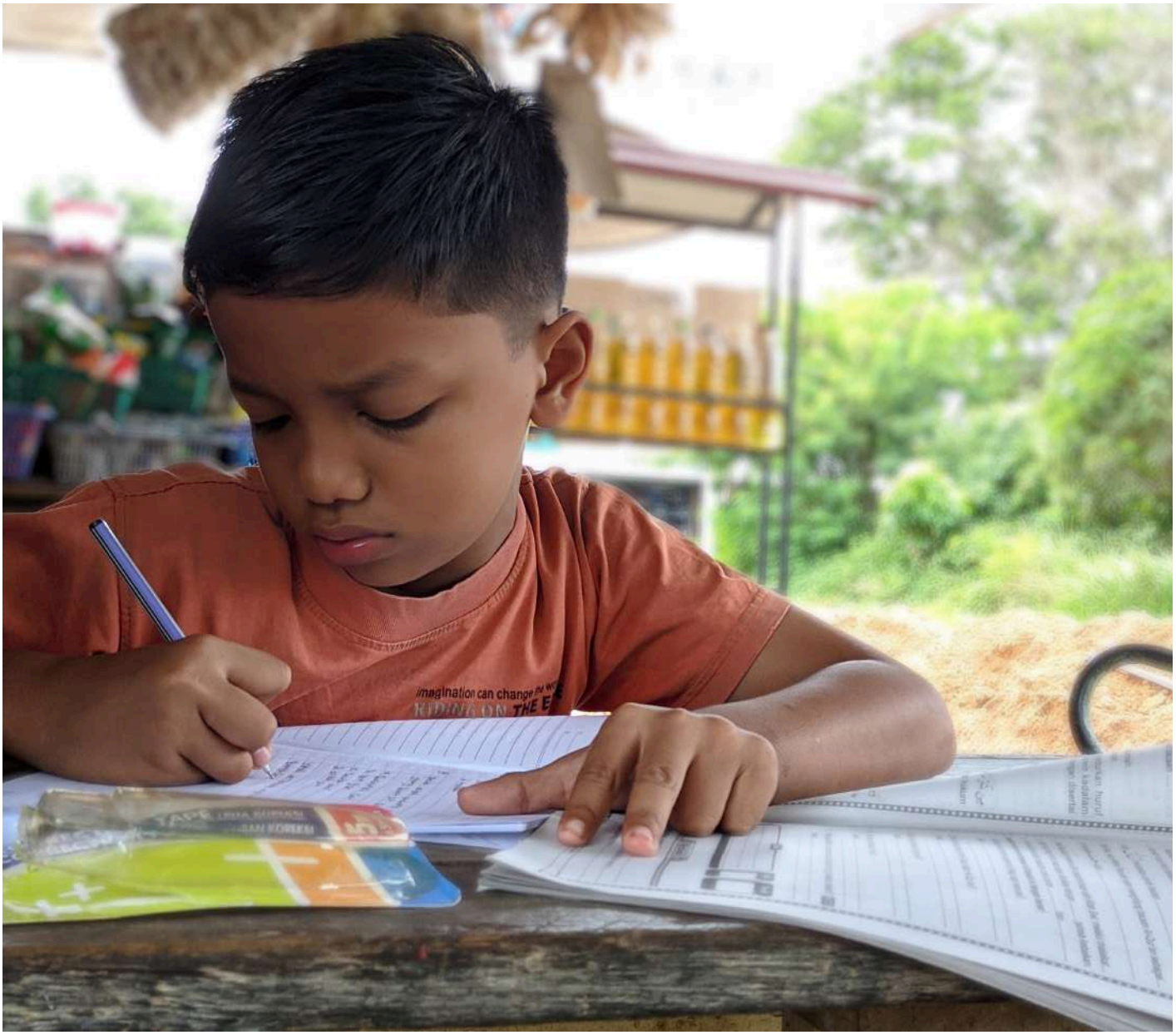
They also must have a long-term vision of the role of education in sustainable development in Amazonia, including the region's role in the climate change mitigation agenda. Learning must be relevant, aligned with students' interests, especially at the secondary level. Interventions should support students in reaching the learning levels expected for their age. Economic support through scholarships or transfers can make a big difference in this regard, as can the involvement of parents and guardians and regular access to educational centers.

Developing governance and management capacity to ensure the sustainability of educational actions is essential. The lack of coordination between different levels of educational governance hinders the implementation of effective policies, especially in territories where local governments lack sufficient technical or financial resources. Obstacles in needs assessment are related to a data challenge, as many countries still have weak education information and management systems. Improving articulation among actors and ensuring the presence of qualified professionals who can monitor and implement policies with a territorial approach will thus be crucial to strengthening educational management in Amazonia.

In order to address educational governance gaps, the IDB has funded a program to improve schooling from preschool to secondary education in hinterland regions. This

approach involves working with or supporting schools and education secretariats in coordination with the national government—something underway in six Colombian departments considered part of the Amazonia Region: Amazonas, Caquetá, Guainía, Guaviare, Putumayo, and Vaupés.

It is worth noting the great mutual benefit that policymakers in the different Amazonia countries can gain from exchanging experiences in addressing common challenges, identifying optimal solutions, and putting them into practice. These interactions can, in some respects, be even more effective than interactions with policymakers in their own countries who are not directly involved with Amazonia. Designing and implementing effective educational policies can help overcome many of the region's challenges. But to do so, they must ensure open dialogue, knowledge of local capacity and context, autonomy, the rights of traditional peoples, and cooperation with other policymakers in the Amazonia Region.





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Chapter

07

BOLSTERING SOCIAL PROTECTION FOR INTENSIFIED CLIMATE AND ENVIRONMENTAL RISKS

Alexandre Bagolle, Laura Goyeneche, Gabriela Perin & Luis Hernán Vargas Faulbaum



7.1 Introduction: Growing Vulnerabilities Require Vigorous Responses

With more than one-third of its population living below the poverty line and poverty rates 30% higher than in non-Amazonian areas, Amazonia has some of the highest poverty rates in Latin America and the Caribbean.[59] Moreover, in recent decades, the effects of poverty in Amazonia have been exacerbated by climate and environmental risks which have intensified as a result of steady rises in temperature, shifting rainfall patterns, ecosystem degradation, and biodiversity loss. Poor and vulnerable populations are at the front lines of the climate and environmental crisis. They experience its effects most acutely and could play a critical role in containing it.

The stark injustice of this crisis lies in the fact that those least responsible for its causes are often those who endure its most devastating consequences (Ogunbode et al., 2024; Allafta and Opp, 2024). Poor populations are likely to suffer the most from climate and environmental changes, deepening their poverty and worsening inequality gaps. Extreme events—such as droughts, wildfires, and floods—frequently destroy their livelihoods and productive assets, causing them larger losses. Extreme heat and air pollution, especially from forest fires, make outdoor work more hazardous, forcing many of them to choose between protecting their health and earning an income. Climate disruptions deeply affect their agricultural systems, and the degradation of forests and water sources places pressure on their food security, reducing their access to species they depend on for hunting, fishing, and gathering.

As outlined in Chapter 1, these close interlinkages between environmental, climatic, and social vulnerabilities underscore the need for integrated responses (see Figure 7.1.) and the need to bridge the gap between climate adaptation and mitigation efforts, as well as social protection policies. This challenge is particularly relevant for Amazonia as it is a vast territory with a critical role in stabilizing not only its own rainforest ecosystem but also adjacent biomes, such as the Cerrado and Pantanal wetlands or the Andean grasslands. Moreover, the region faces a convergence of entrenched social issues—such as limited access to basic services, higher poverty rates and insecure land tenure—alongside escalating environmental and climatic risks, which together magnify local vulnerabilities and imperil both livelihoods and local ecosystems.

This chapter explores the evolving role of social protection in responding to dramatic changes. Traditionally designed to ensure a minimum standard of well-being and protect individuals from life-cycle risks, such as illness, old age, or job loss, social protection systems must now adapt to a new reality shaped by increasingly complex and compounding climate and environmental threats, marked by extreme weather events and the degradation of natural resources, respectively. The latter is especially pertinent in Amazonia, where accelerating ecosystem degradation coincides with economies that remain heavily dependent on natural resources extraction, as illustrated in Figure 7.1. In that context, the adaptive capacity of social protection

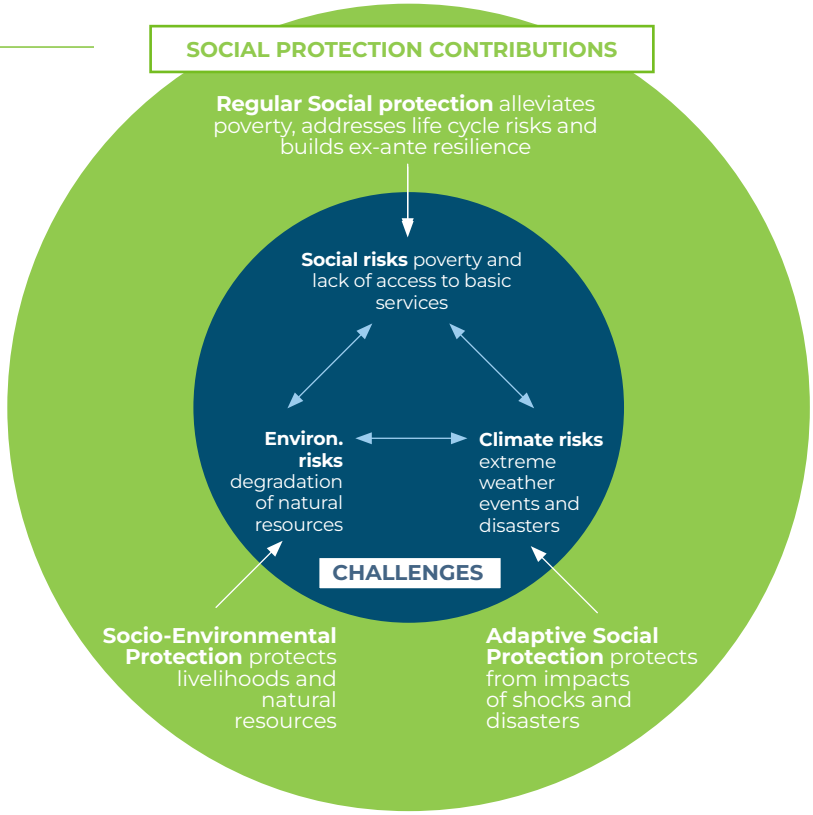
[59] For methodological details about the poverty measurement utilized in this chapter, please see Annex 2.

systems emerges as a critical asset for managing life-cycle risks compounded by climate and environmental hazards, thereby bolstering local livelihoods.

Adaptive social protection, understood as the integration of social protection systems with disaster risk management and climate change adaptation, is gaining recognition as a powerful tool to enhance resilience and support adaptation among affected communities in Latin America and the Caribbean (Bagolle, Costella, and Goyeneche, 2023). When effectively integrated with environmental conservation, social protection programs can also enhance the contributions of local populations—including Indigenous Peoples, Afro-descendants and traditional communities—to the conservation of natural resources and the broader fight against environmental degradation and climate change (Bhalla et al., 2024). This chapter will place special emphasis on the analysis of non-contributory social protection mechanisms[60]—particularly cash transfers—as they are the most widely used and farthest-reaching instruments in the region for addressing poverty and responding to shocks.

FIGURE 7.1.

An Integrated Approach to Social, Climate, and Environmental Risks in Amazonia



Source: *Authors' own elaboration*

Drawing on a combined analysis of poverty maps, disaster risk, and environmental degradation across eight Amazonian countries, this chapter examines how social, environmental, and climate risks intersect and reinforce one another, particularly in the Amazonia Region. It reviews evidence on the effectiveness of social protection programs in supporting wellbeing, fostering disaster resilience, promoting sustainable livelihoods, and supporting environmental conservation in rural areas. It discusses the progress and ongoing challenges faced by Amazonian countries in advancing these goals and proposes policy recommendations.

[60] Non-contributory social protection refers to publicly funded programs that provide support—such as cash transfers or in-kind benefits—to individuals and households without requiring prior contributions, targeting those in poverty or vulnerable situations.

7.2 Intensifying Social, Climate, and Environmental Risks

Amazonia faces a convergence of social vulnerabilities and escalating environmental and climate risks that not only overlap spatially but also interact and intensify one another.

Social Vulnerabilities

People living in Amazonia tend to face more challenging social conditions than those living outside the region. Poverty can be measured in monetary terms, considering poor individuals and households whose income is insufficient to meet a minimum threshold of consumption or basic needs.[61] The poverty rate in Amazonia, using this definition, stands at 37%, which is 8.3 percentage points higher than in non-Amazonia areas (28.7%). These disparities are particularly pronounced in countries such as Brazil and Peru, where poverty rates in Amazonia exceed those in the rest of the national territory by more than 10 percentage points. Figure 7.2 shows a heatmap of poverty levels by administrative area in and outside of the Amazonia Region, supported by a table summarizing average poverty rates per country and type of territory. Based on this data, one can clearly see the stark differences in poverty rates across Amazonia and non-Amazonian territories in Brazil and Peru and between Indigenous and non-Indigenous territories.

In addition to monetary poverty, Amazonia populations face persistent barriers to accessing basic social services, further compounding their social and economic exclusion. Nearly half the population, or 23.9 million people, struggle to access at least one essential service (Giles Alvarez et al. 2025). Limited access to quality education and healthcare services comprises a large part of this social vulnerability, discussed in greater detail in Chapter 6.

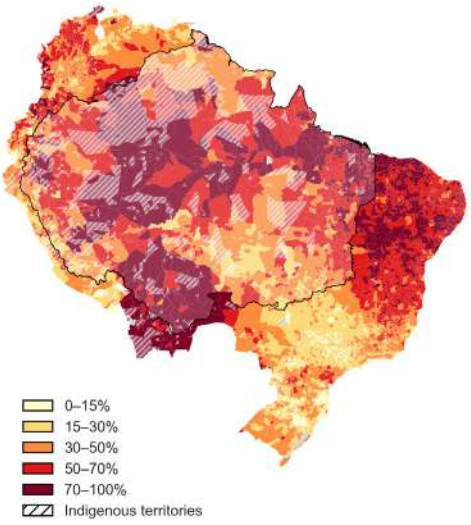


[61] There are multiple ways to assess social conditions, including multidimensional poverty indices and measures such as unsatisfied basic needs. However, using national poverty maps, monetary poverty remains one of the few standardized indicators consistently available at the subnational level, making it suitable for the purposes of this chapter.

FIGURE 7.2.

There are stark differences in poverty rates across Amazonia and non-Amazonian territories in Brazil and Peru and between Indigenous and non-Indigenous

Poverty and Indigenous Territories in Amazonia



	POVERTY RATE					
	Country level	No-Amazonia	Amazonia	Amazonia indigenous territories	Amazonia Rural area	Amazonia Urban area
BO	55.8	59.7	55.1	56.2	66.0	49.8
BR	30.9	29.2	39.1	44.0	41.5	36.5
CO	30.7	30.5	33.7	31.9	35.0	28.8
EC	22.0	22.5	21.2	32.7	17.7	25.9
GU	48.4	-	48.4	-	-	-
PR	21.8	16.2	30.2	30.5	34.9	24.1
SU	27.1	-	27.1	-	76.6	27.1
Weighted average	**30.4**	**28.7**	**37.0**	**40.5**	**39.4**	**33.9**

Source: *Authors' elaboration based on official subnational maps of monetary poverty (see Annex Table A.1.) and data on lands designated for Indigenous use in Amazonia, from (RAISG). The average value corresponds to the population-weighted average. Poverty rates for Indigenous territories were calculated by classifying a subnational area as Indigenous if the Indigenous land covered at least 50% of its area; otherwise, it was classified as non-Indigenous. Similarly, subnational areas were classified as urban if urban settlement covered at least 50% of the municipal area; otherwise, they were classified as rural.*

The largest concentration of poverty is currently found in rural areas, which account for an estimated 53.3% of the people living in this condition in Amazonia. At the same time, poverty rates are higher in rural areas (39.4%) than in urban ones (33.9%).[62] Poverty is also more prevalent and severe among Indigenous and Afro-descendant populations (see Chapter 8). Even though poverty does not entirely reflect the well-being of Indigenous populations, whose conceptions often differ from those used in conventional poverty measurements, it provides an indication of the social exclusion these populations face. In Indigenous territories in Amazonia,[63] 40.5% of the population experiences poverty, six percentage points higher than the regional average.

Women in Amazonia face the gravest challenges, with overlapping vulnerabilities. In Bolivia's Amazonia (2016-2021), households headed by women earn on average only 82% of the income of those headed by men. In Brazil's and Bolivia's Amazonia, individual poverty rates are also higher among women, at 41% and 35% respectively (National Institute of Statistics of Bolivia, 2016-2021; IBGE, 2023). These challenges are compounded by women's limited access to social protection and formal employment. In the Amazonian regions of Peru, Brazil, Bolivia, and Colombia, labor force participation rates are consistently lower for women than for men. In Colombia (2023), in at least five of the six Amazonia departments, the gender gap in labor force participation exceeds 20 percentage points. In Brazil's Amazonia (2024), the unemployment rate exceeds 10% for women and is under 6% for men (National Institute of Statistics and Informatics of Peru, 2023; National Administrative

[62] It is not entirely possible to draw a clear distinction between rural and urban poverty in Amazonia, given frequent internal migration—both temporary and permanent—and the close connections between rural and urban areas that shape the livelihood strategies of vulnerable households.

[63] Indigenous territories are legally recognized areas under the use, management or ownership of Indigenous Peoples and other ethnic groups, designated by national governments or competent authorities to protect their rights, autonomy and traditional livelihoods.

Department of Statistics of Colombia, 2023; IBGE, 2024; National Institute of Statistics of Bolivia, 2016-2021).

As mentioned in the previous chapter, barriers such as limited access to education, unpaid caregiving, domestic responsibilities, early pregnancy, and entrenched gender roles restrict women's entry into the formal labor market. In Ecuador, Brazil, Peru, and Colombia, women in Amazonia spend more time on unpaid caregiving and domestic tasks than men. For example, in Brazil's Amazonia (2022), women spend 10.2% of their time on unpaid domestic and care work, compared to 5.2% among men. On average, this means women dedicate 17 hours per week, 8 more than men on such work (IBGE, 2022).

This imbalance in time-use for unpaid domestic work and the educational gender gaps limit women's income-generating opportunities and access to formal employment as well as their participation in social protection schemes such as pensions and healthcare. These intersecting challenges not only reduce women's ability to secure livelihoods and well-being. They also weaken their capacity to cope with environmental and economic shocks.

Addressing high poverty levels and improving living conditions in Amazonia is essential to closing the persistent gender gap. It is also critical to closing the development gap with non-Amazonian regions and strengthening resilience at a time when Amazonia faces escalating risks from climate change and environmental degradation.

Climate and Environmental Issues

Amazonia has experienced a steady rise in temperatures over recent decades, with projections from the UN Intergovernmental Panel on Climate Change (IPCC) indicating continued warming at rates above the global average. If current trends persist, some areas could see increases of over 4°C by 2050 (Flores et al., 2024). This warming is intensified by deforestation and forest degradation, which contribute to longer dry seasons and reduced rainfall, threatening not only biodiversity and carbon storage capacity but heightening the vulnerability of local communities as well.

In addition to forest loss and degradation (see Chapter 3 for further information), 46% of the region is exposed to disasters and extreme climate events, including droughts and wildfires. These vulnerabilities are particularly serious in Guyana, Suriname, Ecuador, and Brazil (see Figure 7.3). The two phenomena are closely linked: degraded areas are more vulnerable to drought and fire; conversely, drought and fire—exacerbated by climate change—accelerate forest and ecosystem degradation.

Such conditions directly affect the well-being of the local population, especially in rural areas where livelihoods largely depend on agriculture and natural resources. An estimated 14.5 million people living in poverty in Amazonia reside in areas with a high risk of drought and wildfires, and 25.4 million live in environmentally degraded areas. The severe droughts of 2005 and 2010 in the department of Madre de Dios in Peru, for example, led to crop losses and reductions in key food security products, like Brazil nuts and fish stocks (Chavez Michaelsen et al., 2020). As a result of climate change and environmental degradation in their territories, the Kukama Kukamiria communities in Loreto (Peruvian lowland Amazonia) and the Asháninka

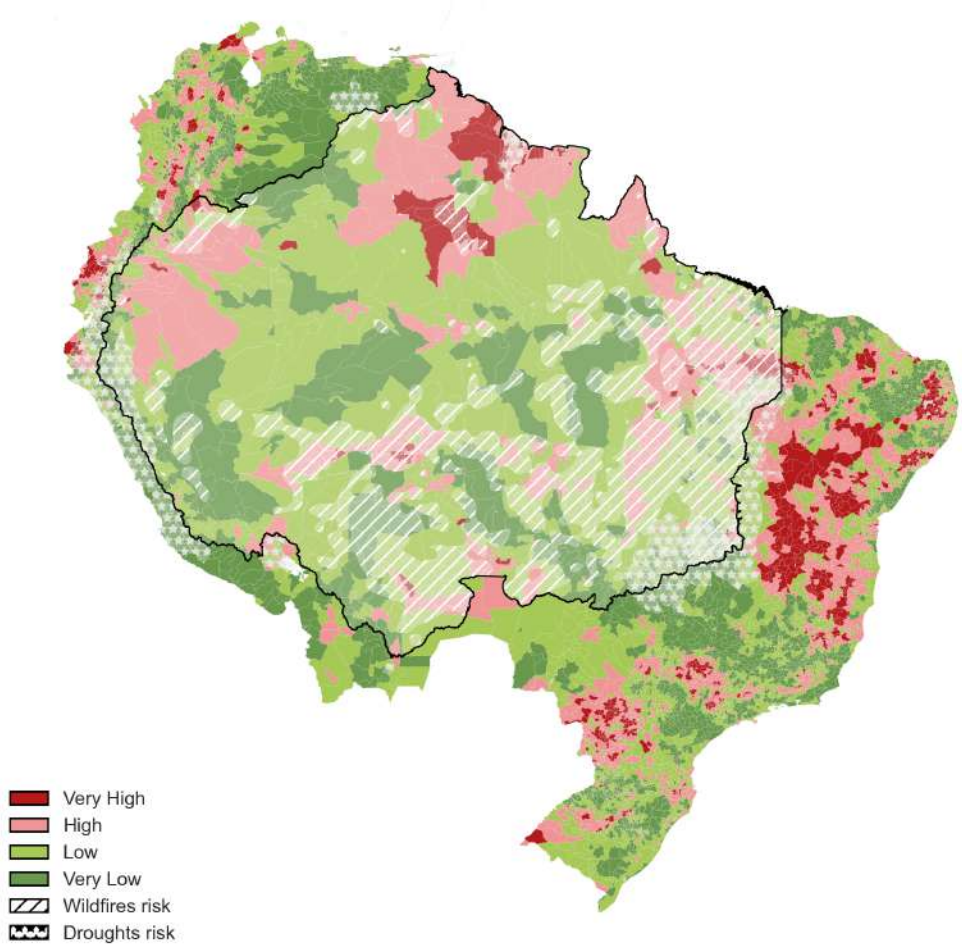
communities in Junín (Peruvian highland Amazonia) also reported total crop losses, as well as declining yields of traditional crops, the disruption of water sources, and reduced access to wildlife (Lastra Landa and Grados Bueno, 2021).

Heatwaves, meanwhile, are impacting Amazonia with greater frequency and increasing the risk of fatalities, especially from heart-related causes, with older adults and women the most affected (Silveira et al., 2023). Heatwaves also limit working hours and reduce income, particularly for informal workers who lack adequate social and labor protections (Kjellstrom, Lemke and Lee, 2019).

FIGURE 7.3.

Guyana, Suriname, Ecuador, and Brazil are particularly exposed to disasters and extreme climate events, including droughts and wildfires

Areas with Vegetation Loss, Droughts, and Wildfires



Source: *Authors' elaboration based on Normalized Difference Vegetation Index (NDVI) data and data from the World Resources Institute (WRI).*

People living in poverty lack access to insurance or protection mechanisms and suffer disproportionately from the impacts of such threats. When poor households lose assets, crops, or other sources of income due to the combination of climate events and a lack of support networks, they are often forced to rely on short-term

coping strategies that undermine their future well-being. These include the selling of productive assets, incurring catastrophic expenses, withdrawing children from school, increasing child labor, and overexploiting local natural resources. These measures may address people's immediate subsistence needs. But they erode the long-term capacities they need to escape poverty. In this way, environmental and climate risks in Amazonia can trigger a vicious cycle in which more people fall into poverty or become more deeply entrenched in it, exacerbating their pre-existing social vulnerabilities (Bagolle, Costella, and Goyeneche, 2023).

The Link Between Poverty and Adaptation to the Climate and Environmental Crisis

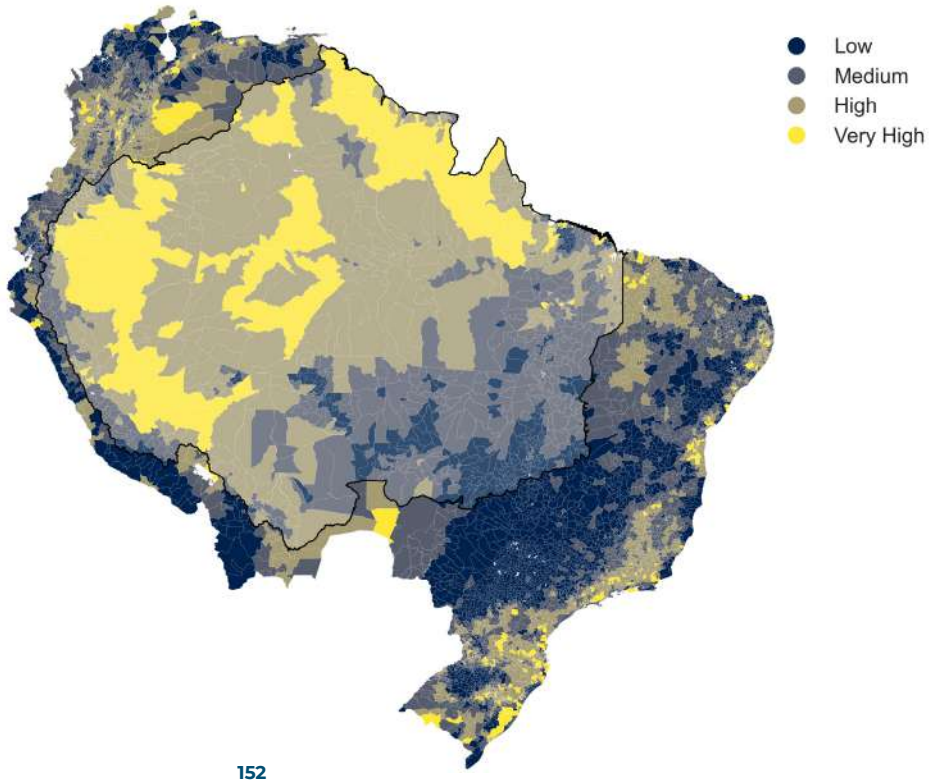
The ecosystems of Amazonia are key regulators of the Earth's climate and vital reservoirs of biodiversity (see Chapter 1). Halting the environmental and climate crisis requires protecting them. That, in turn, is inseparable from enhancing the living conditions of local populations and empowering their role as stewards of nature and biodiversity.

The richest areas for biodiversity and ecosystem services in Amazonia often coincide with the highest levels of poverty. In these areas of high ecosystem value (Chaplin-Kramer et al., 2020),[64] poverty rates stand at 40.2%, far above national and regional averages (see Figure 7.4). Such areas also frequently overlap with Indigenous territories, 82.5% of which lie within zones of high ecosystem value.

FIGURE 7.4.

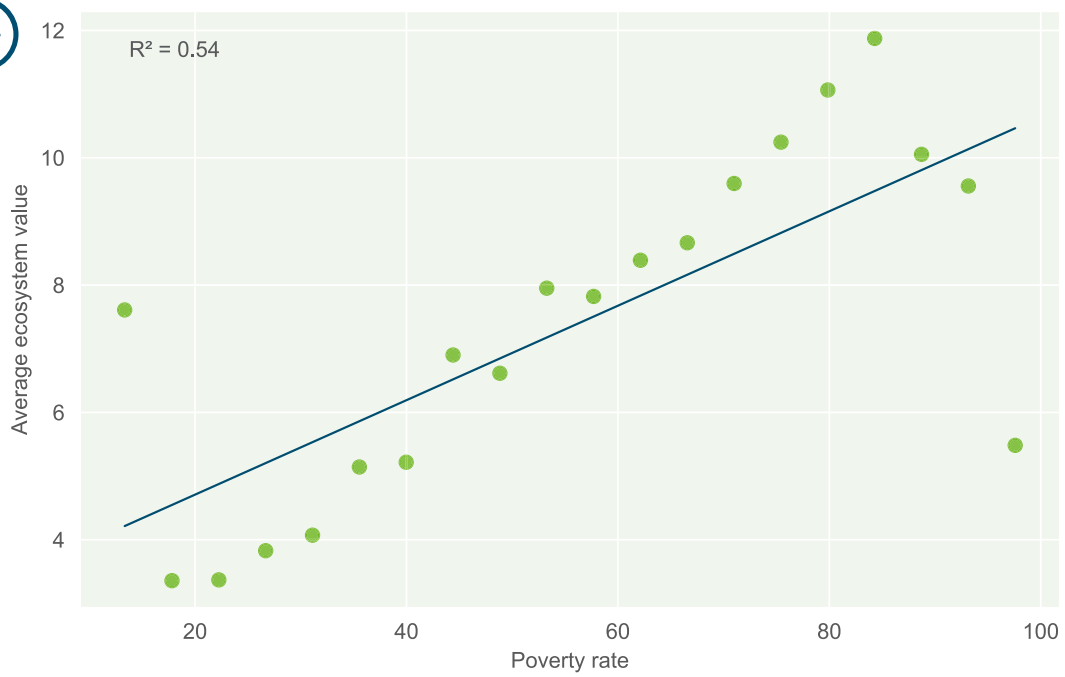
The Richest Areas for Biodiversity and Ecosystem Services in Amazonia Often Coincide with the Highest Levels of Poverty

Mapping ecosystem value and poverty

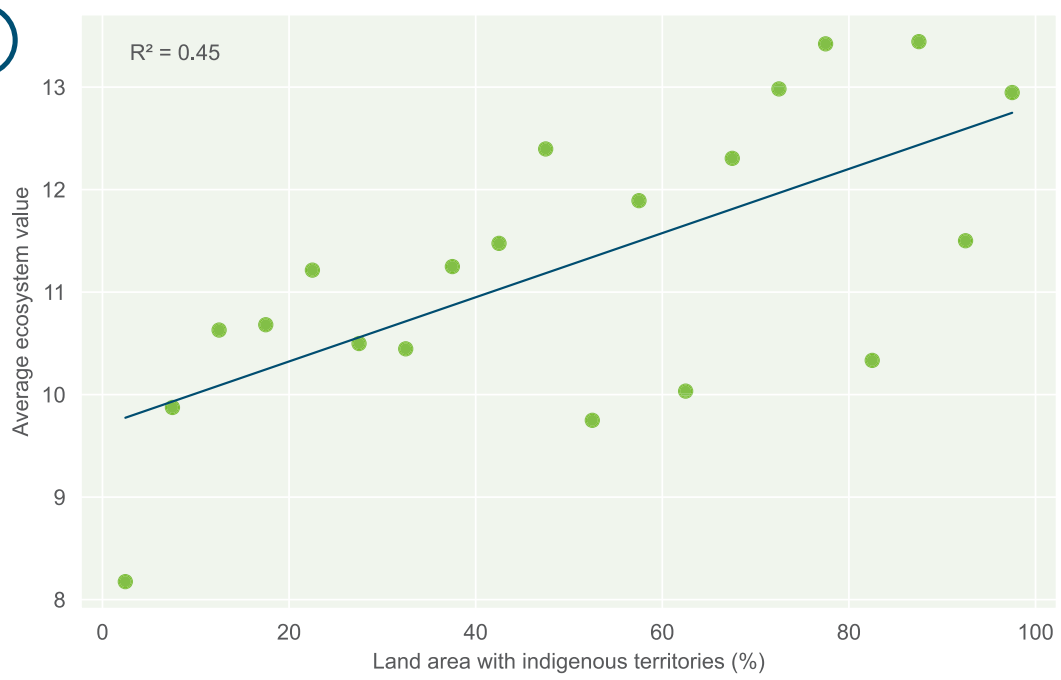


[64] According to Chaplin-Kramer et al. (2020), critical natural assets are ecosystems that provide 90% of nature's key contributions to people, such as food, water, climate regulation, and cultural benefits. These areas are essential for human well-being and sustainable development.

ECOSYSTEM VALUE AND POVERTY



ECOSYSTEM VALUE AND INDIGENOUS TERRITORIES



Source: *Authors' elaboration based on ecosystem value data from Chaplin-Kramer et al. (2020), official poverty subnational maps (see Annex Table A.1.), and data on lands designated for Indigenous use in Amazonia from the Amazonian Network of Georeferenced Socio-Environmental Information (RAISG). Ecosystem value was split into quartiles: bottom 25% (low), 25–50% (medium), 50–75% (high) and top 25% (very high). Areas in the top quartile are those with the highest concentration of natural capital, also known as critical natural assets.*

7.3 Social Protection Reduces Risks

To address the compounded social, climate, and environmental risks in Amazonia, countries can leverage three main types of social protection instruments, each analyzed in this section: regular social protection to alleviate poverty, address life-cycle risks and build ex-ante resilience; adaptive social protection against the impact of extreme weather events and disasters; and socio-environmental protection to protect livelihoods and natural resources. Drawing on rigorous scientific evidence from experimental and quasi-experimental evaluations, this section assesses the effectiveness of these social protection mechanisms in supporting well-being and resilience and reviews the progress made by Amazonia countries in this regard.

Regular Social Protection

Regular social protection consists of two main pillars. Contributory social protection, which is based on contributions made by workers and their employers, covers risks such as illness, old age, and unemployment. Non-contributory social protection, which is funded through public budgets and does not depend on individual contributions, protects people from poverty and promotes investment in human capital by ensuring access to essential services such as health and education. These instruments, although primarily designed to alleviate poverty and address life-cycle risks, are increasingly recognized as effective tools for fostering ex-ante resilience among populations exposed to climate-related shocks (International Labor Organization, 2024).

Regular social protection programs, many studies show, are an effective tool for supporting household income and consumption and improving access to education and health services (Bastagli et al., 2016; Ibarraran et al., 2017). On average, it is estimated that poverty in Amazonia countries would be around 2.2 percentage points higher in the absence of cash transfer programs (Stampini, Medellín, and Ibarrarán, 2023). These aspects of regular social protection—both contributory and non-contributory—can help individuals in adapting to and coping with climate-related shocks. Households receiving regular cash transfers are more likely to accumulate savings, which, when a shock occurs, allow for higher consumption levels and better food security than for comparable non-recipient groups (Asfaw and Davis, 2018; Premand and Stoeffler, 2020. Households receiving regular transfers are also less likely to engage in negative coping strategies, such as child labor, school dropout, asset sales, and catastrophic indebtedness in response to disasters (Maluccio, 2005; De Janvry et al., 2006). Shifts in rainfall patterns and drought can negatively affect educational attainment and labor market outcomes. But these effects are significantly lower among families receiving regular transfers (Adhvaryu et al., 2024; Premand and Stoeffler, 2022).

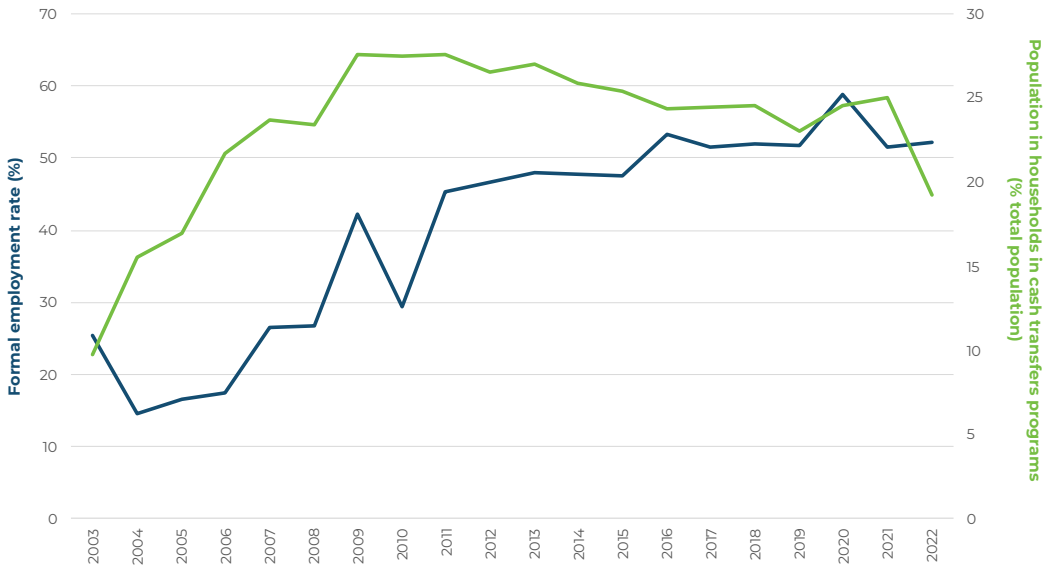
Cash transfer programs can also generate meaningful co-benefits in terms of conservation, even when not explicitly designed with environmental objectives

in mind. Evidence from Colombia and Indonesia shows that such programs have helped reduce pressure on forests by allowing households to replace forest extraction with market-based purchases, thus substituting forests as a coping mechanism during periods of economic or climatic stress (Malerba 2020; Ferraro and Simorangkir, 2020). However, to fully harness these synergies to avoid unintended environmental degradation, improved intersectoral coordination between social protection and environmental institutions is essential (Alix-García and Wolff, 2014).

FIGURE 7.5.

High labor informality rates exclude much of the population from contributory social protection

Formality Rates and Access to Cash Transfers in Amazonian Countries



Notes: *Regional averages were calculated as population-weighted yearly values. The figure includes coverage of major programs: Juancito Pinto (Bolivia), Bolsa Família (Brazil), Familias en Acción (Colombia), Bono de Desarrollo Humano (Ecuador), and Juntos (Peru). Data were unavailable for Guyana, Suriname, and Venezuela.*

Source: *Authors' elaboration based on data on informal employment rates from ILOSTAT (international labor organization modelled estimates) for all countries in the Amazonia Region. Data households receiving conditional cash transfers come from the ECLAC (ECLAC) Database on Non-Contributory Social Protection Programmes.*

Despite progress made in recent years in several Amazonian countries, access to contributory social protection remains limited. Formal employment rates have gradually increased over the past two decades. But they remain below 55% across the region (see Figure 7.5.) and, in Amazonia,[65] informality still affects over half the workforce, exceeding 80% in the Amazonian areas of Bolivia, Colombia, and Peru. These high labor informality rates exclude much of the population from contributory social protection, as core benefits—such as unemployment insurance, healthcare, and pensions—are tied to formal employment. Informal workers are in a grey zone. They often have earnings that put them just above the poverty line, making them ineligible for non-contributory transfers. But their precarious labor

[65] Workers are considered informal if they report not being affiliated with a social security system.

conditions leave them without adequate protection against risks. In Peru, only 4% of informal workers participate in contributory schemes versus 38% of formal workers (non-contributory coverage 29% vs 90%), and in Brazil just 20% of informal workers participate in such schemes vs 65% of formal ones (non-contributory coverage 32% vs 98%) (OECD, 2023).

Access to cash transfer programs, the most widely used non-contributory social protection instrument in Amazonia, has risen in recent decades, with coverage in Amazonian countries increasing from 9.8% to 20% from 2003 to 2022 alone (see Figure 7.5.). These programs are typically conditional on families' investments in human capital, such as attending medical check-ups and ensuring school attendance. They seek not only to alleviate poverty in the short term but also to break its intergenerational transmission by fostering better health and educational outcomes. In Brazil, for example, the Bolsa Família program—the country's main conditional cash transfer program—benefits around 21 million families, equivalent to about 55 million individuals (27% of the population), of whom 48% live in Amazonian states. In Peru, the Juntos program—the main cash transfer program—reaches 762,173 households (2,667,605 people), 76% of whom reside in Amazonian departments.

TABLE 7.1. | Coverage of Social Registries in Amazonia

	BRAZIL	COLOMBIA	ECUADOR	GUYANA	PERU
Population in Social registry	95,421,630	36,081,032	10,821,991	87,889	17,064,731
Amazonia	19,370,305	2,095,514	3,825,780	87,889	8,274,022
Other areas	76,051,325	33,985,518	6,996,212	-	8,790,708
Social Registry Coverage	44%	71%	62%	12%	52%
Amazonia	53%	65%	53%	12%	63%
Other areas	43%	71%	67%	-	45%

Source: *Authors' elaboration based on official data from the social registry*

Cash transfer programs are also critical in the establishment of mechanisms for targeting social policies. This is especially true of social registries, information systems that enable the identification of individuals and households living in poverty or vulnerability at the territorial level. Social registries help ensure that social policy reaches those most in need so they can maintain a minimum standard of well-being. In many countries, they serve as the main entry point for accessing social programs. Amazonian countries have made significant progress in their use (see Table 7.1.). Brazil, for example, has established the robust Unified Registry (Cadastro Único), which covers approximately 95 million people, including 19 million in Amazonia. In Colombia, Ecuador, and Peru, they cover more than 50% of the population, with Colombia reaching 71% coverage due to advancements in the implementation of the Identification System of Potential Beneficiaries of Social Programs.

Adaptive Social Protection

Adaptive social protection consists of integrating disaster risk management, climate adaptation, and social welfare policies to provide timely assistance to vulnerable populations in times of crisis. At those moments, cash transfers can be activated on an extraordinary basis to address a shock, targeting both poor households and those at risk of falling into poverty. They can be triggered in an anticipatory manner (before a predictable shock) or responsively (immediately after the event). Most countries in the region and around the world implemented adaptive social protection measures to mitigate the social impacts of the COVID-19 pandemic (Gentilini, 2022).

These measures are increasingly being used to respond to climate and environmental disasters. For example, in Peru, the government distributed the Single Force (Una Sola Fuerza) bonus during the emergency caused by the 2017 Coastal El Niño phenomenon. That event, with its floods and landslides, affected the livelihoods and assets of vulnerable populations. The bonus benefited recipients of the Juntos and Pensión 65 programs in affected districts. Adaptive social protection measures were also taken in Brazil in response to the 2023 droughts, including distribution of food to vulnerable families in the states of Acre, Pará, Amazonas, and Rondônia, and during the devastating floods in Rio Grande do Sul. During the COVID-19 pandemic, the National School Feeding Program implemented the distribution of school meal kits for home preparation, while continuing to uphold its policy of procuring produce from local food suppliers. This approach was particularly significant for Indigenous and traditional communities within Brazil's Amazonia (World Food Programme and National Fund for Educational Development, 2021).

Cash transfer programs designed to address climate-induced shocks have shown they can boost household resilience. Evidence from Bangladesh, for example, shows that delivering cash transfers just five days before a flood significantly improved welfare, reduced asset losses, and facilitated early recovery (Pople et al., 2024). Similarly, studies in Fiji and Sri Lanka find that post-disaster "top-up" transfers and business grants can accelerate recovery for both households and enterprises (Ivaschenko et al., 2020; de Mel et al., 2011). Comparative research on the effectiveness of pre- versus post-shock responses, however, remains limited. While anticipatory action can strengthen preparedness, it carries the risk of misallocating resources if early warning triggers are inaccurate or if transfers are poorly timed.

Amazonian countries have made significant progress in establishing adaptive social protection systems. In Brazil, the Unified Social Assistance System coordinates with civil defense agencies to implement adaptive and shock-responsive social protection before, during, and after emergencies. Peru has advanced in aligning social protection with disaster risk management through institutional reforms, such as integrating the Ministry of Social Inclusion and Development into the National Disaster Risk Management Council and recognizing it as a first-response entity. New legal frameworks and financial instruments in Peru also reflect the growing institutionalization of shock-responsive social protection. In Ecuador the National Disaster Risk Management Plan coordinates prevention, response, and recovery across all government levels. Collaboration between the Secretariat for Risk Management and the Ministry of Economic and Social Inclusion enables

adaptive measures—such as temporary benefit expansions—using the Unified Social Registry to deliver rapid, shock-responsive support to vulnerable populations (Ecuador, 2023). However, significant gaps persist in adaptive social protection systems, particularly concerning the establishment of contingency funds and insurance mechanisms, such as the Caribbean Catastrophe Risk Insurance Facility or other comparable initiatives integrated with cash transfer mechanisms, georeferenced coverage of households within social registries—especially poor and vulnerable households in areas with high exposure to recurrent disasters—and regulatory flexibility to facilitate vertical and horizontal expansions.[66] Addressing these gaps, among other critical measures, is essential to strengthening the responsiveness and resilience of adaptive social protection frameworks.

Socio-Environmental Protection

Higher ecosystem values in Amazonia are strongly associated with higher poverty rates and a greater prevalence of Indigenous territories, as shown in Figure 7.4. Deforestation rates in Indigenous territories across the Amazonas River Basin, evidence shows, are also much lower than in other areas (Ding et al., 2016) while Indigenous land management is linked to significant reductions in carbon emissions (Blackman and Veit, 2018) (see Chapters 3 and 8). Many IC and other traditional communities have developed sustainable livelihood strategies, such as traditional agroforestry, the collection of NTFPs, and temporary wage labor. These strategies support both food security and ecosystem preservation (Athayde et al., 2021). They demonstrate how such communities, though among the most severely affected by environmental degradation and disasters, can play a key role in protecting Amazonia's natural resources.

In an effort to reconcile poverty reduction goals with environmental conservation, several countries have introduced innovative socio-environmental protection programs. Explicitly focused on local populations, including Indigenous Peoples, traditional communities, and individuals living in poverty and vulnerability, these programs aim to recognize, reward, and strengthen those groups' contributions to ecosystem stewardship. They also seek to enhance their livelihoods through cash or in-kind transfers and technical assistance. More information on these issues can be found in Chapters 3 and 8.

Countries in Amazonia lead this agenda. Brazil (Bolsa Verde), Ecuador (Socio Bosque) and Peru (Programa Bosques) have implemented well-established programs that successfully combine conservation with social support, demonstrating measurable results in reducing deforestation and supporting vulnerable populations. Brazil's Bolsa Verde (see Box 7.1.), relaunched in 2023, provides quarterly payments to low-income families living in conservation areas, conditional on their sustainable land use and forest protection. It is built directly on the structure and mechanisms of the existing social protection system, as beneficiary families must be registered in the Unified Registry (Cadastro Único) and can receive Bolsa Verde in addition to Bolsa Família, the country's main social cash transfer program. Bolsa Floresta, active in Amazonas state until 2022, was succeeded by the Guardians of the Forest (Guardiões da Floresta) program. This doubled payments and expanded coverage by over 50%. As a result, it now includes 28 protected areas and reaches Indigenous and traditional forest communities. In a similar vein, Ecuador's Socio Bosque program, launched in 2008, offers long-term

[66] Horizontal expansion refers to the expansion of coverage to other population groups. Vertical expansion is a temporary raise in the amounts or duration of transfers.

conservation contracts to individuals and communities who voluntarily protect native ecosystems. With payments based on the area preserved, the program supports over 175,000 people and targets both ecological conservation and poverty reduction. Peru's Programa Bosques offers conditional payments to IC committed to halting deforestation and supports forest monitoring and public investment projects that promote sustainable livelihoods. In 2024–2025, nearly 6,624 families received incentives under the program to preserve 1.83 million hectares of forest (AMAZONAS, 2022; Ecuador, 2022; Jones et al., 2017; MMA, 2023; SEMA, 2024).

BOX 7.1.

Bolsa Verde: A Socio-Environmental Protection Program

Launched in 2011, Brazil's Bolsa Verde program is an environmental cash transfer initiative that was temporarily discontinued in 2016 but successfully reinstated in 2023. Functioning as a PES program, it addresses two critical challenges simultaneously: combating extreme poverty and promoting environmental conservation. It achieves this by providing financial incentives to vulnerable communities actively engaged in protecting Brazil's natural resources.

Bolsa Verde targets low-income families registered in CadÚnico (Brazil's unified social program database) that participate in environmental conservation activities within sustainable use protected areas (reservas extrativistas). These include national forests; environmentally-focused agrarian reform settlements, such as agroextractive and forestry communities; traditional communities, including Indigenous ones, quilombolas (Afro-Brazilian communities); riverside dwellers, and traditional forest-dependent populations (povos extrativistas). Priority is given to beneficiaries of Bolsa Família.

The program provides quarterly payments of around $110 (BRL 600) per family for two years with the possibility of a two-year extension. Payments are preferentially made to female heads of households to promote financial inclusion and women's empowerment. Beneficiaries also have access to technical assistance and training in sustainable practices to enhance long-term environmental and economic outcomes.

The program, managed by the Ministry of Environment and Climate Change with an allocated budget of around $36.4 million (BRL 200 million) (2023), is projected to benefit 53,200 families by 2025.

Source: *Ministry of Environment and Climate Change, 2023*

Rigorous evidence shows that socio-environmental protection can play a transformative role in reconciling environmental conservation with poverty reduction, particularly when it aligns income support with ecological goals. Brazil's Bolsa Verde reduced deforestation by 22% in Amazonian settlements (Wong et

al., 2023) and was cost-effective, with avoided CO_2 emissions valued at nearly four times program costs (Costedoat et al., 2022). Similarly, the country's Bolsa Floresta program reduced deforestation by as much as 27% in high-pressure zones, with stronger effects near enrolled communities (Cisneros et al., 2022). In Peru, high administrative costs limited the net benefits of Programa Bosques. Nonetheless, the community-based incentives offered by the program helped avoid 14%–16% of projected deforestation (Giudice & Börner, 2021). Ecuador's Socio Bosque reduced deforestation by up to 1.5%, particularly through collective contracts that protected 1,247,500 hectares, (4816.6 square miles), preventing the loss of 11,227 hectares (43.35 square miles) of forest areas between 2008 and 2014. (Cuenca et al., 2018).

Another way to implement socio-environmental protection mechanisms is through public work programs designed to support the conservation and restoration of natural resources. Ethiopia's Productive Safety Net Program offers a compelling example. This large-scale public works initiative links social protection with ecosystem restoration by providing cash transfers in exchange for environmental activities such as afforestation, soil conservation, and watershed management. In doing so, it has not only improved household resilience and food security. It has also contributed to the preservation of natural resources, resulting in the sequestration of more than 62 million tons of CO_2 over 15 years (Hirvonen et al., 2022).

7.4 Conclusion: Leveraging Social Protection for Inclusive Development and Environmental Sustainability

Social, environmental, and climate risks mutually reinforce one another in Amazonia. To improve the well-being of the population—especially the poorest and most vulnerable—amid these growing challenges, countries must strengthen their social protection systems. This involves reinforcing both contributory and non-contributory components of regular social protection, while also developing and expanding new mechanisms for adaptive social protection and socio-environmental protection. **Advancing this agenda requires action in five key areas:**

Strengthen integrated policy frameworks and financing schemes that align poverty alleviation, social protection, environmental conservation, and rural development.

Cross-sectoral coordination and joint budget planning are essential to ensure policy coherence and efficient resource use. Social protection strategies should explicitly incorporate measures to address emerging

environmental and climate risks. At the same time, climate change mitigation and adaptation strategies—including NDCs and national adaptation plans—must recognize and strengthen social protection systems as key instruments for supporting people's resilience. This alignment is critical to ensuring that climate and social policies work in synergy rather than in silos. Poor and vulnerable local populations receive only a very small share of climate finance. Social protection systems offer a strategic channel to direct adaptation resources toward these at-risk groups, helping to make climate transitions both fair and inclusive.

Reinforce regular social protection systems, including both contributory and non-contributory schemes, to expand coverage and reduce structural vulnerabilities across the life cycle.

The expansion of contributory social protection in Amazonia is inseparable from access to well-paid, quality, and protected employment, which could be supplied in the region by quality green jobs in innovative sectors linked to the bioeconomy and other areas. On average around 46% of the population living in poverty in Amazonian countries does not receive cash transfers. Non-contributory social protection should be expanded to cover those poor and vulnerable populations. Expanding coverage under budget constraints, however, requires improved targeting. About 35% of cash transfer recipients in Amazonian countries are not actually living in poverty (Stampini, Medellín, and Ibarrarán, 2023). Correcting these inclusion and exclusion errors through more accurate information systems and improved family support strategies would help maximize the impact of cash transfers on poverty reduction and ex-ante resilience.

Expanding coverage also requires reforms, such as eliminating socially regressive and environmentally harmful subsidies and redirecting those funds toward improved social protection systems. Reforms would also better integrate noncontributory and contributory pillars so that cash transfer programs helped families move out of poverty, while access to quality employment provided sustained income and protection against adverse events.

Invest in adaptive social protection systems that can anticipate, absorb, and respond to climate-related shocks.

Despite the progress made by Amazonian countries, adaptive social protection instruments still need bolstering. Disaster responses through such instruments remain relatively slow and are often implemented without pre-established protocols or action plans. For example, during the COVID-19 pandemic, it took an average of two months for cash transfers to be disbursed after the onset of lockdown measures (Beazley et al., 2021). New protocols, capacity building and interinstitutional coordination mechanisms should be developed among social protection systems, disaster risk management agencies, civil protection bodies, and humanitarian aid organizations. Roles, activation criteria, and rules for adaptive social protection must be clearly defined to improve adaptation and resilience

capacities. Contingent financing mechanisms that can be rapidly activated in response to disasters should also be developed. For instance, Suriname has established contingency lines of credit supported by the IDB through the Contingent Loan for Natural Disaster Emergencies, which is primarily designed to provide funds triggered by floods. Nevertheless, a key challenge remains the establishment of clear and effective procedures to ensure that these financial instruments are channeled through social protection programs to support affected households. And tools must be available to identify at-risk and affected areas and households, as well as payment and delivery mechanisms that can operate efficiently in times of crisis. For instance, the proliferation of electronic payment systems, particularly Brazil's Pix, has facilitated rapid and efficient cash transfers, proving particularly beneficial during emergency situations.

Scale-up socio-environmental protection programs that link financial and non-financial incentives to forest conservation and poverty reduction.

To effectively address poverty and environmental degradation in Amazonia, socio-environmental protection programs must be significantly scaled up and rooted in territorial approaches that reflect the ecological and cultural diversity of the region. These programs should combine financial incentives—such as cash transfers or payments for ecosystem services—with non-financial support like technical assistance and access to sustainable livelihoods. The active participation of Indigenous Peoples and traditional communities—environmental stewards with deep-rooted knowledge and governance systems—in the design of such programs is central to their success, ensuring cultural relevance, legitimacy, and effectiveness. Their rights and leadership must be recognized and supported, and interventions aligned with their visions of well-being.

Stronger intersectoral coordination between social and environmental protection actors is also needed to ensure that both conservation and poverty reduction goals are achieved in an inclusive and equitable way. When it comes to financing, the mobilization of green and climate funds should be explored to support innovative programs that integrate environmental protection, social policy, and the strengthening of sustainable and resilient rural livelihoods.

Enhance core operational instruments—including social registries, early warning systems, and delivery mechanisms—to enable timely, efficient, and targeted responses across the territory.

To secure timely, efficient, and inclusive social protection in Amazonia, core operational tools such as social registries, early warning systems, and delivery mechanisms must be improved. Social registries should have broad coverage and be up to date, dynamic, georeferenced, and inclusive of hard-to-reach populations. Early warning systems must be integrated with social protection programs to enable anticipatory responses to climate

and environmental risks. Delivery mechanisms should be tailored to local contexts—using digital technologies, mobile units, and community-based approaches—to overcome barriers of connectivity and access, ensuring that assistance reaches those most in need.

These priorities form the foundation of a transformative approach that leverages social protection as a tool for inclusive development and environmental sustainability in Amazonia. The IDB is actively supporting this agenda through ongoing initiatives that strengthen cash transfer delivery systems in Guyana, Suriname and Colombia; that assess and strengthen social protection systems' preparedness for disasters in Brazil, Colombia, Peru, Guyana and Suriname; and that pilot and evaluate socio-environmental transfers linking poverty reduction with conservation goals in Brazil and Colombia.



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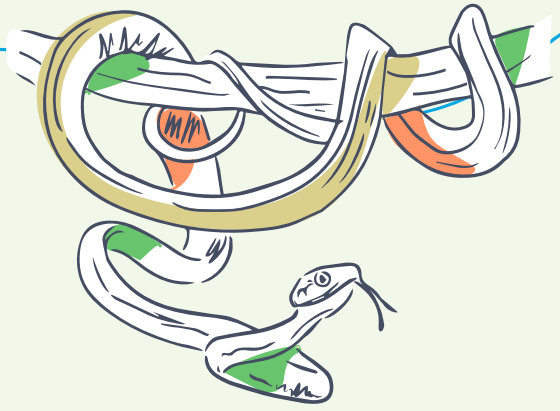
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Chapter

08

DIVERSITY, DEVELOPMENT, & CONSERVATION IN AMAZONIA

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8.1 Introduction: Socioeconomic Gaps

Amazonia is characterized by its high ethnic and cultural diversity. The Amazonian population is predominantly composed of individuals self-identifying as mestizo, Afro-descendant, or Indigenous. In the Colombian and Ecuadorian Amazonia, most inhabitants self-identify as mestizo. The Bolivian and Peruvian Amazonia have the largest numbers and highest proportions of Indigenous Peoples, whereas Brazil holds the largest Afro-descendant population and highest proportion of this population in the region. By contrast, in Suriname and Guyana's Amazonia, persons of Indian origin (Hindostani, Indo-Guyanese) and Afro-descendants make up the majority.

Indigenous Peoples represent the most diverse ethnic group in Amazonia. About 379 IC and over 136 groups living in voluntary isolation or a state of initial contact with the outside world inhabit the region (Annex 3). Approximately 240 Indigenous languages are spoken there, 170 of which occur within Brazil. Indigenous territories in Amazonia cover nearly 2.4 million km²—half of which lie in Brazil—and encompass about 45% of the region's primary forests, an area larger than France, Great Britain, Germany, Italy, Norway, and Spain combined (FAO, 2024). Amazonia also contains 610 protected areas and 2,344 recognized Indigenous territories,[67] (Global Environment Facility, 2020) a reason why any discussion of this biome must necessarily acknowledge Indigenous People's fundamental role in its conservation.

As highlighted in Chapter 1, Amazonia's distinctive features—its biogeography, remoteness, difficult access, and dispersed settlements—pose significant challenges to the provision of public services, resulting in serious socioeconomic disadvantages relative to other regions. The most evident gaps in Amazonia include insufficient basic infrastructure, inadequate access to essential public services, and limited governmental and institutional capacity for fostering development. The marginalization of ethnically diverse groups—including Indigenous Peoples, Afro-descendants, and traditional communities—further exacerbates economic and social inequality.

This chapter delves into an analysis of Indigenous Peoples in the region, emphasizing their key role in conservation and underscoring the importance of measures to achieve their sustainable development while safeguarding their territory and identity. It also provides policy recommendations to foster greater inclusion.

[67] According to the International Labor Organization Convention No. 169 and the United Nations Declaration on the Rights of Indigenous Peoples, an *Indigenous territory* encompasses the lands, waters, resources, and entire habitat traditionally occupied and used by Indigenous Peoples, with whom they maintain a spiritual and cultural connection, and over which they exercise rights of ownership, use, management, conservation, and control of their own development.

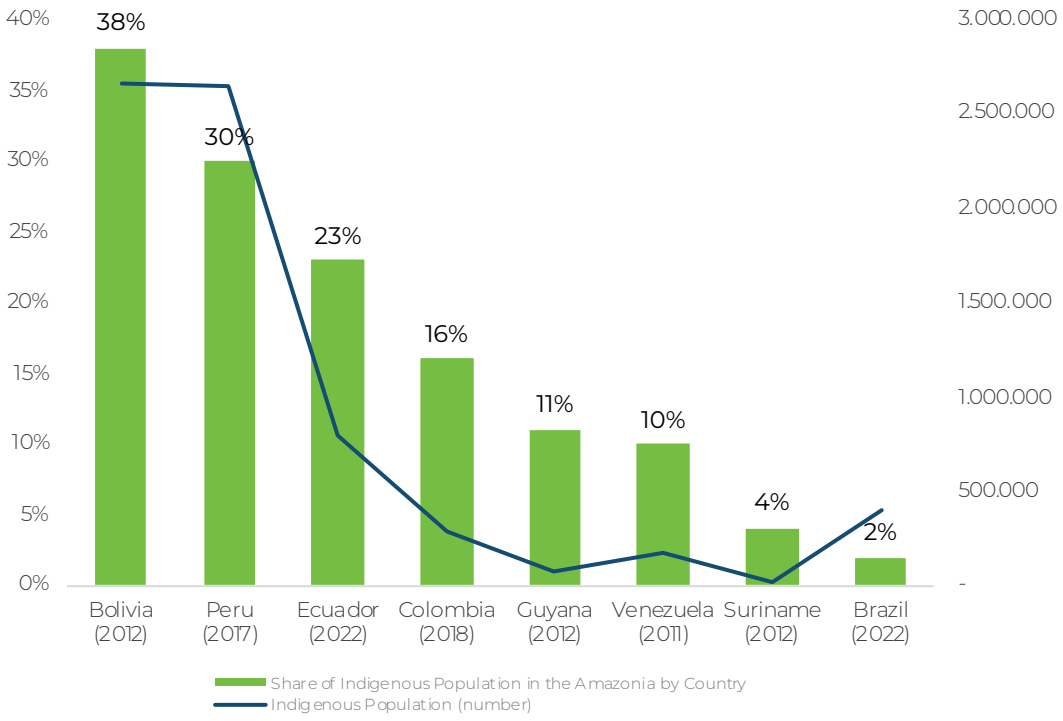
8.2 The Immense Diversity of Indigenous Peoples in Amazonia[68]

The Amazonia Region has 47.4 million inhabitants, of which 7 million, or 15%, are Indigenous Peoples (see the Annex for more information). The largest Indigenous population within the Amazonia Region is found in Bolivia, with 2.65 million people, followed by Peru (2.64 million), Ecuador (791,525), Brazil (391,358), and Colombia (291,134). As seen in Figure 8.1., Indigenous Peoples represent 38% of the population of Amazonia in Bolivia, 30% in Peru, 23% in Ecuador, 16% in Colombia, 11% in Guyana, 10% in Venezuela, 4% in Suriname, and 2% in Brazil.

FIGURE 8.1.

The largest shares of Indigenous population within the Amazonia Region are found in Bolivia and Peru

Indigenous Populations in the Amazonia by Country



Source: *IDB, 2025. Harmonized Census Database (HUD). Amazonia boundaries defined by Amazonia360.*

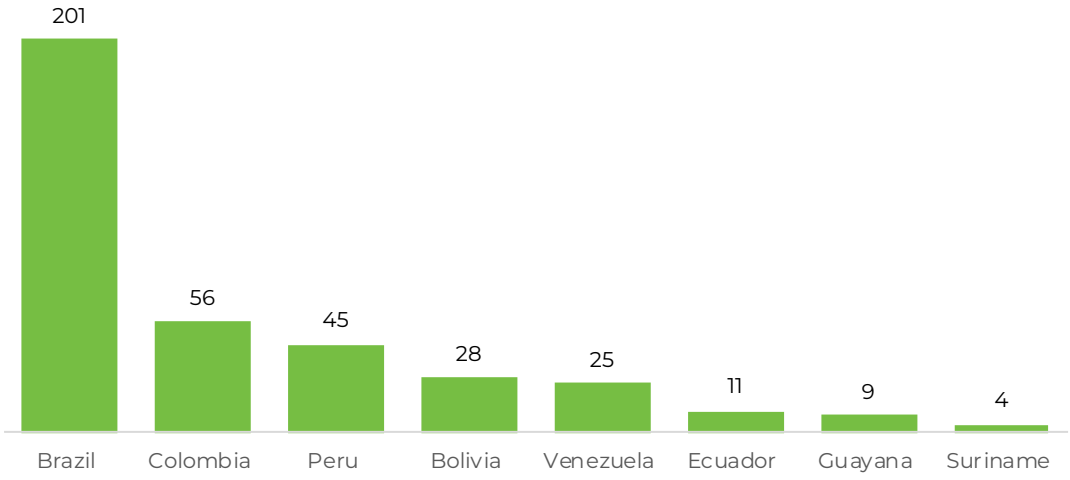
The Indigenous Peoples presented in Figure 8.1. include approximately 379 groups who live in the region and 136 more who live in voluntary isolation or initial contact. This high level of diversity reflects vast geographical, ecological, and historical differences. Each Indigenous group in Amazonia is characterized by a unique sociocultural context. As seen in Figure 8.2. the highest diversity among Indigenous Peoples is found in Brazil (201 groups), followed by Colombia (56), Peru (45), Bolivia and Venezuela (28 and 25 respectively), Ecuador (11), Guyana (9), and Suriname (4) (Figure 8.2.).

[68] The boundaries of Amazonia can be defined according to various criteria, including political-administrative divisions, hydrographic, and biogeographic (biome) classifications. For the purposes of this analysis, the most comprehensive criterion—Pan-Amazonia—is used. This includes broader territories than those defined by the countries' political-administrative boundaries. The information on Indigenous Peoples was developed using the Pan-Amazonia data.

FIGURE 8.2.

In terms of absolute numbers, the highest diversity among Indigenous Peoples is found in Brazil and in Colombia

Number of Indigenous Peoples in the Amazonia by Country



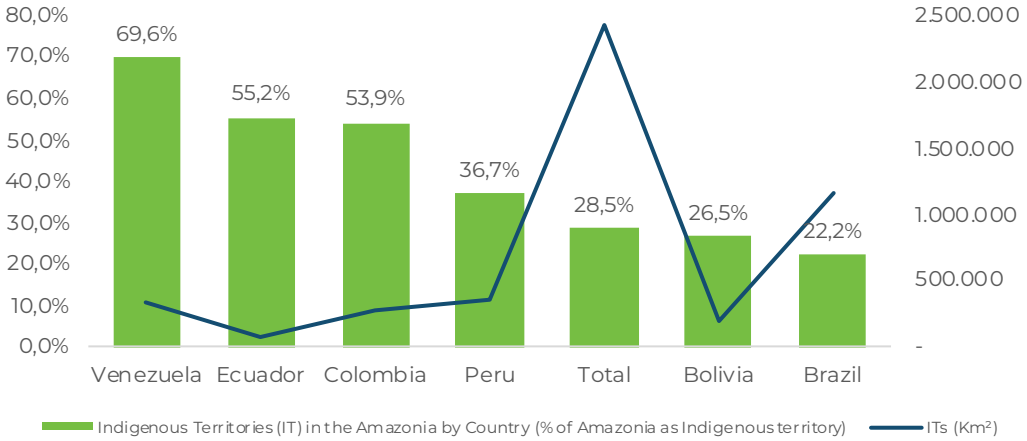
Source: *Author's analysis based on multiple sources (see Annex 3 for details).*

Approximately 28.5% of the Amazonia Region consists of Indigenous territories (RAISG, 2023). The highest proportion of these territories in Amazonia is found in Venezuela (69.6%), followed by Ecuador (55.2%), Colombia (53.9%), Peru (36.7%), Bolivia (26.5%), Brazil (22.2%), and Guyana (15.1%). Despite the recognition and legal titling of Indigenous lands in the region, there are still many communities whose ancestral territories remain unrecognized, leaving them vulnerable to activities such as mining, illegal logging, and oil exploitation (RAISG, 2022). Moreover, even where legal titles exist, the protection of these lands and territories is threatened by illegal activities and the lack of effective law enforcement (WRI, 2023).

FIGURE 8.3.

The highest proportion of Indigenous territories in Amazonia is found in Venezuela and Ecuador

Share of Indigenous Territories Within the Amazonia by Country



Source: *RAISG 2023.*

8.3 Indigenous Peoples Play a Vital Role in Sustainable Development

The economy of Amazonia's Indigenous Peoples depends on traditional livelihoods, including the use of land, forests, biodiversity, and other natural resources. It also depends on their human capital—comprising traditional knowledge systems, skills (such as hunting, fishing, gathering, agriculture, and craftsmanship), community organization, associative capacity, and logistical and trade networks, most of which operate at the local level. Most Indigenous Peoples, traditional communities, and quilombola groups in Amazonia are producers of food, raw materials (such as fibers, oils, and NTFPs), or bioproducts of significance to the food, pharmaceutical, energy, cosmetic, creative, tourism, and construction industries, among others. Their territories also provide multiple ecosystem services of both local and global importance, including carbon sequestration, water regulation, biodiversity conservation, and scenic beauty. The Indigenous bioeconomy is an economic system rooted in the traditional knowledge, practices, values, and principles of IC in their relationship with ecosystems and the sustainable use of biological resources. That bioeconomy plays a critical role in the conservation of forests and ecosystems (further information can be found in Chapter 3). A core component of this system is the pursuit of collective and community well-being, rather than individual profit alone. As a result, Indigenous economies represent a significant opportunity for sustainable development in Amazonia and a bioeconomy that is a viable alternative to the prevailing unsustainable economic model in the region. For example, a study by the WRI estimates that by 2050, under the current economic model, GDP in Brazil's Legal Amazon could reach $250.6 billion (Nobre et al., 2023). However, under a model that fully controls emissions and deforestation, GDP could rise to $258.1 billion (2020 values)—a positive difference of $7.5 billion. This estimate does not include the additional benefits of reducing up to 92% of net carbon emissions and creating 340,000 new green and inclusive jobs—a feasible scenario under the principles of a bioeconomy.

Several examples of Indigenous bioeconomy demonstrate that the deep connection between IC and their forests fosters conservation while delivering tangible economic and social benefits. A notable example is found in Bolivia, where the ethnopharmacological knowledge held by *Tsimane/Chimane* women contributes to the maintenance of Indigenous health while also fostering the sustainable use of biodiversity. These women possess specialized expertise in the use of a wide range of medicinal plants to treat common childhood illnesses, including fever and diarrhea. Because these plant resources are extracted directly from the forest, their material and biocultural value is widely acknowledged. This recognition, in turn, supports efforts to conserve and protect plant species within Indigenous territories (Díaz-Reviriego et al., 2016). In Ecuador, the Amazonian Chakra agroforestry system implemented by Kichwa IC contributes to soil conservation, the maintenance of agrobiodiversity, and the reduction of deforestation (Corporación de Asociaciones de la Chakra Amazónica, 2023). The *Chakra* system promotes the maintenance of high biodiversity within a single space, integrating food crops (e.g., cassava *[Manihot esculenta]*, plantain

[*Musa spp.*], cacao *[Theobroma cacao]*), medicinal plants (e.g., guayusa *[Ilex guayusa Loes]*, dragon's blood *[Croton lechleri]*), timber species (e.g., capirona *[Calycophyllum spruceanum]*, ishpingo *[Amburana cearensis]*), and fruit-bearing trees. This agroforestry management system protects the soil from erosion by mimicking the natural functioning of the forest, while also eliminating the need to clear and burn forest areas to open new plots. It contributes to the food security and sovereignty of IC while preserving ecological integrity. This ancestral practice has been recognized by FAO as part of the Globally Important Agricultural Heritage Systems (GIAHS) (FAO, 2023) (further discussion of these issues can be found in Chapter 12).

The Indigenous Peoples of Amazonia attribute moral, cultural, and spiritual values to the forests, ecosystems, and biodiversity of the region—values that play a critical role in both individual and collective decision-making regarding their use. Natural elements hold cultural significance for most IC, often involving ceremony and mysticism. This, in turn, fosters individual and collective attitudes oriented toward protection and conservation and a worldview in which Indigenous Peoples perceive themselves as guardians of their natural environment and biodiversity. Among various Amazonian Indigenous Peoples such as the *Maijuna* (Peru), *Tikuna* and *Uitoto* (Colombia), and *Kichwa* and *Shuar* (Ecuador), mineral licks (collpas)[69] are regarded as key wildlife reproduction sites (Gilmore, Griffiths, and Bowler, 2020; MonsalveCuartas, Castro Rego, and Vásquez, 2019). As such, they are considered spiritual and sacred places, off-limits for hunting. Likewise, for most Indigenous Peoples in Amazonia, like the *Yawanawa* of Brazil, large tree species such as ceiba (*Ceiba pentandra*) hold sacred and ceremonial significance, leading to their protection (Tareau et al., 2021). For some IC, such as the *Tikuna*, *Yagua*, and *Cocama* in Peru, Colombia, and Brazil, certain fish species—particularly the *arapaima/paiche* (*Arapaima gigas*)—are regarded as manifestations of ancestral beings and guardians of aquatic ecosystems. As a result, their capture is embedded in ritual and spiritual practices that serve to limit their overexploitation and support the protection of freshwater ecosystems (Alcántara Bocanegra et al., 2021; Parathian, 2014).

As a result, although deforestation rates vary across Indigenous territories and pressure on their lands has increased in recent years, these areas have historically exhibited lower deforestation rates than other types of territories. For example, for the period 2000–2015, the rate of forest loss in Peru's Indigenous territories (1.96%) was 29% lower than the general rate for the entire Peruvian Amazonia (2.76%) (RAISG et al., 2017). In Brazil, the rate of native vegetation loss between 2005 and 2012 was 17 times lower in Indigenous territories than in unprotected areas of Amazonia (Alves-Pinto et al., 2022). Data from 1985 to 2020 suggest that less than 1% of total deforestation occurred within Indigenous lands in Brazil, highlighting legal demarcation as an effective conservation tool (MapBiomas Brasil, 2021). In Ecuador, land cover within Indigenous territories, particularly in Amazonia, is characterized by ecosystem integrity and has been incorporated into the national Socio Bosque program, a government initiative providing conservation incentives. Once enrolled, these territories have remained almost entirely forested or covered by natural vegetation (99% of their area) (Zurita-Arthos and Cotacachi, 2019).

Various impact evaluations have confirmed a positive link between Indigenous territories and lower deforestation. In Peru, an impact evaluation that used propensity score matching to analyze 2,926 spatial units (protected areas, conservation concessions,[70] Indigenous territories, logging concessions, and

[69] In Amazonia, mineral licks or saltlicks, are natural, mineral-rich areas where animals congregate to ingest essential nutrients—primarily sodium, calcium, magnesium, and clay.
[70] A legal mechanism through which the state grants rights to individuals, NGOs, or communities to manage and protect a forest area specifically for conservation purposes, rather than for extraction or development.

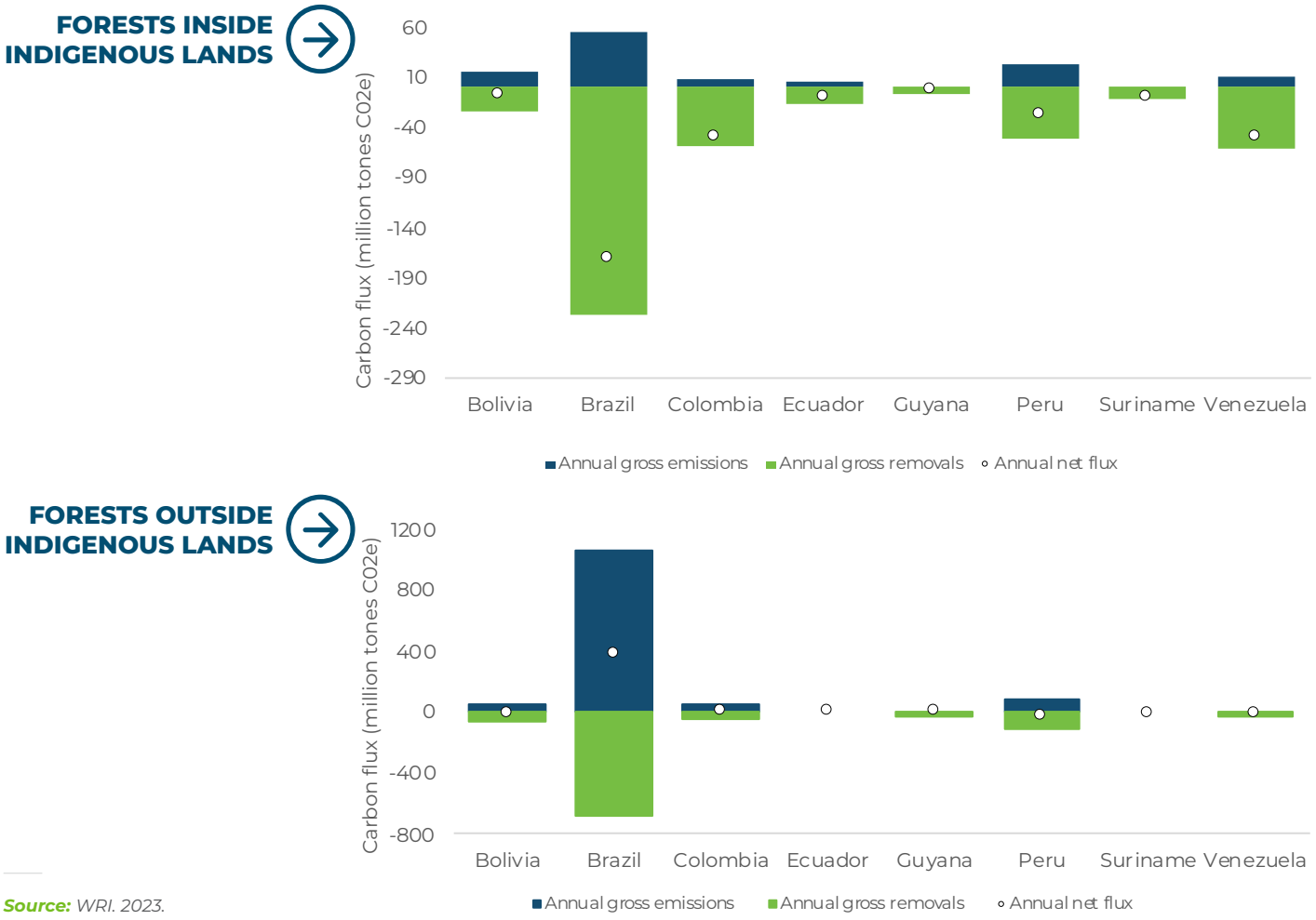
mining concessions) from 2006 to 2011, determined that conservation concessions and Indigenous territories were, on average, more effective in protecting forests than protected areas. Another impact evaluation that used data from 2000 to 2021 revealed that protected areas, non-timber forest product concessions, and Indigenous territories reduced forest loss (Negret et al., 2024). Both studies suggest that local governance, including in Indigenous territories, can on average be as effective as centralized state administrations in protecting forests. Other studies with aggregate information and descriptive statistics suggest similar conclusions.

Lower deforestation rates in Indigenous territories are linked to stronger net carbon sinks (Figure 8.4. A study revealed that between 2001 and 2021 Indigenous forests in Amazonia collectively emitted an average of 120 million tons of CO2e per year while removing 460 million tons of CO2, resulting in a net carbon sink of 340 million tons of CO2e per year (Veit, Gibbs, and Reytar, 2023). In contrast, forests outside Indigenous territories in the Amazonia Basin were collectively a net carbon source between 2001 and 2021 because of significant deforestation.

FIGURE 8.4.

Lower deforestation rates in Indigenous territories are linked to stronger net carbon sinks

Carbon Emissions and Removals in Amazonia



Source: *WRI. 2023.*

8.4 Indigenous Peoples' Challenges

Despite their importance to the region and its nature, the Indigenous Peoples of Amazonia face common socioeconomic barriers that perpetuate cycles of poverty and exclusion. These include (i) limited access to basic services, such as safe water, sanitation, electricity, and healthcare; (ii) gaps in access and quality of education, health services, and adequate jobs, as well as limited access to formal employment; and (iii) vulnerability to deforestation and climate change. Chapter 7 presents poverty rates in Amazonia and Indigenous territories, specifically. This section details the socioeconomic gaps and dimensions of poverty faced by Indigenous populations in Amazonia. In general, poverty in Amazonia across all countries is higher than in non-Amazonian regions with Indigenous Peoples being among the most affected groups. In Brazil's Amazonia (2023) poverty[71] rises to 61.8% for Indigenous Peoples and 43% for Afro-descendants. These are two to three times the rates for white groups (IBGE, 2023). In Ecuador (2022), Amazonian poverty stands at 39.9%, slightly above the national average of 39.6%, and there is a gap of 47 percentage points in favor of non-Indigenous groups when comparing them to Indigenous ones in unsatisfied basic needs (National Institute of Statistics and Censuses of Ecuador, 2022). The Multidimensional Poverty Index is also considerably higher for departments in the Amazonian region of Colombia (2018), particularly for Indigenous groups, who experience poverty rates 21 percentage points higher than non-ethnic populations (National Administrative Department of Statistics of Colombia, 2018). In Suriname, interior regions—home to most Indigenous and Maroon communities— face poverty rates two to three times higher than the national average.

Limited Access to Basic Services

Indigenous peoples in Amazonia's urban centers tend to settle in peripheral neighborhoods or informal settlements, often with precarious housing conditions and, in many cases, in areas highly exposed to natural disasters or environmental contamination (Perz, 2000; dos santos et al., 2022). The situation in rural areas is even more precarious, marked by the remote, isolated, and distant location of some communities.

Access to basic water and sanitation services is a challenge for these population groups. For instance, access to drinking water and sanitation in the Amazonian departments of Colombia is very limited, especially in rural areas predominantly inhabited by IC. According to the 2021 Quality of Life Survey, these departments have rural aqueduct coverage below 50%, and in urban areas of departments like Amazonas and Putumayo, coverage does not exceed 80% (National Administrative Department of Statistics of Colombia, 2021). In Guyana (2019-2020), the percentage of Amerindian people living in houses with improved drinking water sources and improved sanitation stands at just 76%, compared to the national percentage of 98% (2022) (United Nations, 2022; Government of Guyana and UNICEF, 2021). Indigenous households in Amazonia have the lowest access rates in terms of

[71] The poverty line is defined as a per capita monthly household income of R$665.00, equivalent to approximately US$275 in 2022 purchasing power parity dollars.

sanitation, making them more vulnerable to health and environmental risks. In Ecuador, only 44% of homes in the Amazonia Region have access to sewer systems, compared to 49.2% in the coastal region and 73.2% in the highlands (Secretaría Técnica de la Circunscripción Territorial Especial Amazónica, 2021). In the Ecuadorian Amazonia, only 32% of the Indigenous population has access to sewage services, compared to 73% coverage among the non-Indigenous population (National Institute of Statistics and Censuses of Ecuador, 2022). In the Peruvian Amazonia, sewerage and sanitation services in IC constitute one of the main deficiencies in basic infrastructure, and in rural and remote areas, rudimentary latrines or open defecation are predominant. In the Loreto region of the country, only 11.2% of the population has access to improved sanitation services. In rural IC, this rate of service is even lower (Defensoría del Pueblo, 2023).

IC located in more remote areas often lack access to distribution networks for public electricity. A 2018 study by The Institute for Energy and the Environment in Brazil estimated that approximately 990,000 people lacked access to electricity in Brazil's Amazonia Legal.[72] About 32% of those people resided in Indigenous territories, recognized quilombola communities, conservation units, and rural settlements (Ferreira and Silva, 2021). In Ecuador, the Amazonia Region has the country's lowest electricity coverage, at 92.9% compared to a national average of 97.1% (Regulation and Control Agency for Non-Renewable Energy and Natural Resources, 2022). In some rural Indigenous settlements of the Ecuadorian Amazonia, characterized by isolation and population dispersion, electricity coverage does not even reach 1%, reflecting severe disparities between urban and rural areas (Muro et al., 2020). Similarly, in the Bolivian Amazonia, only 26 out of 669 Indigenous settlements have access to electricity.

Access to health is also more limited for Indigenous populations. In Guyana, access to healthcare for Indigenous Peoples, particularly in hinterland[73] villages, is impeded by inadequate infrastructure, a shortage of trained personnel, and significant geographic and economic barriers. Basic health posts in most Indigenous villages of the country lack both qualified staff and essential medical equipment. High rates of communicable diseases are common, including malaria (17%) and dengue (10%), and attending to maternal and child health has proved challenging (Bollers et al., 2019). For instance, the infant mortality rate among Amerindian populations is 32 per 1,000 live births, compared to 19 per 1,000 among East Indian populations and 16 per 1,000 among those of mixed heritage (Centre for Indigenous Peoples' Autonomy and Development and the International Fund for Agricultural Development, 2022). These problems are not restricted to Guyana. Throughout the Amazonian regions of all countries, health systems face two major issues: a) limited access to health facilities offering quality services for rural, predominantly Indigenous populations and b) the need for the sociocultural adaptation of healthcare services to Indigenous populations, including language considerations and the integration of Indigenous health perspectives (Secretaría Técnica de la Circunscripción Territorial Especial Amazónica, 2021).

[72] Amazônia Legal, which translates to Legal Amazon in English, is a political and geographical region within Brazil encompassing a large portion of the Amazonia Basin. It was established in 1953 by federal law to promote specific development and protection policies for Amazonia. The region includes all or parts of nine states: Acre, Amapá, Amazonas, Mato Grosso, Pará, Rondônia, Roraima, Tocantins, and Maranhão.

[73] The interior and often forested regions of Guyana, generally sparsely populated, with limited infrastructure, and inhabited primarily by IC.

Gaps in Access to Education and Adequate Jobs

Access to education for Indigenous Peoples in the Amazonia Region is hindered by problems of equity, quality, and cultural relevance. There is a significant gap in illiteracy rates between Indigenous and non-Indigenous populations in the

Amazonia, with Indigenous groups consistently experiencing higher rates. In Colombia's Amazonia region, the department of Guaviare shows the widest disparity: the illiteracy rate among Indigenous populations is 17.1%, compared to just 4.2% among non-Indigenous people (National Administrative Department of Statistics of Colombia, 2018). In Brazil, 51.3% of the Indigenous population in the Legal Amazonia did not complete primary education (IBGE, 2024). In Ecuador's Amazonia, the illiteracy gap is 8.1 percentage points between indigenous and non-indigenous population, and the average years of schooling for Indigenous people is 8.2 years, compared to 11.7 years for non-Indigenous groups. These figures underscore the persistent barriers Indigenous Peoples face in accessing education (National Institute of Statistics and Censuses of Ecuador, 2022). As discussed in Chapter 6 (Figure 6.2), Indigenous populations also face lower secondary educational completion rates. These challenges are closely tied to structural barriers, such as limited transportation, poor infrastructure, and a lack of qualified teachers, all of which restrict access to quality education, reduce employment opportunities, and reinforce socioeconomic disadvantage (see Chapter 6).

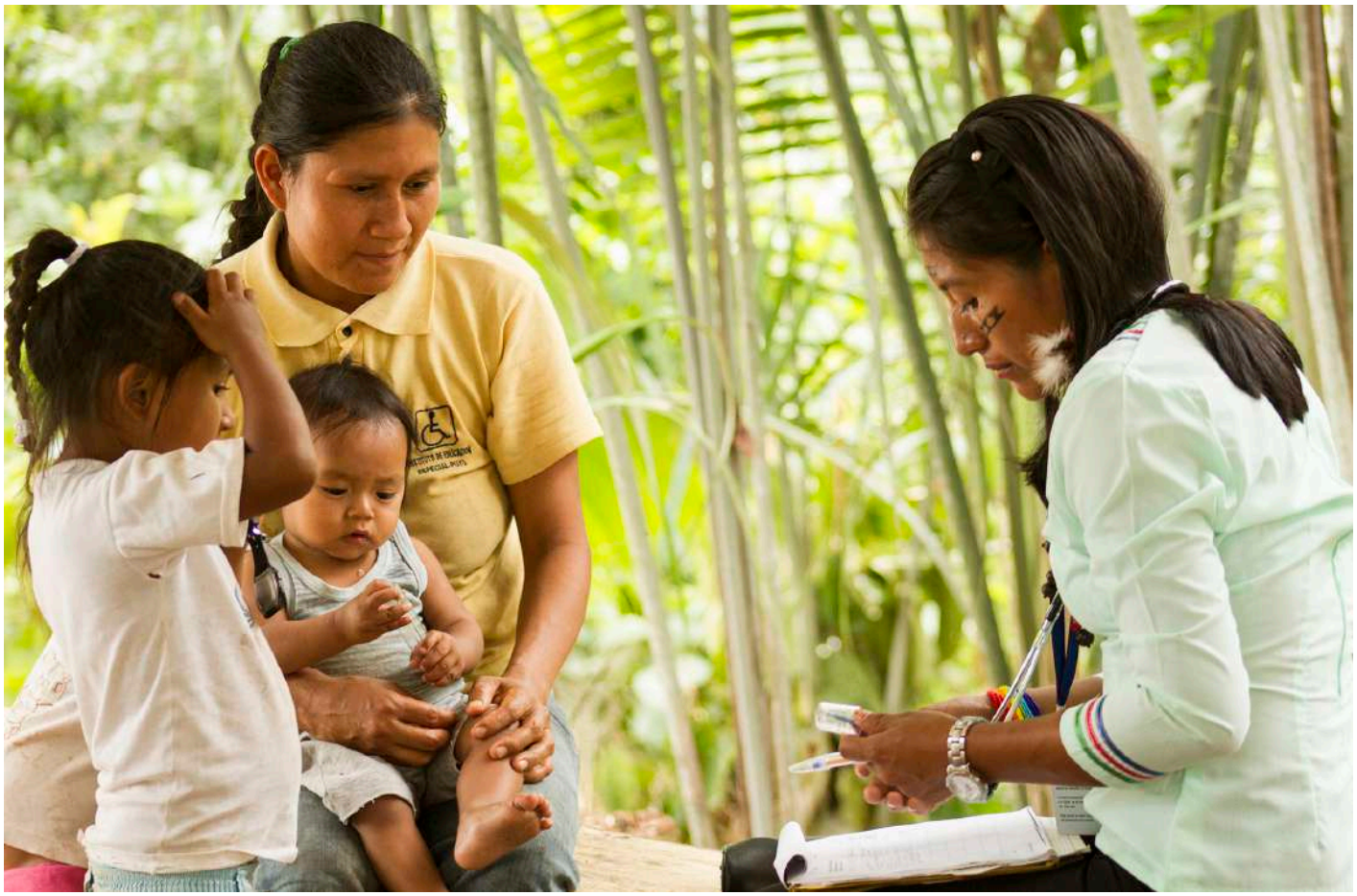
Indigenous Peoples predominantly hold low-skilled and low-paid jobs. A significant segment of the Indigenous population earns low incomes in informal employment or through self-employment, a phenomenon particularly marked among women. Although specific data for Amazonia is limited, broader Latin American data indicate that the labor informality rate among Indigenous people in the economically active population is 86.6%, 31.5 percentage points higher than that of non-Indigenous people (51.1%) (International Labor Organization, 2019). As a result of that high informality, Indigenous Peoples have a lower probability of accessing social security, pensions, health insurance, and other benefits. Limited opportunities for accessing quality formal education or vocational technical training partly explain this exclusion from the formal labor market. Institutional discrimination and prejudice against Indigenous Peoples—based on their geographic origin, traditional clothing, language, or other cultural expressions—contribute to this marginalization. Indigenous women face compounded disadvantages due to poverty, discrimination, unequal care burdens, and violence. For example, in Peru, Indigenous women earn between 57% and 70% of Indigenous men's wages, while non-Indigenous women earn between 82% and 88% of non-Indigenous men's wages (Kolev and Suárez Robles, 2016). In Colombia (2021-2022), Indigenous women spent an average of 9 hours and 14 minutes on unpaid work, compared to 2 hours and 43 minutes for men, highlighting the inequality in the distribution of domestic and care responsibilities (Colombia National Indigenous Association, Colombia National Statistics Office, Ministry of Health and Social Protection of Colombia, and the United Nations Population Fund Colombia, 2022).

The inequality Indigenous women in Amazonia face results from the intersecting factors of gender, ethnicity, and socioeconomic status. They also experience high levels of gender-based violence. In Ecuador (2023), for example, the femicide rate in Amazonian provinces surpasses the national average (Asociación Latinoamericana para el Desarrollo Alternativo, 2023). Indigenous women in the Amazonian regions of Peru, Colombia, and Guyana also face multiple forms of violence, including threats, harassment, coercion, and physical assault, particularly in areas impacted by illegal mining activities (Sierra Praeli, 2025). In Guyana and Suriname, Indigenous populations have the highest rates of child marriage in the region (girls under 18 years of age) (Government of Guyana and UNICEF, 2021; Ministry of Social Affairs

and Public Housing of Suriname, 2019). All these issues are closely linked to poverty, lack of educational opportunities, and the absence of health services tailored to women's needs.

Vulnerability to Deforestation and Climate Change

Deforestation brings with it a serious threat to the food security and to the cultural survival of Indigenous Peoples in Amazonia because of their dependence on the quality and quantity of the natural resources available in their lands and territories. At the same time, Indigenous Peoples are among the most vulnerable to climate change (floods, landslides, fires, changes in ecosystems, and diseases, among others). This is related to their poverty and historical marginalization. It is also due to social stress from conflicts with extractive industries, including the mining, logging, fossil fuel, and agribusiness sectors. The invasion of their territory, the expansion of the agricultural frontier, land tenure insecurity, and the lack of recognition of their ancestral territories increase their vulnerability. Insecure land tenure, in particular, has directly undermined IC' ability to access and control their ancestral territories in Amazonia. For example, empirical studies in Brazil show that, in the absence of formal property rights, both illegal squatters and large landowners engage in strategic deforestation and land clearing, restricting Indigenous peoples' access to traditional resources and weakening their territorial autonomy as a means to assert land use claims (Pacheco and Meyer, 2022; Moutinho and Azevedo-Ramos, 2023).



8.5 Conclusion: Supporting Indigenous Peoples in Amazonia

Indigenous Peoples have inhabited Amazonia for millennia, developing knowledge systems that contribute significantly to the conservation and sustainable management of the region. Their low-emission livelihoods and profound spiritual connection to the land have enabled them to maintain high levels of ecological integrity in their territories, often comparable to, or exceeding, those found in state-managed protected areas. Despite their critical contributions, however, IC remain among the most socioeconomically marginalized populations in Amazonia.

Supporting Better Access to Basic Services

Countries must implement long-term strategies supported by sustained financing to close persistent gaps in access to basic services among Indigenous Peoples in the region. These strategies should be developed through direct consultation and participation with IC, ensuring that solutions are context specific. Solutions should account for biogeography, climate, accessibility, rurality, and settlement dispersion. They should incorporate key sociocultural dimensions and the traditional ways of life of Indigenous Peoples (Torres-Slimming et al., 2019; COICA, 2025; Vargas, Méndez, y Altafin, 2021). This participatory approach facilitates the accurate identification of appropriate technologies, infrastructure, cost parameters, and the technical and social feasibility of service delivery.

Given the remoteness and dispersion of many Indigenous settlements, decentralized solutions are essential. These include water purification systems, rainwater harvesting, ecological dry toilets, community composting units, solar energy systems, satellite internet infrastructure, and mobile health brigades. Long-term sustainability depends on continuous community training and capacity-building (Fundación Aquae, 2022). An impact evaluation in Bolivia, for example, found that household-level water disinfection, safe storage, and community education reduced diarrheal episodes by up to 44% in households that received these interventions compared to control groups. The intervention was also associated with significantly lower E. coli contamination in stored water (Quick et al., 1999). A study in rural communities of the Brazilian Amazonia demonstrated that sodium hypochlorite is effective for disinfecting rainwater. However, its long-term sustainability depends on continuous community education to prevent the recontamination of treated water (Gomes et al., 2024). Dry toilets, according to Peasey (2000), are an effective alternative in areas without access to sanitation, provided they are properly managed. Their public health benefits include reducing vector-borne diseases and protecting water sources from fecal contamination. In the Loreto and Ucayali regions of Peru, several IC are implementing dry toilet systems because of their environmental and health advantages (de Sas and Chumbe, 2019; Fundación Aquae, 2022). In Ecuador (2023), the Ministry of Public Health delivered healthcare services to over 11,127 Indigenous inhabitants of the Napo region through mobile outreach initiatives. These included vaccination campaigns, the monitoring of children with chronic malnutrition, dental services, the identification of tuberculosis, screening for asymptomatic respiratory infections, prenatal care, and assistance to

other vulnerable groups. This mobile healthcare model has proven to be an effective strategy for providing free, high-quality medical services to IC in remote areas and stands as a replicable and scalable intervention (Ministerio de Salud Pública del Ecuador, 2023). In Amazonia's highly diverse biogeographical and sociocultural contexts, standardized, one-size-fits-all approaches are ineffective and inappropriate.

Reducing Gaps in Education Access, Quality, and Decent Jobs

Promoting intercultural and bilingual education tailored to Indigenous contexts is vital to supporting better access to education and jobs. This involves, among other measures, the design and implementation of educational programs that incorporate Indigenous languages, worldviews, and ecological knowledge. It also involves the training of Indigenous teachers and the provision and upgrading of quality educational infrastructure, particularly in remote communities (Chapter 6). In Brazil, Mattos and de Mattos (2020) found, for example, that ethnomathematics programs contribute to deeper reflection on interculturality[74] and strengthen understanding of sustainability, conservation, and the protection of Indigenous lands. In Ecuador, Ponce and Drouet (2017) evaluated the impact of the Millennium Educational Units program—an initiative that provided adequate infrastructure and technological resources—and found a positive correlation between infrastructure quality and students' academic performance. Elacqua et al. (2020) emphasize the importance of offering incentives to retain highly qualified and well-prepared educators, particularly in rural and Indigenous territories. The deployment of teachers with strong pedagogical competencies and a deep understanding of the local context is essential for improving education quality. A study of the Formabiap program in the Peruvian Amazonia, for example, shows that perceptions of educational quality increase when teachers understand students' lived experiences, particularly their language and culture. This, in turn, strengthens the sustainability of intercultural and bilingual education programs (Rahman et al., 2023).

Supporting bioeconomy models based on traditional knowledge and Indigenous livelihoods can be an important source of jobs and livelihoods for Indigenous Peoples (Cotacachi, Tejerina, and COICA, 2023). This entails direct investment in value chains linked to sustainable uses of biodiversity, such as NTFPs, traditional agriculture, aquaculture, medicinal plants, and ecotourism. It also includes capacity development for market access and the promotion of community-based bio-enterprises that generate income and protect livelihoods. The Association of Rural Producers of Carauari, composed of traditional communities in Brazil, works with bioeconomy products such as pirarucu (Arapaima gigas), cassava flour, rubber, and açaí, generating sustainable income for local families. In Ecuador, the Kallari Cooperative produces bioeconomy products such as chocolate, guayusa (a medicinal aromatic plant), vanilla, and handicrafts, exporting directly to markets in the United States, Europe, and Japan, and benefiting over 5,000 people from IC (Instituto Igarapé, 2025). In San Martín, Peru, the Chocowarmis Association—composed of Indigenous women entrepreneurs from the Copal Sacha Native Community—transforms cacao into high-quality chocolate, generating income while preserving the forest (WWF Ecuador, 2023). Indigenous organizations such as the Interethnic Association for the Development of the Peruvian Rainforest and the Confederation of Indigenous Nationalities of the Ecuadorian Amazon are also leading bioeconomy initiatives as alternative models for sustainable economic development.

[74] Interculturality refers to the recognition and incorporation of diverse cultural knowledge systems—such as Indigenous ways of knowing—into formal education.

Vulnerability to Deforestation and Climate Change

A straightforward way to reduce the vulnerability of Indigenous peoples to deforestation and the impacts of climate change is strengthening land tenure security and Indigenous governance systems (Stevens et al., 2014). This means providing support and investment for the legal recognition and titling of ancestral lands. It also means capacity building for Indigenous organizations in the sustainable management and monitoring of their territories. Securing land tenure not only allows Indigenous peoples to live with greater autonomy but also enables their access to a range of programs and financial resources aimed at protecting their livelihoods, territories, forests, biodiversity, and the ecosystem services they rely on for their physical and cultural well-being. For example, in Ecuador, participation in the Socio Bosque conservation incentive program—and access to its associated benefits—requires communities to hold legal rights over their lands. Once enrolled, communities receive collective economic incentives that help strengthen local governance and enhance territorial protection (Arriagada et al., 2018; Perafán and Pabón 2019; Zurita-Arthos and Cotacachi, 2019). In Brazil, the Bolsa Floresta Program—a PES initiative—has shown a significant reduction in deforestation within plots enrolled in the program across multiple sustainable use reserves in the state of Amazonas. The program has also contributed to improvements in local quality of life and community governance (Börner et al., 2013; World Bank, 2019; Fundação Amazonas Sustentável, 2019).

Indigenous Peoples in Amazonia rely directly on renewable natural resources—such as land, water, biodiversity, and forests—that are particularly vulnerable to climate change impacts. Secure access to these resources is thus essential for strengthening their adaptive capacity (Stevens et al., 2014). Indeed, the protection of Indigenous territories is a cornerstone of both climate resilience and adaptation. Preserving the ecological integrity of these territories also helps prevent the forced displacement of communities into places and situations marked by social discrimination and deeper economic marginalization (International Labour Organization, 2017). The Suruí Forest Carbon Project, located within the territory of the Paiter-Suruí people, is a clear example of how forest conservation and the generation of carbon credits can create sustainable income to support forest monitoring, territorial protection, and community-based initiatives, such as handicrafts, local agriculture, and the cultivation of medicinal plants (Zwick, 2019). Numerous bioeconomy initiatives across Amazonia also demonstrate their potential to strengthen local adaptation and resilience in the face of climate change (for more information on bioeconomy, please refer to Chapter 4).

The IDB in 2023 launched the Amazonia for Life Fund, which seeks to bolster the institutional and operational capacities of Indigenous Peoples' organizations to directly design and implement projects within their territories. Priority areas include bioeconomy, institutional strengthening, data generation and management, and territorial governance and conservation. They also include value-added partnerships for collective enterprises and environmental and social risk management. The fund aligns with the long-standing aspiration of Indigenous Peoples to manage international funding autonomously and in accordance with their own development visions. It supports projects directly designed and implemented by national Indigenous organizations, ensuring cultural relevance and long-term sustainability and enhancing local capacity. And it actively promotes consultation, participation, and the use of traditional knowledge and Indigenous

governance systems. In the process, it provides a compelling example of how to establish effective, equitable partnerships with Indigenous Peoples—rooted in sustained dialogue and iterative participation—where communities define investment priorities. Ultimately, the most replicable and potent elements stand out: structured, transparent dialogue and meaningful participation by Indigenous Peoples are fundamental prerequisites for legitimacy and long-term impact.



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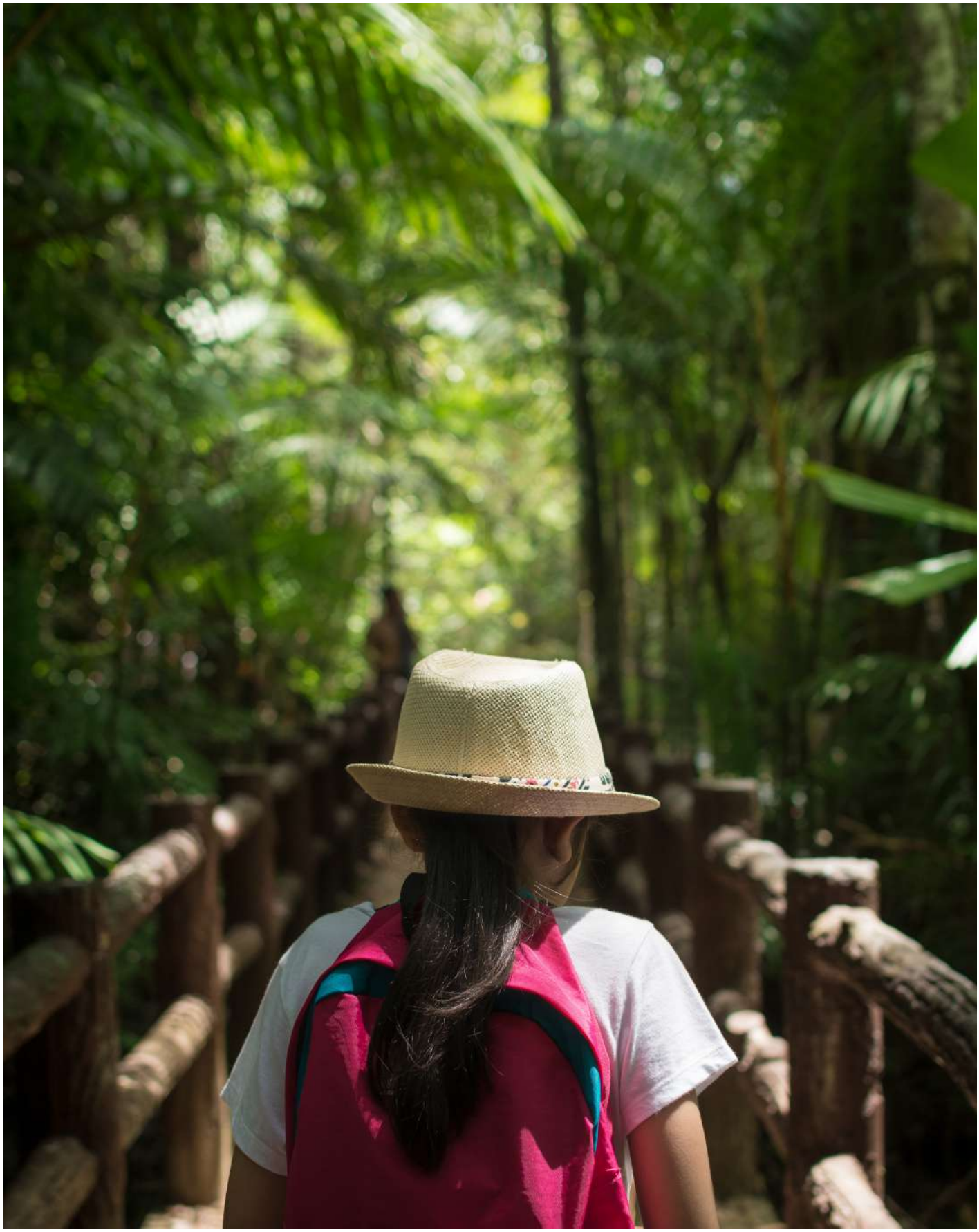
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SUSTAINABLE INFRASTRUCTURE, CITIES, AND CONNECTIVITY

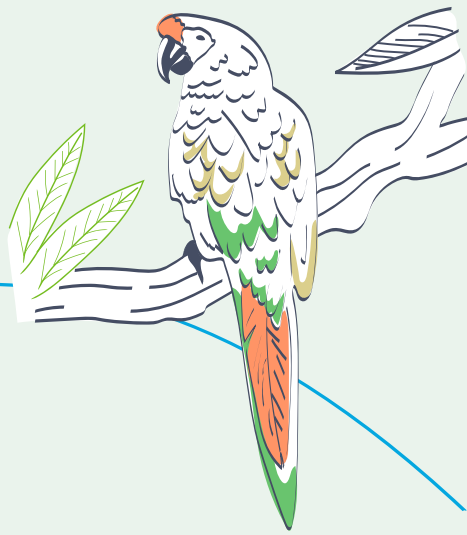


Chapter

09

CITIES OF AMAZONIA

Nora Libertun



9.1 Introduction: Challenges and Opportunities for Amazonian Cities[75]

Amazonia, like Latin America and the Caribbean as a whole, is highly urbanized, with a continuing trend in that direction. Not surprisingly, many of the salient challenges facing cities in Latin America and the Caribbean also confront those in Amazonia. Basic services do not meet the needs of urban residents, resulting in cities where a large share of the population lives in informal and underserved neighborhoods. Cities in Amazonia also tend to have low levels of productivity and are marked by low-density urbanization that frequently takes the form of extensive sprawl.

Despite these similarities, the mechanisms behind Amazonia's challenges reflect the unique way in which human interaction with the forest has shaped the urbanization process. This distinctive relationship shapes the kinds of actions needed to respond to the challenges that cities in the Amazonia Region face—a relationship explored in this chapter.

9.2 Why Focus on Amazonian Cities?

Population trends are shifting toward urban centers in Amazonia. There are approximately 895 urban areas spread across the Amazonas River Basin.[76] These urban areas are home to around 70% of the region's population (Table .1) (Martin & Scetta, 2025). In Brazil, Bolivia and Peru—where 95% of the Amazonia population lives—the urban population represents 72.5%, 66.6% and 62.6% of the total population, respectively. Most of these urban areas are small. But they also include large cities, like Manaus with 1.8 million residents, Belem with 1.4 million, and São Luís with 1 million residents in Brazil; and Santa Cruz de la Sierra, with 1.5 million residents (SP/OTCA, 2024) in Bolivia.[77]

Despite this high level of urbanization, the cities of Amazonia face challenges in many important dimensions. Most cities base their economy on the production of basic commodities rather than complex, high value-added products (Cheston et al., 2023). Poverty and unemployment are endemic, and essential infrastructure and services are lacking. For example, 70% of urban buildings are non-compliant with technical or legal standards (Hecht et. al., 2020). Elevated levels of crime, environmental vulnerability, and informal encroachments are also widespread in many of the cities of Amazonia (Furnari, 2024).

The impact that these types of underperformance have on the lives of urban

[75] This chapter is a summary of Libertun de Duren, Nora et al., 2025. Cities of the Amazonia. Inter-American Development Bank

[76] The definition of the Amazonas River Basin used in this chapter—and thus of the cities considered part of Amazonia—follows the criteria established by the IDB's Amazonia Forever program.

[77] Using the degree of urbanization method, urban areas in Amazonia are defined in this chapter as polygons containing at least one high- or moderate-density cluster, with populations of 5,000 or more inhabitants and densities of 300 or more people per square kilometer. The urban population includes all inhabitants within these polygons. Cities are classified as urban areas with 50,000 or more inhabitants.

residents and their relationship with the natural environment has long-term implications for the sustainability of the region. Enhancing cities' ability to implement urban planning that effectively incorporates environmental considerations is key. So is the provision of urban services and job opportunities, as they lie at the core of any strategy aiming to prevent the criminal and environmentally destructive activities that have harmed the region. This is particularly relevant because fostering high value-added activities within cities enables the creation of better-paying jobs. Better jobs, in turn, discourage urban residents from engaging in the production and transportation chains of illicit economies (Hanusch, 2023). The rest of this chapter will explore this idea by highlighting the history and complexity of the urban systems of the region and the need to embrace a sustainable, place-based, and productive urban model.

9.3 From Ancient to Modern Settlements

Since its inception, the unique characteristics of the rainforest have shaped urban life in Amazonia. Recent archeological discoveries challenge the long-standing belief that the region's dense jungle was too harsh or too pristine to have had human settlements. Evidence from remote sensing, radiocarbon dating, soil analysis, and phytolith studies shows traces of sophisticated urban centers, including complex systems of parks, fisheries, and orchards going back thousands of years. In Brazil's Upper Xingu River, low-density garden cities dating from at least 1,500 years ago have been discovered, complete with homes, roads, and defensive structures. Bolivia's Llanos de Mojos features monumental settlements from up to 1,400 years ago with geometric patterns, roads, and pyramids. In Ecuador's Upano Valley, a 2,000-year-old metropolis with over 6,000 earthen platforms, roads, and public squares provides evidence of a once densely populated and well-planned urban network. The Amazonia Region has long been urban, with ancient cities that were more populous, complex, and better planned than previously thought (Rostain et. al., 2024), and that attest to the fact that there are ways to sustain vital and prosperous urban centers that do not contribute to deforestation and are in harmony with their environment.

During the Spanish and Portuguese colonial period, new cities were founded in coastal locations to support the riverine trade routes than ran through the rainforest to meet international shipping lanes. These routes gave origin to cities like Belém in Brazil, Paramaribo in Suriname, and Georgetown in Guyana (Killeen, 2007). While part of large transnational markets, such cities were nonetheless disconnected from continental urban networks, months of travel away from the principal colonial cities of the time. As a result, local administrators in Amazonian cities had vast discretionary power to deal with territorial disputes among rival colonial powers and maintain a coercive hold on riverine local communities and African slaves (Maxwell, 2001).

The global demand for commodities led to a pattern of urban expansion deep into the rainforest from the 19th century onwards, as Amazonian suppliers fed international markets with rubber, quinine, nuts, and timber. The rubber boom, in particular, brought wealth to the region, giving rise to grand palaces, broad streets, and marketplaces in the ports of Belem and Manaus in Brazil, and Iquitos in Peru. Significant demographic changes also occurred as local IC and migrant workers, subjected to brutal labor conditions, were transported into the new towns of the region (Casement, 2011). But as Asian plantations began producing more latex at a lower cost, the Amazonian boom went bust, leaving several cities bereft and stranded. Meanwhile, the continuing remoteness of these cities vis-à-vis central governments increased the discretionary power granted to state authorities, often leading to abuses of power and a lack of accountability (Kiblinger, 2020).

The mid-20th century saw new waves of urban growth tied to large, often industrial-scale extraction of natural resources such as hydrocarbons, minerals, and timber. The discovery of oil pumped money into Venezuela's Maracaibo and Ecuador's Lago Agrio, drawing workers from rural areas and neighboring countries. Iron, bauxite, and manganese prospection in Brazil created company towns, which quickly spilled over into improvised bedroom communities for job seekers. Towards the end of the century, new extraction activities in Amazonia took root, including activities related to fishing, grains and cattle, creating incentives for deforestation beyond what had already been wrought (Meira, 2018). Riverine cities began to expand on terra-firme. Brazil's designation of Manaus as a free trade zone (zona franca) in 1967 created the first urban industrial park in Amazonia and reconnected the city to international supply chains. Bolivia's Santa Cruz de la Sierra, just below the Amazonia Basin, grew as a hub for agricultural exports, while Colombia's Leticia became a center for the timber and fish trade. Exports of soybeans from Brazil, gold from Guyana and Suriname, and oil from Ecuador produced wealth that turned Amazonian cities into trading hubs and weigh stations for ports on the Atlantic and Pacific coasts, with boom-and-bust cycles driven by the rhythms of the global commodity cycles.

This burgeoning trade changed the landscape far beyond the immediate peripheries of the urban nodes. A network of roads scraped out of the forest and linking mines, mills, and factories to cities and ports was built to thread together new enterprises. The Amazonas River and its tributaries were—and still are—critical to the movement of people and goods. But national and local authorities emphasized land connections, and road networks were expanded. The Trans-Amazonian Highway cut through Brazil from the rainforest to the Atlantic Ocean in the east, while the Interoceanic Highway connected Peruvian jungle towns to the Pacific Ocean in the west, creating principal commercial routes and generating high levels of deforestation (Laurance, 2014).

Today, Amazonia holds an immense number of settlements belonging to distinct yet disconnected urban systems that interact with the larger territory. These entail three urban systems: the riparian, the fluvial, and the intermediation systems (Schor and de Oliveira, 2011). The riparian system includes an array of Indigenous and Afro-descendant community-based urbanizations, such as Quilombolas in Brazil and Palenques in Peru. These settlements are relatively self-sufficient and isolated. But they are evidence of the fundamental role played by long established economic practices, including small-scale fishing and commercial agriculture, which provided the means for micro- and meso-urban wealth in Amazonia centuries before the

colonization of the Amazonia began. The fluvial urban system, by contrast, consists of the urban nodes strategically placed to support global networks. These include cities that grew due to the extractive activities behind the mercantile networks of the 19th century when cities, like Iquitos in Peru, and Manaus and Belém do Pará in Brazil, accumulated wealth from their strategic position on the river. Some of these cities ended up being better integrated into the global economy than others, with some having large modern ports and others holding significance only on a regional level. Finally, there are several intermediary networks of cities and urban settlements connecting the riparian and the fluvial nodes and mediating between local and global networks. All these systems can be traced back to the economic functions that they performed over the course of their history, shaping their relationships with the surrounding forest and consumption centers outside Amazonia.

9.4 Urban Territories that are Sprawling, Complex, and Multilayered

Despite the fact that there is not a single, homogenous definition of urban areas in Amazonia, recent estimates show that the urban settlements of Amazonia are home to around 70% of the inhabitants of the region. Together, these urban areas cover about 19,006 km^2, less than 0.2% of the region's total area (8.4 million km^2).[79] Despite increasing urban growth, urbanization in Amazonia remains below the average for the respective Amazonian country (Martin & Manhic, 2025) (Table 9.1). It is also below what is typical for Latin America, which hovers around 84%, and resembles the level in Africa, where urbanization stands at 41%.

Table 9.1. | Urbanization Rates for Amazonia and National Levels

	Amazonia	National
	Urbanization rate[79]	
Bolivia	71	71
Brazil	75	88
Colombia	55	82
Ecuador	53	65
Guyana	27	27
Peru	61	82
Suriname	66	66
Venezuela	86	88
Total	**494**	**569**

Source: *Elaborated by Martin & Manhic (2025) based on data from the last two censuses of each country considered. The censuses used are Bolivia 2001 and 2012, Brazil 2000 and 2010, Colombia 2005 and 2018, Ecuador 2010 and 2022, Guyana 2002 and 2012, Peru 2007 and 2017, Suriname 2004 and 2012, and Venezuela 2001 and 2011.*[80]

[78] The definition of "urban" varies significantly across Amazonian countries. Bolivia and Venezuela define it according to population size; Brazil, Colombia, Ecuador, Suriname, and Guyana rely on administrative designations, while Peru uses a hybrid approach that combines both. This inconsistency introduces biases and hinders international comparisons. To address these limitations, data presented here rely on the degree of urbanization method (United Nations Statistics Division 2020). This method relies on geospatial data, as it is based on a population grid system that divides the entire territory into 1km x 1km squares. Each grid cell is classified according to population density, population size, and spatial contiguity, avoiding distortions caused by the variable sizes of administrative and statistical units.

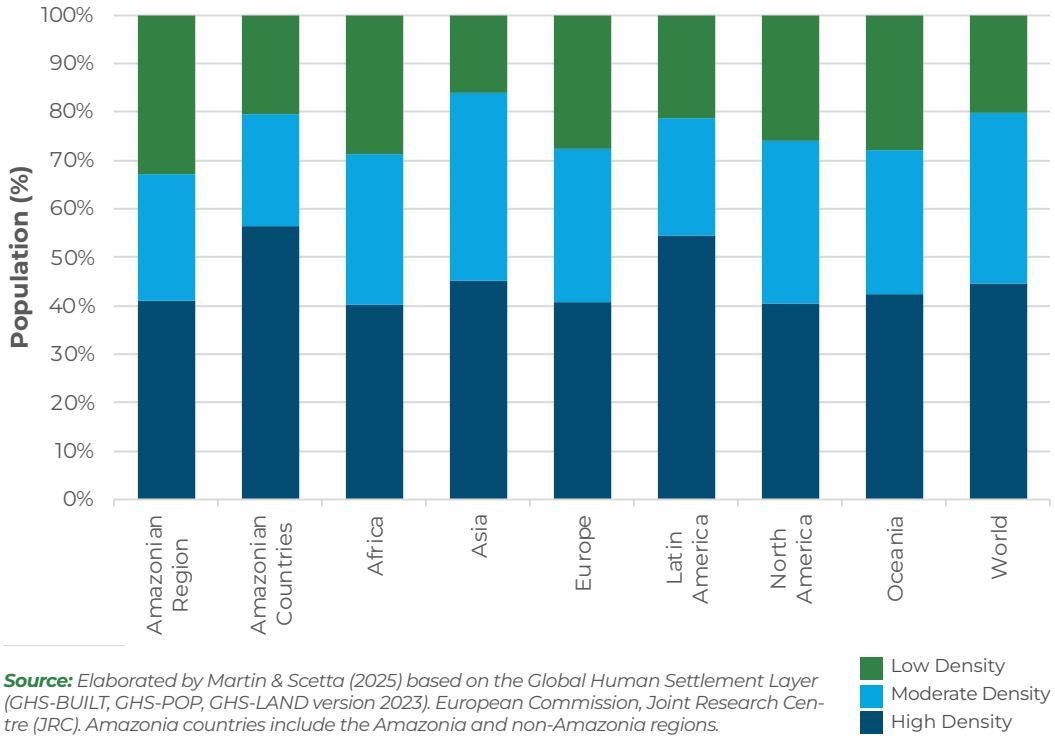
[79] The urbanization rate is the share of the urban population over the total population in the area of consideration.

[80] Some countries have more recent census data. However, only data available at the municipal level when this chapter was written were used for the analysis.

FIGURE 9.1.

Urbanization in Amazonia remains below the average for the respective Amazonian country, and Latin America, resembling the levels in Africa

Population Distribution by Degree of Urbanization, 2020



Source: *Elaborated by Martin & Scetta (2025) based on the Global Human Settlement Layer (GHS-BUILT, GHS-POP, GHS-LAND version 2023). European Commission, Joint Research Centre (JRC). Amazonia countries include the Amazonia and non-Amazonia regions.*

Similar to trends in other parts of the continent, cities in the region have grown substantially. For example, the eight most expansive urban municipalities in Brazil are all found in Amazonia, four of them covering over 100,000 km^2—an area larger than Portugal.

While the majority of urban areas are small, most of the population lives in large- and medium-sized ones. The former are home to 30% of the urban population of Amazonia. By contrast, six cities account for a quarter of the urban population. Some of the large urban centers—Santa Cruz de la Sierra and Cochabamba in Bolivia, and Manaus, Belem and Sao Luis, in Brazil—are not strictly part of Amazonia by biological and hydrographic criteria. But they border the region and are fully embedded in its network.

Towards the west, in the Amazonian territories of Bolivia, Peru, Ecuador, Colombia, and Venezuela, urban areas usually lie in the foothills of the Andes mountains and along major rivers. In Ecuador, they are also connected to the Sierra region road networks. In Peru, there are strategic cities, such as Iquitos and Pucallpa, Jaén, Bagua, Moyobamba, Tarapoto, Satipo, and Bajo Pichanaquilie, that lie near the foothills of the Andes, where they serve as key economic and logistical hubs for Amazonia. Likewise, in Colombia, besides Leticia on the Amazonas River, other cities, like Florencia, can be found near the Andean foothills, connecting the Amazonia Region with the Andes and the country's interior. Urban centers in the Venezuelan Amazonia are mainly concentrated near the Orinoco River, while in

Guyana and Suriname, they can be found principally along coastal enclaves of the Atlantic, like Georgetown and Paramaribo.

There are two major territorial patterns of urbanization in Brazil. One follows the Atlantic coast, particularly around the Amazonas River's delta-estuary region, including Belém do Pará and Manaus, as well as mid-sized cities such as Santarém. Another one, in southern Amazonia, follows the road corridors connecting the region with the rest of the country, particularly route BR-364, linking Porto Velho to Mato Grosso, and BR-163, connecting Santarém to Cuiabá.

Cross-border cities are also important nodes of Amazonia's urban system. These relatively small urban areas, typically not exceeding 100,000 inhabitants, have had annual population growth rates of 2.5%, well above the 1.6% average for the region. That growth, however, reveals some of the key challenges of Amazonia cities. These include insufficient services and affordable housing, the expansion of the city at the expense of natural capital and ecosystems around the metropolitan area, and robust licit and illicit trade networks.



9.5 Urban Planning and Service Provision

Regardless of their historical origins and size, many urban areas in Amazonia face planning challenges. Patterns vary across the region. But, as a result of their growth and shortfalls in urban planning and its implementation, Amazonian cities' use of the territory is suboptimal. This results in sprawling, often informally built settlements, which often lead to detrimental impacts on natural capital and ecosystems in surrounding areas (Porcher and Hanusch, 2022; and Oliveria et al., 2021). The historical reliance of cities on extractive industries has also contributed to the correlation between them and deforestation and environmental degradation (Cheston et al., 2023).

Low population density, limited connectivity between urban centers, and the reliance on extractive industries can also undermine the economies of scale and the creative opportunities that denser settlements afford, hindering cities' productivity and the generation of opportunities. For example, Tapauá, the fifth-largest municipality in Brazil by territory, spans 84,000 km² in the state of Amazonas—55 times larger than São Paulo. Despite that vast size, Tapauá has a population of only 16,000 people compared to São Paulo's 11 million. Additionally, only 65% of localities in the Brazilian Amazonia are within one hour of a town or city, compared to 97% in the rest of the country, illustrating the remoteness of some of these populations (Restrepo and D'Aoust, 2023). Even the region's largest cities are affected by weak connectivity. Manaus—one of the most economically diversified cities of the region—has access to the Atlantic Ocean via the Amazonas River and to the rest of Brazil via the BR-319 highway.

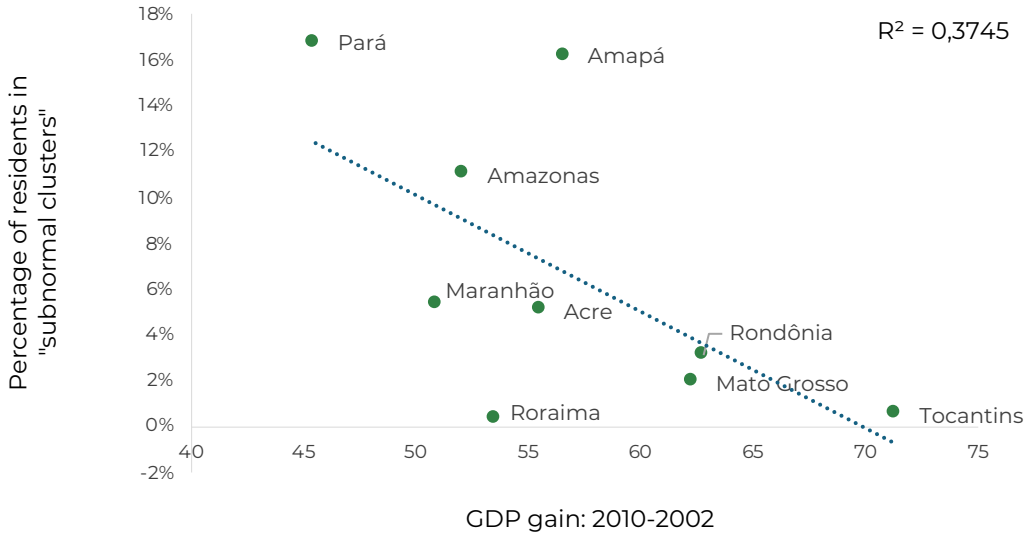
Smaller economies of scale and fewer creative opportunities generate negative effects on social and economic indicators, reflected in high levels of housing informality, low labor opportunities, and high poverty rates, among others. The majority of poor residents in Amazonia live in urban settings. In Brazil, for instance, 65% of the 10 million residents of the Amazonia Region who were living in poverty in 2019 lived in an urban area and nearly one-third of the urban poor in the region that year were unemployed (Lara Ibarra et al., 2023). In Colombia, labor force participation in the Legal Amazonia's capital cities averaged 64% in 2023, below the national rate. Informality reached 55% and vulnerable employment 47%, both above national averages.[81] Informality in housing is also present in urban areas across the region, correlated with lower economic opportunities. In Brazil, for example, favela-like settlements are more common in the Amazonian states with lagging economies.

[81] Data from the Private Council of Competitiveness (2024).

FIGURE 9.2.

Favela-like Settlements are More Common in States with a Sluggish Economy

Correlation between residents in "subnormal clusters" and GDP gain



Source: *Lara Ibarra et al. (2023) using IBGE Population Census 2010 and subnational accounts data.*

Urban areas are also facing long-standing gaps in infrastructure and public services. Underinvestment in infrastructure, in turn, reinforces a cycle of limited connectivity and constrained development opportunities (see Box 9.1. for examples of this in border cities). Giles Alvarez et al. (2025) find significant gaps in urban infrastructure. For example, up to 6.3 million people live in urban administrative areas with less than 96.4% of households served by electricity from the grid. Some 3.4 million people live in urban territories that are more than 30 minutes by car from a health center, and more than 620,000 school-age children in urban territories live more than 20 minutes by car from a primary or secondary school.[82] Limited port infrastructure and poor road conditions continue to restrict cities' commercial integration with national and global markets (see Chapters 10 and 11). Infrastructure provision, however, cannot come at the expense of the environment. As urban population growth continues to be concentrated along roads connecting large- and medium-sized cities such as Cuiabá, Santarém, Manaus, and Boa Vista, thousands of kilometers of "side roads" (known in Portuguese as 'ramais') have been built without government consent. This can have an impact on deforestation (see Chapter 10 for a further discussion on this issue).

The challenges described above, coupled with limited public sector capacity, have also impeded efforts to prevent illicit activities such as land grabbing, forced displacement, and environmental crime.

Transnational organized crime in urban areas in the region has risen in recent decades. Today, trafficking in illegal goods, including those obtained through illicit logging, fishing and mining, engulfs many small cities of Amazonia through its vast

[82] These estimates are subject to population and services provision estimates based on census and open-source data, based on Giles Alvarez et al. (2025). Urban territories are administrative areas with a population density greater than 300 people/km².

illicit networks (see Box 9.1). Small towns are crucial way stations in these networks, receiving the illicit products before they reach larger cities such as Manaus, where they can be sent via plane, boat, or road to consumer markets in Brazil or to the international ports of cities such as Belém and Santana at the mouth of the Amazonas River (Global Initiative Against Transnational Organized Crime, 2023).

Violence and crime within Amazonian cities are also at high levels and partly reflect the growing problems of drug addiction and criminal activity among urban youth (Furnari, 2024). In the Ecuadorian Amazonia, homicide rates increased by over 200% from 2022 to 2023, as disputes over control of illicit gold mining surged (Observatorio Ecuatoriano Crimen Organizado, 2024). The homicide rate for the Brazilian Amazonia in 2023 stood at 32.3 per 100,000 people, 41.5% higher than the national homicide rate. This violence has been heavily influenced by intense competition between transnational criminal actors and local operatives for dominance over Amazonia's urban areas, a competition that can be seen in large, as well as small- and medium-sized cities. The role of the latter is notable: of the 50 most violent cities in the Brazilian Amazonia, only one of them is a state capital (Macapá).

BOX 9.1.

Frontier Cities in Amazonia

The triple border between Brazil, Colombia, and Peru at the convergence of the Amazonas and Putumayo rivers encompasses nine administrative jurisdictions: Leticia and Puerto Nariño in Colombia; Tabatinga, Atalaia do Norte, and Benjamin Constant in Brazil; and Yavarí, Pebas, San Pablo, and Ramón Castilla in Peru. This border is marked by the intense movement of goods and people, but lacks effective institutional coordination. That hinders true regional integration, resulting in high levels of informality in cross-border financial flows of remittances and investments (see Chapter 11), as well as difficulties in combatting criminal networks.

The urban centers in this triple border lack basic infrastructure in energy, digital connectivity, water, and sanitation. They are accessible only by river and air, as the jungle acts as a physical barrier that hinders connectivity and land transport. For example, travel from Leticia—at the center of the triple border—to Iquitos, the closest urban center in Peru, can only be made by river and takes 11 hours to cover 370 kilometers. Relying solely on river routes increases the isolation of the area, which is subject to continuous changes in river geography. In October 2024, for instance, a severe drought caused water levels to drop by 80% along large sections of the Amazonas River, severely disrupting trade routes connecting Leticia in Colombia with Brazil and Peru. The drought also disrupted the water supply and food security for approximately 10 riverine IC, home to about 3,000 people, and affected various tributaries of the Amazonas River in Brazil. These included the Iriri and Xingú rivers, which feed the hydroelectric plant in the city of Belo Monte, a facility that generates 11% of the energy for Brazil's National Integrated System.[83]

[83] Amazon Drought Hits IC of Leticia and Puerto Nariño," The City Paper Bogotá, October 2, 2024, available here.

The binational city of Leticia-Tabatinga sits in this triple border region, divided between Colombia and Brazil. Leticia receives most of its agricultural products from Brazil and Peru, while its tourism sector generates employment in both Leticia and Tabatinga. The cross-border mobility of people and goods is a constant, marking a level of interdependence that demands greater institutional integration.

Poverty on both sides of the border is extreme. In the state of Amazonas in Brazil, the poverty rate is 51.4%.[84] In the Amazonas department of Colombia, 35.2% of the population has unmet basic needs. Both Leticia and Tabatinga face deficiencies in the provision of basic services such as drinking water, sanitation, and electricity. Among the most urgent issues is the lack of proper waste management, particularly affecting the shared landfill. On the Brazilian side, burning waste poses a serious threat to air quality, and at times, waste from one municipality is illegally dumped in the neighboring municipality's territory, complicating the harmonization of waste management policies at the cross-border level.

The levels of violence are extremely high: In 2023, Tabatinga recorded a staggering homicide rate of 95.9 per 100,000 people, while Leticia recorded 31.4 homicides per 100,000 people, making them critical points of concern for regional security. Both places are increasingly being used as permanent bases of operations by criminal actors, particularly large Brazilian drug-trafficking groups. This reflects the inability of state actors to exert control in the territory as transnational criminal groups battle for control of the region's illegal and profitable markets (Furnari, 2024).

In general, the presence of the state at the urban level is limited. For example, Brazil has just 0.82 stations per 100,000 inhabitants, reflecting a weaker institutional footprint despite its many settlements.

9.6 Conclusion: The Way Forward

The history of Amazonia is deeply intertwined with the development of its cities. From early human settlements to the present day, urbanization has reflected the evolving relationship between people and the forest. As discussed in this chapter, approximately 70% of the population in the region is urban. Although small urban areas make up the majority of urban areas, most of the population lives in large- and medium-sized ones. Urbanization has historically been associated with innovation and improved living standards. Yet, in Amazonia, cities have yet to fully

[84] According to 2017 data compared to the international daily income threshold of USD 1 in purchasing power parity.

realize this potential. Poverty levels and unemployment rates are still high, and access to basic services is limited. Local governments face significant constraints. However, the fact that many Amazonian cities have struggled to generate a sustainable interaction with their environment does not mean alternative models are unattainable. Historical evidence suggests that precolonial settlements were able to support a more balanced relationship with the forest, offering potential insights for future development. Based on the analysis presented in this chapter, two key policy recommendations emerge.

First, promoting urbanization planning models that better balance urban development and the environment is essential; for that, local government capacity should be reinforced.

Looking to the past is not a call to return to premodern ways of living. It is rather an invitation to rethink urbanization in a way that improves the quality of life for all residents while ensuring long-term environmental sustainability. It is thus important to continue promoting urbanization planning models that better balance the development of cities and improved service provision with the environment. Providing cities with well-connected services and opportunities cannot be done at the expense of natural capital and ecosystems. Such a reframing must balance the needs of both present and future generations and support the preservation of the forest's valuable resources.

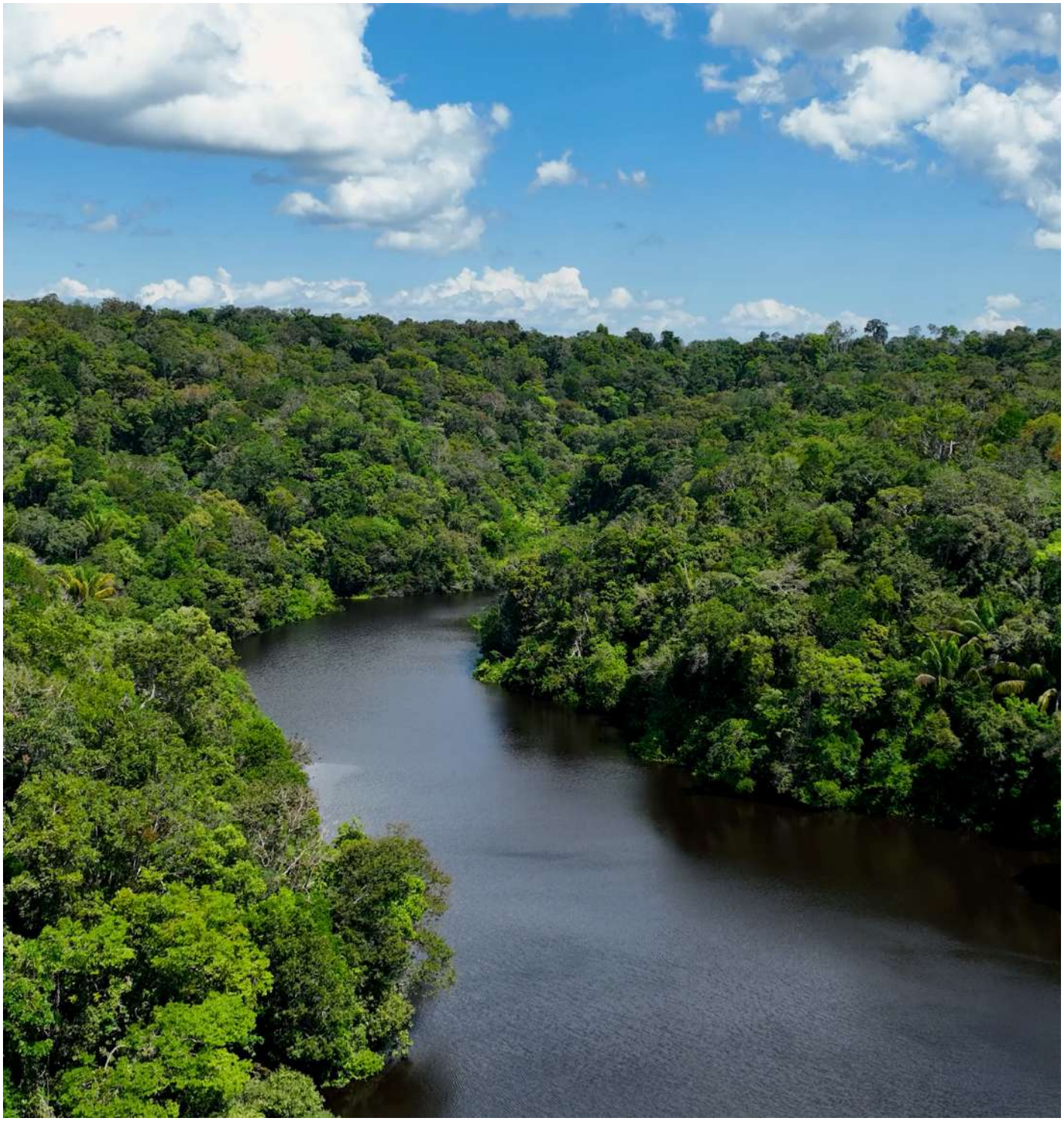
Second, the implementation of better urban planning models is key.

Unfortunately, there are limitations to the public sector's capacity to implement and enforce the urban planning requirements highlighted in the previous paragraph. This limits their ability to provide essential services, guide sustainable growth, and encourage urban densities that promote economies of scale without relying on resource extraction. The reduced presence of effective state institutions has also created conditions where illegal activities can thrive, with insufficient mechanisms in place to prevent or respond to them. The implementation of a coherent and well-planned, multi-scalar, urbanization strategy is essential. It can help prevent crime, increase productivity, create better-paying jobs, and support development that avoids deforestation (Zouarak et. al., 2023).

Policymakers thus need to focus on planning for inclusive and sustainable development across all types of settlements to ensure ecological resilience and the inhabitants' well-being. The IDB has been working with governments in the region towards these goals. Initiatives supported by the IDB—such as Amazonia Forever, the Amazonian Cities Forum, and the Ministers of Housing and Urban Development of Latin America and the Caribbean Amazonia Working Group—have played a pivotal role in strengthening this multilevel coordination. By bringing together 40 local governments from all ACTO member countries, the IDB is supporting the identification of shared challenges and opportunities, fostering knowledge exchange, and coordinating collective action in urban planning and climate change mitigation and adaptation. It is supporting capacity building

towards more effective urban planning and implementation in the region. And through the Amazonian Cities Forum, which consolidates a unified voice for Amazonia cities, it is elevating those cities´ presence within global, sustainable development and climate governance arenas.[85] The MINURVI working group, in partnership with the IDB and UN-Habitat, is also working to guide national and subnational urban policies toward greater sustainability and resilience through collaborative dialogue and country-specific research.

[85] See https://www.redus.org.br/foro-de-ciudades-amazonicas for more information.



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Chapter

10

THE PATH TO BETTER INFRASTRUCTURE IN AMAZONIA

Eduardo Cavallo & Carlos León-Gómez



10.1 Introduction: Promoting Effective Access to Infrastructure

Effective access to infrastructure can help reduce poverty, boost economic growth, and protect the environment. For that to happen, however, infrastructure assets must not only be available to the population. They also must have a certain level of quality (e.g. safe drinking water) and affordability (Straub, Serebrisky, Bagnoli, & Rojas, 2025). In recent decades, governments in the Amazonia Region have committed significant resources to improving effective access to transport, electricity, water and sanitation, and telecommunications services. Yet there is considerable heterogeneity in the accomplishment of this goal. What is true for all of Amazonia is that the access and quality of infrastructure services lag behind those of their respective countries as a whole (Bandura et al., 2020).

When increasing effective access to infrastructure, it is essential to consider the key actors involved and the long-term consequences of each project. As a first step, infrastructure development and service provision are shaped by the regulation in place, and the governance practices under which they are implemented. Public authorities in charge of these duties can either enhance or constrain infrastructure outcomes depending on their institutional strength, coherence, and enforcement capacity. Strong governance and sound regulation tend to promote infrastructure projects that maximize benefits for people and firms, while weak institutions and poor enforcement can create incentives that lead to environmental degradation or inefficient resource use. The immediate impacts of infrastructure decisions are felt across three main dimensions: people's lives, firm productivity, and the surrounding ecosystems. In the long term, public authorities face the challenge of expanding infrastructure access to underserved populations and businesses in a way that fosters inclusive development and economic growth. At the same time, they must actively explore alternative or underutilized infrastructure solutions that can reduce environmental harm (see Figure 10.1). This chapter deals with such decision-making and the trade-offs in enhancing infrastructure provision in Amazonia.

FIGURE 10.1.

Factors that Contribute to the Impact of Infrastructure and Its Long-Term Consequences

	ENHANCED / LIMITED	IMPACTS	LONG-TERM CONSEQUENCES
Effective Access to Infrastructure	Governance	People	Development
	Regulation	Firms	Economic Growth
		Ecosystem	Environment

Source: *Author's elaboration.*

Developing and maintaining infrastructure in Amazonia presents unique challenges. The region's vast scale and interconnectedness require coordinated infrastructure planning, as interventions in one part can generate cross-border impacts (e.g. in areas such as river flow management). The region also faces significant challenges stemming from its high vulnerability to extreme weather events. These issues are particularly relevant for populations already vulnerable, among other things, due to limited or non-existent infrastructure (See Chapter 7 for further information on these issues). In this context, building resilient infrastructure is essential for achieving long-term development and economic growth in the region. There are also notable differences across countries in the extent of their Amazonian territory and the size and characteristics of the population living there. Interventions must be designed to support access to diverse populations, particularly because access to basic services has been historically lower among minority groups (see Chapter 8).

Whether infrastructure is developed in urban or rural territories adds to the complexity of infrastructure planning. Some cities, such as Manaus (2 million inhabitants) in Brazil, Iquitos (0.5 million) in Peru, and Florencia (0.2 million) in Colombia, are densely populated and can benefit from economies of scale in *providing traditional infrastructure* (i.e. through the national electricity and broadband grids, water and sanitation pipelines, and official road networks). However, most municipalities in Amazonia are sparsely populated[86] and highly dispersed (with some estimates suggesting that the average distance between them is as high as 1,000 kilometers)[87] underscoring the need for locally based or alternative solutions to improve infrastructure access. These demographic disparities demand careful planning to prevent harm to Amazonia's ecosystems, the disruption of the livelihoods and rights of Indigenous Peoples and local communities, and prohibitively expensive solutions. This chapter places particular emphasis on the challenges and opportunities associated with improving access to infrastructure for remote populations. It reviews the current state of infrastructure in Amazonia, highlighting key assets and access gaps and addresses the environmental and governance challenges of developing infrastructure in the region.

[86] The urban population of Brazil's Legal Amazonia today stands at around 12 million people, with a few large cities (greater than 500,000 inhabitants) and dozens of small and medium-sized ones, with populations ranging from 20,000 to 250,000. See: https://www.fao.org/4/j5416e/j5416e05.htm

[87] See here for more information.



10.2 A Region of Fragmented Infrastructure

Reliable metrics on effective access to infrastructure in the region are limited. While some data is available regarding basic access, there is a significant lack of information on service quality and affordability. Nonetheless, the existing, albeit scarce and unevenly distributed, data on physical access remains valuable for assessing the extent to which infrastructure services—such as transportation networks, electricity, and water and sanitation—are available to the population, independent of their quality or cost-effectiveness.

Amazonia's road network expanded by approximately 55% within the last two decades, reaching 145,000 kilometers.[88] These figures provide a sense of the scale of construction, with the share of paved roads increasing from 32% to 45% (see Figure 10.2). They also indicate the quality of this type of infrastructure, since paved roads represent a quality upgrade within the primary road network. The enlargement of paved road networks across certain Amazonia countries stems from two main processes: the upgrading of existing unpaved roads and the implementation of planned road infrastructure projects. Although we cannot fully distinguish between these two processes, due to data limitations, the data suggest that both are occurring to varying degrees. For example, in Suriname, the Amazonian Road network documented in the 2012 report consisted entirely of unpaved roads stretching across around 1,400 km. By the 2020 report, the entire network had been upgraded to paved roads, with additional new paved segments incorporated into it for a total of 1,500 km.

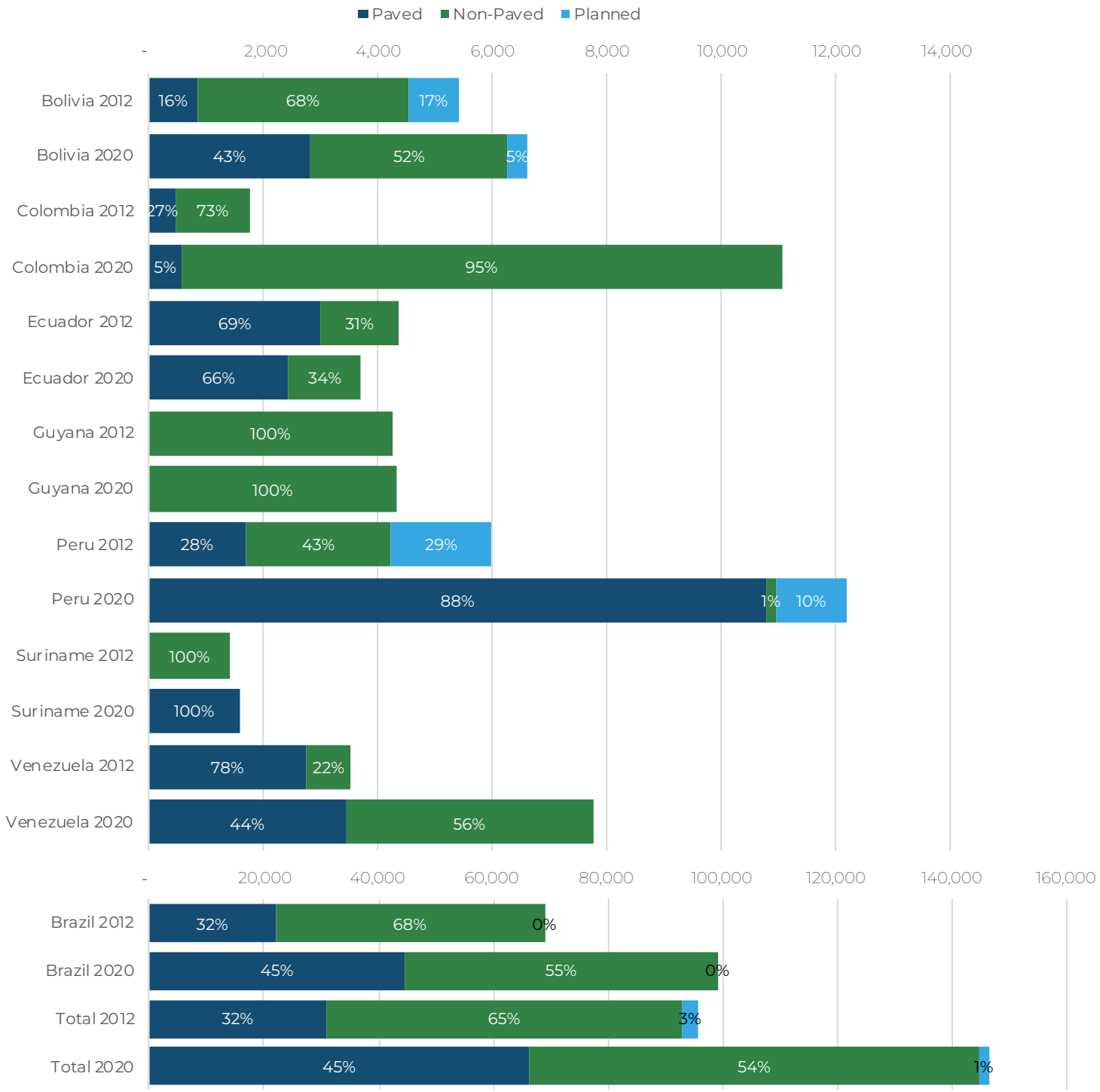
[88] These figures refer exclusively to reported data by the RAISG which consisted in georeferenced primary roads at the national level, both paved and unpaved, as data availability on secondary and tertiary roads differs across Amazonian countries (RAISG, 2012). The reported data corresponds to the most recent data available at the moment of the report's publication, and it differs across countries, since the frequency of data collection varies from one country to another. See RAISG (2012, 2020) for detailed information.



FIGURE 10.2.

Paved, Non-Paved, and Planned Roads in Amazonia

Road length (km)



Note: *The years shown correspond to the available data nearest RAISG report publication's date.*
Source: *Authors' elaboration with data from RAISG (2012, 2020).*

Although all types of roads in Amazonia have economic, environmental, and social impacts, their nature and extent vary according to whether they are official or unofficial (see Table 10.1). Official roads, intended for national or regional connectivity, are typically constructed as part of broader strategies for social and economic integration and may indirectly drive change along highway corridors. By contrast, unofficial roads are often developed by private actors seeking direct access to natural resources or ways to engage in illegal activities. Nonetheless, in many cases, the construction or paving of official roads often serves as a catalyst for the expansion of unofficial road networks (Perz, 2014). There is no clear consensus on the total extent and nature of the road network (Savoldi Jr., 2022). But previous studies estimate that official roads represent between 15-28% of the network[89] and that around three quarters of it have been unofficially built.

Table 10.1. | Roads' Classification

	Official	Unofficial
Paved Roads	Major highways and corridors planned by the state	Rare, but may emerge over time from informal upgrades
Unpaved Roads	Recognized feeder roads, rural access routes	Logging tracks, mining access, new settlers' roads.

Source: *Own classification.*

Despite the significant expansion of roads in recent decades, connectivity remains limited for many parts of Amazonia. This fragmentation restricts people's ability to access essential public services, such as education and healthcare, as well as better job opportunities, ultimately affecting their quality of life. Giles et al. (2025) show that approximately 7.1 million people live more than 45 minutes away from a primary road and 4.7 million are similarly distant from a secondary road.[90]

Water transportation could improve freight and passenger mobility in a sustainable way in the region. But it is currently constrained by limited investment in infrastructure, insufficient maintenance, and inadequate climate resilience. Approximately 51% of the Amazonia has a natural connectivity to waterways. In northern Brazil, inland water transport accounts for 90% of cargo movement, and in the state of Amazonas, an estimated 30% of urban communities are accessible only by boat (Tornaghi, 2021). This illustrates the critical importance of water transport infrastructure not only for cargo shipment, but also for improving the connectivity of remote populations. Yet countries in the region do not fully take advantage of it. In the Brazilian Amazonia as a whole, only 6,500 kilometers of more than 20,000 kilometers of navigable rivers are used for regular commercial shipping (Ivarsson & Sekerinska, 2025) and remote areas often lack adequate port facilities. Instead, they must rely on rudimentary structures such as small piers or sloped riverbanks for the loading and unloading of passengers and goods (Bentes & Cury, 2017).

Infrastructure resilience is crucial for water transport. Recent episodes of climate variability, particularly the severe droughts of 2005, 2010, 2016, and 2023, have

[89] Studies such as Barber et al. (2014), have documented a total of 264,000 km of all types of roads in the Brazilian Amazonia as of 2007, including 190,500 km of unofficial roads. This means that approximately 72% of the road network was unofficial, while only 28% was official. Meanwhile, Bothelo et al. (2022) documented a road network totaling 534,000 km, composed of 80,000 km of official roads and 454,000 km of unofficial roads.

[90] These calculations likely underestimate measures of road quality, which if considered, would expand the gap considerably.

disrupted inland navigation in Brazil. They have left communities isolated, limiting their access to food, fuel, and medicine as well as critical public services, like healthcare and education (Santos et al., 2024). In the Colombian Amazonia, where approximately 7,000 kilometers of navigable waterways and 99 port facilities exist, inland water transport handles about 30% of national cargo and 15% of passenger transport. But the quality of service remains inconsistent due to deficient port infrastructure and frequent flooding (BID, 2023).

In terms of electricity, as of 2020, there were more than 350 dams operating in Amazonia, contributing an average of 55% of total installed capacity in Brazil, Bolivia, Colombia, Ecuador and Peru (Viscidi & Phillips, 2021). Today, hundreds more are planned. These include around 450 small and big hydroelectric plants in Brazil's Amazonia and many others in Peru and Bolivia as those nations seek to boost the percentage of hydropower in their energy mix (see Table 10.2.). However, at least 10% of the plants are currently operating or planned for protected natural areas, and over 5% are operating or planned for Indigenous territories (RAISG, 2020),[91] leading to potential disruptions in the ecosystems and the displacement of local ethnic populations.

While Amazonia has an abundance of dam-derived energy, not all dams in the region serve the interests of the local communities. Six large dams slated for construction in Peru through a 2010 agreement between the Peruvian and Brazilian governments, for example, were intended to export most of their electricity to Brazil (Fearnside, 2020). A lack of connectivity structures translates into gaps in electricity coverage for large sections of the population. In rural parts of Amazonia, for example, an estimated 4.3 million people (8.9% of the Amazonia population), including 1.3 million school-age children, do not have reliable access to electricity.[92] Meanwhile, an estimated 6.3 million people, and 1.6 million school-age children could benefit from better electricity access (Giles, Avila, & Vargas, 2025).[93]

Table 10.2. **Hydroelectric Plants in Amazonia**
Current and Planned Hydroelectric Plants Reported in 2020

Country	Current		Planned		Total
	Small	Big	Small	Big	
Brazil	137	44	340	107	628
Peru	61	15	4	9	89
Ecuador	28	34			62
Bolivia	1	13	1	14	29
Venezuela	10	4	5	2	21
Colombia	1				1
French Guyana		1			1
Guyana				1	1
Suriname		1			1
Total	**238**	**112**	**350**	**133**	**833**

Notes: *Small (less than 30 MW); Big (more than 30 MW).The year reported corresponds to the available information nearest the publication's date.*
Source: *RAISG (2020).*

[91] According to RAISG (2020), the disaggregation between protected natural areas and Indigenous territories does not consider the headwaters of Andean basins or the south-eastern part of the Brazilian Amazonia.
[92] This figure is calculated by summing up all the populations of the administrative districts where the share of households with access to electricity is below 96.4%. As such, it should be considered an upper bound of the potential beneficiary population, regardless of whether electricity access in a given district is very low or just slightly below the threshold.
[93] Since urban areas have better access to electricity, we believe that this number should be considered with caution and as an upper bound limit.

Infrastructure provision is also characterized by considerable geographic disparity. Some rural departments have significantly better services and higher regional GDPs than others. Certain municipalities, particularly those located near major urban centers, boast infrastructure that ranks well by national standards. Still, the effects of underinvestment are clear. By some estimates, 45% of the territory and up to 11.5 million people that live in these administrative areas have an average household access to sanitation of under 9%.[94] Meanwhile, average household drinking water access by administrative area is estimated to be below 43% in almost 30% of the territory,[95] impacting 11.2 million people (Giles, Avila, & Vargas, 2025). Indeed, while hardly uniform, services in the departments of Amazonia overall tend to lag the rest of their respective countries. Access to sanitation and drinking water in Colombia's Amazonia, for example, is at a rate 30% below the national average, while in Peru´s Amazonia that stands at 20% below the national average (Bandura et al., 2020, pp. 36).

Digital connectivity is also crucial for Amazonia's socioeconomic development, since it enables access to public services for remote populations, such as distance education, telehealth services, communication, and political participation. Users with high-speed connectivity are around a third more likely to engage in essential activities online, like accessing healthcare, taking a class, looking for a job, or participating in the digital economy (Jorge & Makwakwa, 2024). However, only 8% of the Amazonia Region has high-speed Internet service that corresponds with its population density,[96] and even in areas with high population density, there are often inadequate levels of connectivity. Although providing digital connectivity is a first step to increasing access to other services in Amazonia, it should be accompanied by other types of investments. For instance, distance education using technology could alleviate the problems of physical access in remote regions if there were both fast connections to the internet and access to digital devices. As shown in Figure 6.7, internet access in schools in Amazonia is well below non-Amazonian averages and digital devices are insufficiently accessible. This highlights the importance of developing comprehensive policies that maximize the impact of infrastructure investment.

[94] The benchmark of 9% was selected based on the World Health Organization and UNICEF estimates. For more information, see Giles Alvarez et al. (2025).
[95] 695 out of 2,503 administrative areas observed rates of household drinking water below 43%. The benchmark of 9% was selected based on World Health Organization and UNICEF estimates. For more information, see Giles Alvarez et al. (2025).
[96] According to Ivarsson & Sekerinska (2025), this comparison is performed using two indexes: the Google's building footprint data (as a proxy for population density and development) and Ookla's internet speed metrics. They classify each index in two categories, high and low. When both indexes match in the same category (e.g. high-high), it means that the level of correspondence between the indexes is shared; in other words, the speed level of the internet is adequate for the population density. Meanwhile, when the indexes differ (e.g., low-high), it means that one of the indexes is underdeveloped relative to the other; that is, the installed infrastructure is insufficient to bridge the needs.

10.3 The Environmental Impact of Traditional Infrastructure

Highways and roads play a major role in Amazonia, moving people and cargo within the region and connecting it to other areas in ways that facilitate access to public services, jobs, and trade. Hydropower facilities generate huge quantities of renewable energy, reduce the need to import and spend money on fossil fuels and, like roads, are enablers of economic and social activities, as well as drivers of economic growth. Yet neither the building of roads and highways nor the construction of dams is immune from challenges, most specifically those related to deforestation and ecosystem degradation.

Although there are different drivers of deforestation (see Chapter 3 for more information), some estimates have documented that 95% of the deforestation in Brazil's Amazonia occurs within 5 km of a road or 1 km of a navigable river (Barber et al., 2014). There is, in other words, a high, though indirect, association between transportation infrastructure and deforestation, even though transport infrastructure's direct contribution to the destructive phenomenon is comparatively small (e.g. building a highway).

Unofficial roads are a significant driver of deforestation in Amazonia, as they often enable illegal activities such as unauthorized logging, unregulated cattle grazing, and other forms of informal resource extraction. These unofficial roads are typically built to access remote areas rich in natural resources. But once those resources are depleted, the groups involved in their exploitation typically abandon the area in search of another place to carry on with the same activities elsewhere. This cyclical pattern of exploitation and expansion not only accelerates forest loss but also complicates enforcement efforts and long-term land use planning. According to Bandura et al. (2020), approximately 2,336 kilometers of these roads cross Indigenous lands, while 7,975 kilometers intersect protected areas, contributing to deforestation, both directly and indirectly.

Electricity from hydroelectric plants on the rivers of Amazonia is abundant and cheap,[97] and, unsurprisingly, it accounts today for more than half the installed capacity in Brazil, Bolivia, Colombia, Ecuador, and Peru. In recent years, however, growing concerns have emerged regarding not only the efficiency and sustainability of large dams in Amazonia, but also their significant environmental impacts. The problems of efficiency and sustainability are illustrated by the severe droughts and historically low river levels observed across the basin in 2024, which sharply decreased electricity generation from hydropower plants and reduced fluvial transportation as well. The environmental elements refer to the substantial and often unaccounted environmental costs of this type of infrastructure. According to Fearnside (2016) hydroelectric plants in the Brazilian Amazonia are linked to flooding-related deforestation, ecological disruption both upstream and downstream, and degradation of critical ecosystem services (such as natural water filtration, carbon storage, and flood regulation). These losses highlight an important issue in Amazonia: although the physical infrastructure may be located in one country, the negative environmental impacts can extend into another. This transboundary dimension of hydropower emphasizes the urgent need for coordinated, basin-wide governance and inclusive planning that balances national energy goals with the protection of the region's shared ecological integrity (Latrubesse et al., 2017).

[97] There is a debate about the cost of this type of infrastructure. In the global context, Ansar et al. (2014) documented hundreds of hydroelectric projects that were not financially profitable.

10.4 The Need for Institutional Strengthening

Enhancing institutional quality increases the economic returns of infrastructure development (Zergawu, Walle, & Giménez-Gómez, 2020). Although several countries in Latin America and the Caribbean have made significant progress in creating situations that support efficient, impactful, and sustainable projects with private participation, the overall lack of project preparation mechanisms remains a major obstacle to the development of quality projects (INFRASCOPE, 2024). This lack of governance quality is linked to costly delays, rent-seeking, and even the failure of infrastructure megaprojects (Estache & Fay, 2010; Flyvbjerg, 2014).

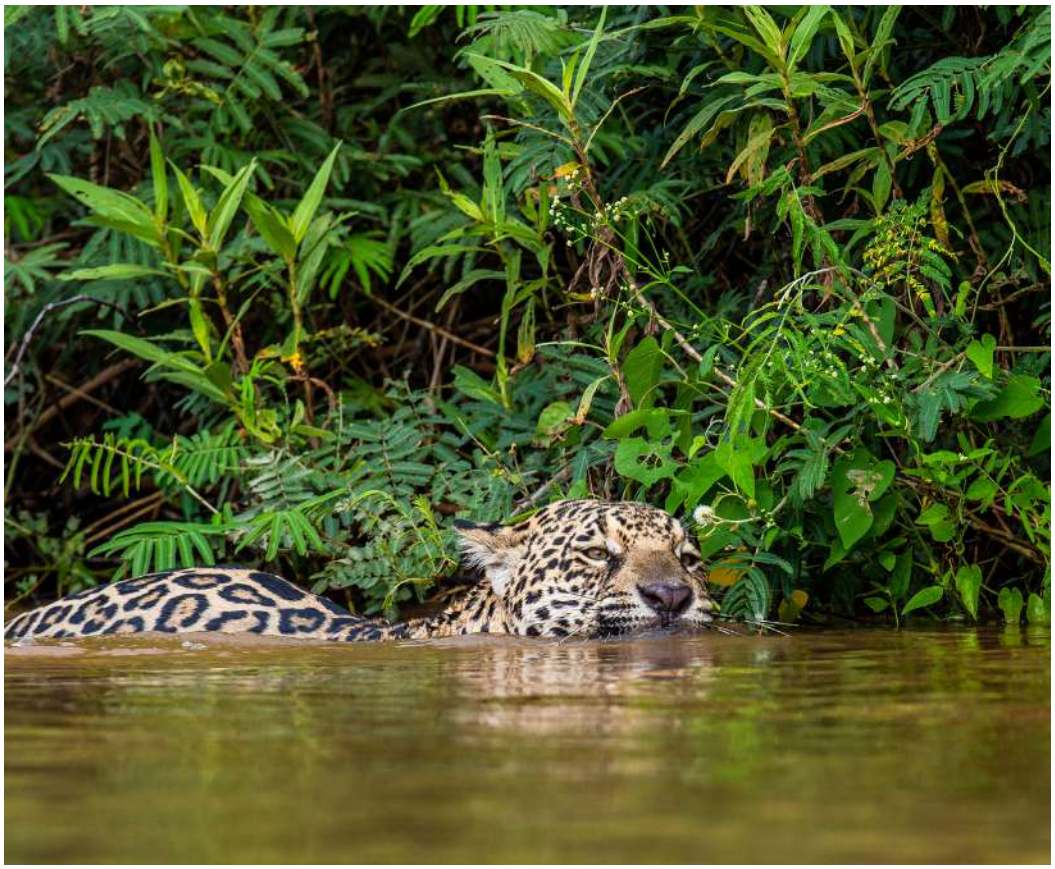
Another source of concern is the absence of coordination between national and subnational authorities. This results in poorly aligned infrastructure plans that often remain incomplete. For instance, in the early-2000s, South American countries embarked on an ambitious initiative to integrate highways, waterways, and hydroelectric dams through the Initiative for Integration of Regional Infrastructure. Yet, both that initiative and others have too often been marred by poor planning, and lack of consulting with local communities or consideration of local governing capacity. Because of inadequate planning, for example, major highways built by national governments often fail to connect to a well-developed network of secondary roads, which are more frequently the responsibility of underfunded local governments (Bandura, 2020). While notable achievements include the completion of key corridors, such as the Interoceanic Highway connecting Peru and Brazil, many projects remain stalled at various stages of planning, approval, or construction.

Poor planning and weak regulatory oversight have created fertile ground for interest groups to dominate procurement processes and extract undue economic rents, severely damaging infrastructure development efforts. Widespread bribery and corruption have prompted planners to bypass critical, high-quality feasibility studies and, in some instances, to procure materials at artificially inflated prices. Addressing these governance shortcomings by rooting out corruption, ensuring a more transparent and competitive bidding process, and engaging local communities through meaningful consultation at the earliest stages of project planning are critical steps toward achieving more sustainable and socially responsible infrastructure development in the region.

Enforcement and a clear definition of property rights are also crucial. In their absence, public and community lands are often taken over by ranchers, agricultural interests, and mining and oil companies. More than 54 million hectares of public land in Brazil have unclearly established property rights (i.e. almost as much land as in the state of Minas Gerais, Brazil's fourth largest state), and much of that is in Amazonia (Sparovek et al., 2019). Because of a lack of oversight bodies, resources, and personnel to oversee the use of land, it frequently ends up being registered as private property, a form of land grab that authorities find challenging to prevent and that leads to an overlap between undesignated lands and areas registered under private and public tenure. The problem is not the lack of laws, but limited enforcement.

Although environmental protection regulations have improved in recent decades, enforcement capabilities remain underdeveloped and are often insufficient to prevent illegal activities such as unauthorized logging and mining. The establishment of protected areas has proven to be an effective tool for reducing deforestation, provided that adequate enforcement mechanisms are in place. But in Amazonia, their effectiveness varies depending on their proximity to infrastructure and accessibility. A study by Barber et al. (2014) found that protected areas near roads and rivers experienced substantially lower deforestation rates (10.9%) than unprotected areas with similar levels of accessibility (43.6%). These findings underscore the importance of combining legal designation with strong institutional capacity to ensure the long-term effectiveness of conservation policies.

Market coordination and financing can also be challenges for infrastructure provision. When it comes to digital connectivity, the Internet service provider market lacks sufficient revenue to support expansion into underserved areas. In the Brazilian Amazonia, there is an estimated $1 billion gap in long-term, low-interest credit needed to meet the investment demands of internet service providers. The market is composed of hundreds of small ISPs with annual revenues between $1 million and $10 million, and thousands of even smaller providers below that threshold.[98] These small ISPs often serve market segments neglected by larger carriers. Their scale and fragmentation make it difficult and costly for financial institutions to conduct the due diligence necessary to extend credit, hindering the development of broadband infrastructure in remote communities. Improving regulation that promotes innovation in this sector should be a priority for increasing access to digital services.



[98] For instance, data from the International Telecommunication Union show that Brazil has nearly 20,000 internet service providers. This is by far the highest number not only among the countries that make up the Amazonia Region (e.g., Colombia with 1,100 internet service providers, Ecuador with 1,000, and others with fewer than 60) but also across Latin America and the Caribbean, where Argentina ranks a distant second with 4,100 service providers. See https://datahub.itu.int/data/?e=ZAF&i=19174

10.5 Infrastructure's Environmental Vulnerabilities

Developing infrastructure in Amazonia is challenging. Cities and rural areas are sparsely distributed. Bringing infrastructure services to small municipalities through traditional methods is costly not only from a financial perspective but also from an environmental one. In this context, traditional ways of extending the electricity or broadband grid, laying water and sanitation pipelines, or building road networks, can be technically and financially infeasible for many localities. Infrastructure is also vulnerable to climate events such as droughts, wildfires, and flooding, which can damage critical assets, disrupt service delivery, and increase maintenance costs. These dual challenges highlight the need for innovative, resilient, and decentralized infrastructure solutions that minimize environmental impacts while enhancing the capacity of communities to withstand and adapt to extreme weather events.

According to Blackman et al. (2025), enhancing infrastructure resilience to extreme weather involves several key actions. First, stronger structures must be built to withstand such weather. Hallegatte et al. (2019) estimate that strengthening new infrastructure in low- and middle-income countries adds only 3–6% to capital costs in the power sector, 1–2% in water, and about 5% in transport—modest increases compared to the substantial benefits. Infrastructure must also be prevented from deteriorating through maintenance and retrofitting. Poor routine maintenance has raised replacement costs by at least 50% in transport and 60% in water infrastructure between 2015 and 2030 (Rozenberg & Fay, 2019). Infrastructure diversification, decentralization, and redundancy are also critical. These strategies can be supported by tools such as decision-making under deep uncertainty and blue spot analysis, which help prioritize solutions under extreme climate risks. Finally, ecosystem-based infrastructure and demand-side behavioral interventions should also be considered.

10.6 Conclusion: Addressing Infrastructure Gaps in Amazonia

Promoting Decentralized and Context-Based Infrastructure

Increasing connectivity redundancy in transportation is a priority for Amazonia. Dense rainforests and seasonal flooding often render road and railway transport unusable for parts of the year, making waterborne transport essential. But

navigable rivers can also become dry or impassable due to shifting hydrological patterns, underscoring the importance of better inter-modal transport planning (Fioravanti & Torres, 2025). While water transport offers a more sustainable and context-appropriate solution for the region, it is underutilized. Improving connectivity could significantly increase its share of overall transportation. Moreover, unlike road transport, waterborne transport in Amazonia is typically a pooled service (shared by individuals or companies) whether provided by public or private operators. This characteristic makes it particularly suitable for policy interventions aimed at maximizing environmental and social benefits. For that reason, the public sector should actively promote it and encourage the adoption of electric mobility technologies within the fluvial transport sector (BID, 2023).

Several pilot initiatives are already demonstrating the feasibility and benefits of electrification in river transport systems in Amazonia. For example, in Ecuador, the Kara Solar project, supported by the IDB, has introduced solar-powered canoes with a capacity of up to 20 passengers. These solar-electric vessels have replaced traditional gasoline-powered boats and operate along approximately 60 miles of river routes, connecting nine Indigenous Achuar communities.[99] Meanwhile, in Brazil, a solar-powered vessel in the community of Santa Rosa, Pará transports students from the island where they live to the municipal school on the mainland. Featuring a 22-passenger capacity, it is operated autonomously and powered entirely by photovoltaic solar energy.[100] In Peru, the IDB is also providing technical assistance to sustainably improve fluvial transportation connectivity and access to basic services in Amazonian riverine population centers. These examples illustrate how locally based transportation solutions can be implemented in Amazonia, and how they can contribute to greater redundancy, improve intermodal connectivity, and promote sustainable and resilient transportation services.

Similar principles apply to energy access. A few large urban centers are already connected to the national electricity grid, allowing for traditional grid expansion as the cities grow. But traditional electricity infrastructure is dependent on long-distance transmission lines and centralized grids. It is also prohibitively expensive for many small- and medium-sized places, due to their isolation and difficult terrain. And it is environmentally harmful and technically infeasible, with a high vulnerability to climate disasters. Photovoltaic solar technology is a more efficient and sustainable alternative. By providing decentralized, locally generated power, these systems offer a practical solution for delivering reliable electricity to remote communities and small towns. The declining costs of solar panels and related technologies, moreover, have made them not only technically viable but also economically competitive.

The IDB's Amazon Clean Energy Accelerator seeks to achieve universal access to clean energy, the decarbonizing of electricity systems, clean cooking, and the expansion of emerging clean technologies and solutions in Amazonian regions. The Accelerator's portfolio includes renewable power generation, mini-grids, energy efficiency, digital grid infrastructure, and clean cooking solutions, with a strong emphasis on inclusion, innovation, and resilience. A program known as the Bio-economy Empowerment in Suriname IC through Access to Water, Energy and Telecommunications is also receiving IDB support. This program addresses the severe isolation of Amazonian villages where electricity costs are considerable due to diesel reliance. It finances the supply, installation, and commissioning of solar mini-grids, reliable water supply, and new distribution and access to telecommunications

[99] For more information, see here and here.
[100] See https://revistapesquisa.fapesp.br/barco-autonomo/

infrastructure. And it supports the development and implementation of productive and sustainable use projects while strengthening the institutional capacity of the public sector to plan, design, and supervise rural electrification and water projects. It will directly benefit about 1,200 households, and numerous health clinics, schools, and businesses in Amazonia with a special focus on local farmers, small business owners, women, Indigenous populations, and Afro-descendants.

Water cisterns also offer an opportunity for bringing critical infrastructure services to remote populations. In 2003, the Brazilian government began implementing an innovative program of cisterns to ensure a readily available source of accessible and clean water for Amazonia. By 2017, the program had distributed nearly 880,000 of them, each holding about 16,000 liters, enough to see a family of five through a dry season lasting as long as eight months. The cisterns took about two days each to build at a relatively low cost of about $790 per unit.[101] A study showed large welfare benefits as a result, demonstrating a 23% increase in formal employment and an 8% boost in formal labor income among the sample studies, as people, freed from the time-consuming hunt for drinking and cooking water, could now look for work at a greater distance from their homes. The hospitalization of beneficiary adults dropped by about 10%, and ten years after the start of the program their reliance on conditional cash transfers had fallen by 12%, reflecting a reduction in poverty (Barreto et al., 2025).

The IDB is also working on water security in Amazonia through the Program for Improving Climate Resilience by Increasing Water Security. The program aims to enhance knowledge and access to information on water security, strengthen preparedness for both extreme and gradual climate events, and catalyze investments in climate-resilient and low-carbon water supply, sanitation, and waste management technologies and infrastructure. It also seeks to foster an enabling environment for climate change planning and investment and establish mechanisms to ensure inclusivity and diversity across interventions in participating countries.

When it comes to extending the broadband network, the challenge is significant: extending it to remote and sparsely populated communities requires a strategic blend of public investment, targeted subsidies, and improved access to financing mechanisms. The lack of enabling, cross-border and in-land digital connectivity, explain the limited capacity, quality, and reliability of the internet in the region. Enhancing internet access and use in the region should thus rely on a combination of tailored solutions. In those cases where existing infrastructure corridors are available—for example, in areas where navigable waterways infrastructure already exists— deploying broadband infrastructure may offer a relatively non-invasive alternative, avoiding the need for deforestation. *Brazil's Norte Conectado* program provides a case study. It aims to install over 12,000 kilometers of sub-fluvial, fiber-optic cable along navigable waterways, connecting 59 municipalities and benefiting approximately 10 million people, while preserving an estimated 68 million trees by avoiding deforestation. Through the *Pará Mais Conectado* program—a $144 million initiative of the State of Pará co-financed by the IDB and the French Development Agency—a submarine fiber optic cable system is being built linking Pará with international connectivity hubs in Fortaleza, Brazil, and Cayenne, French Guiana. This will connect the sub-fluvial, optic-fiber cables of the *Norte Conectado* program to the world. The program also includes the development of a high-capacity backbone ring in the region, among other digital inclusion initiatives (connectivity in schools, quilombos, riverside and IC), ensuring

[101] Before the introduction of cisterns, families depended on small lakes and reservoirs to obtain water. This posed challenges both in terms of time spent collecting water and the quality of the water consumed. A survey of cistern recipients found that only 5.6% of respondents spent less than 15 minutes per day fetching water before receiving the cistern, while 35% reported spending an hour or more. After receiving a cistern, 66.6% of respondents spent less than 15 minutes on this task, and only 0.2% still spent an hour or more (Barreto et al., 2023). Moreover, the cisterns significantly reduced the incidence of waterborne diseases and contributed to improved health outcomes (Sousa, Araujo, Sebastiao et al., 2025).

scalable, resilient, and universal digital connectivity in Pará. With this approach, a considerable increase in quality and resilience is expected, as well as a reduction in the price of the broadband services in Pará, resulting in enhanced access and use of internet by its population. In parallel, satellite broadband provides a fast-to-deploy interim solution for reaching isolated communities in Amazonia. However, due to its capacity limitations and higher cost per Mbps, it is best suited for targeted applications that support sustainable economic activities, to connect extremely small and dispersed populations, or to serve seasonal communities that cannot be reached by fixed infrastructure.

Boosting Institutional Capacity and Coordination

A critical first step to improving infrastructure in Amazonia is establishing effective coordination mechanisms between national, subnational, and cross-border authorities to avoid the fragmentation seen in initiatives like Initiative for Integration of Regional Infrastructure. Countries should develop cross-jurisdictional infrastructure maps that consider both strategic corridors and secondary networks and involve municipal authorities early in the planning phase. Strengthening regional mechanisms, such as the ACTO, can promote information sharing, harmonize standards, and facilitate joint investment planning among Amazonian countries. These coordination efforts must go beyond governmental actors to include multilateral institutions, such as the IDB through its South Connection Regional Program (see Box 10.1.) or the Alliance for Sustainable, Resilient, and Integrated Transport in the Amazon (see Box 10.2.). Civil society organizations, ethnic and Indigenous groups, and academic communities must also be recognized as strategic stakeholders in both intergovernmental and cross-border governance. Their participation brings essential knowledge, enhances accountability, and increases the social legitimacy of infrastructure projects. Initiatives that improve planning processes and increase the likelihood of project success should be considered. For instance, a planning mechanism, proposed by researchers from the Climate Policy Initiative and the Pontifical Catholic University of Rio de Janeiro, recommends a new stage in the project's life cycle called the pre-viability analysis stage. This aims to reduce uncertainties and enable more detailed assessments early on. It would help to prevent low-quality projects from advancing and mitigate pressures driven by institutional inertia or political interests (Climate Policy Initiative, 2020).

BOX 10.1.

South Connection: A Regional Program for South American Connectivity

The South Connection Regional Program (2025–2030), led by the IDB Group, is a flagship program endorsed by 11 South American nations to address persistent economic stagnation and regional fragmentation. With average growth of just 1.7% over the past decade, the Program aims to boost connectivity, competitiveness, and sustainable development through a coordinated, multi-sectoral approach. Its geographic scope includes the

Amazonia Region, with a strong commitment to sustainable infrastructure, improved connectivity, and inclusive economic growth.

South Connection seeks to reverse current trends by substantially increasing investment—well above the historical 1.8% of GDP—and deepening integration into global value chains. It is built around three strategic priorities:

- **Infrastructure Development**
  Cross-border transport, energy, and digital networks to eliminate bottlenecks and expand market access.
- **Trade Facilitation**
  Streamlined logistics and regulatory processes to strengthen supply chains and reduce costs.
- **Institutional Strengthening**
  Regulatory convergence and governance reforms to attract investment and enhance transparency.

The IDB Group will mobilize financing through sovereign and non-sovereign operations, public–private partnerships, and regional collaboration. Demand-driven projects will be prioritized based on rigorous technical, financial, and political analysis to ensure measurable impact and market relevance.

By integrating infrastructure, facilitating trade, and regulatory improvement, South Connection provides a platform for regional cooperation and transformation, repositioning South America as a competitive, resilient, and sustainable player in the global economy.

BOX 10.2.

Alliance for Sustainable, Resilient, and Integrated Transport in Amazonia

The Alliance is a joint initiative led by the IDB that leverages climate financing and technical assistance to support projects aimed at transforming transport infrastructure and services. It focuses on developing transport systems that stimulate economic activities, improve access to goods and services, and are designed in line with environmental regulations and sustainability principles. Its objectives are the following:

- **Improve connectivity and access to basic services** in isolated communities across Amazonian territories, based on a model that prioritizes sustainability, resilience, and regional integration.

- **Promote the finance and implementation of sustainable multimodal logistics and corridors** to facilitate the development of the bioeconomy, with a strong emphasis on river transport.
- **Scale up green infrastructure standards:** implement standards and norms that minimize socio-environmental impact and promote ecosystem-based solutions.
- **Improve the infrastructure and service quality of river transport** in the Amazonia Region, particularly for the transport of passengers in urban, metropolitan, and isolated areas.

Improving the procurement process in infrastructure projects is also essential to increasing competition and reducing corruption, as well as avoiding unjustified renegotiations, cost overruns, delays, and deficient infrastructure. Digital procurement platforms have emerged as valuable tools for this purpose. Academic research shows that digital procurement increases access to information and reduces personal interactions with potentially corrupt officials, leading to better procurement outcomes.[102] But implementing digital procurement alone is not enough. It must be accompanied by efforts to strengthen public sector capacity, ensure effective enforcement of regulations, and expand digital connectivity.[103]

Enhancing land governance and enforcing environmental protections are also important for Amazonia, as they enable property rights and infrastructure development. Clarifying land tenure through transparent and simplified titling processes reduces legal uncertainty and conflicts. It also lays the groundwork for responsible project planning. Initiatives such as Brazil's Terra Legal program in Amazonia, begun in 2009, for example, seeks to reduce violent land disputes and strengthen environmental enforcement by granting legal titles to households that, prior to 2004, had been farming public land for more than five years. For small farmers, the program requires compliance with the Brazilian Forest Code, which mandates the conservation of 80% of land in Amazonia. While it is still too early to assess the long-term impact of this approach on reducing violent land conflicts and deforestation, short-term evaluations show mixed results. Lipscomb & Prabakaran (2020), for example, finds that outcomes vary depending on the number of registrations per county and the size of the farm. But overall, the authors find, land tenure reform can help create incentives to slow deforestation, especially among small farmers.

Strong cadastral systems and effective enforcement should complement such efforts at titling. In many situations, maintaining an official cadastral database is not feasible because of limited public interest, institutional capacity, or financial resources. Protecting the rights of local populations is nonetheless crucial. In this regard, Peru's Cadastral Information System for Native Communities was developed to address the lack of cadastral mapping for IC in the Peruvian Amazonia. Peru's Cadastral Information System for Native Communities is a georeferenced database that compiles geographic and tabular information, helping to fill critical gaps in official land records. While it does not provide legal land titles, Peru's Cadastral Information System for Native Communities, and initiatives like it, play a vital role in recognizing Indigenous presence, clarifying overlapping land claims, and

[102] For instance, Lewis-Faupel et al. (2016) found, for the case of India and Indonesia, that although e-procurement did not lead to lower prices, it resulted in significant quality improvements, including better road construction and fewer delays. Moreover, the adoption of e-procurement increased competition, as evidenced by a higher share of contracts being awarded to firms from outside the local area. This is an indication that the system facilitated easier entry for more qualified contractors.

[103] On this point, Bosio et al. (2022) analyze public procurement laws, practices, and outcomes across 187 countries and find that stricter procurement regulations are associated with better outcomes. but mainly in countries with low public sector capacity. In contrast, in countries with high public sector capacity, overly rigid rules can hinder the socially optimal use of discretion, such as the ability to screen out low-quality bidders. Hence, tailored solutions that strengthen regulatory enforcement and build the capacity of public officials should be prioritized for the Amazonia Region.

supporting the resolution of conflicts involving Indigenous territories, concessions, and public lands. In the process, it demonstrates the value of digital registries and geospatial data in strengthening land governance.

Despite considerable effort and investment in recent decades, significant gaps remain in access to transport, electricity, water and sanitation, and digital connectivity in Amazonia. Traditional infrastructure, while still essential for key projects and urban centers, is in some cases technically unfeasible, prohibitively expensive, or environmentally unsustainable for the majority of municipalities in the region. Solutions such as locally based water cistern programs, decentralized solar energy systems, and electrified fluvial transport can serve as alternatives, demonstrating how targeted, context-driven approaches can complement traditional infrastructure to improve access and resilience in remote areas. All of this can be achieved through the collaboration of the public and private sectors.

Governance deficiencies remain a critical barrier to improving infrastructure development. Weak institutional capacity, poor coordination between national, subnational and cross-border authorities, and widespread corruption have often led to poorly planned infrastructure projects in Amazonia. Insufficient oversight and enforcement by regulatory bodies have allowed projects to proceed without proper environmental and social assessments, exacerbating deforestation in the process. Inadequate land titling systems have led to an overlap in property rights and land conflicts.

Addressing these governance gaps must be a priority. Improving long-term infrastructure outcomes in the region requires stronger regulatory frameworks, increased technical and financial capacity among oversight institutions, and the development of transparent and coordinated planning processes. Ensuring that infrastructure projects are subject to rigorous feasibility studies, competitive procurement, and meaningful consultation with affected communities will help mitigate risks, reduce delays, and enhance the social, economic, and environmental sustainability of investments.





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Chapter

11

FRONTIERS OF AMAZONIA: THE CHALLENGES OF THE TRI-BORDER REGIONS

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11.1 A Trilemma of Economic Growth, Social Development, and Environmental Protection

As discussed in Chapter 1, Amazonia today faces a trilemma: how to foster economic growth, improve local livelihoods, and protect natural capital at the same time. These objectives are deeply interrelated, yet often in tension. Progress in one area can risk undermining the others if not approached holistically. However, this trilemma should not be seen as a zero-sum game. Rather, it represents a space of opportunity where integrated strategies and place-based innovation can help reconcile goals that sometimes seem in conflict and generate mutually reinforcing outcomes.[104]

The achievement of sustainable productive development in Amazonia does not start from scratch. There are material, territorial, and sectoral foundations, albeit uneven, on which to tackle the trilemma and build more inclusive, resilient, and ecologically compatible strategies. The key lies in how to strengthen existing value chains and channel investment toward sectors that combine competitiveness with sustainability. Trade is central to this strategy, serving both as a catalyst and as a result of productive development. Unlocking its potential in the region depends on multiple factors, notably the effectiveness of territorial clusters—geographically connected areas that share borders and economic linkages. For example, firms operating in well-integrated clusters with improved infrastructure, logistics, and coordination are more likely to participate in national and international markets (Ketels and Memedovic, 2008). In turn, greater trade connectivity enhances the competitiveness of local firms, facilitates innovation, and creates incentives for upgrading along value chains (Brambilla et al., 2017). This can then have positive externalities on social, economic and environmental outcomes in these clusters, with well-designed territorial interventions generating transformative impacts.

This chapter provides an overview of the state of trade and regional integration in the Amazonia Region. It also provides recommendations on how to achieve a more integrated region, focusing on three tri-border clusters (Brazil–Colombia–Peru, Brazil–Bolivia–Peru, and Brazil–Guyana–Venezuela).[105] In each case, the Amazonian trilemma is clearly present, reflected in the ongoing tension between economic advancement, social development, and environmental conservation. Key challenges and priority productive sectors in each cluster are identified, offering targeted recommendations and investment proposals to support sustainable development.



[104] The trilemma directly aligns with the IDB's current Institutional Strategy (Impact+) objectives: reducing poverty and inequality by improving the living conditions of the region's inhabitants; addressing climate change through the preservation of ecosystem regulatory functions; and bolstering sustainable regional growth through accelerated economic development.

[105] These clusters serve as focal areas for the Strategy for Productive Development in the Amazon Border Regions, an initiative of the IDB's Productivity, Trade, and Innovation Sector aimed at fostering sustainable growth. The initiative provides a framework for analyzing the challenges facing Amazonia. It focuses on specific geographic areas where activity is most concentrated and solutions can be implemented and tested, provided there is cooperation between authorities, private and public stakeholders, and local communities, and there is an emphasis on a more responsible relationship with the environment. This chapter is an excerpt of that work.

11.2 Trade and Productive Linkages Can Drive Sustainable Development

Despite its geographic isolation and limited economic integration, the Amazonia Region plays a meaningful role in the external trade of the countries it partially spans, with concrete contributions from multiple territories and sectors. Recent data show that different Amazonia regions participate in national exports, though with significant variation in scale, territorial concentration, and product composition. In some cases, these exports are dominated by extractive industries and concentrated in a handful of departments. In others, they include highly differentiated products, such as coffee, cocoa, Amazonian fruits, timber, and essential oils—often linked to small producers and biodiversity-based value chains. This export base, still incipient and uneven, offers a tangible platform on which to design and scale more inclusive and sustainable development strategies, particularly in border areas where trade, production, and ecosystems intersect. Table 11.1 summarizes this structural diversity, showing the export volume for each country, its relative weight, the territories that concentrate export activity, and the most relevant products.

IN BOLIVIA, Amazonian exports reached approximately $2.018 billion in 2024, accounting for 22.6% of the country's total exports.[106] Export activity is concentrated in Santa Cruz (78%), followed by Beni (13%), Cochabamba (5%), Pando (2%), and La Paz (2%). Among these departments, only Beni and Pando are entirely located within the Amazonia Region, while Santa Cruz, Cochabamba, and La Paz are only partially so.[107] The export basket is dominated by residues and waste from agro-industrial processes and animal or vegetable fats and oils (products largely associated with the agricultural expansion in northern Santa Cruz) followed by meat and edible offal, fresh fruits, oilseeds and forage crops, and precious stones. Other relevant products include timber, dairy, honey, processed fruits and vegetables, coffee, cocoa, essential oils, and a range of minor exports. This combination of resource-intensive goods at varying levels of transformation offers a concrete basis for diversifying into higher-value and more territorially sustainable activities.

IN BRAZIL, the nine states comprising the Legal Amazon exported more than $60.610 billion in 2024, equivalent to 18% of the country's total exports.[108] Export activity is concentrated primarily in Mato Grosso (41%) and Pará (39%), followed by Maranhão (10%), while states like Amazonas, Rondônia, Tocantins, Roraima, Amapá, and Acre have smaller shares. The export basket is dominated by oilseeds, metal ores, beef, cereals, cotton, and timber products, reflecting a resource-intensive profile with limited local processing and strong environmental pressures. However, there are also incipient exports of goods such as coffee, cocoa, Amazonian fruits, and essential oils, which, while still modest in value, point to concrete opportunities for a more sustainable and territorially anchored development model.

[106] Authors' calculation based on data from Bolivia's National Institute of Statistics. The estimate includes exports from the five departments of the Legal Amazon: Beni, Cochabamba, La Paz, Pando and Santa Cruz.
[107] To estimate Amazonian exports from partially covered departments, a departmental product-level analysis was conducted using the most disaggregated data available. Only products known to be produced in Amazonian areas were included, based on data from Bolivia's National Institute of Statistics, complemented by online searches and independent verification through AI platforms (Gemini and ChatGPT). In the case of Santa Cruz, oilseeds, cereals, and their derivatives were included given the expansion of the agricultural frontier into Amazonian zones; however, this may overestimate the department's Amazonian share, as production and exports may also originate from non-Amazonian areas. Similar caveats apply to La Paz and Cochabamba.
[108] Authors' calculation based on data from Brazil's Ministry of Development, Industry, Trade and Services. The estimate includes exports from the nine states of the Legal Amazon: Acre, Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, and Tocantins. (Ministry of Development, Industry, Trade and Services, 2024).

IN COLOMBIA, Amazonia exports reached approximately $815 million in 2024, equivalent to 1.6% of the country's total exports.[109] Export activity is heavily concentrated in the department of Meta, which accounts for 79% of the Amazonian total, followed by Putumayo (21%). Other Amazonia departments—Caquetá, Guainía, Vaupés, Amazonas, Guaviare, and Vichada—record marginal or no export values. The export basket is dominated by fossil fuels, which account for over 96% of the total, reflecting the weight of the energy sector in Meta. However, products such as rubber, fresh fruits, essential oils, timber, cocoa, fish, and ornamental species are also exported, primarily from Putumayo, Caquetá, and Amazonas. Although smaller in scale, the exports of these products reflect real potential for diversification based on Amazonia resources, particularly if conditions for traceability, processing, and market access are strengthened.

IN ECUADOR, Amazonia exports were estimated at approximately $9.591 billion in 2024, accounting for 27.9% of the country's total exports.[110] This figure is heavily dominated by crude oil exports, which are concentrated in the provinces of Sucumbíos (60%), Orellana (20%), and Napo (14%). Non-oil exports, although significantly smaller in absolute terms, originate mainly in Morona Santiago, Zamora Chinchipe, and Pastaza, and include products such as flour, peanuts, fresh fruits, chocolates, timber, gold, and coffee. This dual structure reveals an Amazonia that is already integrated into foreign trade, though with a strong bias toward extractive industries. At the same time, it points to a concrete foundation for developing more diversified and sustainable value chains in sectors with territorial identity and low environmental impact.

IN PERU, Amazonian exports totaled approximately $220 million in 2019, representing just 0.5% of the country's total exports.[111] Export activity is concentrated in San Martín (32%), followed by Madre de Dios (25%), Ucayali (19%), Amazonas (14%), and Loreto (10%). The basket includes a combination of traditional primary goods and more differentiated products. Notable items include coffee (24%), gold (19%)—particularly from Madre de Dios—cocoa and derivatives (13%), as well as fuels, vegetable oils, timber, Amazonia fruits, fishery products, and some processed foods. While the export scale remains modest, these products reflect a set of existing capabilities and a tangible base on which to build more competitive and sustainable value chains in the medium term.

IN GUYANA, Amazonian exports amounted to $1.799 billion in 2024, representing 9.1% of total exports.[112] Since the entire country lies within the Amazonia Region, according to the boundaries of the Amazon Geo-Referenced Socio-Environmental Information Network (RAISG), these figures are country wide. Aside from oil and gas, its main exports are raw gold (5%), rice (1.3%), bauxite (0.5%), fish (0.1%) and timber (0.1%).

IN SURINAME, by contrast, all exports are likewise country wide and include oil and gas because their production is carried out primarily onshore.[113] Total exports reached $2.840 billion in 2022, with raw gold accounting for 75%, oil and gas 7%, and timber 3%.

[109] Estimate based on data from Colombia's Ministry of Trade, Industry and Tourism and the National Tax and Customs Directorate. The Amazonia classification includes the departments of Amazonas, Caquetá, Guaviare, Guainía, Meta (Amazonia area), Putumayo, Vaupés, and Vichada. (Ministry of Trade, Industry and Tourism, 2024).
[110] Estimate based on data from the Institute for the Promotion of Exports and Investments (Pro Ecuador) and Ecuador's National Customs Service. The total includes oil exports distributed according to the share of Amazonian provinces in national production, and non-oil exports based on the 2019 provincial distribution.
[111] Estimates based on data from Peru's National Superintendency of Customs and Tax Administration for the year 2019. The Amazonia classification includes the departments of San Martín, Madre de Dios, Ucayali, Amazonas, and Loreto. (National Superintendency of Customs and Tax Administration, 2019).
[112] These estimates include national exports, excluding offshore oil and gas. For more information see this link.
[113] ASTAATSOLIE is Suriname's state own company. It produces most onshore oils and gas production. New offshore projects might start after 2028. For more information see link.

Despite differences in scale, composition, and territorial origin, the Amazonian regions of the Andean countries and Brazil reveal an Amazonia that is already exporting. In some countries, such as Ecuador and Bolivia, Amazonian exports account for a significant share of total national exports. In others, such as Colombia and Peru, the share remains low but includes highly differentiated products with strong potential for added value. In Guyana, it accounts for total national exports, excluding offshore oil and gas production, and in Suriname it includes all exports, as oil and gas are currently not produced offshore.

Table 11.1. Amazonian Exports Range from Being a Significant Portion of Exports to a More Modest Percentage with Potential

Country	Amazonia Exports (USD billion)	Share of National Exports (%)	Main Departments/States	Main Export Products
Bolivia	2.018	22.6%	Santa Cruz (78%), Beni (13%), Cochabamba (5%), Pando (2%), La Paz (2%)	Agro-industrial residues, vegetable oils, meat, fruits, timber, Brazil nuts
Brazil	60.610	18.0%	Mato Grosso (41%), Pará (39%), Maranhão (10%), Rondônia (4%), Tocantins (4%), Amazonas (2%), Roraima (1%), Amapá (0%), Acre (0%)	Oilseeds, minerals, beef, cereals, cotton, timber, coffee, cocoa, Amazonian fruits
Colombia	0.815	1.6%	Meta (79%), Putumayo (21%), Caquetá (0.06%), Guainía (0.01%), Vaupés (0%), Amazonas (0%), Guaviare (0%), Vichada (0%)	Fossil fuels, rubber, Amazonian fruits, timber, cocoa, ornamental fish
Ecuador	9.591	27.9%	Sucumbíos (60%), Orellana (20%), Napo (14%), Pastaza (5%), Morona Santiago (1%), Zamora Chinchipe (0%)	Oil, flours, peanuts, fresh fruits, chocolate, timber, gold, coffee
Peru	0.220	0.5%	San Martín (32%), Madre de Dios (25%), Ucayali (19%), Amazonas (14%), Loreto (10%)	Coffee, gold, cocoa, fuels, timber, Amazonian fruits, fish and seafood products
Guyana	1,.799	9.1%	Countrywide	Mineral (gold and bauxite), rice, fish, timber
Suriname	2,.840	100%	Countrywide	Mineral (gold and bauxite), oil, timber

Source: *Authors' elaboration based on official data from national statistics agencies and customs authorities: National Institute of Statistics (Bolivia), Ministry of Development, Industry and Trade Services (Brazil), Directory of Taxes and Customs and Ministry of Commerce, Industry and Tourism (Colombia), Custom Services of Ecuador (Ecuador), National Superintendency of Customs and Tax Administration (Peru), Bureau of Statistics (Guyana), World Bank Trade Statistics (Suriname).*

Trade plays a central role in the productive transformation of a region. In territories marked by sparse economic activity, limited market size, and weak connectivity, it offers a tangible pathway to expand markets, generate income, and catalyze local activity. Beyond the sheer value of exports, trade can trigger structural shifts—enabling regions to move from low-productivity, primary sectors toward more diversified, value-added production systems (IDB, 2019; OECD et al., 2019). Integration into regional and global value chains generates positive spillovers, including improved quality standards, traceability, logistics, environmental compliance, and technological adoption. These effects are particularly relevant in border areas, where productive systems are disjointed. In Amazonia, they could be transformative, especially in the vast border areas where such systems remain fragmented and transboundary development challenges are especially acute (Giles Álvarez et al., 2025).

The benefits of trade are not automatic, however. They depend on whether countries and regions can convert external integration into internal improvements, including greater productivity, stronger local capabilities, and more quality jobs (IDB, 2023a). This kind of conversion calls for proactive, territorially adapted policies and close coordination between public and private actors.

In this context, logistical barriers can work to stifle commerce. Empirical evidence shows that high internal transport costs not only reduce the value of exports but also the variety of products and their destinations. Municipalities with better logistics infrastructure export more and are more diversified, while those with higher costs are excluded from the benefits of international trade (IDB, 2013). Indeed, reducing internal transport costs can be just as important as expanding external trade access, especially in remote regions with small-scale economies and limited access to national or global markets (IDB, 2013).

Alongside infrastructure gaps, administrative and procedural barriers can also act as binding constraints on trade and integration. Opaque regulations, lack of coordination among border agencies, and cumbersome border procedures raise transaction costs and limit firms' ability to reach new markets, especially in remote regions like Amazonia. Just as poor roads restrict the movement of goods, inefficient processes delay shipments and discourage trade. Streamlining customs, harmonizing documentation, and reducing clearance times are crucial to unlocking its potential. Evidence from Latin America shows that well-designed trade facilitation reforms—such as single windows, streamlined transit systems, and authorized economic operator programs—not only improve export performance, but also promote diversification and firm survival in international markets (Carballo, 2017).

Exporting firms, both domestic and foreign, play a strategic role in the economic development of low-density regions such as Amazonia. Their relevance lies not only in their size or employment levels. It also resides in their ability to foster local supply chains, raise standards, and connect domestic producers to broader markets. Empirical evidence shows that firms engaged in international trade tend to outperform non-exporters in multiple dimensions. They are more productive, pay higher wages, invest more in innovation, and offer higher-quality goods and services (Brambilla et al., 2012; Brambilla et al., 2017; Brambilla and Peñaloza Pacheco, 2018). These advantages in productivity, innovation, and quality are critical in Amazonia, where limited scale and geographic isolation hinder the

competitiveness of local firms. By participating in trade, even small firms can access new technologies, expand their client base, and improve managerial practices, helping to overcome structural barriers to development. When these firms are embedded in territorially organized clusters (as we will explore in the following sections) their impact is multiplied through spillovers in knowledge diffusion, productive linkages, innovation, and export performance.

Among exporting firms, those with larger scale and more stable links to global markets, such as multinational enterprises (MNEs), can be especially catalytic, shaping value chains, accelerating compliance with global standards, and opening new markets for smaller firms (see Box 11.1.). Globally, MNEs account for roughly 30% of global output, 50% of international trade, and 25% of total employment (Cadestin et al., 2018). Their subsidiaries tend to be larger, more capital-intensive, more productive, and more likely to export and invest in research and development than domestic firms (Antràs and Yeaple, 2014). These characteristics enable them to act as "lead firms" in local economies, generating positive spillovers through supplier relationships, labor mobility, and demonstration effects (Rodríguez-Clare, 1996; Glass & Saggi, 2002).

At the territorial level, exporting firms can stimulate exports, drive productive diversification, and facilitate knowledge transfer—especially when they establish local supply chains or integrate small- and medium-sized enterprises (SMEs) into their operations (Aitken et al., 1997; Harding and Javorcik, 2012; Bajgar and Javorcik, 2020). Recent studies based on firm-level microdata show that domestic firms supplying larger exporters—particularly MNEs—exhibit measurable gains in productivity and export performance, with stronger effects when the lead firms are themselves integrated into international markets through exports or foreign affiliates (Alfaro-Ureña et al., 2022; Carballo et al., 2025). Evidence from Amazonian regions in countries like Peru confirms that these dynamics are not theoretical. Exporting firms operating in the region have stimulated local economic activity by building supplier networks, providing technical services, and facilitating access to international markets. These effects are further explored in Box 11.1.

BOX 11.1.

The Peruvian Amazonia: Linkages, Connectivity, and Productive Transformation

The Peruvian Amazonia covers more than 50% of the country's land area but accounts for only around 5% of national GDP and less than 4% of manufacturing output. While this may appear disproportionate, it reflects broader structural patterns typical of low-density, remote regions worldwide rather than economic exclusion per se. The region is home to only a small share of national firms—5.7% (37,086 out of 653,931)—and contributes just 2.4% of national exporters (193 out of 8,011), hosting 0.7% of the MNEs in the country. These figures highlight the limited integration of Amazonia into Peru's national and global economic networks, due more to enduring challenges of geography, connectivity, and investment in productive capacity than the region's potential.

Economic Exclusion Factors

Connectivity constraints, weak service provision, and limited commercial and enterprise articulation continue to hold back the region's structural inclusion in the economy. More than 90% of the Peruvian Amazonia lies over eight hours away from a cargo port. Geography imposes severe logistical barriers: cities like Pucallpa and Puerto Maldonado face long distances, unpaved roads, and high-altitude crossings to access national and international markets. This raises transport costs and limits access to inputs, technical services, certifications, and export channels. (IDB, 2013). In addition, 94% of firms have no connection to either MNEs or domestic exporters, and only 0.5% of firms export directly. While average export values per firm remain low across all groups, the data confirm that even in peripheral areas like Amazonia productive linkages can strengthen firm capabilities and enhance access to international markets.

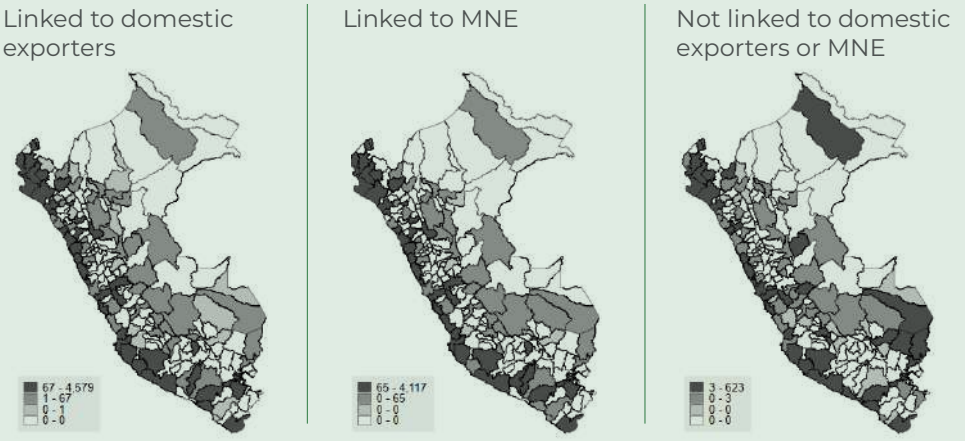
Export Promotion Potential

In this context, building productive linkages with firms that are already integrated into global markets—such as MNEs or domestic exporters—represents a concrete strategy for overcoming structural barriers. As seen in Figure 11.1., a study based on administrative microdata for Peru (2018–2019) shows that firms linked to domestic exporters or MNEs generate significantly higher export values than those operating without such ties. Specifically, local firms supplying MNEs are 0.7 percentage points more likely to export, while those linked to domestic exporters have a 1.7 percentage point higher probability of doing so. Moreover, firms connected to domestic exporters export, on average, 22.5% more than unlinked firms. These companies are larger, employ more workers, and tend to be older. Firms linked to domestic exporters employ an average of 36 workers and export $6.6 million per year, compared to four workers and $0.7 million in exports among unlinked firms (Scattolo & Volpe Martincus, forthcoming).

FIGURE 11.1.

Local Firms Supplying to Multinationals or Linked to Domestic Exporters are More Likely to Export

Exports by Province and Type of Linkage (2019 – in USD millions)



Source: *Authors' elaboration based on data from the National Superintendency of Customs and Tax Administration, WORLDBASE, PROINVERSIÓN, PROMPERÚ and National Institute of Statistics of Peru.*

Unlocking Productive Potential Through Greater Exports

The Peruvian Amazonia holds natural assets and productive capabilities that could be better integrated into dynamic and sustainable value chains. Several sectors with low environmental impact and strong international demand—such as Amazonian fruits, processed foods, NTFPs, and ecotourism—offer clear opportunities. More traditional sectors like mining and forestry, while having higher environmental footprints, could also be developed under frameworks of responsible and controlled management.

Unlocking this potential will require sustained and coordinated interventions that combine horizontal and vertical policies. Priorities include improving logistics infrastructure in critical corridors, promoting local supplier networks with access to quality services, scaling up traceability and certification mechanisms, and strengthening institutional capacities at the subnational level. A more integrated territorial governance framework is also needed to better align investments and support programs with productive opportunities in the region. Existing success stories—such as Guayakí Yerba Mate and Bolivia's Corporación Agroindustrial Amazonas—illustrate how well-functioning agro-food chains, combined with sustainable practices and favorable trade conditions, have enabled local firms to reach high-value markets. Initiatives like the Amazonia Finance Network (2023) and the first Amazon private-sector bond (2024) are mobilizing private capital to scale such dynamics across the Amazon. By reinforcing infrastructure, certification mechanisms, and governance under the Amazonia Forever framework, the IDB is creating the enabling conditions for many more companies in the region to flourish while advancing sustainability and inclusion.

Policies that promote clustering, contract farming, shared logistics platforms, and export consortia can also enable small- and mid-sized Amazonia firms to achieve scale, meet standards, and participate more equitably in international markets. Leveraging these synergies can help set in motion more inclusive, resilient, and globally connected development pathways in the Peruvian Amazonia.

11.3 The Potential of Tri-Border Clusters

Trade can be both a driver and an outcome of productive development, yet its expansion depends on several factors, among which the functionality of territorial clusters plays a fundamental role. The rest of this chapter adopts a territorial approach centered on cross-border clusters in Amazonia as functional units for policy intervention. These clusters bring together municipalities and regions that share ecosystems, productive linkages, and common institutional challenges and that are located in close proximity to each other and to international borders. Their intermediate scale provides a platform for coordinating public policies, organizing the provision of collective goods, and fostering economic integration grounded in real productive capacities (IDB, 2023b).

Border regions of Amazonia are vast and diverse and are home to a significant population. For example, a 100-kilometer strip, spanning 50 kilometers on each side of the 15 international border segments, contains over 200 towns and cities, home to approximately 6 million people across the eight countries.[114] Collectively, this area has an estimated GDP of $186.8 billion (adjusted for purchasing power), representing 15% of the Amazonia Region's total output.[115] Given their geographic location, these borders regions are also key for trade, as some of them cover up to three countries in each territory. However, due to their remoteness, they attract little investment and development. (For more information on the tri-border clusters, please refer to Figure 11.2.) This makes it hard for them to integrate into larger economic networks or access domestic and international markets. They also face conflicts over migration pressures and illegal activities (logging, mining, illicit drugs) which further constrain prospects for growth and prosperity (Duran-Fernandez & de Carvalho Coutinho, 2025).



[114] The data in this section is drawn mainly from three unpublished reports commissioned by the IDB in 2023: IDB (n.d.), "Characterization of the Brazil–Bolivia–Peru Cluster"; IDB (n.d.), "Characterization of the Brazil–Colombia–Peru Cluster"; and IDB (n.d.), "Characterization of the Brazil–Guyana–Venezuela Cluster".

[115] Given the challenges of estimating GDP in Amazonia due to the scarcity of detailed data, this research draws on the estimates provided by Chen et al. (2022), which infer economic activity based on nighttime satellite imagery capturing human-generated luminescence from 1992 to 2018.

FIGURE 11.2.

The Tri-Border Clusters

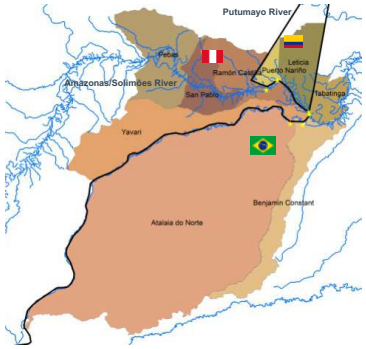
What´s the geographic context?

Borders in numbers

- **14,600 km** of internationalboundary lines.
- **15** border segments.
- **2,106,920:** Territory defined by the 100 km buffer zone on the border lines (in sq km).
- **6,040,157**: Estimated population for the 100 km buffer zone on the borders.
- **214 Urban centers** located within a 100 km buffer zone.

Environmental importance

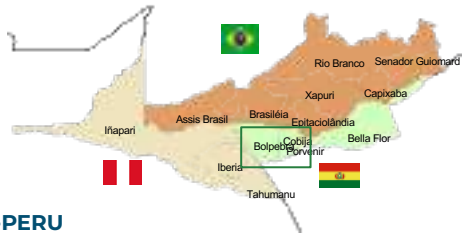
- Proximity to areas of high **CO^2 sequestration.**
- They concentrate a **high biodiversity,** since they are generaxlly isolated.



1. BRAZIL-COLOMBIA-PERU



2. BRAZIL-GUYANA-VENEZUELA



3. BRAZIL-BOLIVIA-PERU

Source: *Amazonia 360+ (IDB).*

Compounding these issues is a persistent lack of reliable, disaggregated data, which hinders a full understanding of local economic dynamics. These overlapping vulnerabilities —remoteness, limited institutional presence, a prevalence of illicit activities, and a lack of disaggregated data—make border regions particularly exposed to the impacts of climate change. And their isolation and information gaps hinder effective planning, risk management, and adaptation efforts. For those reasons, the trilemma—balancing economic growth, environmental protection, and social inclusion—manifests most acutely in these areas.[116] They also possess, however, the conditions necessary to harness agglomeration economies, lower transaction costs, and facilitate public–private investment. In short, they serve as strategic platforms to align trade, infrastructure, and productivity initiatives with a territorial development perspective (Hausmann and Klinger, 2007).

This section focuses specifically on tri-border clusters. These are clusters of municipalities and regions located in a specific territory of the three countries' borders. There are various examples in the Amazonia Region, but this chapter focuses on three: the Brazil–Colombia–Peru cluster, the Brazil–Bolivia–Peru cluster and the Brazil–Guyana–Venezuela cluster. These clusters were selected based on strategic criteria that combine economic potential, geopolitical relevance, and opportunities for cross-

[116] To address data limitations, this study adopts a dual approach that complements official statistics with satellite-based geographic information and insights from key local stakeholders. This methodology enables a more comprehensive analysis of the unique characteristics of each of the three distinct areas of Amazonia that are the study's focus.

border trade integration. Priority was given to areas with the capacity to articulate transnational value chains, enhance regional connectivity, and stimulate commerce in historically underserved territories. Moreover, these clusters align with existing regional cooperation agendas, facilitating their integration into broader sustainable development efforts in Amazonia. Each cluster analyzed in this chapter reflects different combinations of environmental assets, productive potential, and institutional gaps (Figure 11.3.). They share a common feature, however: they are areas where territorial approaches can yield high-impact, sustainable development outcomes.

The methodology used for the analysis of the tri-border clusters was developed in three phases, combining both quantitative and qualitative approaches.

- **PHASE 1** involved a top-down approach to gain a comprehensive understanding of the Amazonia Region as a whole, focusing on its border regions and, within those, the tri-border clusters. This phase utilized geospatial and statistical data to identify priority areas for further analysis.
- **PHASE 2** followed with a bottom-up approach aimed at understanding the dynamics within these clusters. This included extensive fieldwork and active engagement with local stakeholders. A prioritization matrix—designed specifically for this study and based on 44 indicators—was used to identify the sectors with the greatest development potential in each cluster.
- **PHASE 3** consisted of a deep dive into the identified bottlenecks, analyzing the key challenges constraining growth and sustainability. Based on this detailed diagnosis, the study proposes concrete strategies and actions to promote inclusive and sustainable development.

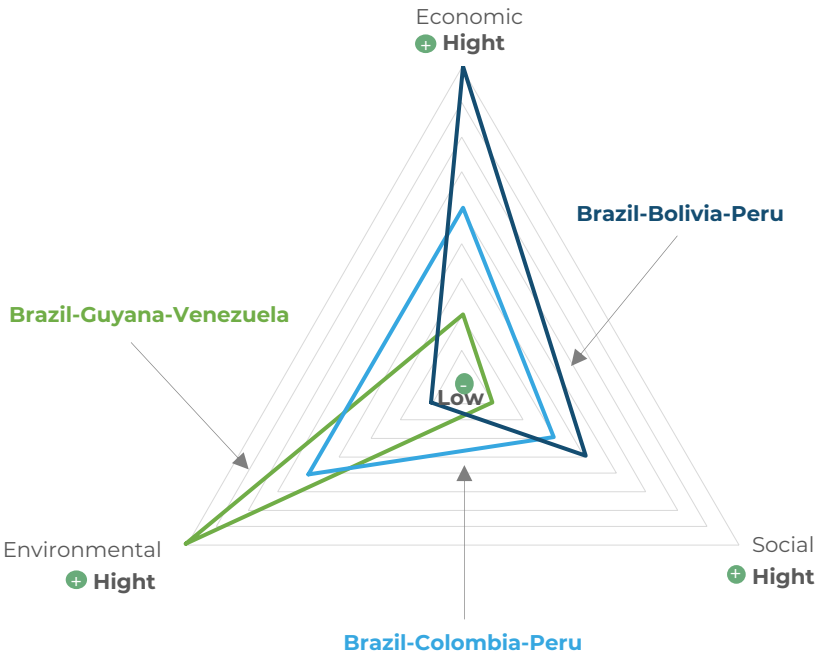
Throughout the process, high-potential productive sectors were analyzed in depth, enabling the design of tailored programs and initiatives. The full methodology, along with key recommendations and insights for a comprehensive development strategy, is documented in IDB 2023.



FIGURE 11.3.

Amazonia's Trilemma Highlights the Interconnected Challenges and Opportunities that Stem from Social, Economic, and Environmental Factors

The Amazon Trilema



Source: *IDB.*

The three clusters exhibit asymmetric levels of development.

Brazil–Colombia–Peru, being the most geographically isolated cluster, shows the lowest level of economic development and the greatest social lag; however, it also boasts the highest levels of environmental conservation and ecosystem integrity.

Brazil–Guyana–Venezuela, with stronger connections to regional markets, features a more dynamic economy and lower levels of social lag; however, it faces greater environmental challenges.

Brazil–Bolivia–Peru is the best-connected cluster, with a dynamic economy and progress on social development goals; however, it also shows the greatest environmental degradation, particularly in terms of deforestation.

These contrasting development patterns suggest that the region's development strategy faces a kind of trilemma, in which it is difficult to simultaneously achieve high levels of economic growth, social inclusion, and environmental sustainability.

The key public policy challenge for Amazonia is to identify a development strategy capable of fulfilling this triple objective: building a prosperous, equitable, and sustainable society.

CLUSTER	SUBNATIONAL JURISDICTIONS	AREA (KM²)	ESTIMATED POPULATION
Brazil–Colombia–Peru	Tabatinga, Atalaia do Norte, Benjamin Constant (BR); Leticia, Puerto Nariño (CO); Yavarí, Pebas, San Pablo, Ramón Castilla (PE)	135	244,000
Brazil–Bolivia–Peru	Assis Brasil, Brasiléia, Epitaciolândia, Rio Branco, Xapuri, Capixaba, Senador Guiomard, Plácido de Castro (BR); Cobija, Porvenir, Bolpebra, Bella Flor (BO); Iñapari, Iberia, Tahuamanu (PE)	120	600,000
Brazil–Guyana–Venezuela	Boa Vista, Bonfim, Normandia, Pacaraima, Uiramutã (BR); Region 7, Region 8, Region 9 (GY); Gran Sabana (VE)	267	598,000

Source: *Amazon360+ (IDB).*

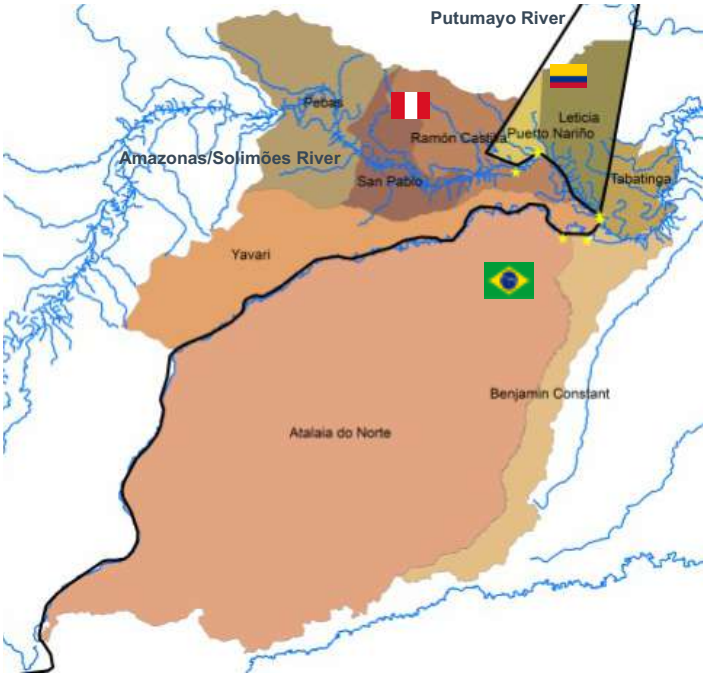
To better understand existing dynamics and design effective responses in each of the three tri-border clusters, this section provides recommendations for developing strategies for economic diversification and growth stemming from trade, regional integration, and transboundary initiatives.[117] The recommendations come from the IDB's comprehensive Amazon Frontier Productive Development Strategy, designed specifically for border regions of Amazonia.

The Brazil–Colombia–Peru Tri-Border Cluster

The Brazil–Colombia–Peru cluster (Figure 11.4.) lies at the confluence of the Amazonas and Putumayo rivers and is accessible only by plane and boat, with no roads linking it to national transportation systems. In this region, building and maintaining roads is so costly that land transportation is less viable than traveling by river. Rivers have been essential to this area's patterns of social and economic interaction, driving trade integration and migration, even though traveling on the waterways is slow and arduous. From Leticia, it takes up to 50 hours to reach Manaus (Brazil) and 11 hours by boat to reach Iquitos (Peru) (Rome2Rio, 2024). From Iquitos, passengers can continue by road to Lima, a journey that takes approximately 80 hours.[118]

FIGURE 11.4.

The Brazil–Colombia–Peru Tri-border Cluster



Source: *Amazon360+.*

Colombia's Leticia Airport, the primary gateway to the area, handles most of the air traffic to the cluster, highlighting the critical role that air transportation plays in the region's connectivity. This region is mostly covered by tropical rainforest, which is prone to flooding in the lowlands during the rainy season. Floods define how and when soil (which is not very fertile because of its composition) can be used for agriculture in this cluster. They are also fundamental to river transportation, as variations in flow volume are considerable.

Half of the cluster's 244,000 inhabitants live in the binational city formed by the

[117] The analysis starts with a top-down analysis using geospatial and statistical data to identify priority areas, followed by a bottom-up process rooted in fieldwork and local stakeholder engagement. A prioritization matrix, developed specifically for this study, was used to assess high-potential productive sectors in each cluster across 44 indicators.

[118] IDB (n.d.), "Characterization of the Brazil–Colombia–Peru Cluster" (unpublished internal report).

agglomeration of Leticia (Colombia) and Tabatinga (Brazil), the economic heart of the area, where people and goods continually cross a barely perceptible border (IBGE, 2024). Each of the two cities has its own rhythm, but they are mutually dependent and deeply integrated. Residents, whose livelihoods depend on tourism, trade, and agriculture, often live on one side of the border and work on the other.

Trade is a key economic driver, but it is largely informal. Leticia depends on goods from Brazil and Peru, including food, household products, and transportation services; while trade on the Brazilian side focuses on food, fuel, manufactured goods, personal care, and cleaning supplies. There are opportunities in key sectors, particularly tourism and agriculture, that could boost production and trade. Tourism, especially niche, high-value ecotourism, has a strong potential for generating employment and fostering integration without major environmental impacts. Opportunities range from birdwatching and conference-based corporate tourism in Colombia to scientific tourism and sport fishing in Brazil. Gastronomy tourism centered on Amazonia biodiversity and culinary experiences could also be promising but requires the further development of operational and commercial strategies.

Agriculture, particularly food production and processing of fruit pulp, jams, and supplements, represents an important opportunity. There is growing international interest in Amazonian products in high-value sectors such as cosmetics, essences, and biodegradable materials, and innovation and local value chains offer competitive advantages for fruits. Crops like yuca and cocoa require more technical and financial support. But additional investments are needed to overcome key obstacles, including limited access to advanced technologies, conservation processes, logistics, and export markets.

There are three key conditions that shape the challenges to any development strategy in the Brazil–Colombia–Peru cluster and that need to be addressed: (i) strengthening institutional presence, particularly to foster cooperation among authorities, harmonize rules and practices, and encourage business formalization. A stronger institutional presence can also reinforce the rule of law and state legitimacy, especially in areas affected by informality, environmental crimes, and illicit trade (ii) greater investment in connectivity infrastructure, mainly in river ports and fluvial logistics. Such investment is critical to overcoming geographical isolation and enabling better integration with national and international markets; and (iii) improving access to markets for goods and services in order to unleash production and trade potential. This requires actions to promote responsible value chains in strategic sectors such as agriculture, fisheries, and tourism; stimulate investment; and enhance the quality and competitiveness of local production. All these recommendations must be complemented by cross-cutting enablers such as bioeconomy promotion, investment in education and innovation, protection of ecosystems as strategic assets, and the inclusion of local communities in planning and benefit-sharing processes.

FIGURE 11.5.

Brazil–Bolivia–Peru Tri-Border Cluster



Source: *IDB Amazon360+.*

The Brazil–Bolivia–Peru Tri-Border Cluster

The Brazil-Bolivia-Peru cluster (Figure 11.5.) is home to some of South America's largest rivers (the Amazonas, Acre, Purús, Madeira, and Mamoré) that flow through jungles, savannas, and lakes rich in biodiversity, under the shadows to the west of the eastern slopes of the Andes. More than 600,000 people live in this region, 80% of them on the Brazilian side of the borders. The largest city is Rio Branco (Brazil), home to 365,000 people, followed by Cobija (Bolivia), with 90,000. The Brazilian cities of Brasiléia and Epitaciolândia face Cobija on the Bolivian side of the Acre River, the three cities forming a largely continuous metropolitan area (IDB, 2024). Cobija is a free trade zone that enjoys a binational agreement with Brazil to allow free movement within a 50-kilometer radius.

The development trilemma presented in Chapter 1 is clearly visible in the deforestation caused by extensive export-oriented cattle ranching and road construction in some parts of the cluster. The cluster's connections to Brazilian cities and the Pacific coast, supported by existing road infrastructure, offer substantial growth potential, even though many of the roads are in poor condition and in need of maintenance. But deforestation and the loss of natural capital are serious issues. By applying science, technology, and Indigenous knowledge, this cluster could boost productivity without expanding the agricultural frontier.

The main productive activities in this cluster are agriculture, cattle ranching, fishing, gold mining, and forestry. Some manufacturing also exists, related to lumber, gold, agricultural products, and the significant production of chestnuts, cashews, and Brazil nuts. Education, science, technology, and innovation would benefit from investment in training for bioeconomy activities, marketing, and better business practices. Agriculture could use better quality storage and commercial facilities, improved production practices, and lower financing costs. The tourism sector requires better training and higher-quality customer service.

To enable productive development and trade integration in this cluster, a comprehensive approach must be adopted. First, that involves promoting productive integration along logistical corridors that connect the Atlantic and Pacific markets to facilitate cross-border trade and regional connectivity. Boosting sustainable strategic sectors, particularly agriculture, tourism, and NTFPs, through responsible value chains and targeted investment can unlock inclusive growth opportunities. Strengthening territorial governance and the promotion of forest-based economies can help advance the conservation of ecosystems as productive assets. And enhancing enabling conditions, including education, technical training, innovation, and local production capacities, can build long-term competitiveness. These four components must be reinforced by institutional cooperation and binational policy coordination, which are essential to improving governance, ensuring environmental safeguards, and supporting sustainable cross-border integration. Together, they offer a strategic roadmap to transform this Amazonia border region into a hub of inclusive and sustainable development.

FIGURE 11.6.

The Brazil–Guyana–Venezuela Tri-Border Cluster



Source: *Amazon360+.*

The Brazil–Guyana–Venezuela Tri-Border Cluster

The Brazil–Guyana–Venezuela (Figure 11.6.) cluster spans the Guiana Shield, a biodiverse region of tepuis, dense rainforests, and savannas. It includes five municipalities in Brazil's Roraima state, regions 7, 8, and 9 in Guyana, and the Gran Sabana in Venezuela. Geographic and infrastructure constraints isolate cities from national markets and services in all three countries.

Roughly 80% of the cluster's 600,000 inhabitants live on the Brazilian side, primarily in Boa Vista, the cluster's economic hub, accounting for 75% of its GDP. Boa Vista is connected to Manaus and Venezuela via the BR-174 highway and to Lethem (Guyana) via BR-401. Lethem, a city in a tax-free zone, draws Brazilian customers but is isolated by poor road conditions, while former tourism hub Santa Elena de Uairén (Venezuela) has declined due to migration.

Agriculture on the Brazilian side focuses on soy, corn, sorghum, and beef. Roraima's exports, mainly food products like soy, reached $255 million in 2022, driven by demand from Venezuela and Guyana. In Guyana, ecotourism has become a growing source of employment that also benefits the environment. Gold, bauxite mining, and lumber remain vital, but Guyana's government is also advancing sustainable agriculture and investing in hydropower and solar energy.

The Brazil–Guyana–Venezuela cluster has diverse opportunities across key productive sectors. Agriculture and fisheries can generate local employment and support sustainable livelihoods. Investments in infrastructure, education, science, and technology, particularly around urban hubs like Boa Vista, would position the cluster as a strategic area for advancing a sustainable and inclusive bioeconomy in northern Amazonia. And tourism offers dual potential, generating economic value while similarly supporting environmental sustainability and social inclusion. Workforce training in critical skills and languages, along with improvements in marketing, quality standards, and infrastructure, is needed.

Key challenges must be overcome to realize these opportunities. Logistics must be improved, access to financing increased, and environmental risks like hydrometeorological events, deforestation, and agricultural expansion, mitigated. Enhancing cross-border economic cooperation and strengthening institutional integration are crucial, as are efforts to diversify the economy beyond low-complexity sectors such as cattle, soy, and gold. Promoting technological innovation and sustainable agricultural practices, particularly in Brazil's Roraima State, is also important. Upgrading infrastructure, including roads, border facilities, and internet access, will facilitate trade and reduce costs. Integrating value chains will boost cross-border economic activity. Strengthening institutions and government presence could generate more legal certainty, lead to the enforcement of environmental regulations, and help ensure that local and IC have access to services, markets, and financing.

To fully realize the region's potential, the development strategy for the Brazil–Guyana–Venezuela cluster sets out four interlinked components aimed at sustainable and inclusive development. First, there is a need for improved education, technical training, connectivity (both physical and digital), innovation systems, and access to finance. Second, key productive sectors, such as agriculture, fisheries, tourism (see Box 11.2.) and forest-based value chains compatible with the region's ecological and cultural assets must be developed. Third, the economy must be diversified toward higher value-added and more complex activities, supported by innovation, local entrepreneurship, and productive integration. Fourth, institutions and cross-border cooperation must be strengthened, ensuring effective state presence, environmental regulation, legal certainty, and access to public services for local and IC.

BOX 11.2.

Tourism in the Amazonian Tri-Border Clusters

Tourism is emerging as a strategic tool for sustainable development across the tri-border clusters. Its development offers a pathway to diversify local economies, empower communities, and preserve unique ecosystems.

Cultural, community, and ecosystem-based tourism activities in these regions align well with global demand for authentic, conservation-oriented travel experiences.

In the Brazil–Colombia–Peru cluster, the binational urban center of Leticia–Tabatinga exemplifies this tourism potential. Initiatives like Tarapoto Amazonas Jungle Tours collaborate with scientific institutions, such as the Cornell Lab of Ornithology, to develop birdwatching experiences that support conservation while creating local livelihoods. The nearby Mundo Amazónico Ecological Park complements this with environmental education focused on biodiversity and traditional knowledge of medicinal plants.

In the Brazil–Bolivia–Peru cluster, improved connectivity would enable a more diverse tourism offer, including community-based, scientific, and event tourism. The region's natural and cultural assets have international appeal, though challenges persist in addressing informality, infrastructure gaps, and limited local capacity.

The Brazil–Guyana–Venezuela cluster has a high potential for ecological and cultural tourism, supported by a varied landscape and rich cultural heritage. Here, tourism can act as a lever for local development, particularly in the face of geopolitical and economic pressures.

But sustainable tourism across these border regions faces several constraints. Many sites lack adequate facilities, digital connectivity, and transportation infrastructure that meet international standards while minimizing environmental impact. Deficient water and sanitation services pose risks to visitors and communities. Security concerns related to cross-border illegal activities requires coordinated responses that balance safety with respect for local autonomy. Local workforce readiness—particularly in hospitality, languages, and business management—remains limited. Regulatory harmonization across borders and adaptation to flood cycles and climate variability must be improved.

Despite these challenges, promising models are emerging. Community-Based Sustainable Tourism, supported by initiatives like the World Bank's Amazon Sustainable Landscapes Program, is empowering local actors to design and manage their own tourism offerings. In Colombia, the BioDiverse and Resilient Cities Program—developed in collaboration with MIT—seeks to position Leticia as a hub for biodiversity-driven tourism within a broader framework of inclusive local development.

11.4 Conclusion: Addressing the Trilemma Successfully

This chapter has delved into the intricate relationship between the trilemma, trade promotion, and the development of tri-border clusters. To start with, it demonstrates that it is possible to make simultaneous progress advancing economic growth, protecting natural capital, and improving local livelihoods.

The chapter also highlights various strategies to enhance trade, which is essential for fostering economic growth and development. These include improving infrastructure and fostering regional cooperation. Such efforts are particularly significant in tri-border clusters, where the convergence of three countries creates unique opportunities and challenges. Tri-border clusters can serve as hubs for trade and investment, driving economic growth and regional integration.

Finally, the chapter emphasizes the importance of concentrating on sustainable development and leveraging Amazonia's unique biodiversity. That means, first, promoting exports and greater linkages between local firms, MNEs, and domestic exporters. Second, investing in infrastructure and connectivity within the tri-border clusters to enhance trade and facilitate the movement of goods and services. And lastly, focusing on promoting more sustainable practices in existing sectors, such as agriculture and fisheries, while expanding the development of other sectors with potential, such as tourism. By adopting these strategies, the Amazonia Region can achieve sustainable development and become a model for other regions facing similar challenges.





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TOWARDS MORE SUSTAINABLE AGRICULTURE, LIVESTOCK, AND FORESTRY



Chapter

12

TOWARDS MORE SUSTAINABLE AGRICULTURE, LIVESTOCK, AND FORESTRY

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12.1 Introduction: Agriculture in Amazonia

Agriculture in Amazonia is shaped by a unique convergence of ecological, cultural, and socioeconomic factors, demanding approaches that differ from generic models. Natural conditions—such as soil properties, rainfall variability, and local biodiversity—directly affect productivity (Iron 1978; Coomes et al., 2016). Traditional farming systems are deeply rooted in traditional knowledge, inherited land management practices, and direct harvesting from forests (Clement et al., 2015; Levis et al., 2017, 2018). Socioeconomic aspects, including access to markets and infrastructure, also play a crucial role in the sector (Costa et al., 2021).

This chapter discusses traditional and current agricultural practices in the Amazonia Region, highlighting the region's unique characteristics. It aims to enhance understanding of agricultural dynamics in Amazonia by showcasing practices that reconcile production, environmental conservation, and socioeconomic development in the face of the challenges and opportunities associated with sustainable development in the region. The text focuses on terrestrial land-use systems[119] and the transition to sustainable and low-carbon practices, specifically in the Amazonian lowlands, as the highlands exhibit stronger Andean influences and different ecological and productive characteristics (Val et al., 2021).

12.2 Agricultural Practices Shaped Over Millennia

The megadiverse forests of Amazonia thrive under a complex hydrological regime and seasonal floods (Junk et al., 1993),[120] and develop on soils that are naturally acidic, highly weathered, and deficient in nutrients (Iron, 1978). Despite these challenging environmental conditions, human populations have long managed to cultivate food successfully in this region, where diverse agricultural practices have historically been shaped by geography and society (Clement et al., 2015).

Research demonstrates that eastern Amazonian forests have been shaped by over 4,500 years of polyculture agroforestry practiced by pre-Columbian societies (Maezumi et al., 2018). Rather than degrading the environment, these societies actively transformed its structure and composition, creating biodiverse and productive landscapes that continue to influence Amazonian ecology today (Clement et al., 2015).

One remarkable legacy of pre-Columbian land-use practices is Amazonian Dark Earth (*ADE; terra preta de índio*). This fertile anthropogenic soil found throughout

[119] This chapter focuses on agriculture, forestry, and livestock. While fishing is also a vital livelihood for many Amazonian communities, its dynamics differ from those of terrestrial systems. As such, it falls outside the scope of the present analysis.

[120] Amazonian river types of shape forest productivity. White-water rivers like the Juruá and Ucayali are nutrient rich due to heavy sediment loads. In contrast, black-water rivers such as the Guainía are nutrient poor, with high humic content from slow litter decomposition. Intermediate rivers, like the Curaray and Tigre, shift between these states seasonally.

the basin, rich in charcoal, organic matter, and ceramic fragments, remains agriculturally productive for centuries. It reflects advanced pre-Columbian knowledge of soil management and long-term carbon sequestration (Schmidt et al., 2014). Interestingly, some communities are aware of the origin of these soils and avoid their use believing it belongs to others (Torres & Cuartas, 2013).

Pre-Columbian groups also adopted complex land-use systems that combined annual crops with long-term enrichment of edible forest species. An example of such practices was the use of agroforestry systems that included cassava (*Manihot esculenta*), maize (*Zea mays*), sweet potato (*Ipomoea batatas*), squash (*Cucurbita spp.*), cereals, and tubers. These polycultures emulate the resilience and diversity of natural forests while maintaining soil fertility (Maezumi et al., 2018).

This historical legacy can still be seen today. The region, where subsistence agriculture and local markets coexist with global supply chains, is currently home to a diverse mosaic of communities with different practices. This social diversity shapes ecosystems and agricultural practices (Levis et al., 2017). About 379 Indigenous groups live in Amazonia, along with traditional communities of Afro-descendants, riverine populations, artisanal freshwater fishers, coastal groups (fishers, crab collectors), forest-dependent groups (rubber tappers, coconut breakers, açaí palm extractors, fiber harvesters), and smallholder farmers. Ranching and agro-industrial communities are involved in large-scale monocultures and extensive livestock farming (Hecht et al., 2021). Urban and peri-urban populations also depend on the ecological wealth of Amazonia for their subsistence, culture, and economic well-being.

12.3 Agricultural Practices Shaped Over Millennia

Amazonia has an extensive variety of native plant species that have long contributed to global food systems. Among the most important are cassava, Brazil nut, cacao, and açaí, each valued for their resilience, nutritional, cultural, and economic importance.

Cassava is the most important food crop native to Amazonia. According to Market Research Future (2022), the global cassava market was valued at $198.9 billion in 2024 and is projected to reach $299.6 billion by 2034. It originated in southwestern Amazonia, particularly in areas of Brazil, Bolivia, and Peru (Olsen & Schaal, 2001), and is well adapted to nutrient-poor soils and seasonal droughts, thriving in traditional systems such as swidden-fallow and agroforestry mosaics (Howeler et al., 2013). Its diverse food derivatives—such as farinha, tucupi, and tapioca—make it essential for regional food security. Brazil produces about 18 million tons annually, with Pará as the top-producing state (IBGE, 2023).

The global market for cacao beans was valued at $17.2 billion in 2024 and is projected to grow to $34.8 billion by 2034 (Market Research Future, 2025). Cacao from Amazonia is known for its genetic richness and high-quality beans. Brazil, Peru, Colombia, and Ecuador are the main producers (VOICE Network, 2022). Initiatives like PROCACAO in Peru promote sustainable agroforestry and traceability systems, allowing smallholders to access premium markets while conserving native cacao varieties (AgroPerú, 2024). These initiatives support farmer incomes and climate-resilient practices.

Brazil nuts are the most economically important non-timber forest product in Amazonia (Wadt et al., 2009). In 2024, its market size was estimated at $96.4 billion (Data Bridge Market Research, 2025). Harvested from old-growth forests, Brazil nuts support the livelihoods of thousands of rural families and generate tens of millions of dollars in exports across Brazil, Peru, and Bolivia (Guariguata et al., 2017). They are rich in selenium, healthy fats, and protein (Yang, 2009). Since the trees need intact forests to regenerate, the Brazil nut economy is inherently linked to forest conservation.

Açaí palms are central to Amazonian diets and economies. Brazil alone produces 1.6 million tons of *Euterpe oleracea* fruit per year (IBGE, 2023), while *Euterpe precatoria* is more common in Peru and Colombia (Paniagua-Zambrana et al., 2017; Rodríguez-Cortina & Hernández-Carrión, 2025). In addition to their antioxidant-rich fruits, these palms have potential use in bioenergy, cosmetics, and high-value food products (Melo et al., 2021; Kang et al., 2012). Their cultivation in polyculture systems supports ecosystem resilience and climate adaptation.

Beyond these native food crops, Amazonia produces commodities that are important for regional livelihoods and land use dynamics. These include natural rubber and timber, which are also from native species, as well as large-scale soy, sugarcane, oil palm, and livestock.



12.4 Varied Production Systems

Amazonia's rich biodiversity has historically shaped traditional production systems, offering both opportunities and challenges for agriculture. While conventional agro-industrial models often struggle to adapt to the region's ecological complexity, traditional systems have evolved to work with, rather than against, the environment.

Agricultural practices have important implications for land-use planning and management. In areas with better infrastructure and market access, such as Brazil's "arc of deforestation," mechanized, export-oriented agriculture dominates, especially soy and beef production (Nepstad et al., 2006). In contrast, smallholder farmers and traditional communities in remote areas face persistent production barriers, including poor road access, limited energy and storage infrastructure, and insufficient extension services (Hecht et al., 2021). Understanding these diverse realities is essential to designing inclusive and effective policies that support sustainable development and conservation across the entire Amazonia Region. This section provides an overview of the region's main production systems, highlighting their benefits and drawbacks.

Traditional Indigenous Agriculture

Indigenous agricultural systems in Amazonia, developed over centuries, are deeply grounded in traditional ecological knowledge and a profound connection to the land (Miller & Nair, 2006). These systems are increasingly recognized as sustainable models of territorial management, capable of enhancing both productivity and resilience through diversified cropping, nutrient cycling, and natural pest control—strategies that are likely to become critical in the face of climate uncertainty (Altieri & Nicholls, 2017). Indigenous agriculture also supports ecosystem services, including carbon sequestration (Pinho et al., 2012) and water regulation (Heredia-R et al., 2021) (for more information on these issues please see Chapters 3 and 8). Indigenous agroforestry systems in the Ecuadorian Amazonia, known as chakras and ajas, have average above-ground biomass carbon stocks significantly higher than those observed in surrounding pastures and monocultures. They can achieve a carbon mitigation potential comparable to that of secondary forests, demonstrating their superior potential for carbon sequestration compared to conventional agricultural systems (Álava-Núñez et al., 2025). Unlike large-scale monocultures, these practices offer low-emission models that align with climate objectives while honoring cultural traditions and territorial governance (Porro et al., 2012).

Common Indigenous practices include: i) swidden-fallow systems (small-scale rotational cultivation of staples like cassava, plantains, and maize, followed by long fallow periods that allow forest regeneration) (Coomes et al., 2000); ii) homegardens (small, intensively managed plots located near dwellings, typically maintained by households (Miller & Nair, 2006); iii) floodplain agriculture (cultivation on nutrient-rich floodplain soils, with rotating crops timed to the flood cycle, often integrated

with fishing and small-scale animal husbandry) (Junk et al., 2000); and iv) tree domestication and forest enrichment (domestication of wild species and increased density through selective protection or planting and management of useful tree species in secondary forests and fallows) (Clement et al., 2015).

Several terms are used to refer to swidden-fallow systems in Latin America, including roçado, coivara, milpa, conuco, roza, chacra, and chaco, each reflecting regional linguistic and cultural variations (Pedroso Juniro et al., 2008). In Ecuador, the Kichwa and Shuar communities traditionally practice a form of swidden agriculture that evolves into long-lived, biodiverse homegardens. These systems support household food security through staple crops such as cassava and banana, while cacao production provides an important source of income. A variety of native forest species are also cultivated for their fibers, seeds, and medicinal properties, cultivation that supports the production of crafts and traditional remedies (Grijalva et al., 2011). In Venezuela, Indigenous farmers from the Huottöja, Jivi, Curripaco, and Baré ethnic groups are diversifying their agricultural systems by incorporating perennial crops and reinforcing traditional production areas. These areas are initially based on swidden fields used primarily for cultivating staple crops (particularly cassava) and gradually evolve into shaded agroforestry systems (Freire, 2007). In Peru, Indigenous agricultural systems rely on traditional homegardens and swidden fields. But agroforestry practices are increasingly incorporating improved fallows and multistrata systems. A notable example is the successional agroforestry along the alluvial soils of the Aguaytía River with Guazuma crinita (Castillo, 2009).

Indigenous women in the Peruvian Amazonia play a central role in sustaining traditional agricultural systems. They shift cultivation by selecting forest areas, preparing land with controlled burning, and planting diverse crops like cassava, maize, and beans. Their knowledge of soils, seeds, and fallow cycles helps preserve soil fertility and supports forest regeneration (Arana & Escalona, 2024; Iverson and Iverson, 2021). These systems, however, are not without complications. Population growth and land pressures often shorten fallow periods, compromising soil fertility and increasing weed and pest issues (de Sherbinin et al., 2008). Swidden agriculture is also frequently misunderstood by policymakers, who stigmatize the use of fire to clear plots, leading to restrictions that threaten Indigenous rights (Fox et al., 2009). For those reasons, long-term viability depends on secure land tenure, cultural continuity, and supportive governance.

Forest-Based Economies and NTFPs

Direct harvesting from forests (known as extraction or extrativismo and not to be confused with oil or mineral extractivism) is an important economic activity for thousands of rural communities in Amazonia, particularly in regions with limited access to infrastructure (Mathaess, 2021). This form of production is based on the harvesting of timber and the extraction of NTFPs, such as Brazil nuts, açaí, vegetable oils, and natural resins. In the Chico Mendes Extractive Reserve in Acre, a powerful symbol of the rubber tapper social movement, the extraction of NTFPs remains a key livelihood strategy for many households, despite the expansion of cattle ranching (Wallace et al., 2018). Indeed, forest-based economies offer alternatives to ranching and conventional agriculture. They contribute to forest conservation, poverty alleviation, and local economic development (Guariguata et al., 2017; Shanley et al., 2015).

Brazil nuts are among the most important NTFPs in the Amazonia region (Duchelle, 2007). Brazil has historically been the leading producer. But by 2021, Bolivia became the largest exporter, generating approximately $157 million in exports, followed by Peru with $49 million and Brazil with $41 million (OEC, 2021). In Bolivia the sector significantly contributes to national export revenues. The northern departments of Pando and Beni, in particular rely heavily on Brazil nut wild harvest and processing, with over half of the population depending on the crop for their livelihood, including nut crackers, assistants, permanent factory workers and temporary workers (Soldán, 2003). Similarly, in Peru's Madre de Dios region, Brazil nut collection accounts for an average of 55% of the total household income from forest products (Garrish et al., 2014).

The açaí berry has also gained remarkable popularity and economic relevance since the 1990s, maintaining a strong position in a growing global market (Tonore Freitas et al., 2019; Lopes et al., 2019). In Brazil's state of Pará, the açaí value chain has emerged as one of the most dynamic forest-based economies, supplying nearly 90% of the country's domestic market (Oliveira et al., 2015).

Timber extraction remains a major economic activity in many parts of the basin. High-value hardwood species such as ipê, cumaru, and jatobá are harvested for national and international markets, often driving forest degradation when not managed sustainably (Brancalion et al., 2018).

Although not a big player today, rubber extraction was a major economic activity in Amazonia at the end of the 19th and beginning of the 20th centuries. In Brazil, the rubber-tappers movement led to the creation of Reservas Extrativistas, a management system based on conservation, associativity, and sustainable use (Allegretti, 2008).

Forest-based economies face several hurdles (Ticktin & Shackleton, 2011): First, species-specific limitations pose a significant constraint, as tolerance to harvesting varies greatly depending on the species and the plant parts being extracted. Second, institutional and governance gaps, including weak regulations and limited enforcement, can undermine sustainable management. Third, value-chain inequities often leave small producers with minimal bargaining power and limited access to higher-value markets. Fourth, infrastructure and capacity constraints hinder market access. Fifth, ecological unpredictability—driven by seasonal fluctuations and increasing climate variability—can reduce the reliability of NTFP yields. Additionally, without proper management, intensive harvesting of certain species may lead to population declines of these species, jeopardizing the long-term sustainability of this vital pillar of the Amazonian economy (Peres et al., 2003).

Family Agriculture and Medium-Scale Farming

Family farmers and medium-scale producers are vital to food production across Amazonia, as they both supply domestic markets and contribute to the management and potential restoration of degraded lands (Brondizio, 2008). Many such producers are also linked to rural settlement programs or migratory dynamics that have shaped the region over recent decades (Staevie, 2005).

These production systems are highly diverse. In Brazil, family farming contributes

significantly to the production of staple crops such as cassava, rice, beans, and maize, particularly in states like Rondônia and Pará (Santos et al., 2017). In Peru's San Martín and Ucayali regions, smallholders grow coffee, cocoa, fruits, and subsistence crops, like rice, cassava, beans, maize, and banana (Marquardt et al., 2019). Similar patterns are observed in Bolivia and Colombia, where rural colonization zones have emerged as key agricultural hubs, frequently situated along the forest frontier (Pacheco et al., 2006; Tello et al., 2019).

The migratory flows from other regions of Amazonia, such as the Andean highlands, or south, southeast, and center-west Brazil, bring production models that are not suited for Amazonian conditions. The use of fire as a land-clearing method is still very frequent. This pattern of land use generates cycles of exploitation, exhaustion, and abandonment, intensifying land conflicts and pressure on natural resources (Instituto de Pesquisa Ambiental da Amazônia, 2021). It also represents a strategic opportunity for advancing sustainability. The adoption of practices such as agroforestry, silvopastoral systems, and crop-livestock-forest integration is expanding, especially in areas where land has been degraded by previous land uses (de Souza et al., 2022). These approaches have the potential to enhance productivity, diversify income sources, build resilience to climate change, and restore ecological functions.

Producers, however, face persistent barriers. Limited access to credit, technical assistance, secure land tenure, and adequate infrastructure reduce their capacity to innovate, adapt, and scale sustainable practices (Neves et al., 2020). Women often face the greatest barriers to participation in agricultural systems. In Brazil's Legal Amazonia, for example, only 18.1% of women hold land titles, a figure that mirrors the national average but reflects persistent inequality. Access to technical support and agricultural services for women is also limited. In the North Region, which covers most of the Legal Amazonia, only about 15% of women receive rural technical assistance, a figure lower than that for men (IBGE, 2017).

These constraints hinder competitiveness in local and regional markets, weakening producers' ability to cope with climate variability and economic shocks and exacerbating gender gaps in agricultural production. Strengthening production systems and expanding access to reliable credit mechanisms could improve market access, facilitate knowledge exchange, and accelerate the adoption of innovative and climate-resilient technologies (Moreira-Dantas et al., 2023; see also Chapter 5).

Agribusiness

In recent decades, Amazonia has experienced a significant expansion of agribusiness, particularly in the production of sugarcane (Ferrante & Fearnside, 2018), oil palm (Butler & Laurance, 2009), soy (Paim, 2021), and cattle (Nepstad et al., 2006). This expansion has been fueled by growing global demand, gains in productivity, and increased investments in logistics, storage infrastructure, and supply chain efficiency, and it has been instrumental in driving economic growth through technological innovation and enhanced access to international markets (Richards et al., 2015).

Productivity gains, however, are accompanied by sustainability challenges. This is especially true when production stems from land expansion rather than from

improvements in land-use efficiency. Large-scale agricultural operations have reshaped landscapes and local economies, often advancing along road corridors and into previously forested areas (Hecht & Cockburn, 2011). The inefficient use of already cleared land, habitat fragmentation, and non-compliance with environmental regulations are problematic. Large-scale livestock farming, whether for production or as a means of land appropriation, has been a major driver of deforestation and environmental degradation in Amazonia (Dávalos et al., 2014; Hecht, 1993; Hänggli et al., 2023). A study by Murillo-Sandoval et al. (2023), for example, shows that cattle ranching is the primary driver of forest loss outside the legal agricultural frontier in Colombia. At the same time, the lack of full supply chain traceability in the cattle subsector undermines efforts to meet international zero-deforestation market standards.

Some participants in the soy and meat value chains have affected smallholder farmers and Indigenous and traditional communities through these dynamics, deepening poverty and undermining the foundations of food production (Maluf et al., 2024). Addressing these issues requires stronger law enforcement, interventions in soy and beef supply chains, credit restrictions for non-compliant actors, and the expansion of protected areas (Nepstad et al., 2014).

Climate change adds additional pressures. Rising temperatures, altered rainfall regimes, and more frequent droughts threaten agricultural productivity and increase production risks (Rattis et al., 2021). Large-scale agriculture can also amplify the climatic effects of deforestation, leading to greater increases in surface temperatures and more pronounced declines in rainfall than small-scale farming systems (Maeda et al., 2021). According to Brazil's National Institute for Space Research and the Brazilian Agricultural Research Corporation, 79.5% of deforested areas in Brazil's Legal Amazon have been converted into pastures and soy plantations (Pivetta, 2023), many of which operate with low productivity, leading to soil degradation and loss of fertility. The adoption of climate-smart approaches is needed. The industrial forestry sector in Amazonia plays a crucial role in the regional economy, providing employment and raw materials for national and international markets (Sist et al., 2023; Barros & Uhl, 1999). But it has also been historically associated with environmental impacts, primarily due to illegal logging practices that have contributed to deforestation and ecosystem degradation (Potapov et al., 2017). In this context, growing pressure from global buyers, financial institutions, investors, consumers, regulatory frameworks, and international agreements has catalyzed a wave of reforms aimed at aligning large-scale agriculture and forestry with environmental stewardship, positioning these sectors as critical for sustainability-driven innovation (Wardell et al., 2021; Muradian et al., 2025).

12.5 Promoting Sustainable Agriculture

Effective agriculture in Amazonia must adapt to the region's unique environmental and social conditions. Expanding agriculture without considering natural limitations can lead to declining productivity over time (Martins et al., 1991; Don et al., 2011). Clearing forests, for example, eliminates the litter layer. This may result in reduced productivity due to rapid degradation, compaction, and soil exhaustion. Without proper management, systems become economically unviable, demanding high input costs to sustain minimal yields. Farming practices must also consider high temperatures and humidity that generate pests and diseases and accelerate the decomposition of organic matter (Altieri & Nicholls, 2017). These biophysical constraints influence agricultural yields and the viability of scaling up production systems.

Agroforestry: A Path to Sustainable Farming

Agroforestry refers to a diverse set of long-established practices that integrate trees with agricultural and/or livestock production systems in various ways. They include agrosilvicultural systems (trees and crops), silvopastoral systems (trees integrated with pastures and livestock), and agrosilvopastoral systems (trees, crops, and livestock) (Nair et al., 2021). A growing body of scientific evidence highlights the multiple ecological and environmental benefits of these approaches, like enhanced biodiversity, greater carbon sequestration, improved soil health, and increased resilience to climate change. In many cases, these approaches also boost productivity and diversify income sources for rural producers (Jose 2019; FAO, 2017).

Some reports of success come from Brazil and Peru. The Apuí Agroforestry Coffee 147 project in Brazil, launched in 2008, fosters sustainable, low carbon coffee production. By January 2024, it had benefited 83 families. It has also helped restore 159 ha of land, conserve 10,835 ha of forest, and produce 130,000 kg of coffee, increasing farmers' incomes by 300%. In Peru, the National Livestock Farming Development Plan (Minagri, 2017) has created favorable conditions for silvopastoral systems. Already, 353,458 ha of degraded pastures have been rehabilitated, with a goal of 119,000 ha more by 2030.

BOX 12.1.

Agriculture for Peacebuilding in Colombia

In the Colombian Amazonia, sustainable agriculture has been promoted as a pathway to peacebuilding in historically conflict-affected and environmentally vulnerable areas. The Sustainable Colombia Initiative (*Colombia Sostenible*)—implemented by the Colombia in Peace Fund (*Colombia en Paz*) with IDB financing—integrates forest conservation with

rural development. It supports sustainable projects in municipalities covered by the Territorial Focused Development Programs, which stem from the peace agreement, and benefits over 4,600 families while covering more than 10,000 ha with agroecological models such as native fish farming, agroforestry cacao, and sustainable cattle ranching.

Over 25,000 hectares have been conserved through voluntary zero-deforestation agreements. At the same time, the Sustainable Colombia Initiative Fund—funded by Norway, Sweden, and Switzerland and managed by the IDB—implements complementary strategies focused on conservation, ecological restoration, territorial governance, and bioeconomy promotion. Both the Initiative and the Fund emphasize a responsible forest economy as key to conservation and development, demonstrating how sustainable forest use and bioeconomy-based value chains can strengthen local livelihoods and peacebuilding. Progress still needs to be made, especially in organizational capacity, connectivity, and institutional continuity, highlighting the need for long-term financing and a state presence aligned with Amazonia's realities.

Sustainable Use of Native Species

Integrating native Amazonian species into commercial markets can help industries meet growing sustainability commitments while leveraging the region's rich biodiversity. Species such as açaí, andiroba, copaíba, and Brazil nuts have long been part of traditional economies based on direct harvest (extrativismo). They are now gaining relevance in broader markets, particularly in food, cosmetics, and pharmaceuticals (Ribeiro et al., 2024). When responsibly sourced, their commercialization can contribute to forest conservation by providing incentives to maintain standing forests, while also aligning with international demands for deforestation-free, low-emission, and socially inclusive supply chains (Wardell et al., 2021).

In Peru's Ucayali region, deforestation-free cacao production emits far less carbon than other systems, demonstrating the climate benefits of low-impact methods (Ivanova et al., 2020). In Brazil, the IDB, United Kingdom Department for Environment, Food and Rural Affairs funded, Sustainable Rural Development Program worked from 2013 to 2019 in promoting low carbon agriculture, establishing 133 low carbon agriculture demonstrative units and helping 1,600 families in three Amazonian states implement low carbon agriculture technologies. Since 2022, the Sustainable Rural Development Program has expanded its activities with the Sustainable Rural Development Program–Amazon Project, working with traditional communities and their organizations in capacity building and value chain strengthening for açaí, cocoa, Brazil nuts, coffee, pirarucu, and other fish. To raise private capital for bioeconomy initiatives, the IDB is advancing blended finance solutions through the EcoInvest initiative (see Annex 1 for further information), which mobilizes private capital alongside public and concessional resources to expand sustainable production.

These experiences show that scaling up sustainable practices can meet climate

goals while keeping forests intact and ensuring competitive, responsible supply chains. For the direct forest harvest of native species to truly advance corporate sustainability commitments, coordinated multi-level actions are necessary. Strengthening regulatory frameworks and enforcement, expanding accessible certification models to small producers, securing territorial rights, and fostering robust producer organizations are also key priorities (Wardell et al., 2021).

Supporting More Agribusinesses that are Resilient Against Climate Change

A growing body of research shows that agribusinesses will need to transform their production systems. They must do so to comply with market and policy demands and to build resilience against escalating risks posed by climate change, such as more frequent, extreme weather events; pest outbreaks; and resource scarcity (IPCC, 2023). This transformation includes integrating precision agricultural technologies, broadly adopting good agricultural practices, and increasingly implementing voluntary sustainability standards and certification schemes aimed at improving both productivity and climate resilience. It also involves upholding social standards, such as labor rights and equitable practices. These initiatives generally fall into three main categories: those led by individual companies or groups through the adoption of voluntary sustainability standards; sectoral efforts focused on improving practices across entire supply chains; and integrated models that align supply chain interventions with territorial strategies governed at the jurisdictional level (Pacheco et al., 2018).

Growing pressure from stakeholders has led companies and governments to commit to deforestation-free supply chains. Examples include the 2014 Climate and Land Use Alliance, the 2015 Amsterdam Declaration (Zu Ermgassen et al., 2020), and the 2023 European Union Deforestation Regulation. In Ecuador, PROAmazonía, a government program, supports coffee producers while advancing sustainable and deforestation-free agricultural models,[121] including the launch of the world's first certified deforestation-free coffee.[122] Impacting the palm oil value chain, the Roundtable on Sustainable Palm Oil,[123] founded in 2004, sets global standards for sustainable palm oil, emphasizing environmental protection, fair labor, and economic viability—a model that could serve as a blueprint for scaling forest-friendly production.

Prioritizing Sustainable Livestock Farming

Large-scale livestock farming in Amazonia is undergoing a transition in response to increasing demands for sustainability from both domestic and international stakeholders (Alves-Pinto et al., 2013). Strategies such as rotational grazing, restoration of degraded pastures, and livestock traceability have become central components in promoting more sustainable and climate-resilient livestock systems increasingly aligned with zero-deforestation policies and commitments such as the Glasgow Leaders' Declaration on Forests and Land Use (United Nations Climate Change Conference United Kingdom, 2021), and the European Union Deforestation Regulation (European Union 2023/1115).

There is growing evidence supporting the economic and environmental viability

[121] ProAmazonía. Sustainable Coffee. Disponible en: https://www.proamazonia.org/ppr/en/cafe-sostenible/

[122] Programme of the United Nations Development Programme (UNDP). Deforestation-Free Coffee. UNDP Climate Promise. Disponible en: https://climatepromise.undp.org/deforestation-free-coffee

[123] More information can be found here.

of sustainable livestock intensification in Amazonia. In Pará, Brazil, the From Field to Table initiative has helped farms switch to rotational grazing, good agricultural practices, and environmental restoration since 2016. That, in turn, has brought higher profits than conventional farming, especially on large farms with over 400 ha of pasture. Improvements include gains in carrying capacity, healthier pastures, and more production within six to 12 years (Garcia et al., 2017). In Peru, the National Alliance for Regenerative Cattle Ranching[124] is helping move toward deforestation-free, traceable cattle farming. National Alliance for Regenerative Cattle Ranching 's goal is for 20% of Peru's Amazonian cattle to be deforestation-free by 2025, and close to 100% by 2030. Traceability systems are being developed in several territories concurrently. In 2023, the Brazilian state of Pará launched the first mandatory individual traceability policy (Pará, 2023), which includes environmental requirements and incentives for producers to adhere to a digital tracking system, with a goal of tagging and monitoring all cattle by December 2026. In Ecuador, PROAmazonía[125] is implementing a digital tracking system based on blockchain. This system overlays deforestation data to assess the environmental impact of cattle ranches and links up with public funding, loans, and green certification.

Sustainable Amazonian Forestry

To safeguard resource renewal and maintain ecosystem integrity, large-scale forestry companies have begun adopting Sustainable Forest Management principles, including selective logging, detailed planning, and rigorous monitoring protocols (Vidal et al., 2020). Certification processes—such as those of the Forest Stewardship Council and the Programme for the Endorsement of Forest Certification - have been adopted to ensure compliance with international standards for responsible forest management and to improve access to differentiated markets. Bolivia stands out among tropical countries for having a significant portion of its natural forests certified under the Forest Stewardship Council system, with over 1 million hectares under sustainable management (Nebel et al., 2005). It is worth noting, however, that while certification paves the way for better forest governance, its effect on reducing deforestation remains unclear. In Peru, the comparison of deforestation data in certified and non-certified areas did not find significant effects from certification alone (Rico-Straffon et al., 2023).

The SPA notes that existing legal frameworks for timber extraction in the region—typically allowing for the harvest of about 20 m^3 per hectare every 15 to 35 years—do not ensure long-term sustainability (Sist et al., 2023). Nonetheless, initiatives to advance sustainable forest management face major barriers. These include unfair competition with illegal logging and the absence of dedicated markets that value timber sourced from well-managed natural forests (Sist et al., 2023). Rigorous enforcement, transparency in supply chains, and effective incentives to prevent the use of certification for greenwashing must be implemented for a positive effect to occur.

[124] Information about the National Alliance for Regenerative Cattle Ranching is available here.
[125] Information about PROAmazonía is available here.

BOX 12.2.

Facilitating *Extrativismo* in Brazil

The Acre Sustainable Development Program is a long-standing partnership between the IDB and the Acre Government to promote sustainable management and a sustainable economy in the Brazilian Amazonia by reducing deforestation, conserving biodiversity, and improving the quality of life for rural communities. Since it began in the early 2000s, it has directly benefited more than 14,500 people. The program boosts the sustainability and market competitiveness of forest and agroforestry value chains by increasing the participation of companies and local producers in the market. Approximately 3,725 families, composed of small farmers and members of traditional communities (12% of whom are Indigenous), joined sustainable agroforestry value chains and received technical assistance for adopting new technologies, management practices, and participation in production chains. The program invested around $10 million (approximately $3,500 for each directly benefited family). Beneficiaries reported improvements in organization, production, and household income, as well as positive effects on nutrition and job creation. In IC, for example, there was an increase in the consumption of locally grown food.

The Role of Supranational and National Actors and Policies

Supranational and national interventions are essential to addressing the complex internal and transboundary challenges of promoting sustainable agriculture in Amazonia. Supranational efforts foster regional cooperation, helping Amazonia countries harmonize policies, mobilize resources, and coordinate actions. National-level interventions enable the implementation of context-specific policies, incentives, and institutional frameworks that respond to each country's unique socio-environmental realities. Indeed, effective policies in Amazonia require strong coordination and alignment across multiple levels of governance to ensure that regional commitments translate into actionable programs on the ground. Together, these multi-level efforts help boost regenerative farming, protect biodiversity, improve livelihoods, and reduce inequalities among and within countries, fostering more equitable management of the region's natural resources and agriculture.

Among Amazonian countries, Brazil has the most emblematic national policy frameworks with demonstrated impact (Hänggli et al., 2023). A good example is the Soy Moratorium, a voluntary private-sector agreement in place since 2006 under which major trading companies pledge not to purchase soy from areas in Amazonia deforested after July 2008. This has led to a 35% to 55% reduction in soy-related deforestation (Heilmayr et al., 2020), illustrating that targeted, time-bound commitments—when backed by strong market pressure and transparency mechanisms—can effectively reduce deforestation. The achievement was made possible by advances in satellite-based deforestation monitoring and spatially explicit supply chain tracking that enabled verification of compliance and created

reputational risks for non-compliant actors. The agreement has contributed to decoupling soy expansion from direct deforestation in Amazonia (Heilmayr et al., 2020). But evidence of leakage into other regions indicates that soy-driven land conversion remains a major challenge (Gibbs et al., 2015; Zu Ermgassen et al., 2020).

More recently, other Amazonian countries have also developed promising initiatives for sustainable agriculture. In Peru, the Low-Emissions Rural Development Strategy, created in 2021 by the Regional Government of Ucayali, emphasizes zero-deforestation and low-emissions production systems aligned with Peru's NDCs. The Low-Emissions Rural Development Strategy supports local producers through technical assistance, certification, and market access, serving as a model for subnational climate governance in Amazonia (Gobierno Regional de Ucayali, 2021). In Colombia, The Tropical Forest Alliance launched in 2017, has become a critical platform for coordinating national efforts to eliminate deforestation from key commodity supply chains (Alianza Colombia TFA, 2021). Its first major milestone was the National Zero Deforestation Agreement for the Palm Oil Chain. This was endorsed by producers and supported by national monitoring systems, such as the monitoring system of the government's Institute of Hydrology, Meteorology and Environmental Studies, demonstrating the country's commitment to more sustainable agricultural practices.

There are various international treaties, organizations, and forums that promote coordination and cooperation, including the OTCA and the Belem Declaration (Brazil, 2023), among others (see Annex 1). Financing flows, as outlined in Chapter 1, have also been critical for the region and have increased in recent years. By mobilizing and aligning such financing with environmental and social goals, regional commitments can be translated into actionable programs. Initiatives such as Amazonia Forever, led by the IDB (Chapter 2), exemplify how multilateral financial actors are supporting large-scale efforts that integrate biodiversity conservation, sustainable livelihoods, and inclusive economic growth. One of the program's key pillars is Sustainable Low-Carbon Agriculture, Livestock, and Forestry, which focuses on boosting and conserving sustainable and low-carbon agricultural production systems and promoting the transition to sustainable models of livestock management and forest protection.

12.6 Conclusion: The Need for Tailored, Place-Based Solutions

Amazonia is characterized by an extraordinary diversity of ecosystems, cultures, and production systems. This complexity should be considered in any strategy aimed at fostering sustainable agriculture in the region. Standardized, top-down approaches often produce policies that are disconnected from local realities, resulting in limited effectiveness and elevated social and environmental costs. Instead, tailored, place-based solutions that align production with conservation and strengthen local capacities and markets should be implemented. Agricultural systems adapted to

ecological conditions in Amazonia will respond better to the region's diversity of soils, rainfall patterns, flooding regimes, and biodiversity. Research and investment programs should focus on enhancing productivity in the region through sustainable and efficient land management practices that increase yields without expanding agricultural frontiers, while preserving key ecosystem functions such as water regulation, nutrient cycling, and habitat connectivity.

This chapter highlighted the importance of diversified and regenerative production systems, including agroforestry, silvopastoral practices, and Indigenous agriculture. These systems have significant potential to harmonize food production with climate and biodiversity goals. Their expansion depends on targeted investments in technical assistance, secure land tenure, inclusive rural finance, and the development of equitable value chains. Climate change is reshaping the agricultural landscape of Amazonia. Both smallholders and large-scale producers must adopt climate-smart approaches, such as zero-deforestation commitments, precision agriculture, and traceable, sustainable supply chains, to remain competitive and resilient.

It is important to note that this chapter presents a non-exhaustive overview of agricultural systems across pan-Amazonia. The existing literature remains heavily concentrated on Brazil, which may lead to geographic and thematic biases and does not fully capture the environmental and cultural heterogeneity of less-studied areas such as Suriname and Guyana. Addressing these knowledge gaps is essential for advancing inclusive, evidence-based policy solutions across the entire Amazonia.





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ANNEXES



Annex 1. Institutional Framework and Financing Flows

Henry Alexander Ballesteros, Anderson Caputo, Amancaya Conde, Laura Giles Alvarez, Rodolfo Gomes Benevenuto, Carolina Lembo, David Margolis, Valentina Marquez, Daniel Moura da Costa Teixeira, Rafael Palma Ribeiro, Orlando Cesar de Souza Lima & Alexander Vasa.

The diverse actors and their varied roles in Amazonia make it difficult to fully track financing flows (Juelsgaard, 2024). Recently, organizations like the IDB, World Bank, OECD, and initiatives such as Aid Transparency Initiative have improved mapping and analysis of these flows. This has enhanced coordination among financiers and increased effectiveness. Additionally, new financing methods, including thematic bonds, PPPs, and public bank coalitions, have boosted funding opportunities and engagement.

Sovereign Financing

Dimensioning the total amount of public funding that is channeled to the protection and sustainable development of Amazonia is difficult. First, it requires identifying the spending executed in Amazonian territory by the different levels of government (central, regional, and local) which is not always easily available. The role of central, regional and local funding depends on the degree of a country's decentralization and political organization. For instance, in Suriname and Guyana, funding primarily comes from the national budget, whilst in Brazil, it depends in large part on State budgets (subnational). In addition, there are still extensive geo-referenced information gaps in public spending at the different levels of government which limit the ability to assess the specific impact of the aggregated public spending in each location. The 2025 Colombian National State Budget, for example, allocates $1.5 billion (less than 0.1% of this budget) to specific agencies for the sustainable development of Amazonia. But this is one of the very few earmarked budget lines for the region. The state also allocated $285.7 trillion to the Ministry of Environment (0.2% of the budget), of which $50.5 million was allocated specifically to Amazonia.[126] One cannot rule out that other budget items within the Ministry were also allocated to, or overlap with, programs related to the region.

In addition, even if this georeferenced information exists, the aggregated public spending data alone does not allow for an assessment of its sufficiency and adequacy. The lack of sufficient functional classification to assess whether spending aligns with what may quality as an Amazonian positive investment is a major challenge. The region lacks consistent operational definitions across countries to distinguish spending with positive or negative impacts in Amazonia, as well as to identify tax expenditures (fiscal incentives) that influence positive or negative outcomes. Without these details, aggregated spending figures are inadequate for determining sufficiency or alignment with conservation and sustainable development goals in the territory and across the pan-Amazonia.

[126] These figures assume an average exchange rate of 4,199.9 USD/COP. See here for more information.

Some Amazonian countries have taken positives steps to close these information gaps. For example, Peru has information available on both direct spending of the central government at the municipal level and direct spending of the intermediate governments at the municipal level with georeferenced information and functional classifications. Other countries like Bolivia, Brazil, Colombia and Peru, have information available on direct spending by municipalities with functional classification. Amazonian countries are working together in the context of the network of Ministries of Finance and Planning of the Amazonia on issues related to Amazonia budget tagging, taxonomies and common frameworks such as the Amazonia Bonds Investment Guidelines – which provides concrete recommendation on eligible investments considering the unique socio-environmental characteristic of Amazonia (Box A.1.). Furthermore, Amazonian countries are developing tools such as climate-change budget tagging to identify climate-relevant expenditures across otherwise conventional budget classifications and advancing together with other Latin American countries in potential common frameworks for biodiversity-related taxonomies.

Public Development Banks, financial institutions tasked with financing public policies on behalf of the state, are also important in funding initiatives for the region. While their mandates vary significantly, these banks are generally aligned with international social and environmental standards and goals. A 2024 study by the Green Coalition, an alliance of public development banks from Amazonia countries, found that $185 billion was disbursed in 2023 by more than 15 first-tier public development banks in Bolivia, Brazil, Colombia, Ecuador, Peru, and Suriname. Of this sum, $19.4 billion (10.5%) was allocated to Amazonia, including $7.6 billion in sustainable investments. Within the sustainable portfolio, agriculture and livestock accounted for the largest share (46.2%), while infrastructure, energy, and logistics combined received 9.3% (Coalición Verde, 2024).

Governments in the region are exploring new types of financing instruments to catalyze greater private sector financing flows, including, but not limited to, debt-for-nature swaps, thematic bonds, credit facilities and structured financing instruments.

Debt-for-nature swaps are innovative financial arrangements in which a portion of a country's foreign debt is forgiven in exchange for local investments in environmental conservation. These deals are especially relevant in ecologically sensitive regions, such as Amazonia. For example, in 2023, Ecuador implemented a debt-for-nature swap that enabled the country to repurchase part of its foreign debt and issue sustainability-linked bonds. These are being used to finance a dedicated conservation fund that supports forest and marine ecosystem protection in Amazonia (IDB, 2024).

BOX A.1

Amazonia Bonds

Sovereign bonds for initiatives in Amazonia work similarly to traditional government bonds, with added environmental and social objectives that seek to address the urgent need for sustainable development in the region. Funds are raised to finance environmentally beneficial projects, like

reforestation, conservation, and the development of the bioeconomy, or for social purposes, like increasing access to basic infrastructure and supporting Indigenous Peoples, Afro-descendant, and traditional communities.

To enhance transparency and accountability in the use of proceeds, all issuances— including those from the private sector—will be reported on the IDB's open reporting platform, the Green Bond Transparency Platform (IDB, 2025a), enabling stakeholders to track project implementation, environmental and social risk management, and impact. The IDB Group and the World Bank Group have developed guidelines for the issuance of Amazonia Bonds, which tailor sustainable bond criteria to Amazonia's distinct socio-ecological context so that investments are aligned with local priorities (IDB, 2025b). The guidelines, seeking to incorporate best practices, facilitate identification of eligible project categories, exclusion lists, target populations for social categories, and processes for evaluating and selecting projects.

Non-Sovereign Financing

The private sector, including national, regional, and international firms, can contribute to development, boost aggregate productivity, build new knowledge and skills, and play a fundamental role in the protection of the environment in Amazonia. To date, the extent of this source of funds is still unknown. For these actors to effectively engage in the region, public policies, innovative financial instruments (such as Amazonia Bonds, among others), and coordination mechanisms must be in place to generate the incentives and mechanisms to align productive activity with sustainable, inclusive, and green practices (Echeverrey et al., 2024). Innovative instruments, such as credit facilities and PPPs, can make a significant difference in this regard.

Credit facilities for Amazonia are structured financial mechanisms that channel funds from international donors, multilateral banks, and private investors into local projects for environmentally and socially responsible development (see Box 5.2.). The Green Coalition, for example, seeks to mobilize $10 billion to $20 billion in the region between 2024 and 2030. Brazil's EcoInvest program (Box A.2.) is also raising significant funds, including over $ 13 billion already mobilized in the first two auctions.

BOX A.2

Brazil's *EcoInvest* Program

Brazil's EcoInvest program, launched under the Novo Brasil ecological transformation plan, exemplifies catalytic financial innovation.[127] It seeks to address the financing gap by integrating public, private, and multilateral financing to promote investments in sustainable projects. The program serves as a global model for mobilizing resources, addressing currency risks, and targeting high-impact sectors for ecological transformation, and the

[127] The "Novo Brasil" Ecological Transformation Plan is a comprehensive initiative by the Brazilian government aimed at promoting sustainable development through bioeconomy, green energy, and climate adaptation, while aligning economic growth with environmental preservation.

IDB aims through it to encourage private-sector involvement and PPPs critical to scaling up investments in Amazonia.

The program introduces four key credit lines: a blended finance facility, a foreign exchange liquidity line, a derivatives hedge line, and a project preparation line. During its 2024 auction, EcoInvest mobilized $7.8 billion by leveraging public and private capital to support investment-ready, climate-resilient projects in areas such as green infrastructure and the bioeconomy (Brazil, 2023). The second EcoInvest auction mobilized over $5.5 billion for the recovery of degraded lands (Brazil, 2025) and includes the Amazonia biome. The third one is expected to focus on promoting foreign exchange hedged foreign equity for early-growth and early-stage investments, while the fourth auction will focus exclusively on the Amazonia Region. In the auctions, financial institutions are selected on a competitive bidding process based on pre-established criteria and their commitments to: (i) mobilize private investments; and (ii) distribute the combined resources towards eligible projects aligned with the auction's eligibility and prioritization criteria.

EcoInvest represents a paradigm shift in climate finance by blending public, private, and multilateral funding to accelerate Brazil's ecological transformation. By creating favorable investment conditions, reducing financial risks, and fostering a network of international investors, it is poised to drive sustainable development in Amazonia while positioning Brazil as a global leader in green finance.

Structured financial instruments, increasingly prominent in Amazonia's financial ecosystem, are designed to attract both public and private capital for sustainable development, while managing the region's unique risks. They are often complex, combining different sources of funding and risk-sharing mechanisms. They include bonds (discussed above), blended finance, guarantees and risk-sharing mechanisms, results-based financing, and PPPs, among others (see Box A.3. for more information). Brazil leads worldwide on tools such as Receivables Investment Funds, Agribusiness Receivables Certificates. Whereas it is a regional pioneer in Private Equity Funds, and Exchange Traded Funds, many of which are now incorporating environmental, social, and governance criteria (International Financial Corporation, 2024; IDB, 2023g).

BOX A.3

Public-Private Partnerships (PPPs)

PPPs can play an important role in addressing existing barriers and unlocking new investment opportunities. The private sector can play a bigger role in sustainably managing public forests and protected areas and supporting activities related to the management of environmental assets (Lembo et al., 2025). Public-private cooperation can also enhance land

tenure security and economies of scale, as well as government assistance in infrastructure development and risk mitigation through underwriting mechanisms (Löfqvist, Garrett, and Ghazoul, 2023).

Amazonian countries have accumulated experience in recent decades with certain kinds of PPPs, especially forest concessions for timber production (van Hensbergen 2018; FAO and European Forest Institute, 2018; Löfqvist and Ghazoul, 2019; Pereira, et al., 2024). Data from the IDB shows that today more than 150 projects are either operating or have the potential for development, in countries with a PPP regulatory framework, including in Brazil, Colombia, Ecuador, Guyana, Peru, and Suriname. Sustainable forest management forms the cornerstone of these efforts, complemented by others in ecotourism and nature-based restoration and conservation (IDB, 2025).

The IDB is spearheading numerous of its own initiatives. Its approach unites efforts to conserve and sustainably manage public forests, parks, and natural areas with a collaborative project alongside BNDES and the Brazilian Forest Service that targets the rehabilitation of degraded areas through forest concessions and payment for environmental services. The IDB is also conducting diagnostic studies, such as those at Peru's Tambopata National Reserve, to evaluate the land's potential and the socio-environmental factors needed to support innovative PPP models. And it is exploring a flexible guarantee instrument to lower capital costs and mitigate risks for Brazil's inaugural public concession for forest restoration at the Triunfo do Xingu Restoration Unit. All these efforts are backed by robust technical-legal reviews, market research, and economic-financial modelling with support from Amazonia Forever.

Other Types of Financing

Donor financing is considerable in the Amazonia Region. But it is difficult to quantify its full extent, given the lack of mapping for sectors and territorial scope.[128] Nonetheless, the IDB's Amazonia Forever Partner's platform estimates that from 2022–2024 donors committed $7.6 billion to support the basin's protection, sustainable management, and social and economic development. Despite the fact that these commitments are substantial, however, they only meet a small part of the region's financing needs—enough to keep 80% of the Brazilian Amazonia under protection (based on figures provided previously). The bulk of donor funding, around $3.9 billion, was allocated to economic development programs, with about $1.7 billion going to social development interventions. Conservation initiatives received $1.3 billion, far below the amount needed to keep just 80% of the Brazilian Amazonia protected.

From 2022-2024, multilateral financing for sustainable development in Amazonia amounted to 82% of donor financing flows during this period. MDBs were one of the most important sources. The IDB Group, through Amazonia Forever, directed nearly $3.2 billion for Amazonia programs through a combination of grants, loans, equity investments, bonds, and guarantees (the IDB Group's Amazonia portfolio is more than $5 billion). FONPLATA currently has more than $200 million invested in the

[128] Most of the information relating to financing flows in this section is obtained from the Amazonia Forever Partner's Platform.

Amazonia Region, and there are a number of multi-donor trusts and funds working there. Additionally, from 2020-2022, the World Bank Group, through the Amazon Sustainable Landscapes Program, invested around $150 million in programs that are largely focused on environmental protection and conservation (Juelsgaard, 2024).

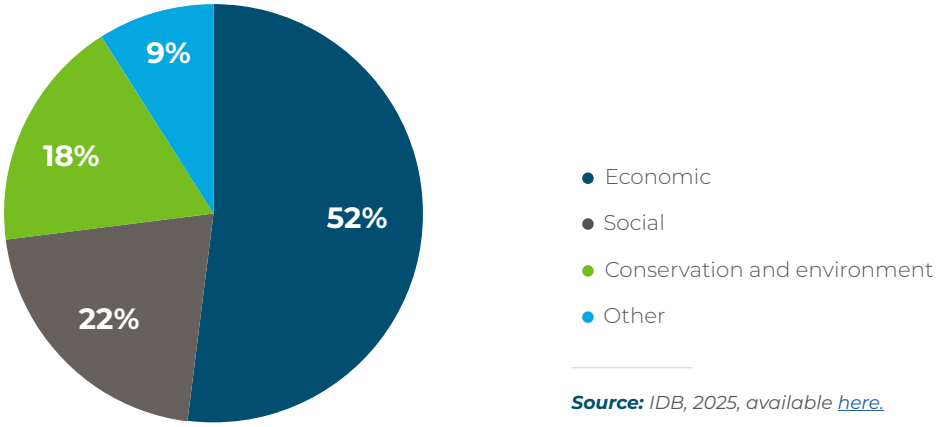
Between 2022 and 2024, bilateral financing for sustainable development in Amazonia was estimated at $1.2 billion, 16% of the total financing flows to the region during this timeframe. Norway, Germany, the US, the UK, and France provided most of that funding.

The entry of large private foundations—most notably the Bezos Earth Fund in 2020—has complemented non-governmental organizations (NGOs) and propelled philanthropic actors into a more prominent role in the region. Their non-reimbursable financing for conservation and sustainable management in Amazonia between 2022 and 2024 reached 2.3% of donor financing. The Gordon and Betty Moore Foundation and the Bezos Foundation were among the biggest contributors.

Financing from multilateral, bilateral and philanthropic actors between 2022 and 2024 flowed principally to larger countries, with Brazil receiving the most funds (53.2%), followed by Colombia (15%), Bolivia (9.7%), and Ecuador (9.2%). Suriname and Guyana combined received 5.9%, and Peru received 2.6%. Regional projects accounted for 4.2% of the flows. National governments got the bulk of the funds (41.1%), followed by private sector/entrepreneurs (32.4%), and NGOs (26.5%).

FIGURE A.1.

Donor Funds by Sector 2022-2024



Source: *IDB, 2025, available here.*

A Complex Institutional Structure

Financial flows are still far too few for the monumental task of closing the immense development gaps of the region and guaranteeing the conservation of its natural patrimony. A complex and vast institutional framework only exacerbates the challenge, often leading to inefficiencies and duplication that render policies and programs less effective and complicates the mission of channeling funding to common development initiatives through the region.

The institutional framework in the region is intricate. There are multiple administrative layers across the eight countries, each with its own legal frameworks, mandates, capacities, priorities, and degree of decentralization. In each of the countries in the region, for example, the institutional landscape includes not only national state actors, but also subnational and other entities, such as state-owned companies, independent agencies, and research institutes. Figure A.3. shows the main categories of subnational administration tiers by country. There are 99 first-level units and more than 1,500 second-level administrative units (Figure A.2.).

FIGURE A.2.

Administrative Units in Amazonian Countries

BRAZIL
- States
- Municipalities

BOLIVIA
- Departments
- Municipalities

COLOMBIA
- Departments
- Municipalities

ECUADOR
- Provinces
- Cantons

GUYANA
- Regions
- Municipalities

PERU
- Regions
- Provinces

SURINAME
- Districts
- Resorts

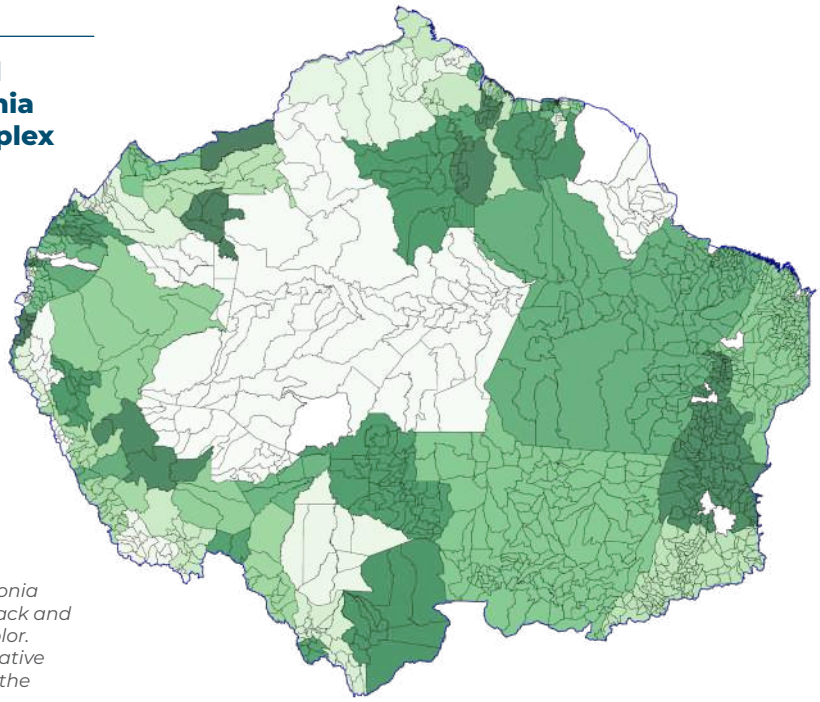
VENEZUELA
- States
- Municipalities

Source: *Authors' elaboration.*

FIGURE A.3.

The Institutional Setup in Amazonia is Vast and Complex

Subnational Governments in Amazonia



Note: *ADM2 in the Amazonia Region are outlined in black and ADM1 are identified by color.*
Source: *GADM administrative data and RAISG data on the Amazonia Region.*[129]

[129] Administrative data available here and layer for the Amazonas River Basin available here.

Service provision varies depending on the type of governance model in place and whether it is more centralized or decentralized. At the national level, several ministries—such as the ministries of education, health, transportation, and finance—coordinate nationwide public policies. Subnational entities, such as states, departments, provinces, or municipalities, play varying roles in implementation and service delivery. For example, in Brazil, municipalities are responsible for primary education and basic health services; states manage secondary education and more complex healthcare; and road infrastructure is the joint responsibility of both municipal and state governments (Lopreato, 2022). In contrast, in countries like Suriname, the central government ministries directly manage key sectors like education, healthcare, and road construction.[130]

National and subnational government institutions also interact with other key state and civil society organizations. COICA, for example, represents groups of Indigenous Peoples across the eight Amazonia countries.[131] Coordinating actions across such diverse institutional settings requires navigating not only national boundaries but also overlapping jurisdictions and divergent policy agendas at the subnational level. Adding to this complexity is the large number of donors and financiers, including multilateral development organizations, each with their own strategic priorities, conditionalities, and operational modalities. While their support is essential, the heterogeneity of these actors' objectives and requirements often makes alignment across stakeholders—both public and external—an additional and critical challenge for effective regional action in Amazonia.

[130] See here, here, here and here for more information.
[131] See here for more information.

Annex 2. Data and Methodology

Alexandre Bagolle, Laura Goyeneche, Gabriela Perin & Luis Hernán Vargas Faulbaum

Poverty

Poverty estimates from eight countries were analyzed: one at the national level, one at the departmental level, and six at the municipal level (Table A.1.), to assess poverty percentages in areas with high ecosystem value and degradation. Guyana used a national-level poverty rate due to a lack of regional variability. Poverty data for six countries come from official government sources, the World Bank, IDB, or peer-reviewed studies, employing regression, small-area estimation, or Bayesian geospatial models. For two countries lacking poverty maps, the Unsatisfied Basic Needs Index, based on housing and demographic criteria from census data, served as a proxy. While useful, Unsatisfied Basic Needs can underestimate poverty by overlooking households with low incomes but adequate housing (Feres & Mancero, 2001). Future poverty maps will improve data consistency.

Table A.1. | Poverty Data Availability

Country	Year	Data Source	Type	Level
Bolivia	2010	UDAPE (2010)	Poverty map	Provinces
Brazil	2010	DATASUS (2010)	Poverty map	Municipalities
Colombia	2019	DPS and ECLAC (2021)	Poverty map	Municipalities
Ecuador	2014	Molina et al. (2014)	Poverty map	Canton
Peru	2019	Banco Mundial (s.f.)	Poverty map	Country
Guyana	2017	INEI (2017)	UBN	Provinces
Suriname	2020	Beuermann et al. (2018)	Poverty map	Districts

Source: *Author's elaboration. UBN refers to the Unsatisfied Basic Needs Index. Poverty maps represent income-based poverty at administrative levels 1 (departments) or 2 (municipalities). For Guyana, country-level data were used.*

Ecosystem Services

To identify areas of high ecosystem value, we used multiple layers, including ecosystem services data from Stanford's Natural Capital World Viewer and critical environmental asset data (Chaplin-Kramer et al., 2022). Areas of ecosystem value are defined as those with a concentration of natural capital in the highest quartile. Areas with the highest concentration of natural capital, also known as critical environmental assets, are defined as the natural and semi-natural terrestrial and aquatic ecosystems necessary to maintain the Nature Contributions to People at both the local and global levels. At the local level, 12 Nature Contributions to People are considered, including, for example, nitrogen and sediment retention, crop pollination, timber production, and fish stocks for fisheries. At the global level, two Nature Contributions to People related to climate regulation are considered: carbon storage in terrestrial ecosystems and vegetation-regulated recycling of atmospheric moisture.

Degradation

Weekly satellite imagery data (Normalized Difference Vegetation Index) from 2002 to 2022 published by Google Earth were analyzed at a 500m resolution. Two indicators were calculated: the Normalized Difference Vegetation Index average and the Normalized Difference Vegetation Index trend. The Normalized Difference Vegetation Index average is the 20-year mean value, and the Normalized Difference Vegetation Index trend measures vegetation changes over time, accounting for seasonal variations. Negative values indicate degradation, near-zero values represent stability, and positive values show improved vegetation health. Extreme values were normalized to -1 (negative) and 1 (positive). Subnational averages were classified as: (i) very high degradation (-1 to -0.5), (ii) high degradation (-0.5 to 0), (iii) low degradation (0 to 0.5), and (iv) very low degradation (0.5 to 1).

Annex 3. Amazonian Indigenous Peoples by Country

Ellen Acioli, Paula Ayala, Juanita Bernal, David Cotacachi, Amancaya Conde & Verónica Tejerina

Table A.2. | Key Indigenous Groups by Country

Country	Indigenous peoples
BOLIVIA (28)	Araona, Ayoreo, Baure, Canichana, Cavineño, Cayubaba, Chacobo, Chiquitano, Esse Ejja, Guarasugwe, Guarayo, Itonama, Joaquiniano, Leco (piedemonte amazónico, norte de La Paz), Machineri, Maropa (Reyesano), Mojeño (Mojeño-Trinitario, Ignaciano, Loretano), Moré, Mosetén (zona yungueña, transición amazónica), Movima, Pacahuara, Sirionó, Tacana, Tsimane (Chimán), Yaminahua, Yuki, Yuracaré, Yuracaré–Mojeño. (Instituto Nacional de Estadística de Bolivia, 2013). **Indigenous Peoples in Isolation and Initial Contact:** Toromona (IPIA), Ayoreo/Ayoréode (IPIA), Mbya-Yuki (IPIA), Pacahuara (IPIA), and Esse Ejja (IPIA) (n = 5) (IDB, 2015).
BRAZIL (201)	Aikanã, Aikewara, Akuntsu, Akuriyó, Amanayé, Amondawa, Anambé, Aparai, Apiaká, Apinayé, Apurinã, Arapaso, Arapium, Arara, Arara Shawãdawa, Arara da Volta Grande do Xingu, Arara do Rio Amônia, Arara do Rio Branco, Araweté, Arikapú, Aruá, Ashaninka, Asurini do Tocantins, Asurini do Xingu, Avá-Canoeiro, Awa Guajá, Aweti, Bakairi, Balatiponé (Umutina), Banawá, Baniwa, Barasana, Bará, Baré, Boe (Bororo), Borari, Canela Apanyekrá, Canela Memortumré, Chiquitano, Cinta Larga, Deni, Desana, Djeoromitxí, Dâw, Enawenê-nawê, Galibi Kali'na, Galibi-Marworno, Gavião Akrãtikatêjê, Gavião Kykatejê, Gavião Parkatêjê, Gavião Pykopjê, Guajajara, Guarani, Guarasugwe, Guató, Hixkaryana, Hi-merimã, Huni Kuin (Kaxinawá), Hupda, Ikolen, Ikpeng, Ingarikó, Iny Karajá, Iranxe Manoki, Jamhadi, Jarawara, Jaraqui, Jiahui, Juma, Javaé, Ka'apor, Kahyana, Kaixana, Kalapalo, Kamaiurá, Kanamari, Kanela do Araguaia, Kanoê, Karajá do Norte, Karapanã, Kararayana, Karipuna de Rondônia, Karipuna do Amapá, Karitiana, Karo, Kassupá, Katukina do Rio Biá, Katukina Pano, Katxuyana, Katuenayana, Kawaiwete (Kaiabi), Kawahiva, Khisêtjê, Krenak, Krenyê, Krepynkatejê, Krikatí, Kujubim, Kuikuro, Kulina, Kulina Pano, Kuntanawa, Kuripako, Kuruaya, Kwazá, Macuxi, Makuna, Makurap, Manchineri, Marubo, Matipu, Matis, Matsés, Mebengôkre (Kayapó), Mehinako, Menky Manoki, Migueleno, Miranha, Mirity-tapuya, Munduruku, Mura, Nadöb, Nahukwá, Nambikwara, Naruvotu, Nawa, Nukini, Oro Win, Panará, Parakanã, Parintintin, Paresí, Patamona, Paumari, Pirahã, Piripkura, Pira-tapuya, Puyanawa, Puruborá, Rikbaktsa, Sakurabiat, Sateré

Mawé, Shanenawa, Siriano, Surui Paiter, Tabajara, Tapajó, Tapayuna, Tapirapé, Tariana, Taurepang, Tembé, Tenharim, Terena, Ticuna, Tikmu'un (Maxakali), Tiriyó, Torá, Trumai, Tsohom-dyapa, Tukano, Tunayana, Tupari, Turiwara, Tuyuka, Uru-Eu-Wau-Wau, Waimiri Atroari, Waiwai, Wajãpi, Wajuru, Wapichana, Warekena, Wari', Wauja, Wayana, Witoto, Xavante, Xerente, Xikrin Mebengôkre, Xipaya, Xowyana, Xowyana, Yaminawá, Yanomami, Yawalapiti, Yawanawá, Ye'kwana, Yudja, Yuhupdeh, Yura, Zo'é, Zoró, Zuruahã. (Instituto Socioambiental, 2025).

Indigenous Peoples in Isolation and Initial Contact: PIA da TI Ituna Itatá, PIA do Rio Alto Jutaí, PIA do Rio Quixito, PIA do Rio Jandiatuba, PIA Korubo, PIA Kanamari, PIA do Igarapé São José, PIA Hi-Merimã, PIA do Jacareuba/Katawixi, PIA Piriti, PIA do Riozinho/Envira, PIA das cabeceiras do rio Jaminaua, PIA do Alto Tarauacá (TI Alto Tarauacá), PIA das cabeceiras dos rios Muru e Boiaçu, PIA do Alto Iaco (prováveis Mashco-Piro do Peru), PIA Mashco do Rio Chandless, PIA Mashco e isolados do Rio Envira, PIA do Alto Rio Humaitá, PIA do Rio São Simão (Massaco), PIA do Bananeira, PIA do Rio Cautário, PIA Kawahiva do Rio Muqui, PIA da TI Tanaru, PIA do Rio Pardo, PIA da TI Piripikura, PIA da TI Arariboia, PIA dos Igarapés Presidio e Juriti, PIA da Serra da Estrutura (n=28), +72 não identificados (IDB, 2015).

COLOMBIA (56)

Andoke, Bara, Barasano, Bora, Cabiyari, Yuri (Carabayo), Carapana, Carijona, Cocama, Coreguaje, Cubeo, Curripaco, Baniba, Desano, Guanano, Jiw, Inga, Kamëntsa, Cofán, Letuamo, Makaguaje, Makuna, Nukak-Maku, Kakua, Hupdu, Juhup, Judpa, Maku, Masiguare, Matapí, Jurumi, Miraña, Nonuya, Ocaina, Piapoco, Piaroa, Piratapuyo, Pisamira, Puinave, Siona, Siriano, Taiwano, Tanimuka, Tinigua, Tatuyo, Tariano, Tikuna, Tsiripu, Tukano, Tuyuka, Murui (Witoto), Muinane, Yagua, Yauna, Yukuna y Yuruti. (Departamento Administrativo Nacional de Estadística, 2025).

Indigenous Peoples in Isolation and Initial Contact: Yuri-Aroje/Carabayo-Caraballo, plus three unconfirmed groups (IDB, 2015).

ECUADOR (11)

Achuar, Andwa, Kichwa Amazónico, Kijus, Kofán, Secoya/Siekopai, Shiwiar, Shuar, Siona, Waorani, Zápara. (Confederación de Nacionalidades Indígenas de la Amazonía Ecuatoriana, 2025).

Indigenous Peoples in Isolation: Tagaeri, Taromenane (n=2).

GUYANA (9)

Akawaios/Kapon, Arawaks/Lokonos, Arekunas/Kamarakoto, Karinya/Caribs, Makushis/Macuxi, Patamonas, Wai Wais, Wapishanas, Warraus (Wenner, Bollers, Clarke, & Johnny, 2019).

PERU (45)

Asháninka, Awajún, Kichwa, Kukama Kukamiria, Shawi, Shipibo-Konibo, Ashéninka, Achuar, Yagua, Matsigenka, Yanesha, Wampis, Urarina, Kandozi, Tikuna, Yine, Nomatsigenga, Murui-Muinani, Matsés, Harakbut, Cashinahua, Kakataibo, Bora, Mastanahua, Kapanawa, Yaminahua, Secoya, Madija, Sharanahua, Shiwilu, Maijuna, Ikitu, Amahuaca, Ese'ejá, Ocaina, Nahua, Kakinte, Arabela, Resígaro, Quechuas (de la Amazonía), Marinahua, Chapra, Chamicuro (Instituto Nacional de Estadística e Informática, 2018).

Indigenous Peoples in Isolation and Initial Contact: Kakataibo, Mashco-Piro, Kugapakori, Nahua, Nanti, Matsiguenkas, Iscobákebu, Arawak-hablantes, Kakinte, Pano-hablantes, Matses, Kirineri, Murunahua, Chitonahua, Amahuaca, Ishconahua, Mastanahua, Cacataibo, Matsés - Iscobákebu, Matsés-Mayoruna-Iscobákebu, Kapanawa, Arabela, Pananujuri, Taushiro, Taromenane, Iquito-Cahua (n=26) +other unidentified groups (IDB, 2015).

SURINAME (4)

Kaliña (Karinya/Caribs), Arawaks (Lokono), Trio (Tirio/Tareno), Wayana (IWGIA, 2022).

VENEZUELA (25)

Akawaio, Arekuna, Baniva, Baré, Curripaco, Eñepa (Panare), Hoti, Jivi, Kamarakoto (subgrupo Pemón), Mapoyo, Panare, Pemón, Piaroa (includes Uwottüja/Wotjuja), Piapoco, Puinave, Sanemá, Sanumá, Sapé, Shiriana, Taurepan (subgrupo Pemón), Warekena, Yabarana, Yanomami, Yekuana (Maquiritare), Yeral. (Wataniba – Grupo de Trabajo Socioambiental de la Amazonía, 2025; International Work Group for Indigenous Affairs, 2019).

Indigenous Peoples in Isolation and Initial Contact: Jödi/Hoti/Hodï, Uwottüja/Piaroa, Yanomami, E'ñepá/Panare (n=4) (IDB, 2015; Wayamoutheri, 2025).

Source: *Author's elaboration based on multiple sources. Note: Due to the absence of a unified orthographic standard, the names of the same Indigenous people may appear with different spellings or be referred to by alternative terms (e.g., exonyms). Moreover, the names of some Indigenous Peoples may appear more than once, particularly in the case of trans-boundary groups or those in situations of mobility or migration. In the event of discrepancies, it is recommended to consult primary sources or the self-identification recognized by Indigenous Peoples.*



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