

NEARING THE TIPPING POINT

Drivers of Deforestation in the Amazon Region

By Matt Piotrowski
Introduction by Enrique Ortiz

Foreword

I am proud to present “Nearing the Tipping Point: Drivers of Deforestation in the Amazon Region” a report by Matt Piotrowski, senior analyst at Climate Advisers, with an introduction by Enrique Ortiz, program director at the Andes Amazon Fund.

The Amazon rainforest is one of our planet’s most important ecosystems. An indispensable asset in regulating global climate, it has been estimated to contain 10% of all the biomass on Earth, including vast quantities of carbon that would otherwise linger in our atmosphere, contributing to the greenhouse effect. However, unchecked development is placing the Amazon under threat, pushing forest cover loss to near-record levels throughout the region. This report identifies the key forces driving deforestation in Brazil, Peru, Colombia, Bolivia, and Ecuador, which together contain almost 90% of the Amazon rainforest, and analyzes policies aimed at reducing deforestation. It proposes measures that could be implemented to encourage the sustainable development of the Amazon’s rich resources while ensuring it remains a cornerstone in the fight against climate change and a trove of biodiversity.

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Introduction

BY ENRIQUE ORTIZ

The Amazon River basin is home to the largest tropical rainforest on the planet. Twice the size of India, it spans 2.6 million square miles across Brazil, Peru, Colombia, Venezuela, Ecuador, Bolivia, Guyana, Suriname, and French Guiana. But its impact reaches far beyond South America. The Amazon rainforest plays a critical role as a storehouse of carbon and mediator of the global water cycle, influencing rainfall patterns as far away as the western United States.¹ It holds a greater share of the world's known biodiversity than any other ecosystem. It is also home to millions of people, including uncontacted tribes. However, rising deforestation rates jeopardize the future of this region.

The Amazon Basin is estimated to house at least 10% of the world's known biodiversity.² Given that only a small portion of the basin has been studied, and that new species are discovered daily, some scientists claim it may contain up to 30% of the world's flora and fauna. One in five of the world's bird and fish species are found in the Amazon. A study examining a single hectare in Ecuador identified more than 470 species of tree,³ and famed biologist E.O. Wilson once found 43 species of ant in a single tree, more than those found in the whole United Kingdom.⁴

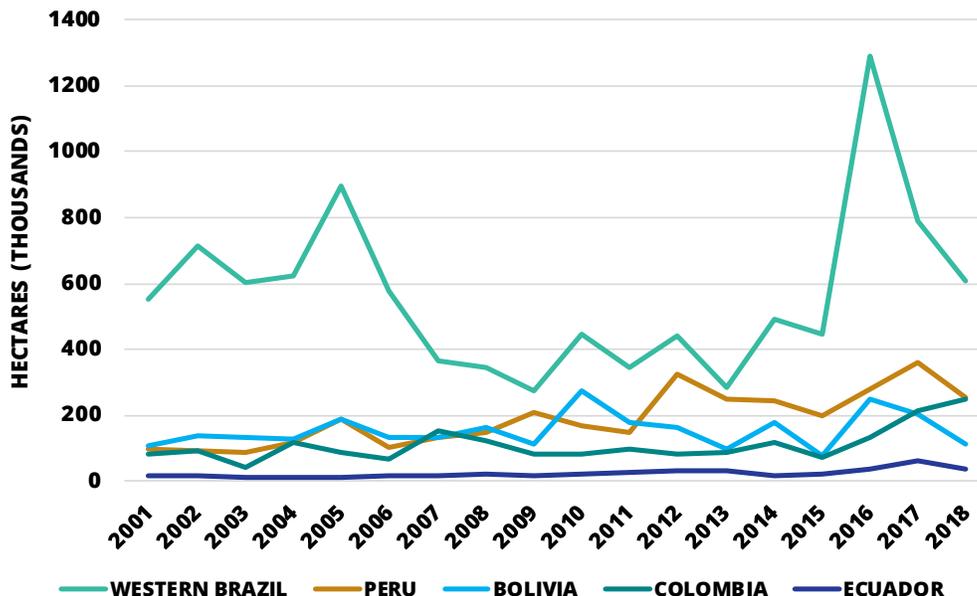
There are also about 30 million people living in the Amazon basin,⁵ and for one million of them, this tropical forest is their ancestral home. Close to 400 ethnic tribes,⁶ each with its own culture and language, are estimated to live in the Amazon. Over 100 tribes live with little or no contact with the outside world, commonly referred to as "uncontacted" or "peoples living in voluntary isolation." Indigenous peoples have property or exclusive use rights in large areas of the Amazon, particularly in Brazil and Colombia. Indigenous territories account for close to 20% of the total area of the basin.⁷ In most of these territories, indigenous peoples live in a traditional way, with practices that minimize forest degradation. Many more non-indigenous people, descendants of migrants, also live in the Amazon.

The Amazon basin is also an important center of economic activity. Large cities like Manaus, Iquitos, and Leticia are vibrant centers for economic development. The region provides important products for the world, such as edible commodities, oil, and minerals. In addition, its variety of life forms may offer key elements for developing new pharmaceutical drugs that could cure illnesses.

In spite of the Amazon's critical role, the forest is being depleted at an alarming pace. Over the last decade, deforestation rates have remained stubbornly high in Peru, Colombia, Ecuador, and Bolivia (see Figure 1) and are rising in Brazil after a previous sharp decline. All countries remain significantly behind on their commitments to

FIGURE 1: AMAZON FOREST LOSS, 2001-2018

Source: MAAP using data from Hansen/UMD/Google/USGS/NASA



reduce deforestation. For consistency, most figures in this report are based on satellite data from Amazon Conservation's Monitoring of the Andean Amazon Project (MAAP). Governments from each of the countries also provide data on deforestation rates, but the reported levels are generally lower, possibly due to less accurate monitoring or the use of different methodologies. The specific locations where deforestation is happening are also troubling (see Figure 2). Forests close to the Andes and other large sectors of the basin are more susceptible to the effects of climate change, such as forest fires. Most Andean Amazonian countries are approaching record deforestation figures.

Deforestation is a major contributor to greenhouse gas emissions: 25% of global emissions result from the clearing and burning of forests worldwide,⁸ and the Amazon holds 60% of the world's remaining rainforests.⁹ Avoiding further deforestation and increasing forest cover are among the most effective ways to fight the impacts of climate change. All Amazonian countries signed on to the 2015 Paris Agreement—which seeks to maintain the global temperature rise to well below 2 degrees Celsius above pre-industrial levels—and all committed to reduce deforestation. But current emissions data shows that these targets are far from being met as deforestation in the Amazon rises.

The trends of rising emissions and a changing climate trigger even further deforestation. Forest loss leads to increasingly drier conditions that could result in forest fires on a massive scale.¹⁰ More worryingly, the Amazon may be approaching a “tipping point.” The basin generates approximately half of its own rainfall by recycling moisture as air masses move from the Atlantic across the basin to the west.¹¹ At some point, deforestation will likely reduce this moisture cycle to a point where it will no longer support rainforest ecosystems. Current science indicates that the tipping point may be at 20-25% of deforestation in Amazonia¹²—and some estimates already place deforestation to date at 20%.¹³ Current deforestation trends and the risk of further forest depletion threaten the survival of vast numbers of plant and animal species as well as the homes and livelihoods of millions of people.

The main causes of deforestation vary between countries in the Amazon and in many cases a chain of events leads to deforestation rather than a single driver. For instance, roads are built or land is illegally seized, opening up areas to make pastures or grow crops.

The agricultural sector is undoubtedly one of the main

drivers across the basin. The sector is a key source of employment, government revenue, and investment in Amazonian countries. Most deforestation occurs for the ultimate purpose of using land for livestock or food crops. But the commodities produced vary widely—from cattle to soy, palm oil, and cacao. Often, land is used inefficiently. In Brazil, improvements in efficiency meant that cattle and soy production rose from 2004 to 2012 even as deforestation declined. However, the recent rise in deforestation in Amazonian countries suggests that sustainable practices are not used widely enough. In addition, companies are not proactive enough in ensuring deforestation-free supply chains. Recent analyses show that deforestation over the last decade has shifted to smaller plots (five to ten hectares), suggesting small-scale farmers are expanding the agricultural frontier.¹⁴

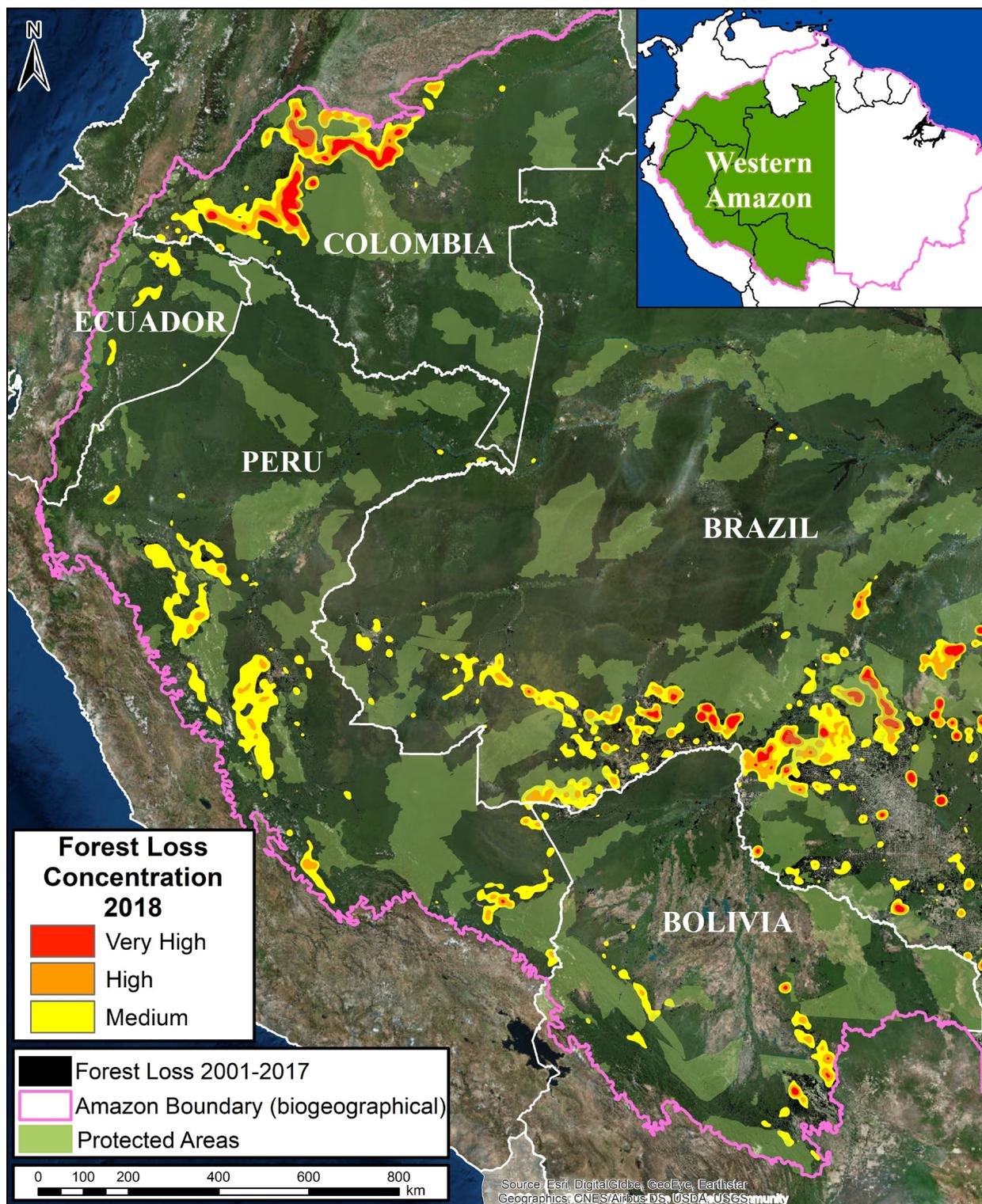
Illicit activity in Amazonian countries is also a challenge, having both direct and indirect impacts on deforestation. Recent studies show that the impacts of illegal or unregulated use of forest resources (logging, hunting, fishing, and wildlife commerce) are much higher than previously thought. It is estimated that up to 70% of wood for commercial use has been extracted illegally in Brazil, Peru, and Colombia.¹⁵ The construction of secondary roads associated with illegal logging operations indirectly causes further destruction, opening the forest to illegal occupation and hunting. In Colombia, 70% of Amazonian deforestation is related to land grabbing driven by mafias linked to illicit activities like drug trafficking and money laundering. Illegal gold mining in rivers and floodplains is a driver of deforestation, even threatening protected areas, particularly in Peru.

Infrastructure development has also resulted in land-use changes, deforestation, and forest degradation in large portions of the Amazon. Transport infrastructure has the largest impact on forests because creating access to previously unconnected areas leads to deforestation around the roads. Roads are often built without proper socio-environmental safeguards and land tenure planning. Energy infrastructure, such as large hydroelectric dams, which require flooding of broad forest areas, is also a driver of deforestation. Although new large hydroelectric dam construction in South America has slowed recently, the Brazilian government has plans to build new dams in the Amazon to meet rising electricity demand. In Ecuador, the government recently opened a protected area in the Amazon to oil exploration and production.

International financial institutions such as the World Bank, Inter-American Development Bank, and CAF Development

FIGURE 2: FOREST COVER LOSS HOTSPOTS IN THE WESTERN AMAZON, 2018

Source: MAAP using data from Hansen/UMD/Google/USGS/NASA, GFW, SERNANP, SNAP, SINAP, SERNAP, RAISG



Bank of Latin America, as well as local development banks such as Brazil's BNDES, have improved their environmental standards. However, Chinese state banks are increasingly providing loans to South American governments for projects that other banks decline to finance because of environmental and social concerns. Chinese banks and companies generally follow local environmental standards, which are often less stringent than those of multilateral development banks. Although not all of its projects may come to fruition, China has very extensive plans for financing and building infrastructure throughout South America through its Belt and Road Initiative.

A lack of oversight, often due to inadequate resources for environmental regulation, is a pervasive challenge in Amazonian countries, and signs suggest this problem is only growing. In his first months in office, Brazil's new president, Jair Bolsonaro, reduced the already strained budgets of national environmental and indigenous offices. In Colombia, the relinquishing of control by the Revolutionary Armed Forces of Colombia (FARC, by its Spanish initials) following the 2016 peace agreement with the government created a vacuum of governability now occupied by other illegal armed groups, resulting in land grabbing and significant deforestation. Weak governments and political instability in Ecuador and Peru have reduced capacity to halt deforestation and related expansion of illegal activities.

Although this picture may seem bleak, there are reasons for optimism. National parks and indigenous reserves have been expanded in all Amazon countries, even doubling and tripling in size in some countries over the last decade. Deforestation rates inside protected areas are significantly lower than those outside. The legal frameworks for protecting forests have improved considerably. And there are numerous successful examples of forest protection, management, and restoration. Perhaps more importantly, civil society organizations, indigenous movements, and government agencies at both the national and subnational levels are collaborating effectively. Though the current trends are worrisome, the region has vast areas under protection and a deeper involvement and commitment from society than ever before. It's not too late to prevent reaching the tipping point and maintain an ecologically and socially vital region that can provide services and support life for present and future generations.

Drivers of Deforestation in the Amazon Region

BY MATT PIOTROWSKI

Brazil

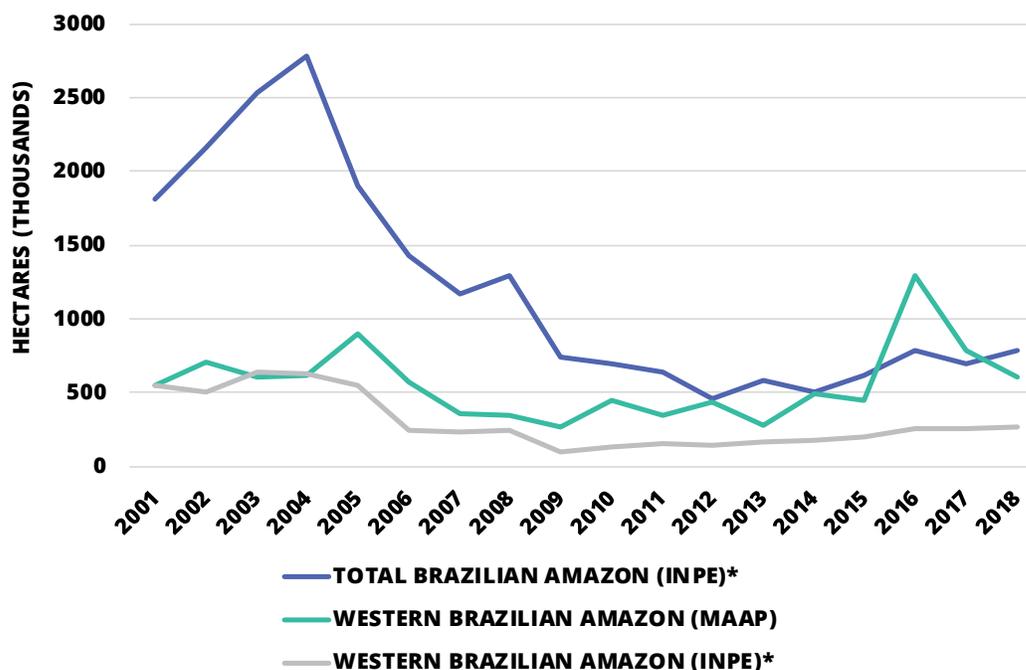
Home to more than 60% of the Amazon region,¹⁶ Brazil has long been a focal point in efforts to combat climate change. After a successful campaign reduced deforestation rates by 80% between 2004 and 2012, deforestation has been on the rise once more since the 2012 loosening of Brazil's Forest Code.¹⁷ Deforestation in the entire Brazilian Amazon in 2018 was 14% higher than 2017¹⁸ (see Figure 3), according to preliminary data from the Brazilian government's National Institute for Space Research (INPE, by its initials in Portuguese), which estimates that 790,000 hectares in the Amazon were cleared over the period. MAAP, the data source used throughout this report, currently only has data for the western Brazilian Amazon, and those figures are much higher than government figures for the same region.

Rising deforestation comes in spite of Brazil's pledge in 2015 under the Paris Agreement to eliminate illegal deforestation in the Amazon by 2030 and restore 12 million hectares of forest by that date. Climate Action Tracker, which provides independent research on country commitments, labels Brazil "insufficient" in meeting its Paris target of reducing emissions to 43% below 2005 levels in 2030.¹⁹ Based on current policies, CO₂ emissions are projected to reach approximately 2 billion tons per year by 2030, placing them at the same level as in 2005.²⁰ Government figures suggest that deforestation is already more than 40% above the country's target. In this context, it appears that Brazil will fail not only to reduce the trend in deforestation but also to meet its Paris goals.

The trend of rising deforestation rates began under President Dilma Rousseff's administration (2011-2016) with the 2012 weakening of Brazil's Forest Code, which included the removal of deforestation restrictions, a loosening of the permitting process, and amnesty for illegal deforestation prior to 2008, which some have argued created an expectation for similar pardons in the future.²¹ Her successor, Michel Temer, curbed protections for the environment and indigenous peoples by slashing the Ministry of the Environment's budget along with funding for enforcing laws to protect rainforests.

FIGURE 3: FOREST LOSS IN THE BRAZILIAN AMAZON, 2001-2018

Sources: MAAP (using data from Hansen/UMD/Google/USGS/NASA) and INPE. MAAP data refer to forest loss, INPE data to deforestation. *2018 data preliminary.



Many expect this increase in deforestation to accelerate under President Jair Bolsonaro, who is dismissive of climate change and relied heavily on the support of the *bancada ruralista* (the large bloc of legislators allied with agribusiness) during his campaign. Among Bolsonaro's first acts after taking office on January 1, 2019, was to shift the power to demarcate and oversee indigenous lands from the National Indian Foundation (Funai, by its Portuguese acronym) to the Ministry of Agriculture,²² which is run by Tereza Cristina, formerly a member of the agribusiness caucus in the lower house of Brazil's legislature. Indigenous reserves play an important role in Amazon preservation in Brazil, accounting for 13% of its territory.²³ Bolsonaro also reassigned the Brazilian Forest Service, which is responsible for the implementation of the Rural Environmental Registry (CAR, by its initials in Portuguese) from the Ministry of Environment to the Ministry of Agriculture.²⁴ The CAR is a mechanism for tracking which rural property is designated for conservation versus cultivation and enforcing the Forest Code using satellite imaging. The Forest Service's new head, a former legislator, has been one of the most active opponents of the CAR, and his appointment has been decried by environmental groups as the final dismantling of the Forest Code.²⁵ Brazil's environmental agency (Ibama, by its Portuguese acronym) remains under the Ministry of the Environment but is undergoing a similar weakening. For example, it is revising its environmental

licensing process so that rural property owners can grant themselves a license electronically,²⁶ and Bolsonaro has signed a decree allowing environmental fines to be replaced by environmental recovery and conservation actions.²⁷ Finally, the administration has ambitious plans for infrastructure expansion and has announced several major bridge, road, and dam projects in the Amazon.²⁸

DRIVERS OF DEFORESTATION IN BRAZIL

The conversion of forests to pastures and plantations for commodity production is a major driver of deforestation in Brazil. From production and trade to sourcing by retailers, the agricultural commodities industry leaves a large environmental footprint. In some cases, illegal land speculation creates a domino effect: land is cleared illegally to increase its value with the intention to sell. The cleared land is then used for cattle grazing or commodity production. Limited certification and lack of transparency make accountability and traceability difficult.

Cattle ranching is the sector with the greatest impact on Amazon deforestation in Brazil. Indeed, estimates suggest that 80% of deforestation throughout the entire Amazon stems from this industry, either directly or indirectly.²⁹ Approximately 75 million hectares have been deforested for cattle ranching in the Brazilian Amazon, where nearly 40% of the country's cattle herd are located. Demand for

Brazilian beef comes from both domestic and foreign markets. Although 80% of the country's beef supply is consumed domestically, Brazil also has positioned itself as the largest exporter of beef in the world. And its overseas market is only growing—in 2018, the beef industry shipped 1.64 million tons to foreign countries, a 10% increase over 2017, with China and the Middle East as top buyers. All told, Brazil's livestock farming sector accounts for more than 7% of the country's GDP and almost one third of agribusiness GDP. Although beef from the Amazon is not usually exported, the increase in volumes sent to international markets from southern regions of the country translates to more land used in the Amazon for domestically consumed cattle. The combination of cheap labor, low operating costs, and access to roads and other transport infrastructure facilitates the expansion of cattle ranching in the Amazon.

However, despite strong demand, between 2008 and 2012, deforestation actually declined as cattle and soy production expanded (see Figure 4). This suggests that deforestation is not necessary for agricultural operations to grow—farmers can tap underutilized land and improve efficiencies instead of clearing forests.

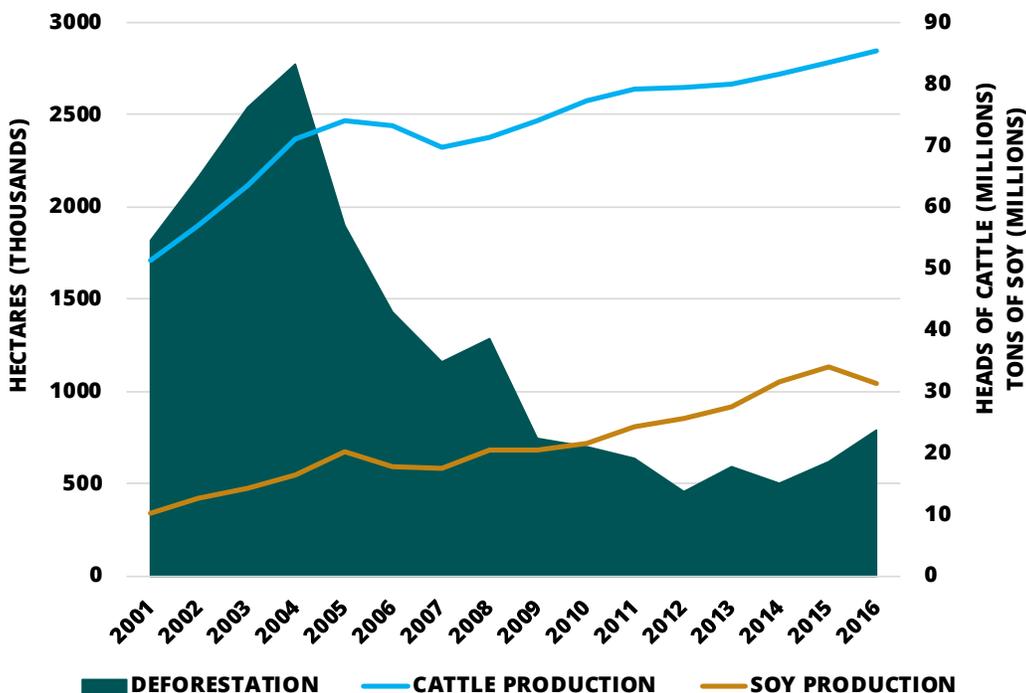
Numerous companies operating along the cattle supply chain in Brazil have established goals to monitor activity in order to reduce deforestation. However, deforestation

persists in part due to “leakage” supply (products that are tied to illegal activity or environmental damage) as well as lack of sufficient monitoring by companies.³⁰ Many Brazilian retailers source, directly or indirectly, from slaughterhouses in the Amazon where there are high levels of deforestation.³¹ Approximately 30% of capacity is operated by slaughterhouses in the Amazon that have not signed Terms of Adjustment of Conduct (TACs)—agreements to prevent illegal deforestation—with the government. But even supply sheds that have signed TACs are still connected to deforestation.³² From 2010 to 2015, more than eight million hectares of deforestation were linked to slaughterhouses that signed TACs, highlighting industry obfuscation and difficulty with government oversight.³³

Rising production of soy is a more limited but still important driver of deforestation in the Brazilian Amazon. Soy production growth connected to deforestation is more prominent in the Cerrado,³⁴ a tropical savannah in the central regions of the country. However, recent shifts in global trade and weaker government regulations and enforcement have also put the Amazon at risk. For the 2017-18 marketing year (September to August), Brazil led global production at 122 million tons, marking a major milestone as it surpassed the United States as the world's top producer. Approximately 13% of Brazil's soy

FIGURE 4: DEFORESTATION AND SOY AND CATTLE PRODUCTION IN BRAZIL, 2001-2016

Sources: INPE (deforestation), Brazilian Institute of Geography and Statistics (IBGE) (soy and cattle production)



crop comes from the Amazon.³⁵ In the past year, Brazilian production has risen as a result of currency depreciation and the declining competitiveness of US farmers due to the tariff dispute with China. This opening provided Brazilian exporters with greater access to China, the largest market in the world. Brazil now ships almost 80% of its soy exports to China.³⁶

Following past improvements in environmental management, there are signs that the soy industry's impact on deforestation may increase once again. Aprosoja, an influential group that represents the soy industry, supports Bolsonaro and has encouraged him to loosen processes for producers to obtain permits in rainforest areas and restrict the naming of new territories for indigenous peoples.

More promisingly, however, major traders and retailers along the Brazilian soy supply chain are playing a role in limiting deforestation in the Amazon. The 2006 Soy Moratorium, under which soy buyers committed not to purchase from suppliers that deforested land for production, played a large role in reducing deforestation in the Amazon.³⁷ Large international commodity traders, such as US firms Archer Daniels Midland, Bunge, and Cargill, Netherlands-based Louis Dreyfus, China's COFCO, and Brazil's own Amaggi, have announced "zero-deforestation" commitments, with some going back as early as the middle of the mid-2000s. Similarly, retailers such as Unilever and Carrefour have committed not to source supply linked to deforestation. The momentum has picked up with the signing of the New York Declaration of Forests, a voluntary and nonbinding commitment to eliminate global deforestation, in 2014, and other corporate commitments since then. These commitments offer examples of public policy intersecting with increasing sustainability ambition in the business community to protect forests.

However, deforestation-free commitments have limitations. They do not sufficiently cover all actors along the supply chain, and companies are lagging on implementation. Furthermore, companies need help from the public sector to improve governance of land in general and provide support to rural growers that are not covered by sustainability commitments.

Amid Brazil's agricultural boom, infrastructure development—particularly of roads and railways—in connection with the increased production, transportation, export, and consumption of commodities has also led to more clearing of land, both directly and indirectly. New

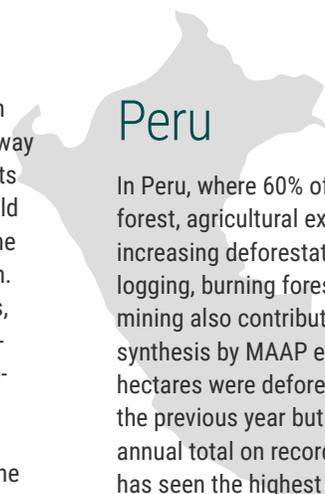
infrastructure creates avenues into remote forest regions for economic development, leading to more land clearing around the transport infrastructure itself. In the 1970s, roads in the Amazon were built primarily in an effort to integrate the local population with the rest of Brazil. Now, however, the construction, upgrading, and paving of highways, along with new railways, are linked to the movement of commodities. One estimate claims that infrastructure development in the Amazon could total \$70 billion by 2020, potentially undermining sustainability efforts.³⁸ The BR-163 highway, an important corridor in the heart of the Amazon that is used to ship soybeans to terminals at Mirituba and Santarém on the Tapajós River for export, poses a particularly significant threat. The Bolsonaro administration is seeking to expand BR-163 by 300 miles into rainforest area.³⁹

Beyond the agricultural sector, timber logging, both legal and illegal, is a significant driver of deforestation in Brazil. Logging activity is not directly connected to deforestation, but it does create access to forested area and increase the land's value. Logging is an Amazon-wide problem, but the Brazilian state of Mato Grosso is reportedly the area where illegal activity is particularly rampant. Ibama had only four officers patrolling over 17 million hectares there last year, and when fines were issued, only about 10% were paid.⁴⁰ In the state of Pará, some 44% of logging during 2015-16 was illegal, according to data from the Institute of Man and Environment of Amazonia (Imazon, by its Portuguese acronym).⁴¹ Timber extraction typically goes undetected by authorities due to limited resources and technology, or in some cases corruption.⁴²

CONCLUSIONS

With the sharp drop in deforestation rates from 2004 through 2012, Brazil demonstrated that effective measures, proper regulations, and improved corporate governance can protect forests. Now the government needs to recommit to stricter enforcement. Brasília should increase the budget for enforcement and equipment such as helicopters and satellite monitoring. Since 2012, when deforestation rates began to rise again, the government has scaled back conservation efforts and given amnesty to millions who cleared land. Instead, the government should revert to initiatives that proved successful during the 2004-12 period: anti-corruption measures, the Soy Moratorium, targeted enforcement, and the meatpacker agreement made in 2009.⁴³

It is critical that local and national governments work with companies to follow international agreements on



zero deforestation. Investors, retailers, and traders can engage and pressure commodity producers to move away from clearing land, while the government can provide its own financial incentives. Overall, the government should increase dialogue with agricultural companies along the supply chain to achieve the goal of lower deforestation. Large agriculture companies such as the major traders, along with retailers, need to remain committed to zero-deforestation policies and their implementation. Large-scale companies should work with small and medium-sized farmers to provide incentives to halt clearing of forests for commodity production. At the same time, the government should provide market signals for agricultural producers to increase efficiency and operate on under-utilized land that is not forested. Just as importantly, the government should offer financial incentives to traders to operate using existing infrastructure rather than building new outlets such as roads, railways, and rivers.

The Brazilian government should also finance long-term reforestation efforts, whether through international institutions, nongovernmental organizations (NGOs), or corporations. A commitment to a multi-year, robust reforestation program would help Brazil to meet its Paris pledges.

Finally, expansion of protected areas, which include biological reserves, indigenous lands, and national parks, is one method to curb deforestation rates.⁴⁴ It is important that the government sufficiently monitor existing protected areas and establish new ones. This can not only limit deforestation but also protect biodiversity and indigenous peoples.

Peru

In Peru, where 60% of the land is covered by Amazonian forest, agricultural expansion is the main driver of increasing deforestation. Illicit activities such as illegal logging, burning forest for coca cultivation, and gold mining also contribute to forest loss in the country. A synthesis by MAAP estimates that approximately 250,000 hectares were deforested in Peru in 2018, a decline from the previous year but still the country's fourth-highest annual total on record (see Figure 5). Since 2001, Peru has seen the highest rates of deforestation in the Andean Amazon. The Ucayali and Huanuco regions in central Peru have witnessed the largest amount of deforestation, predominantly due to cattle grazing. Agricultural development and illegal gold mining along the Interoceanic Highway are the main drivers in the southern area of the Peruvian Amazon.

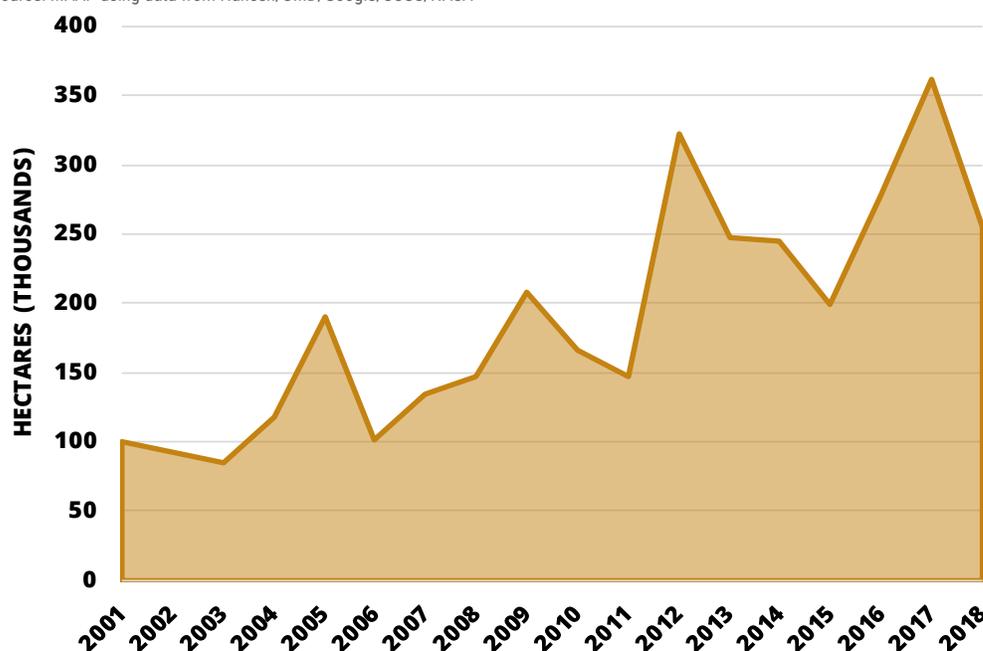
The rise in deforestation is contributing to Peru's increasing greenhouse gas emissions despite the government's demonstrated commitment to fighting climate change as host of COP 20, a key 2014 United Nations summit leading up to the Paris Agreement. Peru is not on track to meet its Paris emissions reductions targets and is well behind on its fast-approaching Copenhagen goal of "net-zero" deforestation by 2021. In Paris, the Peruvian government agreed to cut emissions by 30% below its "business-as-usual" scenario, which projects greenhouse gas emissions to reach 269 million metric tons, by 2030. At the time, Peru estimated that it could achieve more than three fourths of its mitigation efforts through forest conservation.⁴⁵ But rather than declining, emissions from deforestation are projected to rise by more than 80% between 2012 and 2030.⁴⁶ Under current policies, Peru's total CO₂ emissions are projected to reach as high as 174% above 1990 levels by 2030, compared to the goal of 143%.

In recent years, Peru has loosened environmental enforcement, a trend continued under President Martín Vizcarra in December of 2018 with the weakening of the forestry auditor (this was reversed in April 2019 following the threat of US sanctions).⁴⁷ However, despite the country's poor record of controlling deforestation, Peru has passed several important laws to fight illegal activity in forests and curb land clearing for industries. For instance, the National Strategy on Protected Areas and the country's forest laws provide a framework for improving forest management and safeguarding protected areas. The Inter-American Development Bank and the Climate

It is important that the government sufficiently monitor existing protected areas and establish new ones. This can not only limit deforestation but also protect biodiversity and indigenous peoples.

FIGURE 5: FOREST LOSS IN THE PERUVIAN AMAZON, 2001-2018

Source: MAAP using data from Hansen/UMD/Google/USGS/NASA



Investment Fund have both provided large-scale grants and loans to help facilitate measures for Peru to meet its goal of net-zero deforestation. While the current government has declared a state of emergency to crack down on illegal mining as an immediate measure, it is also starting a program to provide alternative economic activities to local people in the Madre De Dios region of southwestern Peru in hopes of creating a longer-term solution.

DRIVERS OF DEFORESTATION IN PERU

Production of agricultural commodities is a leading factor behind forest loss in Peru. Given that the agriculture sector represents 7.5% of the country's GDP and the economy continues to grow at a rapid clip, these sectors are likely to remain important sources of government revenue and economic development.⁴⁸ In the agricultural sector, cultivation of coffee and cacao are among the top drivers of deforestation. Cattle grazing and palm oil also have a modest impact. Most production of agricultural commodities occurs on small farms where farmers' livelihoods depend on agriculture, suggesting that conservation policies will have to consider the needs of subsistence farmers.

Small-scale coffee and cacao cultivation cause the majority of agriculture-driven deforestation in the Peruvian Amazon.⁴⁹ The Peruvian Agricultural Census of 2012 recorded that a quarter of agricultural land in the Peruvian Amazon was used for coffee production.⁵⁰ Most of the

coffee cultivation occurs on farms with less than five hectares of land. These small landowners make up 62% of coffee grown in the Peruvian Amazon.⁵¹

Meanwhile, the employment and income of some 90,000 families, many of whom live in poor areas, are linked to the cacao business.⁵² Families grow and sell cacao, which is transported and exported by larger players. The industry has become highly dependent on the lucrative export business. For instance, from 2007 to 2016, exports of cacao beans increased fifteen-fold, according to International Trade Centre data.⁵³ Although small farmers are behind most cacao growth, larger companies have taken advantage of the growing industry too. United Cacao, a larger producer with several small plantations, reportedly destroyed thousands of hectares of forest to grow cacao in Peru.⁵⁴ The company's CEO stepped down in 2017 and a forensic audit exposed numerous financial and environmental violations, underlining the challenge of policing large as well as small companies.⁵⁵

In addition, palm oil production is responsible for a small but rising share of deforestation. Since 2000, an estimated 31,500 hectares of primary forest have been cleared for palm oil plantations in Peru, according to MAAP.⁵⁶ While this represents a minor share of overall deforestation in Peru, the industry's output is expected to triple this year, raising concerns that production may lead to increased deforestation.⁵⁷

Illicit activities and their detrimental environmental impacts also pose a tremendous challenge to policymakers in Peru. A chain of illegal activity leads to deforestation: mafia-like actors invade land, pay owners to abandon their plots, and subsequently mine the land for gold. The sharp rise in the price of gold beginning in the early 2000s (see Figure 6) attracted more players to the lucrative business. Gold mining also became more profitable following the construction of a new highway, the Interoceanic Highway, which connects Peru to Brazil. The faster, more efficient transportation in the Peruvian Amazon provided by the new highway has opened access for workers seeking economic opportunities, mafias, and other groups traveling to gold-rich areas. Miners destroy trees and other vegetation in the Amazon before extracting the gold. A study conducted by Wake Forest University and released in late 2018 showed that deforestation driven by small-scale gold mining has reached a record high. Over the last five years, this activity has led to the loss of 100,000 hectares of forest, double the levels seen in 2013.⁵⁸

Policies to fight illegal gold mining have so far been largely ineffective. The government has had difficulty monitoring gold mining operations with satellites. It has increased troop deployment and police presence to crack down on this activity, but it is too soon to judge the success of this policy. In February, Vizcarra declared a 60-day state of emergency in Madre de Dios and deployed a combined

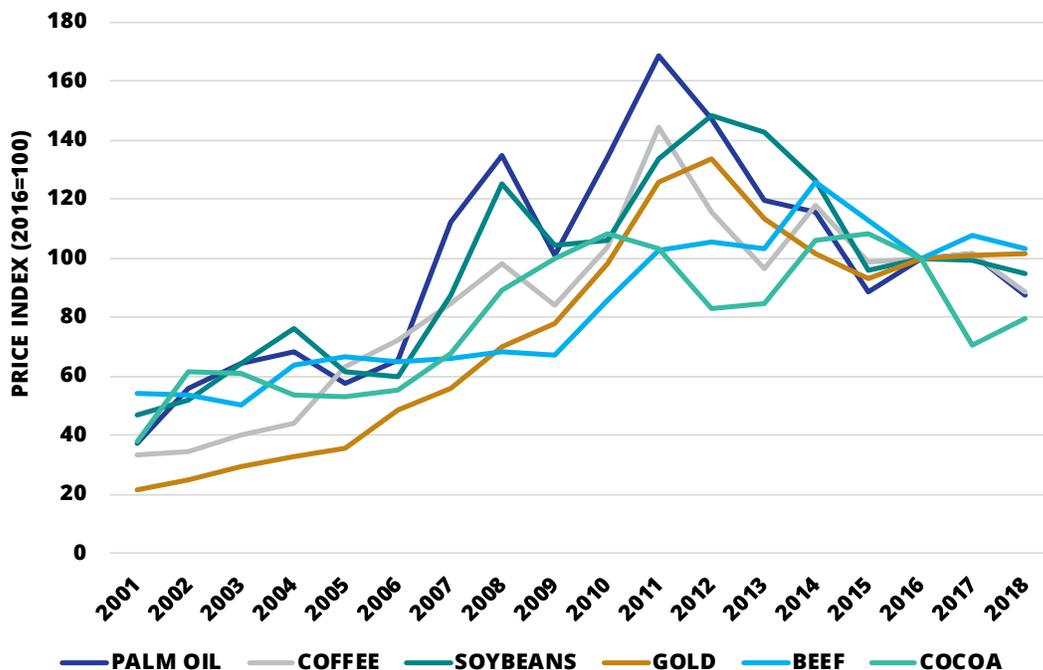
army and police force of 1,500 to crack down on illegal gold mining as well as kidnapping and other crimes.⁵⁹ The operation will be followed by the creation of alternative economic opportunities including tourism, forestry, and agriculture.⁶⁰ Still, the quantifiable impact of these policies on emissions and deforestation rates is unclear, particularly since levels are now consistently on the rise.

Peru's forests are also a victim of the global cocaine trade. Growth in coca production, the plant from which cocaine is manufactured, is responsible for some 9% of the country's deforestation. University of Maryland satellite data show that the situation is worsening as the illicit drug business continues to prosper.⁶¹ In a reflection of the increased attention to coca cultivation and its impacts in the Amazon, the United Nations Office on Drugs and Crime (UNODC) said in its yearly report that coca-driven deforestation has risen at alarming rates in the past two years. Even so, the overall number of hectares deforested for the trade remains relatively low and has received attention largely because of activity in national parks and other protected areas.

The construction of the Interoceanic Highway that has enabled small-scale gold mining exemplifies how infrastructure development in Peru facilitates the transportation of commodities and other activities nearby, leading to deforestation. Looking forward, a new

FIGURE 6: PRICES OF SELECT COMMODITIES INDEXED TO 2016, 2001-2018

Source: International Monetary Fund



law establishing national priority roads in Ucayali and other roads in the Loreto region has set the stage for investments in future infrastructure that will cut through protected areas and indigenous territories.⁶²

CONCLUSIONS

Like other Amazonian countries, Peru must position itself to promote sustainable economic development alongside environmental conservation. In the agriculture sector, for example, Peru could expand zero-deforestation certification programs for both small and large companies. For large-scale infrastructure development, governments should ensure that environmental impact studies are conducted early in the projects’ approval process and include input from all stakeholders. The government should also expand protected areas and promote alternative economic activities based on sustainable resource use, including ecotourism, in these territories. Currently protected areas, which include national parks, wildlife refuges, and protected forests, account for only 15% of the country’s land.⁶³

Peru should also commit to reforestation investments, for which finance could come from international institutions, multi-national corporations, or domestic sources. To develop projects at either the national or sub-national level, coordination between civil society, private companies, the government, and environmental experts will be crucial

for long-term commitments to be realized and managed effectively.

Given that a large part of Peru’s deforestation stems from criminal activity, Lima should increase law enforcement efforts to monitor illegal activity in the Amazon, particularly in the most remote areas, where environmental defenders have been killed in the last few years.⁶⁴

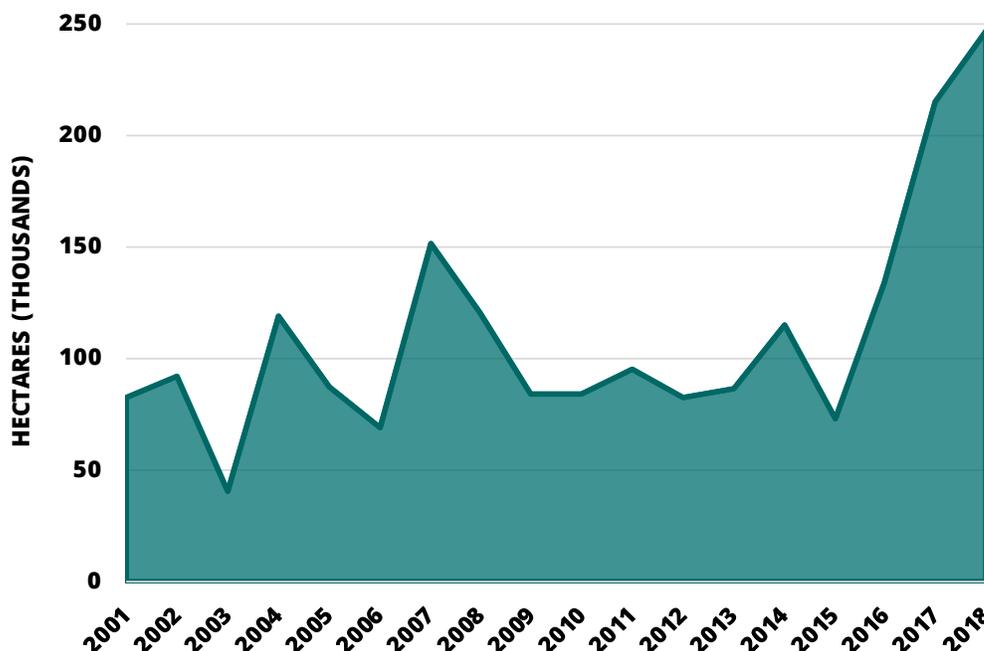
Colombia

Deforestation in Colombia, the second-most biodiverse country in the world and home to more than 60 million hectares of forest,⁶⁵ has surged in the past few years, led by land-grabbing and agricultural commodity production which has increased in the aftermath of the government’s 2016 agreement with the FARC. Last year, some 247,000 hectares of forest were lost in the Colombian Amazon (see Figure 7), the highest annual rate ever for Colombia.⁶⁶ In total, forest loss has accumulated to 2 million hectares since the beginning of the century, meaning more than 40% of total Andean Amazon forest loss has taken place in Colombia, second only to Peru.

Such levels of deforestation are derailing Colombia’s ability to meet its climate mitigation commitments. Under the Paris Agreement, Colombia vowed to cut its greenhouse gas emissions by 20-30% versus its “business-as-usual”

FIGURE 7: FOREST LOSS IN THE COLOMBIAN AMAZON, 2001-2018

Source: MAAP using data from Hansen/UMD/Google/USGS/NASA



scenario by 2030.⁶⁷ Under the business-as-usual trajectory, emissions would rise from 250 million metric tons currently to over 330 million metric tons, compared to the Paris target of 270 million metric tons.⁶⁸ The government has also committed to reaching zero net deforestation by 2020 and eliminating all forest loss by 2030. Land-use changes account for almost 60% of total emissions. Since Colombia's congress ratified the agreement in 2016, the country has developed climate change legislation, a carbon tax, and a ministerial committee on climate change, among other initiatives. However, without a reduction in deforestation, Colombia will likely fail to meet its climate targets.

The government has already taken measures to reverse the upward trend in forest loss. For instance, in April 2018, Colombia's supreme court ruled in favor of protecting the country's rainforest by recognizing the Amazon as an "entity subject of rights,"⁶⁹ which essentially gives the forest the same legal rights as humans. Prior to that decision, in 2016, the national government created the Amazon Vision Program to provide incentives for industry and Amazonian communities to protect forests and develop the area's resources sustainably.⁷⁰ Other important milestones include the expansion of Chiribiquete National Park⁷¹ and the indigenous territories south of the park and the approval of the co-management agreement between the indigenous peoples of Yaigojé Apaporis and the National Park Service.^{72,73} In 2018, then-President Juan Manuel Santos added eight million hectares to the country's protected areas, putting the total at 40 million hectares, or one fifth of total land, in an effort to curb land-grabbing.⁷⁴

President Iván Duque, who took office in August 2018, has declared reversing Colombia's deforestation trend

to be one of the primary goals of his 2018-2022 National Development Plan. This document establishes the aim of stabilizing deforestation rates at around 220,000 hectares per year, until 2022, at which point they will begin to decrease. Though environmentalists have criticized this plan as unambitious, the government argues that these target are aggressive, given that under current policies, growth in deforestation would not begin to decrease until 2030.⁷⁵ The government's principal strategy for stemming deforestation is to crack down on illicit activity, which it estimates accounts for 70% of deforestation.⁷⁶ It intends to do so by increasing monitoring through the Institute of Hydrology, Meteorology and Environmental Studies (IDEAM, by its initials in Spanish) and incorporating agricultural databases into this monitoring, heightening enforcement and prosecution by the armed forces, police, and the justice system in areas of high illicit activity, and creating alternative economic opportunities in these areas.

DRIVERS OF DEFORESTATION IN COLOMBIA

The recent sharp increase in deforestation has occurred partly because of the vacuum created in the aftermath of the 2016 peace deal. When the FARC controlled vast swaths of Colombia's land, deforestation was curbed by the rebels, who enforced strict limits on logging, partly to maintain forest cover to protect from air raids.⁷⁷ However, after members of the FARC demobilized, the government failed to provide effective environmental oversight in these large, remote areas. Other illicit groups, including paramilitaries, members of the remaining leftist guerrilla group the ELN (National Liberation Army in English), and former FARC members took over these areas, scrambling to colonize unoccupied lands by clearing forests. The government estimated that deforestation increased by 44% in the year after the agreement.⁷⁸ The province of Caquetá, located in the Amazon and previously held under FARC control, for example, has seen 40% of the country's deforestation since the peace accords, despite accounting for just 12% of the national territory.⁷⁹

These criminal groups continue to occupy abandoned areas and engage in illegal activities, including crop cultivation for illegal drugs, illegal mining, land-grabbing, and unregulated agricultural expansion. For instance, in the year after the peace agreement, cocaine production hit an all-time high, according to the UNODC.⁸⁰ Some 171,000 hectares were used for cocaine production, a 17% increase over 2016. There has also been an increase in confrontations between indigenous peoples and ex-FARC members as they invade indigenous territories to access land. Environmental defenders are under greater threat

High levels of deforestation are derailing Colombia's ability to meet its Paris climate change mitigation targets. Land-use changes account for almost 60% of Colombia's total emissions.

as a result. The Colombian government has responded by increasing security forces to fight drug trafficking, but they have failed to stop criminal activity or deforestation due to limited manpower and insufficient technical support.

However, deforestation in Colombia is not limited to areas formerly controlled by the FARC. Beyond those territories, Colombia is struggling with Amazon forest loss stemming from agriculture, cattle ranching, and infrastructure development. These activities often occur on illegally seized lands. Land grabbing is rife in the Amazon, typically for the purpose of land speculation or to expand cattle ranches.

Cattle ranching ranks as a top driver behind both legal and illegal deforestation in the Colombian Amazon. The cattle sector plays an important role in the Colombian economy: it makes up more than a fifth of the agribusiness sector and 1.4% of total GDP.⁸¹ The sector employs 810,000 people, generating 6% of total employment. Most cattle ranching takes place in the Orinoquía and Amazon regions.⁸² The industry is poised to grow further, making it more challenging to mitigate deforestation risks. Since the beginning of the last decade, the number of cattle in the country has steadily increased, expanding at the highest rates in the past few years. However, a large share of Colombia's territory is already dedicated to cattle ranching, meaning there is little room for expansion. In 2016, some 37.5 million hectares of land were used for livestock, which is the equivalent of approximately 80% of all agricultural area in Colombia.⁸³ Moreover, the country is facing illegal cattle slaughtering and animal smuggling, further complicating efforts to regulate the industry's environmental impacts. Companies are also not as active in mitigating their impact on the Amazon as in other countries. There are over 400 companies that operate along the country's beef supply chain, with more than 500 slaughterhouses. Yet only one publicly traded company—Minerva—has a deforestation policy that specifically deals with activity in the Amazon.

Infrastructure development, particularly transport infrastructure, is another driver of deforestation in the Colombian Amazon. Environmentalists registered a victory when the government put the building of the Marginal de la Selva highway on hold. This road, a \$1 billion project, was expected to serve as a trade route, bypassing the Andes Mountains and stretching from Venezuela to Ecuador. Santos cited increasing deforestation as a factor behind his decision to cancel the project.⁸⁴ The construction of major highways facilitates the creation of illegal roads and land-grabbing nearby because of the rising value of the

land—which in turn facilitates even more forest loss.

Extractive industries can also cause deforestation as infrastructure is built to transport oil, natural gas, metals, and minerals. To date, the oil and mining sectors have not had a significant impact on Amazon forests. However, following the peace accord, mining concessions are planned in areas that were previously inaccessible due to the conflict. Although it's unlikely that these areas will be developed in the short term due to ongoing security concerns, new areas of the Amazon could be opened to extractive industries in the longer term, potentially increasing deforestation. In addition, there has been a surge in illegal gold mining that has created specific hotspots of deforestation along riverbeds.⁸⁵

CONCLUSIONS

To solve the problems connected to deforestation, Colombia, like other Amazonian countries, needs to face both legal and illegal activity. Reforestation programs, expansion of protected areas, corporate sustainability incentives, and accountability measures are necessary to reverse current trends.

Colombia should work with international institutions and corporations to attract investment to develop reforestation programs. The government, civil society, and companies, both domestic and multinational, can work with international alliances such as Tropical Forest Alliance 2020, a global public-private partnership whose mission is to reduce commodity-related tropical deforestation, in order to set reforestation targets and work to maintain them.

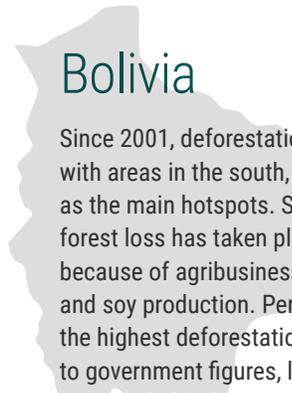
The government, civil society, and companies, both domestic and multinational, can work with international alliances to set reforestation targets and work to maintain them.

It is also vital that stakeholders coordinate with companies operating along agricultural commodity markets to increase transparency and verify that their supply chains are not linked to deforestation. The government can offer fiscal incentives to promote private sector environmental conservation.

With corruption and criminal activity in large part behind higher deforestation rates, the Colombian government should strengthen enforcement of existing laws and increase accountability. Agricultural businesses, infrastructure developers, and local governments have not been properly held accountable for activity tied to deforestation. It is crucial to strengthen central government authorities' ability to manage subnational activity by administering funds, providing technical assistance, and overseeing projects. Many local authorities have a long history of corruption and connections to organized crime, making national oversight necessary. With proper instruction and supervision, local actors can be leaders in the national debate and contribute to holding their peers accountable.

An increase in government funding for environmental protection is also essential. Less than one third of 1% of GDP goes to programs to protect the environment. The recent carbon tax has allocated 25% of its revenues to benefit the environmental sector, and of this amount

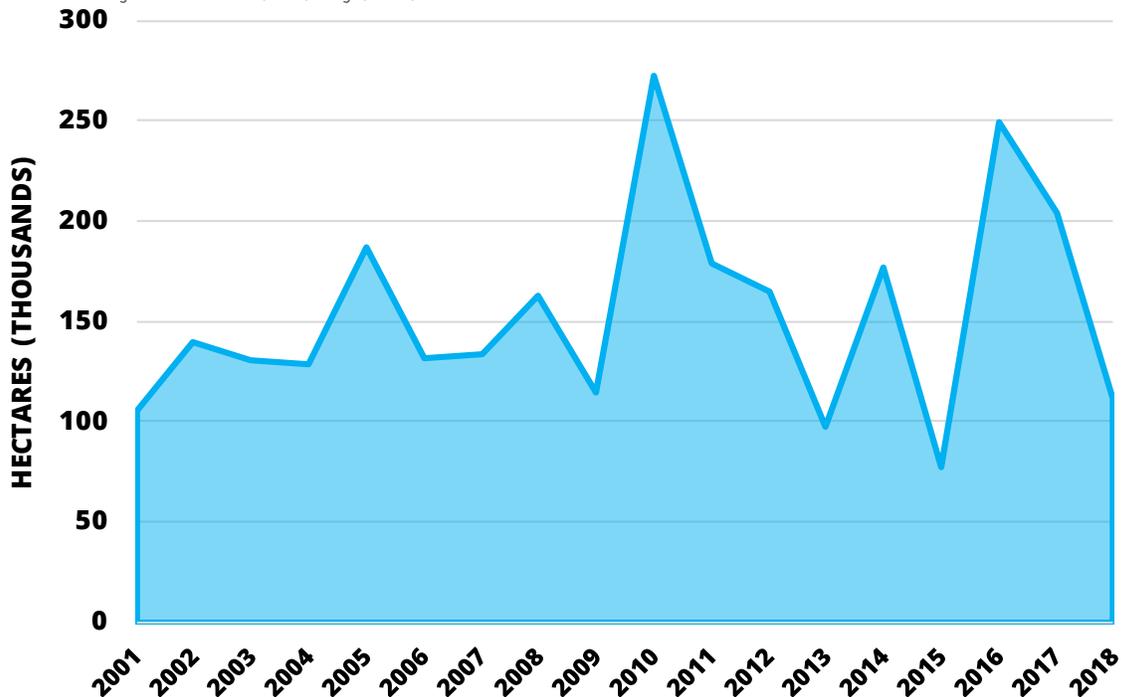
5% would go to the National Park Service—a unique and promising model. Still, more needs to be done.⁸⁶ Expanding protected areas, particularly indigenous reserves, and increasing environmental authorities' resources to manage these areas would undoubtedly reduce deforestation in Colombia.



Since 2001, deforestation has risen sharply in Bolivia, with areas in the south, outside Santa Cruz province, as the main hotspots. Some two-thirds of the country's forest loss has taken place in or near Santa Cruz, largely because of agribusiness activity such as cattle ranching and soy production. Per capita, the country has one of the highest deforestation rates in the world.⁸⁷ According to government figures, legal deforestation in the country as a whole has been increasing at a faster rate than illegal deforestation, soaring from just 10,244 hectares in 2012 (an 8% share of the total) to 124,062 hectares (48% of the total) in 2017.⁸⁸ This is owed to government-promoted expansion of agriculture, large energy projects, and infrastructure, even in protected areas. There has been some positive news: within the Bolivian Amazon, the area deforested in 2018 declined by 46% compared to the previous year, totaling 111,083 hectares, according to MAAP (see Figure 8).

FIGURE 8: FOREST LOSS IN THE BOLIVIAN AMAZON, 2001-2018

Source: MAAP using data from Hansen/UMD/Google/USGS/NASA



Deforestation has clearly contributed to Bolivia significantly lagging on its climate goals. Some 80% of the country's greenhouse gas emissions stem from deforestation.⁸⁹ Its emissions per capita are on par with those of many European countries even though Bolivia ranks 122nd in the world in GDP per capita while 12 European countries make up the top 20.⁹⁰ With approximately 50% of the country covered in forest, halting deforestation is essential to meeting the country's Paris commitments.

Under the Paris Agreement, Bolivia pledged to reach zero illegal deforestation by the end of this decade and increase net forest cover to 54 million hectares (up 1.5 million hectares from current levels) by 2030, among other land-use actions.⁹¹ In its action plan for Paris, Bolivia said it would seek "adoption of a new model of civilization in the world without consumerism, war-mongering, and mercantilism, a world without capitalism."⁹² Yet, the government has pushed to expand the agricultural sector without creating proper safeguards to ensure that companies operating in the country do not contribute to deforestation. Given recent deforestation trends in the country, Bolivia is clearly well behind its 2020 goal of achieving zero illegal deforestation.

President Evo Morales has pursued ambitious plans for economic development but environmental oversight of the agricultural industry and infrastructure projects has been weak. Morales has long sought to expand Bolivia's agricultural frontier.⁹³ In September 2018, he signed a law to use bioethanol in gasoline, an incentive to sugar production.⁹⁴ In 2017, Morales approved a 190-mile highway through the Isiboro Secure Indigenous Territory and National Park despite local opponents who claimed it would open the park to logging and coca farming, as well as oil and mining operations.⁹⁵ Running for a fourth term in October 2019, Morales will be able to point to strong, sustained GDP growth, but he is losing support among his indigenous base as he paves the way for unchecked development in previously remote areas.⁹⁶

DRIVERS OF DEFORESTATION IN BOLIVIA

Bolivia, like the other countries experiencing increasing deforestation, faces rapid forest loss owing to agricultural expansion, while illegal activity is adding to forest destruction. Bolivia has implemented a variety of measures aimed at environmental protection. The Mother Earth Law, for example, essentially gives rights to nature and holds individuals and companies responsible for environmental destruction.

However, conservation efforts are undermined by President Evo Morales's strategy to encourage expansion of agribusiness and "food sovereignty." Bolivia is a land-locked country, limiting its opportunities for international trade and driving its efforts to reduce dependence on imports of food and other commodities. The country's economy is also highly dependent on agricultural commodities. The sector employs approximately 1.4 million people, which constitutes some 30% of the workforce. Agriculture's influence on the economy had been on a steady decline from the mid-1980s, but its share of GDP is on the rise again, reaching 11.5% in 2017.⁹⁷ A variety of companies are investing in Bolivia's agriculture sector—some that operate in Argentina and Brazil have entered Bolivia to expand their Latin American operations. Currently, Bolivia is expanding its beef and soy industries to feed its own growing population (now at 11 million) and also reach neighboring export markets when economics are favorable.

The soy and cattle industries are the main drivers behind rising deforestation, both legal and illegal. Other commodities, including sugar, have also contributed to forest loss. From 2017 to 2025, the country expects to clear some 5.7 million hectares of rainforest to use as farmland.⁹⁸

In the soy market, there are generally three types of producers. Small farms are owned by families that hold less than 50 hectares of land. In Santa Cruz, they own more than 80 percent of the farms and occupy almost a quarter of the crop area.⁹⁹ Producers of medium size—farms of 50-500 hectares—make up just over 20% of land used for soy cultivation. Estimates suggest that two thirds of these farms are owned by foreign enterprises. The large farms, which are greater than 500 hectares, make up

The soy and cattle industries are the main drivers behind rising deforestation, both legal and illegal, in Bolivia. The country's agricultural sector employs some 30% of the workforce.

56% of farmland in Santa Cruz but are owned by only 3% of the companies.¹⁰⁰ In order for the government to curb deforestation, it must provide incentives to companies of each size, which have overlapping interests but also conflicting needs.

The country's beef industry is looking to expand aggressively, with exports rising, particularly to lucrative markets such as Russia and China. The country had 9.3 million cattle in 2017, enough to produce 258,000 tons of beef, of which 7% was exported. Approximately 40% of cattle production currently takes place in Santa Cruz. The Bolivian Foreign Trade Institute (ICBE, by its initials in Spanish) projects that by 2025 Bolivia will export 117,000 tons of beef per year.¹⁰¹ Morales has stated that he sees the cattle herd rising to 30 million by 2025, an ambitious goal aimed at capitalizing on export opportunities but one that would increase deforestation if better environmental regulations are not in place.¹⁰²

As commodity production has grown, particularly in Santa Cruz, infrastructure to transport supply has also contributed to higher deforestation rates.¹⁰³ Chinese investment through the Belt and Road Initiative (see Figure 9) has helped finance transport and energy infrastructure, including in the Amazon. Indeed, Bolivia has been a particular focus for Chinese construction companies, which have pursued more than 20 road and bridge

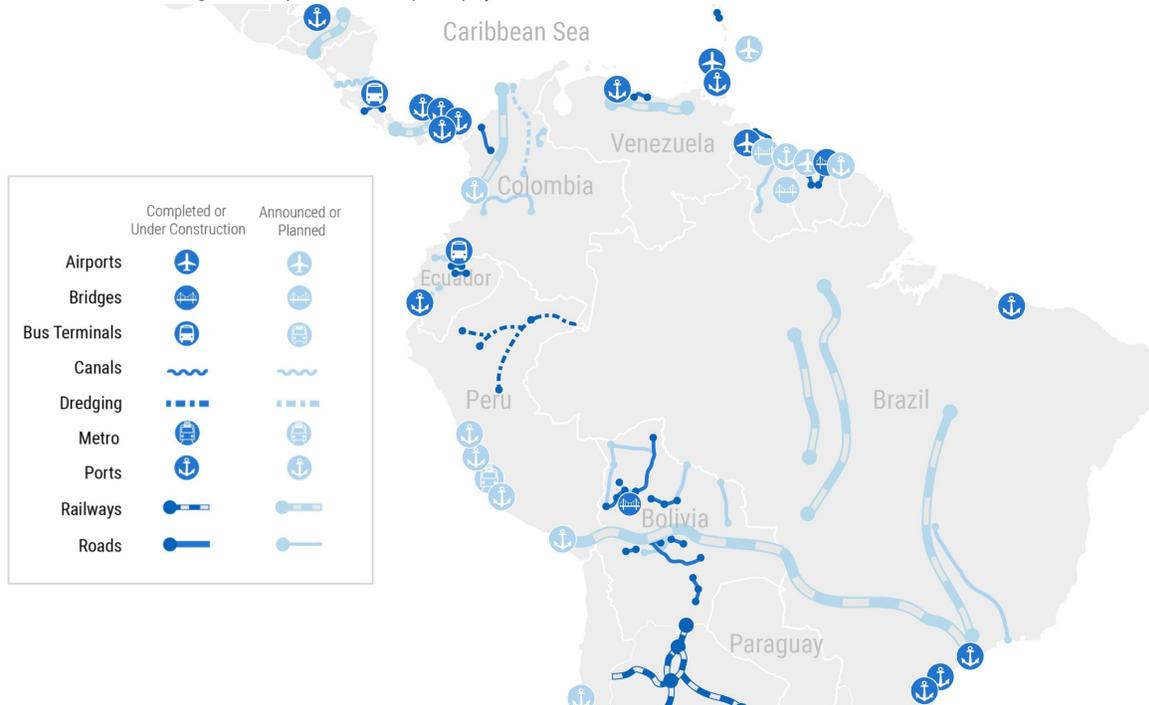
projects in the country since 2013, as well as several dam projects.¹⁰⁴ The government's ambitions to export electricity to neighboring countries have also given rise to a number of hydroelectric dam projects, including near Madidi National Park in the Amazon region¹⁰⁵ and inside Carrasco National Park, a project whose environmental approval raised concern.¹⁰⁶ At least seven more dams are planned.¹⁰⁷

Forests are also commonly destroyed through fires to clear land for farming, particularly in the Santa Cruz and Beni provinces. For instance, during the first eight months of 2016, the number of fires quadrupled compared to the previous year.¹⁰⁸

Amid this expansion of the agriculture sector, the government has failed to enforce laws against deforestation or issued only minor penalties. Companies, for their part, have not taken appropriate action to produce deforestation-free products. For instance, no soy produced and sold in Bolivia has been certified, according to the Round Table on Responsible Soy (RTRS), despite available certification.¹⁰⁹ While agriculture expansion accounts for a majority of legal deforestation, illegal logging remains a greater problem in Bolivia. The Forest and Land Monitoring and Control Authority, for instance, estimates that 52% of all deforestation in the country is illegal.¹¹⁰

FIGURE 9: CHINESE TRANSPORT INFRASTRUCTURE DEVELOPMENT

Source: Inter-American Dialogue. Shows planned and completed projects, 2002-2018.



CONCLUSIONS

To mitigate deforestation risks in the land sector, Bolivia can advance reforestation and improve land-sector management, both of which can provide opportunities for sustainable economic development. To develop practical and durable solutions, the Bolivian government should work closely with the agriculture industry, given its association with deforestation-related activity. One opportunity is to connect agricultural subsidies to environmental protection and zero-deforestation agreements. The government can also foster collaboration between major traders and small farmers to eliminate soy and beef linked to deforestation in their supply chains. It is important for the economy to provide financial incentives for companies to use only soy that is certified by RTRS.

Bolivia can work with NGOs, international and domestic companies, or international institutions to put forth a robust reforestation plan. Several environmental organizations have successfully established projects to protect specific areas and avoid deforestation in parts of Bolivia. Establishing a plan to monitor protected areas and national parks will be crucial in keeping deforestation from rising.

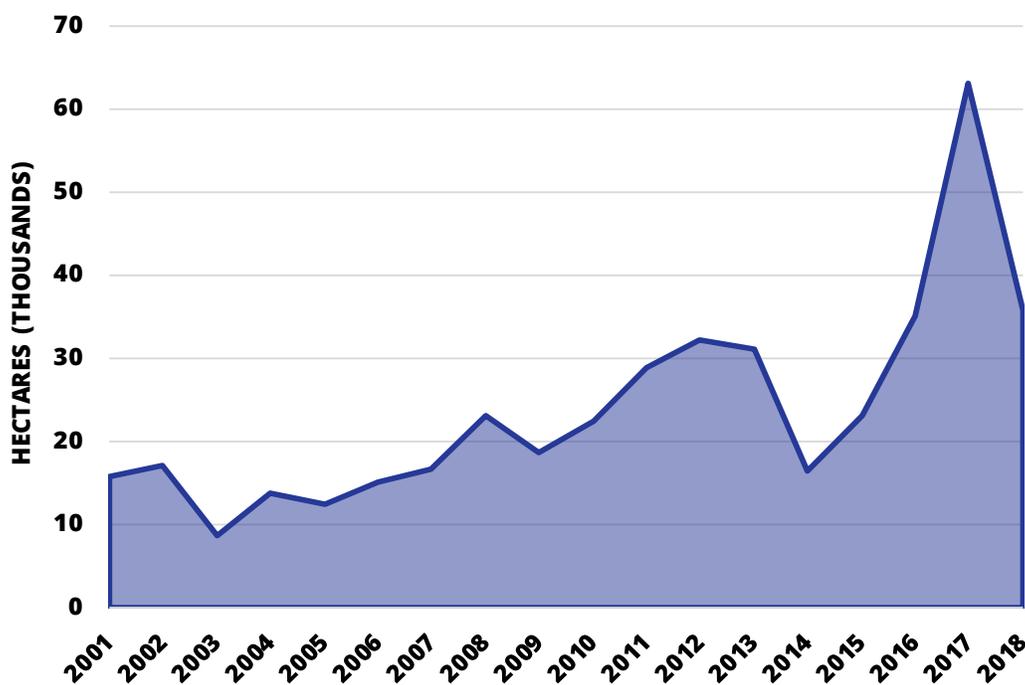
Ecuador

Levels of Amazon deforestation are not as high in Ecuador as in the countries previously discussed since the Ecuadorian Amazon makes up only 2% of the total basin. The country has taken important measures in recent years to slow deforestation through the creation of protected areas, where conservation has been largely successful. But the production of agricultural commodities and the opening of areas of the Amazon to oil and mining activity, which has not been coupled with adequate enforcement of environmental regulation, have led to increased deforestation.

From 2001 to 2018, some 429,000 hectares of the Amazon were deforested in Ecuador, with a peak of over 63,000 hectares lost in 2017, (a 72% year-over-year increase)¹¹¹ (see Figure 10). Ecuador is responsible for 9% of total deforestation in the Andean Amazon region. The Orellana province, in the northern Amazon zone of the country, is the main hotspot for deforestation related to agricultural development. Meanwhile, Morona Santiago, in the south, is now the Amazonian province with the highest deforestation rate in the country, largely thanks to a series of major roads crossing it and the resulting land colonization.

FIGURE 10: FOREST LOSS IN THE ECUADORIAN AMAZON, 2001-2018

Source: MAAP using data from Hansen/UMD/Google/USGS/NASA



Ecuador's commitments to the Paris Agreement included extensive reforestation plans. The country committed to 500,000 hectares of reforestation by 2017, and another 100,000 hectares by 2025. The government estimated that it was able to reduce CO₂ emissions by some 28 million tons with reforestation efforts from 2008 through 2014, a sign that it could reverse current trends through proper forest management.¹¹² However, the country has woefully fallen short of its targets.

In 2008, the government of then-President Rafael Correa made Ecuador the first country in the world to inscribe legal rights for nature in its constitution.¹¹³ The implementation of the Ministry of the Environment's Socio Bosque program (part of the United Nations "reducing emissions from deforestation and forest degradation in developing countries" or REDD+ program), which provided economic incentives to landowners that held native forests, was a bold recognition of these rights. From 2009 to 2014, the country was able to cut its deforestation rates by almost 50%.¹¹⁴ However, other actions during Correa's tenure conflicted with this change, including the construction of eight new major dams by Chinese firms¹¹⁵ and the auctioning of oil acreage in the megadiverse Yasuní National Park.

As in other policy areas, President Lenín Moreno, who took office in May 2017, has broken with his predecessor. In early 2018, he held a referendum in which more than two thirds of the voting population opted to reduce the area in which oil extraction was allowed in the park.¹¹⁶ The "Reverdecer Ecuador" program, initiated in 2018 with a \$330 million budget, includes reforestation programs.¹¹⁷ Moreno has also canceled more than 2,000 previously awarded mining concessions and fired his minister of environment for failing to annul one.¹¹⁸ In October 2018, the ministries of agriculture and environment signed an agreement with the Confederation of Indigenous Nations of the Ecuadorian Amazon to increase collaboration on

sustainable development and prevention of deforestation in the indigenous Amazon.¹¹⁹

DRIVERS OF DEFORESTATION IN ECUADOR

Agricultural expansion plays a major role in deforestation in the Ecuadorian Amazon, and small-scale ranching and production of commodities such as palm oil are key drivers. The country's economy depends on a wide variety of commodities including not only cattle and palm oil, but also coffee, cacao, sugarcane, and dairy, among others. The agriculture industry makes up only 6% of the economy, but employs almost 30% of the country's workers and uses 30% of its land.¹²⁰ Within the Ecuadorian Amazon basin, agricultural activities make up almost 60% of income, with cattle farming consisting of 10% and "mixed farming" 30%.¹²¹ Productivity is, for the most part, relatively low, which creates inefficient land use.

From 1990 through 2008, agricultural expansion contributed to an overwhelming majority of deforestation in the northern Ecuadorian Amazon.¹²² As in many other Amazonian countries, cattle ranching is the greatest driver of land-use change. The sector is dominated by small-scale landowners that raise cattle alongside other livestock, while larger companies are growing their operations.

Palm oil is a key driver of deforestation in the northern Ecuadorian Amazon, according to MAAP.¹²³ Ecuador is the sixth-largest palm oil producer in the world, and the second largest in Latin America, behind Colombia. Even though the industry is a small part of the overall economy, it represents a large share of the country's exports, and its growth could increasingly influence deforestation rates in the future. Half of the country's total supply is exported,¹²⁴ and approximately 90% is produced by small landowners, who are responsible for an overwhelming majority of deforestation from palm oil in the Amazon.¹²⁵ Companies typically acquire land for palm oil production either by obtaining concessions in the Amazon from the government, buying land through intermediaries, or purchasing areas from indigenous communities.¹²⁶ Most of the palm oil from Ecuador comes from the coast and Chocó regions (Esmeraldas Province) where deforestation rates are the highest, but production in the Amazon accounts for 13% of the country's total.¹²⁷

The government has introduced measures to reduce deforestation related to palm oil production that could serve as a model for reducing environmental impacts of other commodities as well. Rather than encouraging

In early 2018, more than two thirds of Ecuador's voting population opted to reduce the area in which oil extraction was allowed in Yasuní National Park.

companies to join the Roundtable on Sustainable Palm Oil (RSPO)—a certification body active in southeast Asia that determines whether palm oil is deforestation-free—Ecuador takes a jurisdictional approach. This system allows each province to certify that palm oil supply is not tied to deforestation or labor abuses.¹²⁸ Advocates of this method value that governments are directly involved, allowing them to use their power to negotiate terms with local farmers to implement efficient supply chains, curb environmentally damaging practices, and develop systems where producers can see profit margins. Critics, in turn, claim that the government may not be stringent and vigilant enough to enforce best practices, allowing companies to operate unregulated, and that local governments are vulnerable to corruption. The government also provides tax breaks for palm oil exporters that invest in sustainability efforts—which could be a model for incentivizing other industries. Quito is also coordinating a \$1.2 billion investment to support local growers and stimulate research and development to limit deforestation associated with palm oil production.¹²⁹

Beyond the agricultural sector, oil operations have also had a modest impact on Ecuador's Amazon deforestation rates due to the government's decision to open the Yasuní National Park to drilling.¹³⁰ Although Ecuador's constitution prohibits hydrocarbon and mining activities in protected areas, in 2013, Correa approved oil exploration contracts in the Ishpingo-Tambococha-Tiputini (ITT) oil field complex in the park, citing the national interest. Ecuador's oil industry is central to the economy, making up one third of total export revenue.¹³¹ The ITT, which holds over one billion barrels of oil, stretches through Amazonian rainforest in the eastern part of the country. Despite opposition from environmental NGOs and indigenous peoples, the government auctioned off some three million hectares of land to Chinese oil companies. This included an agreement that the China Development Bank would lend at least \$1 billion to Ecuador in exchange for the rights for Chinese firms PetroChina and Andes Petroleum to drill in the park.¹³² Production began in the ITT block in the summer of 2016.

MAAP satellite data show that within Yasuní National Park, oil exploration and production has led to slightly more than 400 hectares of deforested land.¹³³ Although this is a relatively small area, the ITT, a 3,800-square mile stretch of Amazonian rainforest, is one of the most biodiverse habitats in the world, home to more than 4,000 plant species and wildlife.¹³⁴ Given its vast oil reserves, the field complex is expected to produce oil for many more years. The government's decision to permit oil exploration and

production within this national park also raises concerns about whether drilling will be allowed in the eastern and southern sides of Ecuador's Amazon region, leading to further deforestation.

CONCLUSIONS

The Ecuadorian government should further explore and strengthen forest conservation incentive programs with national and international funding. The country's success in fighting deforestation during the 2009-14 period can inform Ecuador's policies going forward. With international financing and support, the government should view protected areas as a way to reverse the recent uptick in deforestation and meet its Paris commitments. The Ministry of the Environment's Socio Bosque Program provides valuable guidance on the most effective approaches.

The government, in collaboration with industry, should monitor RSPO work to ensure that the jurisdictional approach is effective in keeping small farms, domestic companies, and large international firms in compliance with environmental and labor standards. Providing financial incentives to producers, traders, and retailers can help actors along the palm oil supply chain cooperate and reduce financial and reputational risks by avoiding deforestation. The government could extend this model to other agricultural sectors, providing fiscal incentives to produce sustainable commodities.

To avoid deforestation in the Amazon related to oil production, the government should strengthen and enforce regulation for oil and gas exploration in national parks and Amazonian areas. The 2008 Constitution assigns rights to nature and prohibits oil exploration inside national parks. However, if it is not feasible for Quito to comply with the ban on drilling in all sites connected to the Amazon, it is imperative that regulators impose the strictest standards on the industry to minimize environmental damage, whether that includes deforestation, infrastructure development, transportation, or oil spills.

More broadly, the government should expand the system of protected areas established in the 1970s to safeguard Ecuador's critical ecosystems and biodiversity. The government, with support from civil society, should also focus on strengthening indigenous territorial management since large areas are owned and managed by indigenous peoples, especially in the southern Amazon region (the Pastaza and Morona Santiago provinces) and surrounding the Yasuní National Park.

POLICY RECOMMENDATIONS TO TACKLE AMAZON DEFORESTATION

1

Promote sustainable agriculture and ranching

Cattle ranching and other agriculture industries, particularly soy and palm oil, are important sources of exports, investment, and employment in many South American countries. However, these industries are also the top drivers of deforestation in the Amazon. Governments should promote transparent, sustainable supply chains for these industries—for example, by requiring commodity traders and other downstream actors to buy only from producers that do not operate on deforested land. They should also create fiscal incentives for agribusiness companies to adopt zero-deforestation policies and link any agricultural subsidies to environmental protection. For small-scale farmers, direct compensation or subsidies for conservation of forests may be the most effective way to prevent land clearing for agricultural expansion.

2

Design transparent, sustainable infrastructure programs

Infrastructure in Amazonian countries is often designed and built without sufficient transparency and government oversight. Governments should evaluate and mitigate the environmental impacts of infrastructure (particularly roads, but also hydroelectric dams and other energy and transport infrastructure), introducing environmental criteria early in the planning process with input from indigenous peoples and civil society. Governments could also require companies in environmentally sensitive areas to use existing infrastructure to avoid exacerbating the environmental impact of economic activities.

3

Increase forest protection monitoring and enforcement

While legislation to curb deforestation could be improved, in many countries the more immediate challenge is to effectively monitor and enforce existing laws and regulations for forest conservation in the Amazon region. Governments should increase their budgets for monitoring and enforcement, including for more staff to visit sensitive sites as well as equipment such as helicopters and satellite monitoring. In most countries, law-enforcement officials also need to be involved given the illicit nature of activities that drive illegal deforestation.

4

Expand protected areas

Although considerable gains have been made, Amazonian countries should further expand protected areas, including national parks and indigenous reserves, while improving management of existing ones to ensure zero deforestation in these areas. Governments should differentiate between protected areas that are completely off limits to economic activity and those that allow sustainable farming, sustainable energy projects, ecotourism, or other activities with appropriate environmental safeguards.

5

Strengthen reforestation programs

Governments can employ various mechanisms to encourage reforestation, such as the United Nations REDD+ programs, national carbon taxes or cap-and-trade systems, or corporate reforestation programs. It is critical that governments in the Amazon region commit to multi-year reforestation programs to meet their Paris targets. Central governments should provide technical assistance and capacity building to local government counterparts to design reforestation and sustainable development projects that can access international climate finance.

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