BUILDING A SUSTAINABLE FUTURE IN BRAZIL

Environment, Development, and Climate Change

Wilson Center

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Building a Sustainable Future in Brazil:

Environment, Development, and Climate Change

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TABLE OF CONTENTS

Editors' Note

by Anya Prusa and Amy Erica Smith

Famous for the Amazon Rainforest, Brazil is home to what was once another vast forest: the coastal Mata Atlântica. The slow removal of the Mata Atlântica in the service of economic development goes back more than five centuries, to the arrival of the Portuguese on Brazil's northeast coast in 1500. Plantations, ranching, logging, and eventually urbanization all hacked away at the trees, with deforestation accelerating as cities expanded in the twentieth century.

Today, just 12 percent of the forests that once covered a million square kilometers along the coast of Brazil remain in good condition, and the region is now home to 72 percent of the Brazilian population.[1] What is left of the Mata Atlântica exists in patches. Dense urban sprawl is punctuated by islands of green; untamed vegetation and tall palm trees pop up on empty plots of land left to their own devices for a few years. Little black capuchin monkeys scamper up and down isolated trees in urban parks and small forest preserves.

These remnants of the Mata Atlântica still form one of the most biodiverse forests in the world: more than 52 percent of its tree species are found nowhere else in the world. Many initiatives are underway to restore the forest, including the innovative Atlantic Forest Restoration Pact, created in 2009. The Pact's more than 270 members—research organizations, private companies, NGOs, and government institutions—are developing new techniques and models to aid forest restoration, including using data to predict where the forest is most likely to regrow quickly.[2] Their goal is to restore 15 million hectares (150,000 square kilometers) over the next 30 years.[3]

Yet the scale of the effort required to restore even part of the Mata Atlântica serves also as a cautionary tale for the fate of the Amazon. It is far easier to conserve a standing forest than to regrow one, and the Amazon has already lost about 18 percent of its total tree cover. The need to prevent forest loss in the Amazon is particularly acute because the world's largest rainforest creates its own weather. Deforested areas become dryer and hotter; and studies indicate that, at least in the short-term, regrown forest is less effective at carbon capture, more dominated by dry tree species, and more prone to future fires. Scientists Thomas Lovejoy and Carlos Nobre, both contributors to this report, warn of a looming tipping point near 20-23 percent deforestation, after which the forest will no longer be able to sustain its current hydrological cycles, and will instead transition instead towards drier savannah and scrub—drastically diminishing rainfall and driving a spike in warming across South America—with profound implications for the global climate.[4]

[1] *Atlas da Mata Atlântica*, 2018-2019, SOS Mata Atlântica, https://www.sosma.org.br/sobre/relatorios-e-balancos
[2] Karen D. Holl. "Restoring Tropical Forests from the Bottom Up," *Science* 355, no. 6324 (February 2017): 455-6, https://doi.org/10.1126/science.aam5432.
[3] Pacto pela Restauração da Mata Atlântica, https://www.pactomataatlantica.org.br/o-pacto.
[4] Thomas E. Lovejoy and Carlos Nobre, "Amazon Tipping Point: Last Change for Action," *Science Advances* 5, no. 12, eaba2949, https://advances.sciencemag.org/content/5/12/eaba2949.

The stakes are clear. Nonetheless, addressing deforestation—and environmental conservation more broadly—remains an ongoing challenge. Deforestation is often an individual-level decision in Brazil, yet one embedded in a policy context that incentivizes land clearing. Millions of people deforest in large and small ways in their daily lives. City dwellers chop down the forest regrowing on their properties. Rural landholders burn down the vegetation on their plots, selling the charred remains as charcoal. Loggers chop and traffic the trees of the Amazon, usually illegally.

At the same time, deforestation is the product of political and economic systems that incentivize land clearing. Not unlike in the United States, Brazilian politicians encouraged citizens to "go west" to claim and clear land, aligning individual lucre with the national interest. Brazil's 1964-1985 military dictatorship built highways and industrial parks in the middle of the jungle to secure Brazil's vast territory. Policies that allow politicians to expropriate "unproductive" land further encourage deforestation.

Moreover, spoils often go to those who skirt Brazilian law: from networks that launder cattle raised on illegally cleared forest to frequent amnesties for those who grab land illegally in the Amazon (see interview with Daniela Lerda in Chapter 5). Today, the legacy of these policies can be seen in the growing degradation of the wetlands of the Pantanal, the savanna of the Cerrado, and most famously the Amazon Forest.

After hitting a low-point of 4,700 km^2 during the administration of President Dilma Rousseff in 2012, Amazon deforestation has risen over most of the past decade (see interview with Minister Izabella Teixeira in Chapter 4). Under President Jair Bolsonaro—who campaigned on the promise (yet unfulfilled) to withdraw from the Paris Accords—deforestation rose 29.5 percent between 2018 and 2019, to nearly 9,800 km^2.

The COVID-19 pandemic appears to have triggered a further rise in deforestation. In the first six months of 2020, Brazil's satellite monitoring systems show that deforestation has risen 25 percent, compared with the same period in previous years.[5] Federal environmental agents have withdrawn from monitoring their forest stations. Meanwhile, the Bolsonaro administration is accused of inadequately protecting indigenous communities from devastating viral outbreaks--thus further threatening the forests that indigenous groups traditionally defend from loggers and miners. These trends underscore an ongoing lack of commitment at the highest levels of government to tackling deforestation. Recently released footage from an April cabinet meeting revealed Minister of the Environment Ricardo Salles speculating that the crisis provided good cover to eliminate environmental regulations. More broadly, there are fears that the economic crisis resulting from COVID-19-related closures could increase pressure on the forests, as the government and individual Brazilians alike look for quick ways to raise revenue. In Manaus, residents fleeing COVID-19 are

[5] David Biller and Mauricio Savarese, "Brazil Sacks Official After Soaring June Deforestation Data," *Washington Post*, July 13, 2020, https://www.washingtonpost.com/world/the_americas/brazil-sacks-official-after-soaring-june-deforestation-data/2020/07/13/31c503ae-c550-11ea-a825-8722004e4150_story.html; "Brazil Amazon Deforestation Up in June, Set for Worst Year in Over a Decade," *Reuters*, July 10, 2020, https://www.reuters.com/article/us-brazil-environment/brazil-amazon-deforestation-up-in-june-set-for-worst-year-in-over-a-decade-idUSKBN24B1VG.

returning to rural communities in the interior of the state of Amazonas—places where most ways to earn a living involve deforestation (see the interview with Denis Minev in Chapter 3).

However, deforestation is not inevitable. This report represents the outcome of a series of conversations we (as well as the Brazil Institute's recently retired director, Paulo Sotero) have been having over the past year—discussions with policy makers, scientists, civil society, the business community, and ordinary citizens. These conversations have changed the way we understand both the problem and its possible solutions.

Getting to sustainability will, we suspect, require advancing along three different paths simultaneously.

First, environmental laws, policies, and international commitments must be ever more ambitious. As Solveig Aamodt describes in Chapter 8, environmentalists have tallied many policy successes in Brazil, including pushing Brazil to take leadership in international climate negotiations. More work remains, however—a recent UN report estimates that Brazil's commitment under the Paris Accords is not quite sufficient to hit the Accords› maximum target of 2 degrees Celsius of global warming (see Appendix).

The battle for tougher legislation will be uphill during the Bolsonaro administration. Although President Bolsonaro now appears unlikely to withdraw from the Paris Accord, he is unlikely to support any effort to tighten environmental laws. Moreover, though legislative commitments are important, the larger challenge is non-compliance with existing law, including Brazil's landmark Forest Code. Quotas, laws, and international commitments are just words on paper; they cannot implement themselves.

Thus, the second path forward is to implement existing laws more effectively and consistently. Regularizing and legalizing land titles is one critical piece of the story, as most illegal logging and land clearing currently occurs on misappropriated public lands (see interview with Denis Minev in Chapter 3). Moreover, Daniela Lerda explains in Chapter 5 that inconsistent monitoring hurts businesses that attempt to implement environmentally responsible practices, and generates perverse environmental consequences. As she describes, an industry commitment to avoid buying cattle raised on illegally deforested land ultimately failed due to poor tracking systems and networks that launder cattle. Cattle from embargoed suppliers were sold to "legitimate" ranches, which then sold the cattle to the slaughterhouses—ultimately leading to an increase in total cattle production in the Amazon.

The third path involves rethinking individual incentives so that people don›t even want to engage in deforestation. A classic survey question on public support for environmental protection asks citizens whether they would prefer for the government to protect the environment «even if it hurts the economy,» or instead promote the economy «even if it hurts the environment.» What if this is a false choice?

The most famous effort to change individual incentives for deforestation is the REDD+ carbon pricing scheme, under which wealthy investors from developed countries pay Amazon residents to

leave the woods intact (see chapters by Christopher Schulz and Magaly Medeiros). However, as Christopher Schulz explains, REDD+ has proven surprisingly difficult to get right. Among other criticisms, payment arrangements that only protect certain sections of forest may simply stimulate logging, ranching, and mining to move from one area to another.

Instead, many of the most promising ideas coming out of this report would engage Amazon residents in sustainable, low carbon economic development. The Amazon is home to 30 million people who will find ways to provide for their families in their own local areas, regardless of legal and regulatory frameworks.

Traditional economic activities can be "greened." R&D and capital investments in low carbon agriculture and ranching are increasing—indeed, companies are deploying cutting-edge technologies in Brazil, from artificial intelligence to precision agriculture—, while wind and solar power have begun to develop what Kathryn Hochstetler calls a "green spiral," in which environmental and economic benefits begin to reinforce each other. And as Thomas Lovejoy points out, public works projects in the Amazon can be redesigned to rely on riverine transportation routes or to build elevated highways through forests, thus protecting biodiversity and maintaining intact ecosystems.

Most intriguing, though, are efforts to create what Carlos Nobre calls a "bio-economy" that "leaves the forest standing." Nobre and business partners are now engaged in a series of entrepreneurial ventures called the Amazon Creative Labs, which aim to create lucrative value chains from forest crops such as the brazil nut, the cupuaçu (a cocoa-like fruit), and the açai berry. Their goal is to demonstrate to international investors the feasibility of engaging college students and Amazon residents in new businesses with dramatic money-making potential.

Building the standing forest economy will also require human capital investment, as Denis Minev points out. At present, STEM university education in the Amazon is dramatically underfunded for the demands of a twenty-first century, sustainable Amazon economy.

Public opinion, civil society, the business community, and international donors can all help push these efforts forward. Citizen pressure could be critical in driving the federal government to take action. However, public opinion has been ambivalent on this issue. On the one hand, as Amy Erica Smith describes in Chapter 7, Brazilian citizens are highly concerned about the impacts of climate change and environmental degradation in their own lives. On the other hand, this concern has not typically translated into robust mobilization. Brazilians living in São Paulo or Rio tend to see deforestation as something that happens far away, and the environment has not been a top concern when Brazilians go to the polls. Amy Erica›s ongoing research examines whether and how religious ideas and networks could more effectively build a broad citizen front demanding environmental protection.

Nonetheless, absent widespread public demands for action, a courageous and highly mobilized network of Brazilian civil society activists and scientists began to coalesce in the 1970s (see Chapters 4, 5,

and 8 with Minister Izabella Teixeira, Daniela Lerda, and Solveig Aamodt). This network has achieved important gains in both policy and environmental enforcement. However, such activists are marginalized at present in the Bolsonaro administration's policy-making processes.

Local stakeholders are also essential. Magaly Medeiros describes how effective policy collaboration between state government and indigenous communities in the far western state of Acre has empowered those communities to monitor and protect the Amazon (see Chapter 6). Daniela Lerda argues that local business communities in endangered areas such as the Amazon, the Cerrado, and the Pantanal should likewise demand effective environmental enforcement in order to guarantee a consistent and equitable playing field (Chapter 5). Building an environmentally sustainable Brazilian economy will require business and environmental leaders insisting that economic development and environmental protection are essential for each other.

Finally, international pressure can amplify the calls of citizens, civil society, indigenous, and local business groups. Historically, international outcry has proven important for prodding the government to take action for sustainability, as many of the chapters in this volume describe. When Amazonian fires dominated international headlines last August, concerted pressure from international donors and investors convinced Bolsonaro to clamp down temporarily on enforcement. However, international pressure only goes so far. International groups must pay attention to many crises simultaneously; when their attention strays to wildfires or pandemics in another corner of the globe, enforcement will decline and deforestation resume. Moreover, maintaining vigilance over an area of land the size of the Amazon requires sustained investment of resources.

In recent weeks, as the dry season again approaches, a committed coalition of investors and corporations—both Brazilian and international—has engaged in a concerted push to get the Bolsonaro administration to take environmental concerns seriously. The combination of economic leverage and reputational damage is having some effect. The administration has begun a public relations campaign to portray its environmental efforts in a more favorable light, and it has announced a moratorium on forest fires for the next 120 days.

Yet much more is required, a point underscored in a recent open letter from former Brazilian finance ministers and Central Bank presidents calling on the government to prioritize a low-carbon economic recovery in the wake of COVID-19, and warning of the "systemic repercussions" and "costs of neglecting climate events."[6] Brazil's long-term economic future is inextricably tied to its capacity to develop sustainably. The country's agriculture industry is vulnerable to changing temperature and rainfall patterns. Its coastal cities are threatened by rising seas; its hillside towns by devastating

[6] Alexandre Antônio, Armínio Fraga, Eduardo Guardia, Fernando Henrique Cardoso, Gustavo Krause, Gustavo Loyola, Henrique Meirelles, Ilan Goldfajn, Joaquim Levy, Luiz Carlos Bresser-Pereira, Maílson da Nóbrega, Marcílio Moreira, Nelson Henrique Barbosa Filho, Pedro Malan, Persio Arida, Rubens Ricupero, Zélia Cardoso de Mello,"Low-Carbon Economy: A Necessary Convergence," Convergência Pelo Brasil, July 14, 2020, https://convergenciapelobrasil.org.br/read-the-full-letter/

mudslides, and its urban centers by droughts that increasingly threaten to leave millions without access to potable water. However, Brazil is also uniquely poised to respond to the threat of climate change, through its enormous capacity to reduce deforestation but also through leveraging new technologies and innovations to drive advances in sustainable agriculture, industry, and energy.

Brazil, like the Amazon Rainforest, stands at an inflection point. It is increasingly clear that Brazil's future lies not in the deforestation of its past, but in summoning the political and societal will to build a twenty-first century economy that prioritizes human capital and sustainable, low-carbon growth. History shows that effective legal, regulatory, and enforcement frameworks can substantially reduce deforestation, which fell as low as 4,700 square kilometers in 2012. Sustaining that level of effort has proven politically and economically challenging. In the current political environment, it will be even more so. But the alternative—the destruction of the Amazon—should terrify us all.

About the Editors

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01

Introduction: The Amazon Fulcrum

by Thomas Lovejoy

Thomas Lovejoy, an accomplished conservation and tropical biologist, serves as a Senior Fellow of the United Nations Foundation where he advises Foundation leaders on biodiversity and environmental science. He served as President of the Heinz Center for Science, Economics, and the Environment from 2002-2008, and as the Biodiversity Chair of the Heinz Center from 2008-2013. He has also served on science and environmental councils under the Reagan, Bush, and Clinton administrations in addition to serving as the World Bank's Chief Biodiversity Advisor and Lead Specialist for Environment for Latin America and the Caribbean. He earned his B.S. and Ph.D degrees from Yale University.

As the Amazon heads into a new burning season, with deforestation in March 40 percent higher than the previous year, which itself commanded global attention, 2020 looks to be more than just a very bad year. In part, that is because cumulative deforestation matters much more than this annual increment. The degradation of the hydrological cycle (of which the forest is an integral part) is at the tipping point which will lead to the transformation of much of the southern and eastern Amazon from rain forest to savannah.[1]

The early signs are unmistakable. The dry season in those regions is now four months long instead of three. There are historically unprecedented droughts roughly every five years. In the forest itself, tree species composition is shifting from wet-adapted species toward ones more tolerant of drought.

The loss of those forests will constitute a significant loss of biological diversity, release of a very large amount of carbon into the atmosphere (thus worsening climate change), and a severe blow to the livelihoods of the people who live in those forests. Brazilian agriculture to the south of the Amazon will be less productive, and every country in South America (except Chile) will receive less moisture from the amazing Amazon hydrological cycle. This is environmental change at the continental scale.

Currently, most people are focused—and rightly so—on the COVID-19 epidemic wreaking havoc in Brazil, including in the Amazon. The impact on Manaus is horrific. It has already reached some indigenous communities in the Amazon, where it has genocidal potential.

Few are aware the pandemic originates from widespread human disruption of the natural world, both through habitat destruction and wild animal trade and markets. The same can happen in South America, if there is continued wholesale incursion into, and destruction of, the Amazon. The Amazon has plenty of micro-organisms, some of which I studied as part of my PhD thesis while based physically

[1] Thomas E. Lovejoy and Carlos Nobre, "Amazing Tipping Point: Last Chance for Action," *Science Advances* 5, no. 12 (2019): eaba2949, https://doi.org/10.1126/sciadv.aba2949.

at the Instituto Evandro Chagas in Belem, and some of these micro-organisms could spill over into human populations.

The way to avoid the tipping point is through forest restoration and policies which keep 80 percent of the Amazon under forest cover, so there are enough trees and leaves generating the moisture needed to maintain the hydrological cycle. That is, however, insufficient to achieve a sustainable future.

What is needed is a new vision of Amazon development based on sustainability and the incredible biological richness of the region. Important steps were made in creating various conservation areas and in demarcating indigenous reserves, but those areas are under increasing pressure and suffer illegal incursions and deforestation.

The Amazon has been plagued since the 1960s by poorly conceived and analyzed infrastructure projects, together with limited visions of development. Cambridge Prof. Partha Dasgupta and his team have produced an interim report at the behest of the U.K. Treasury on the economics of biodiversity. They find that decisionmakers only marginally, at best, account for the economic benefits of biodiversity.

Last year's United Nations (IPBES) report on the state of global biodiversity highlighted the prospect of major loss of biodiversity. The Amazon should not be part of that.

The Amazon is overdue for a new, science-based vision of development. This should be part of the concerns of scientists on Brazil's newly formed Amazon Council.

The explosion of new infrastructure projects should be replaced with ones that embrace the traditional system of transportation, namely the rivers. Highway infrastructure should be avoided, because it almost always leads to uncontrolled, spontaneous (and largely illegal) deforestation. There is no commandment that says the best way from Point A to Point B is a straight line. "Best" is not defined by efficiency, but rather by impact.

If, for some reason, there is an overwhelming transportation imperative to construct a highway, it should be an elevated highway, like Rodovia dos Imigrantes in the Atlantic Rainforest in the state of São Paulo. Yes, it is likely to be more expensive to build, but probably not when compared to the cost of the environmental destruction that would come from a conventional highway. In addition, full cost accounting (rarely done for highway projects) would include maintenance costs, which are notoriously high for highways in wet, tropical regions, but would be quite low for an elevated highway, because it is all concrete. Further, the environmental impact of the pylons would be about 2.5 percent of a conventional highway.

Similarly, hydroelectric projects should be subject to more serious economic analysis. The Belo Monte Dam was such a marginal project that private investment refused to engage, and the project only went ahead because of government money, as well as alleged corruption. Further, it only functions seasonally and requires two other dams to create a functional trio.

Amazon dams should be constructed allowing rivers to run freely, without blocking the sediment flows of Andean origin, flows so fundamental to the ecology of the great rivers. Run-of-the-river construction is also fundamental to the seasonal (sometimes called "pulse") agriculture that becomes possible at low water months of the year.

Nor should dams interfere with the migratory catfish species so important as a food source. The life cycles of these amazing fish run from the headwaters to the estuaries and back. Run-of-river design would allow this important feature to continue.

One of the more immediate possibilities for economic growth is aquaculture of native fish species like the tambaqui and pirarucu. This is happening in Peru, and the state of Acre has also had a measurable increase in state economic product from the industry. There is no reason native fish aquaculture could not be brought to scale and become a global commodity as well known and valued as salmon or cod.

A serious investment in science and entrepreneurial approaches could identify items with near-term potential, as was previously done for açai, which is now found in supermarkets across the United States. But it should be done in partnership with industry, so products with potential can quickly be scaled up and not remain a great idea sitting on the shelf.


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Peru and Ecuador have notable ecotourism industries. For whatever reason, with a couple notable exceptions, the Brazilian Amazon lags in ecotourism.

Interesting opportunities exist to explore sustainable cities, especially if they do not draw on vast amounts of forest resources.

The Amazon is teetering on a fulcrum as much socioeconomic as ecological. With proper vision and political will, this can tilt in the direction of sustainability for the people of the Amazon, as well as its amazing biological diversity.

02

Interview with Carlos Nobre

This interview has been edited and condensed for clarity.

Carlos Nobre is a top Brazilian climate scientist known for his research on the climate impacts of Amazon deforestation and on the risk of savannization of the Amazon. Currently, he is a Senior Scientist with the University of São Paulo's Institute for Advanced Studies. He worked for the Brazilian National Institute for Space Research (INPE) from 1983 until 2012, and has previously served on the International Panel on Climate Change (IPCC), as President of the Brazilian Federal Agency for Support and Evaluation of Graduate Education (CAPES), as National Secretary of Research & Development Policies for Brazil's Ministry of Science & Technology, and as a member of the UN Secretary-General Scientific Advisory Board (SAB) for Global Sustainability.

To begin, can you explain the current state of the Amazon?

The Amazon is very close to its tipping point. I'm not only talking about the fact that temperatures in the Amazon Basin have risen 1.5 degrees Celsius over the last 80 years due to global warming. I'm talking about hydrological changes: the whole planetary circulation changes associated with global warming and regional deforestation.

In 2018, Tom Lovejoy and I wrote a report in *Science Advances* warning that if we exceed 20-25 percent deforestation, and with the continuation of global warming and forests becoming more vulnerable to fire, then we will reach an irreversible tipping point, meaning a large portion of the forest will start becoming a dry savanna.[1]

The main impact of global warming over the Amazon Basin is a reduction in rainfall during the dry season. We also considered the increased vulnerability of the tropical Amazon forests to fires. Wet forests are very resilient to fires because the bio-matter is wet and not flammable. However, deforestation, degradation, illegal logging—all those factors together are making the Amazon more vulnerable to fire.

We put all of those factors together in a 2016 paper.[2] Even with zero global warming, if we exceed deforestation of 40 percent of the total area of the Amazon, we will reach a tipping point in which the new climate—the post-deforestation climate—is no longer compatible with the wet forest. The dry season will become more than four months long, and this is the climate analog of the dry savanna.

[1] Thomas E. Lovejoy and Carlos Nobre, "Amazing Tipping Point," *Science Advances* 4, no. 2 (2018): eaat2340, https://doi.org/10.1126/sciadv.aat2340.
[2] Carlos Nobre et al., "Land-use and Climate Change Risks in the Amazon and the Need of a Novel Sustainable Development Paradigm," *PNAS* 113, no. 39 (2016): 10759-68, https://www.pnas.org/content/113/39/10759.

Now, if we only had global warming without deforestation, you would also have a tipping point if the temperature increase in the Amazon exceeded 4 degrees Celsius. The hydrological changes associated with warming also make the dry season much lengthier. These are independent: a 4-degree increase from global warming, or 40 percent deforestation.

This is all modelling, so one might criticize it and say, "Well, how can you be sure?" Unfortunately, we have already seen these things happening. In Bolivia, and the Brazilian Amazonian states of Acre, Rondônia, northern Mato Grosso, and Pará—the southern, eastern part of the Amazon—observations are following exactly what we predicted.

Number one: the dry season is becoming lengthier. Over the last forty years, it has become three weeks longer, and in heavily deforested areas, it is four weeks longer. So, we are almost near the tipping point, which will really turn ecosystems into a dry savanna!

Number two: during the dry season, the temperature is between 2 and 3 degrees warmer. And this is not only global warming—global warming all over the Amazon is something like 1-1.5 degrees. This area is something like 3 degrees warmer. Part of the warming is related to less forest evapotranspiration during the dry season, that is, if you have less evaporation, the air heats up. That's bad news.

Also, in those areas, the Amazon is no longer a carbon sink. It's not removing carbon dioxide from the atmosphere. In fact, it's already carbon neutral and, in some areas, it's losing carbon. I'm not talking about the fires or chopping down the forest as a carbon source. I'm talking about the forest itself, which is not functioning as a carbon absorber in some areas in the southern Amazon.

The most worrying fact is the combination of these factors. The mortality rate of wet forest tree species is much higher than the mortality rate of dry forest species. So, we are not far from the tipping point. From our calculations, [the tipping point is] something like 20 to 25 percent of total deforestation. In the whole Amazon, we have about 16-17 percent of total deforestation. So, we are somewhere between 15 and 30 years away given the current rates of deforestation.

You've done a lot of work on sustainable development and creating a bio-economy in the Amazon region. Can you talk a bit more about it?

Our proposal for a bio-economy is to leave the forest standing. The forest today is not without human interference. Over thousands of years, indigenous communities anthropized the forest. They modified the forest to produce drugs, food, beverages, materials for transportation, tools, canoes, etc. They modified the distribution of species. Through gardening, over thousands of years, indigenous women created thousands and thousands of varieties [of species]. For instance, just one indigenous group in the Peruvian Amazon has knowledge of over four hundred varieties of manioc. The Yanomami in northern Amazonia knows over 30 varieties of cocoa. So, sociologically speaking, indigenous groups developed a standing-forest economy.

We want to use modern technologies to demonstrate that a bio-economy is feasible today. The standing forest has economic value because we can harness its biological

and biomimetic aspects. There is so much hidden knowledge that we can decipher and study scientifically. We can merge indigenous knowledge with scientific knowledge of hundreds of thousands of species.

Let me give you examples. Açai berry palm trees are the most common tree species in the Amazon. And this is not natural. This is because açai was a food staple for indigenous populations for thousands of years. Now, if you manage açai berry in an agroforest, then the tree is worth between four and ten times more than cattle per hectare, and between two and four times the value per hectare of soy in the Amazon. The state of Pará is the largest producer of cocoa, feeding the chocolate industry in Brazil. A recent study shows that people who moved to cocoa agricultural systems are making between four and six times more profit per hectare compared to the cattle.

However, our proposal has one more dimension. Our idea is to create agro-bio industries that add value to the Amazon. Instead of only selling açai pulp, they produce its derivatives. From cocoa, they produce chocolate. We could devise hundreds or thousands of products.

It's a very radical change from the 1970s model of the Manaus free trade zone, which brought people and industries from elsewhere: electronics, motorcycles, etc. It was supposed to create an industrial innovation hub. Of course, that has not happened. The industrial complex is like the assembly lines of maquiladoras in Mexico. They do not create, they do not develop, they do not innovate. In fact, the free trade zone is losing competitiveness, even with all the tax incentives. So, we need a new industrial model.

Baskets of fresh açai berries in Belém (Shutterstock)

So, why should we bring bio-industry to the Amazon? To uncover knowledge, profits, and products, and reach international markets—while returning a large fraction of the financial benefits to the people of the Amazon.

At the Wilson Center in December 2008, you said there were five products from the Amazon and that we needed at least fifty export products that depend on the forest's existence to implement a bio-economy that leaves the forest standing. Where are we now, compared to a decade ago?

The açai berry is really big, generating something like 1.1 billion dollars a year into the Amazon economy. This is more than timber (legal and illegal) and is only inferior to beef. In less than ten years, we developed this bio-economy from the standing forest. Even without industrialization, in ten years it is going to be equal or superior to the deforestation-based economies: meat and grain. Traditional agribusiness has tremendous political power, but they're getting a bit concerned. They're trying to find a way to sustain their model.

When you present the idea of adding value to the Amazon to the Brazilian business community, do more private sector representatives understand your argument now? Are these ideas being better received and do you see more room for progress?

Yes, I see room for progress, but we need to address real challenges. At investment firms, everybody sees potential for products like the açai berry, cocoa, but they still have doubts. I think Brazil is losing faith that we can compete internationally in industry. This is not a problem only with the Amazon; this is an inferiority complex in Brazil. So, when I say, "Listen, you have to invest in these industries," investment funds say, "Well, this is a beautiful idea, but perhaps we are not able to do it."

That's why we are developing the Amazon Creative Labs. We are constructing the first one, a mini-factory to demonstrate the ability to produce chocolate from cupuaçu and cocoa in Amazon communities. There are all these value chains from the seeds of cupuaçu and cocoa. Also, we are designing a lab for the Brazil nut value chain. We are going to run cupuaçu-cocoa exercises in local communities and also on the campuses of Amazonian universities to motivate students to become entrepreneurs interested in the Amazon.

Our goal is not only to convince other Amazonian countries and international investors. We also want to demonstrate—on a very small scale—that communities and university students can do it. I think that as soon as we demonstrate that they can produce products with large added value, we will build the trust of investment groups that Brazil can industrialize bio-economies in the Amazon.

03

Interview with Denis Minev

This interview has been edited and condensed for clarity.

Denis Minev is CEO of Lojas Bemol in Manaus, as well as Co-founder and Board Member of the Fundação Amazonas Sustentável. Mr. Minev served as Secretary for Planning and Economic Development for the state of Amazonas from 2007 to 2009, where he oversaw a decline in deforestation.

To begin, can you please describe briefly the intertwined challenges you see in Manaus and the Amazon region that are related to COVID-19 and deforestation? How do you think the two crises are influencing and will influence each other?

COVID-19 is striking the Brazilian Amazon with incredible speed. Manaus had its peak in late April and by mid-May the virus had already killed more than 0.15 percent of its population (if we consider excess deaths over normal). The disease is now moving to the interior and to other states in the region. It seems to me that our sociology is not very conducive to social distancing, so even closing commerce will not reach the level of social distancing necessary to avoid a catastrophe. The only good characteristic of the region is its demography in terms of age: we are generally a very young population, while COVID-19 strikes with more deadliness in older populations.

As COVID-19 leaves in its wake financial stress, state and municipal governments will have to make choices on what to cut and what to keep. Indebtedness will grow as state revenues plummet: early indications are of around a 30-45 percent decline for the month of May 2020. I suspect in this scenario no government will choose to maintain strong investment in environmental protection.

A second effect is that many people have left Manaus because of economic closures. In my view, it is likely that cities may lose some importance, at least temporarily, to the countryside, as livelihoods dry out and businesses fail. Anecdotally, boats are leaving Manaus for the interior full and returning empty. What all these productive people will do in the interior is unclear, but I suspect it cannot be good for deforestation.

Additionally, Manaus has historically acted as a magnet for entrepreneurs from the interior, who find a lot of opportunities in this mostly industrial and commercial city. Opportunities in Manaus are in industry and services, and so they generally have nothing to do with the forest, and hence have no impact on deforestation. As Manaus loses some of its economic power, it is likely many people will undertake enterprise in the interior, where the most promising opportunities are generally related to land use.

Can you tell us a bit about your career in state government, and about the organizations you founded?

I worked at the State Government of Amazonas from 2007 to 2009 as Secretary for Planning and Economic Development, a period when Amazonas had a GDP growth rate above 10 percent per year and deforestation rates were falling by almost 50 percent. The year 2009 remains the best year on record for fires and deforestation in the state of Amazonas.

We implemented sensible policies that discouraged deforestation for cattle breeding and encouraged highly productive activities in deforested areas, such as fish farming. We also connected some forest products with industries in Manaus, the most notable example being a Michelin tire factory in Manaus using local rubber. We doubled investment in research and development in Amazonas in three years, despite a budget shortfall caused by the 2008 international crisis. We also initiated relations with California for what would eventually become the Governors' Climate and Forests (GCF) Task Force, an important subnational initiative to tackle climate change.[1]

After leaving the state government and going back to the private sector, I remained involved in some causes, including through co-founding two NGOs: the Fundação Amazonas Sustentável (Sustainable Amazon Foundation) and the Museu da Amazônia (Museum of the Amazon).

The Fundação Amazonas Sustentável is a foundation created to protect state-protected areas.[2] It is simple for the government to establish a protected area on paper; it is another story altogether to truly make it protected. We set up partnerships with companies (Bradesco Bank, Coca-Cola, Samsung, and my company, Bemol, among many others) to create incentives for populations living within protected areas to become their defenders. We do so by helping improve living conditions through sustainable economic activities. We have been quite successful so far; many of our protected areas are in the arc of deforestation, the area most likely to be deforested; we have been working in these areas since 2008 and there has been no significant instances of deforestation in any of the protected areas we help manage, which cover an area equivalent to 150 thousand sq km (the size of Illinois).

The Museu da Amazônia is an institution established in a protected area near Manaus focused on education, science, and tourism. It is supposed to be a place for children in Manaus to be exposed to the forest and learn its wonders. It is supposed to be a place where tourists can come and see the fish, the insects, all the wonders of the forest. And it is supposed to be a place where science is developed as well. We are open and growing, at least we were until COVID-19.

You have described deforestation as a "by-product of a bad system." Can you explain this idea further?

Deforestation is a problem, in my view, that you cannot tackle by itself. You have to look at it from four perspectives: the environmental perspective, of course, but also the economic, social, and political perspectives.

[1] To learn more, visit https://www.gcftf.org.
[2] The foundation's annual report is available here: https://fas-amazonas.org/publicacoes-2.

I like to recount a story from 2007. I was secretary for planning of Amazonas, and a city in the neighboring state of Pará called Tailândia (nothing to do with Thailand) was identified as the worst deforester in the Amazon. There was great international outrage (as there is from time to time) and the military was sent there to fix it (as it is from time to time). With the military in the streets, the people of the city initially revolted but then were pacified by force; when the military left (as it eventually has to) everything there went back to normal.

What really happened? It is a city of 30,000 people whose main economic activity is lumber mills. All the lumber processed is illegally extracted from neighboring forests. These neighboring forests have no title, mostly belonging to the federal government or with unclear (and many times multiple disputed) owners. Everything that went on in that city was illegal or informal. Commercial establishments have no title to the land they are on, pay no taxes, exist only physically but not in the "books." Many people have no government-issued ID. People there sell goods and food in the market with no permit to do so. Very few people pay income taxes (most of those who do are municipal employees).

In such a situation, there can be no wealth accumulation, no long-term prosperity. There can only be short-term gain. Illegal deforestation not only makes sense in this situation, it thrives where there will be no consequences; there is a real economic incentive to deforest. The mayor, elected by the people, will support the people's economic activities as they exist. So you have political, social, and economic aspects that have to be deconstructed in order to truly tackle deforestation. Anything else is temporary and costly. I am sad to say that in 2020, much remains the same.

How can we make deforestation not make sense? The quick answer, to me, is to start to formalize the economy. Make sure people exist economically, have IDs, have bank accounts. These seem like simple things, but bureaucracy sometimes forces people to go get permits in Belém, the state capital that is 300km away (and this is close by Amazon standards) and wait there for days. People cannot afford to do that, so they don't.

In my view, in the formalization process, the most important issue, but also a very controversial one, is to get people property rights over the land. There is significant literature, from Ronald Coase to Hernando de Soto, showing how property rights change economies for the better. If one has title to the land, one can start to accumulate capital, one can guarantee a loan, one is responsible for it. Of course, the flip side is that one also has rights to use part of the land (20 percent in current Brazilian law). Additionally, many environmentalists worry that giving property rights will encourage land invasions or reward bad behavior. Though that may be true, I see no other solution to the deforestation problem. There may also be more legal deforestation in the short term, as the forest becomes more valuable economically, but legal deforestation is such a small slice of the total that I believe it unlikely to overtake the current total tally. The alternative is a sequence of short-term repressive measures, intermittent international pressure and condemnation, and continuous and permanent poverty. No one in the Amazon should accept it.

Part of the consequence of a bad system is that you mostly attract bad players and

Dirt road and deforestation near soybean plantations close to Sinop, Mato Grosso, Brazil (Shutterstock)

drive away good ones. For example, I know of no significant businessperson in the state of Amazonas that has earned a significant portion of his or her money from activities related to the forest. The people involved in forestry activities in Amazonas, as I see them, can be divided into three groups: the foreigners who do it for an ideal (e.g., MIL Madeireira or Precious Woods), the local dreamers (who live at subsistence level), and the illegal foresters.

In order to attract good businesspeople, there have to be clear rules, good land titles, and long-term, stable perspectives. I have financed two startups that have tried to engage in sustainable forestry in the region; both have failed, amid enormous bureaucratic challenges and senseless laws.

From that experience, I learned that one cubic meter of generic wood in Manaus today fetches either R$100 (for illegal wood) or R$700 (for legal wood). Despite the enormous difference, the only type available is illegal. Why? Why do people choose to do it illegally and earn seven times less?

The answer unlocks the system. To dissolve the problem of deforestation, forest dwellers have to see the value of being legal (I believe they do already today) and they have to see a path to being legal (I believe they do not today). Making the Amazon a formalized economy is the task of a generation. The unfortunate news is that we are not moving in that direction today. No one seems to be ready to have this conversation while polarization abounds.

For international policymakers and international NGOs concerned about the Amazon, what do you see as the most promising policy levers for incentivizing good behavior in the current economic and political climate?

As I mentioned previously, the politics of fighting deforestation in the current system are not favorable. The people of Tailândia will pressure their mayor. The mayor of Tailândia will pressure the governor. International pressure in the opposite direction may be temporarily effective, but then the international community moves on to the next shiny emergency (North Korea, COVID-19, African immigration, civil war in Syria), and everything goes back to normal.

That is why I think there are issues that are not acrimonious, where cooperation may be more productive. For example, science. Everyone (including the mayor of Tailândia and the governor of Pará) agrees more knowledge and more knowledgeable workers will make for a better future. But we have never chosen to truly invest in doing science in the Amazon. Every government has paid lip service to it, but has not done it truly, not when you look at the numbers. For example, INPA, Brazil's National Institute of Research in the Amazon, has an annual budget that is now less than $15 million. It has never been significantly higher. No one will do true research with such a budget. We should be spending a hundred times more: $1.5 billion is not an enormous sum internationally. And that amount would change the Amazon.

Let me do quick math with $1.5 billion. One PhD in STEM (science, technology, engineering, or math) at the state university in Manaus has a cost of approximately $60,000. So, $1.5 billion would produce 250,000 PhDs (many more than are needed). The state of Amazonas today has less than 5,000 PhDs in all areas. Of course, this

is just a mental exercise, many more investments would be needed, but it gives us the magnitude of the challenge.

Then, and only then, could the Amazon be called on to develop a biotech industry or to try to engage in a green revolution. That is because a green revolution has nothing to do with the natural resources you have, but everything to do with the people you have. The people we have in the Amazon today will not execute a bio-based economic strategy. We have not paid the table stakes to play this game. It is nice to hear the world argue about what the Amazon should do, but suggestions need to be within the realm of possibility and not pipe dreams. I believe that is one thing the international community can help us with: turn what seems like a dream today into reality.

The results long term would be much better than sending us fire-fighting airplanes. But I do understand that an international community and NGOs fueled by fundraising may not find that topic to be emotionally-riveting enough to move voters or impassion donors.

What about for NGOs or private entities such as business groups in Brazil? What are most promising opportunities at present?

It has to be attractive for private players to invest in sustainable activities in the Amazon. It is not; the evidence of it is that there are no mid-size companies successfully investing in anything sustainable related to the forest. There are many pilot projects; we have been doing pilot projects forever, and they never gain scale. Pilot projects will not change the system. They will not render deforestation useless.

This is of course a complex argument, not easily translated into a tweet. NGOs and private entities hoping to get engaged should take the time to understand the system; I believe, in general, they have not.

04

Interview with Izabella Teixeira

This interview has been edited and condensed for clarity.

Izabella Teixeira served as Minister of the Environment during the administration of President Dilma Rousseff, during which time she led Brazil in negotiating the Paris Accords. Prior to her service in the Rousseff government, she had a 25 year career as an environmental analyst in several federal agencies. She holds a PhD in environmental planning from the Federal University of Rio de Janeiro.

Over the course of your career, you have seen a lot of changes in Brazil's capacity to fight deforestation. Can you explain?

Brazil has had a great capacity to fight deforestation since 1989. In 1988, there was the death of Chico Mendes, and a major emergency in 1987, 1988, due to the fires in the Amazon. This caught the world's attention, and the world put great pressure on Brazil. Facing high inflation and international pressure, President Sarney chose to establish the first program to combat deforestation in the Amazon.

The government's response went in three directions. The first was to reformat the country's entire environmental management. In President Sarney's last year in office, the Our Nature (Nossa Natureza) program was created for federal public environmental management. In 1989, he created Ibama, the Brazilian Institute for the Environment and Natural Resources, and the government designed the first program to combat deforestation, which was called the Emergency Program for the Legal Amazon (PEAL, Programa Emergencial da Amazônia Legal). Brazil also worked with INPA [the National Amazon Research Institute] to set up a strategy for monitoring fires.

Second, Brazil used international cooperation to deal with environmental problems that had global reach. I went to the United States in 1990 or 1991 to build an agreement with the US Forest Service, to develop technology for monitoring and fighting forest fires. The partnership between Brazil and the US Forest Service developed capacity in Brazil to fight forest fires.

In that same period, a third choice was that President Sarney offered for Brazil to host Rio 92. It was exactly at that time that scientific studies all over the world began to confirm that the climate emergency was real. Instead of saying that the world was our enemy, we, as Brazilians, brought the world to Brazil to understand what Brazil was doing, and to discuss what we should do more.

The Ministry of Environment allied with the Ministry of Science and Technology and the Ministry of Foreign Affairs. That is why Rio 92 took place, the first conference in a decade in which multilateralism had great strategic force in the world. It was an immense effort, and international visitors

were very well received by the Fernando Henrique government. But also under the Fernando Henrique Cardoso government, deforestation peaked at 29 thousand square kilometers.

The second peak of deforestation comes under President Lula: 27,000 square kilometers per year in 2004. Lula attacked the problem on several fronts. Deforestation began to fall precipitously when the government developed a new plan, called the PPCDAm (Action Plan for Prevention and Control of Deforestation in the Legal Amazon), under the management of Minister Marina Silva. It is in this context that new instruments were developed, such as the so-called DETER (the system for Detection of Deforestation in Real Time), in order to guide federal inspection more effectively.

Lula's second response was an ambitious social agenda addressing human rights and socio-environmental inequalities in the Amazon. His third response was a strong biodiversity conservation agenda. The Lula government implemented a legacy from the Fernando Henrique government, the Amazon Region Protected Areas Program (ARPA), as Brazil's answer at Rio+10 in Johannesburg. We consolidated 60 million hectares of protected areas in the Amazon. Under my management, Brazil had its lowest rate of deforestation, 4,700 square kilometers in 2012.

This all happens concurrently with a movement to make Brazil self-sufficient in food production. Brazil today is one of the largest food producers in the world. This agricultural revolution was brought about particularly by [the Ministry of Agriculture's research arm] Embrapa,[1] and by improving conditions for using the Brazilian Cerrado.[2] It ceased to be a strictly environmentalist thing, and adapted to the concept of global well-being. We weren't doing photosynthesis just to do photosynthesis anymore.

You have represented Brazil at the negotiating table in climate accords. How have you seen Brazil's role change over time?

We arrived in Copenhagen in 2009, with the countries involved failing tremendously in reducing emissions. Then the Kyoto Protocol collapsed. Negotiations failed as countries attempted to produce documents outside of multilateral cooperation.

Then Brazil said: "I am going to do my homework to reduce emissions voluntarily." Under the Climate Convention [the 1992 United Nations Framework Convention on Climate Change], only developing countries had an obligation to reduce greenhouse gas emissions by 2020. Until that period, emissions reductions in Brazil were mostly based on voluntary commitments in the areas of energy and soil. When Lula returned to Brazil, he passed a law, the first national policy, with mandatory goals to be met by 2020. This was followed by state laws. During this entire period, Brazil exercised its sovereignty within its peacefully consolidated borders.

After the failure in Copenhagen, in 2010 we had another failure in Cancun. Then, in 2011, in the Durban Conference, Brazil worked

[1] Embrapa is the Empresa Brasileira de Pesquisa Agropecuária (Brazilian Agricultural Research Corporation), an office for research and agricultural extension within the Ministry of Agriculture.
[2] The cerrado is a vast, biodiverse savanna region covering more than 20 percent of Brazil, that has become home to large scale agriculture and ranching.

The Permanent Joint Commission on Climate Change (CMMC) of the Brazilian National Congress holds a public hearing on October 1, 2015 to debate Brazil's proposal to be presented at the 21st UN Climate Conference - COP-21 in Paris. Presiding Board: Minister of State for the Environment (MMA), Izabella Teixeira; and president of CMMC, senator Fernando Bezerra Coelho (PSB-PE). (Marcos Oliveira / Agência Senado)

with BASIC [Brazil, South Africa, India, and China], a very interesting group that was a strategic legacy of Copenhagen. Brazil demanded two things: that every country would have the obligation to reduce emissions, and that the framework of the climate convention would not be changed, but multilateralism would be protected.

Paris changed the game. Paris was another big problem. Brazil delivered a speech—I delivered a speech—saying that Brazil is on board with a new agreement. Carbon neutrality is a strategic part of Brazil's vision as an emerging economy, using the global issue to promote its development. Brazil still has fat to burn. Although Brazil was on a path of reducing emissions, it started to increase again.

We had presidential participation: President Fernando Henrique created the Brazilian Forum for Climate Change, negotiating with Clinton. President Lula spoke with Obama. Dilma spoke with Obama and Xi Jinping. These bilateral agreements were the support base of Paris. The Minister of the Environment had an important coordinating role, but this was a global issue, not a strictly environmental matter.

This no longer exists. On the contrary, you have a federal government that questions the very existence of climate phenomena. The political role of the Ministry of the Environment was downgraded, and the Foreign Ministry (Itamaraty) dismantled the structures of so-called carbon diplomacy.

What do you see as the next steps in the near term for climate change policy in Brazil?

The current government has fixed ideas about social participation, and many of its allies believe environmentalist NGOs play against national interest. This perception affects the government's ability to foster international dialogue, because environmentalist NGOs are well-recognized abroad. This perspective of a polarized Brazil–on one side you have environmentalists, on the other side you have the government–will not work.

You need to create a dialogue with the private sector and civil society. The only way forward I see is to explore new political stances, starting with economic reform, and build new constituencies.

Environmentalism is increasingly adopting an economic perspective. Now, our climate agenda does not focus solely on deforestation. For example, it also focuses on choosing a new energy matrix for Brazil, on business, and on technological innovation. Climate policy and carbon pricing now take into account agriculture, and they monitor market demand, production costs, and competitiveness. Brazil also needs technological investment to produce foods with low carbon agriculture.

Implementing Paris will require forest restoration. We need to understand the paths to finance the Brazilian forest sector. One of the delicate issues this century, I think, is that countries with forests will have political or geopolitical power. Brazil has already destroyed the Atlantic Forest (Mata Atlântica), which has more biodiversity than the Amazon, but Brazil has a second huge forest that science signals is at a tipping point.

Second generation cellulose biofuels are also a path. Brazil's biofuel sector—that is, ethanol—particularly benefited from the Paris Agreement.

The federal government's role is to have a separate vision of the country's development. However, the private sector is assuming a part of this role, especially in the area of economics. Increasingly, the Ministry of the Economy can coordinate these policies. You also have an emerging political space for the private sector, for the financial sector. You can construct the agenda with Brazil's economic sectors and offer it to the Minister of Economics to promote Brazil's economic, financial and commercial interests.

06

Interview with Daniela Lerda

This interview has been edited and condensed for clarity.

Daniela Lerda is the Climate and Land Use Alliance's Coordinator in Brazil based in the Ford Foundation's Rio de Janeiro office. Prior to joining CLUA, Daniela led PADMA Environmental Consulting, a firm that she founded to work at the intersection of business and biodiversity conservation. Daniela also spent three years at Funbio where, among other responsibilities, she facilitated a network of 22 conservation trust funds on behalf of RedLAC, the Latin American Network of Environmental Trust Funds. She has extensive relationships supporting corporate, government, NGO and foundation clients in areas ranging from supply chain management, certification, finance, mining and energy, agriculture and infrastructure.

Can you describe the state of conservation in Brazil?

Brazil has a prominent place in maintaining global biodiversity and in mitigating climate change. It's got the largest area of tropical and subtropical forests, with a large diversity of biomes, ecosystems and species, many of which are largely unknown, and some critically endangered—all significantly impacted by human activities. Some of these ecosystems have been extensively transformed or lost. That is certainly the case for the Atlantic Rainforest, which covers the coast of Brazil, and also the Cerrado, the rich savannas in the central western portion of the country.

From 2004 to 2012, Brazil decreased deforestation by almost 80 percent through a combination of measures, none of which would have been sufficient alone. Deforestation went down while economic development and productivity went up. These two objectives need not compete, as we have seen and experienced over the past decade.

Unfortunately, in recent years, a number of rollbacks in the form of laws, constitutional amendments, and provisional measures put this prior progress into question—including efforts to downgrade protections, and halt demarcation of new protected areas and indigenous lands.

What is driving deforestation in Brazil right now?

For both legal and illegal deforestation, most of the forest lost ends up as cattle or soy; illegal mining has also been growing significantly in the last few years, advancing onto indigenous lands and protected areas. But according to volume of the area cleared, conversion for cattle and soy are the main sources of deforestation—along with infrastructure: mainly roads to get products out of the forest for both export and domestic markets.

Data also shows a major connection between illegal forest conversion and land speculation. The way Brazilian land laws are set up, it is necessary to show that land is productive—otherwise it may be appropriated by the government. A series of pardons have also been granted to illegal land grab-

bers in the past, granting them amnesty over cutting down the forest. These perverse incentives facilitate illegal clearings and occupation of public lands that end up as pastures with a few heads of cattle. A recent study by IPAM found that of the 49.8 million hectares of forests under state and federal responsibility in the Amazon, but not yet designated for a specific purpose, 11.6 million hectares, or 23 percent, were illegally registered as 'private rural properties' using the Brazilian Environmental Rural Registry (CAR, in Portuguese). The area is equivalent to half of the United Kingdom.

If you look at the Cerrado, even though most of the land has ended up as soy plantations, cattle are driving a lot of the initial land conversion. Satellite data shows us that land cleared for cattle are being converted to soy farms in under three years, which is less than the time necessary to render cattle ranching profitable. This indicates a clear pattern of land speculation also taking place in the Cerrado.

Could you explain the importance of the Cerrado from a conservation perspective? I ask because, at least internationally, the focus is on the Amazon.

The Cerrado is South America's largest tropical savanna and a global biodiversity hotspot. More than 50 percent of its original cover has been cleared for agriculture, mostly for soy. Although tropical zones are not naturally good for growing food, massive research and investments in Brazil during the 1970s adapted and corrected the soil to allow for agricultural production, and in particular, soy. Soy was followed by sugar cane and corn, and the Cerrado soon became the heart of agricultural productivity in Brazil.

What's left of the original Cerrado today, in terms of natural vegetation, is concentrated in four states: Maranhão, Tocantins, Piauí, and Bahia. Conservationists think of the Cerrado as an upside down forest: most of the biomass is under the soil in root systems, which are very important for absorbing moisture from the atmosphere, and rain during the rainy season. These deep root systems feed important aquifers that lie underneath the ground. Three of Brazil's most important watersheds actually originate in the Cerrado.

Agricultural irrigation puts huge pressure on the hydrological systems of the Cerrado. There's an additional threat related to the large volume of pesticides used to grow soy and corn, which seep into the ground and contaminate soils and water sources. Brazil is known for being the world's largest consumer of pesticides, raising concerns for the health of local populations over the long term.

The Cerrado has very different land distribution patterns than in the Amazon, where most illegal deforestation is occurring on undesignated federal lands. In the Amazon, we should be trying to designate public forested lands, by fulfilling the constitutional rights of indigenous people to their lands and also creating protected areas.

In the Cerrado, a lot of the land is state land, rather than federal. It is easier for state lands to come under political influence in terms of how they get distributed and converted for agricultural use. Many of the traditional communities that live in the Cerrado lack formal recognition of their land rights. You may have heard of Harvard's Endowment Fund, which was accused of investing in illegal land conversion in the Cerrado. A lot of times, investors don't even know that this is happening.

We need to remember that the Cerrado is one of the richest ecosystems in the world

and among the 35 most important areas for biodiversity conservation globally. Even if it is not a tropical forest, it is still necessary to protect this delicate ecosystem, which is something we have not been taught to appreciate sufficiently in our culture.

What are the roles of government, Brazilian civil society, and international groups in conservation?

Civil society plays a very active role in helping to guide public policy, including by providing scientific evidence and engaging in public debate. The scientific community has helped determine the most critical areas for biodiversity protection and climate mitigation. Brazil has a strong and vibrant civil society, but non-governmental organizations do not have the authority, mandate or resources—financial, physical, and human—to enforce public policies. It is up to the government to do that.

Civil society's role is also to act as a watchdog and monitor the government—even when it is collaborating to advance policy commitments. It must keep watch and call out the government when it is not fulfilling its promises to society.

International institutions are definitely important, and at the current juncture, essential. Brazil used to be a leader in multilateral forums, advancing commitments to biodiversity conservation and climate mitigation, but it is quickly losing this ground. Unifying voices like Greta Thunberg, along with national governments and multilateral institutions like the UNFCCC, are critical for keeping discussions alive and holding Brazil accountable to its global commitments. The private sector, companies, banks, investors can also help raise concerns when domestic forces are not as favorable. Brazil obviously has a prominent place in the global climate and biodiversity arena – home to the world's largest tropical forest, and two biodiversity hotspots, in addition to being home to hundreds of ethnic, racial, social, and cultural groups.

How much responsibility does the private sector bear, and what role should corporations play?

Companies tend to have clear goals that relate to their bottom line – profit and growth. No matter how good or well-intentioned a company may be, it is still accountable to its shareholders. Without proper regulation and enforcement by the public sector, it is difficult for companies to self-regulate.

On the other hand, corporations that wish to act responsibly need to call on governments to set clear and fair rules that don't allow leakage. While it is often the case that

Cariri, Paraíba part of the dry Caatinga Biome in Northeast Brazil (Shutterstock)

corporations push for deregulation and less bureaucracy when it comes to environmental issues, they could play a reversed role, and call for a competitive environment that also co-generates social and environmental returns. Private sector commitments or public statements favoring transparency will be insufficient. For society to prosper, we actually need companies to proactively deliver on social and environmental objectives.

Here's an example: in 2009, about 50 percent of slaughterhouses operating in the Amazon agreed not to buy cattle from recently deforested areas; they signed an agreement to exclude certain suppliers. However, slaughterhouses that did not sign the agreement continued to buy from suppliers that had illegally cleared their farms. Ultimately, after the agreement was signed, procurement of cattle from the Amazon didn't decline; on the contrary, it went up. Think about it: the math doesn't add up. If the commitment of slaughterhouses to exclude suppliers had been working, we would expect overall purchases from the Amazon to decline. But the volume of cattle sold from the Amazon increased, and at a rate unexplained by increased productivity. This shows us two things: first, commitments are insufficient unless everybody (the whole sector) commits; and second, the regulatory and enforcement system has to be airtight to catch any leakage of illegal suppliers into legal markets and hold them accountable.

How can we use technology to develop the Amazon in a sustainable way?

Brazil is recognized internationally for having the best rainforest monitoring system in the world: PRODES, created in 1988. The system is 95 percent accurate. It combines data from three different satellite systems; it's a testament to global technological cooperation. These systems can capture images of a forest bigger than six hectares, giving you a close reading of what's happening on the forest floor. Now, new technological developments have enhanced these pictures further. Mini-satellites can fly much closer to the ground, and get precise photographs that go down to three meters of visibility, unobscured by clouds.

The other interesting discussion about an Industrial Revolution 4.0 is the untapped potential of forests for future technological and economic opportunities that are still unexplored and largely unknown. What would be an economic model that is compatible with forest protection and management? The Brazilian government recognizes that the Amazon has huge potential—despite the region's historically low economic development and social progress. But so far, the model that has been exported to the Amazon—rather than born out of the Amazon—is not compatible with a standing-forest, flowing-river economy, which is what we need. The current model is based on the exploration of natural, mineral, and energy resources, as well as agricultural commodities that expand and replace forests. We need to understand the biodiversity potential of forests better and implement cycles of sourcing forest products and restoring its resource base permanently. You know, the tree that had quinine in its bark was eliminated a hundred years ago because people didn't understand that cutting off the bark would kill the trees. We need to understand our intricate dependency and relationship with nature, or we will be doomed as a species in the long term.

06

The Role of Indigenous Peoples in the Conservation of the Amazon

by Magaly da F.S.T. Medeiros

Magaly da F.S.T. Medeiros is a biologist, with 30 years of experience with local communities and indigenous peoples in the Brazilian Amazon region. She is a representative member for Brazil on the Global Committee for Indigenous Peoples and Local Populations in the Task Force of the Governors for Climate and Forests (FT-GCF). She served as President of the State of Acre Institute of Climate Change and Environmental Services Regulation (2014-2018), and while part of the State Secretariat for the Environment of Acre, she coordinated International Projects on environmental management and management of natural resources in tropical forests (1999-2013) and has a track record of leadership with public governmental entities and civil society actors environmentalists and indigenistas. She previously worked on research projects in areas of conservation units with involvement of local populations (1990-1998).

The indigenous peoples that inhabit the best-preserved areas of the Amazon have historically contributed to the conservation of natural resources. The low rate of deforestation in indigenous lands is associated with the ways in which indigenous peoples occupy land, their customs and lifestyle, their spiritual relationship with and knowledge of the forest, as well as their adoption of policies to reduce deforestation and lower carbon emissions.

Acre is one of the states with the highest levels of conservation in the Brazilian Amazon. Situated in Brazil's far west, bordering Peru and Bolivia, Acre holds 16 million hectares, of which 87 percent is forest and 14.5 percent is demarcated as indigenous land.[1]

Sixteen tribes constituting approximately 20,000 people occupy indigenous lands, representing 2 percent of Acre's entire population of approximately 820,000 inhabitants.[2]

Over the past two decades, public policies relating to the conservation of forests, indigenous peoples, and the tackling of climate change have been implemented in Acre in an integrated and participatory way. At first, between 1999 and 2007, the priorities were territorial management and instruments such as Ecological-Economic Zoning (ZEE), Ethno-zoning, and Management Plans for Indigenous Lands, aiming to guide community actions based on assessments that supported the creation of territorial management plans. Subsequently, between

[1] Governo do Estado do Acre, *ACRE: Zoneamento Ecológico-Econômico do Estado do Acre: Fase II (Escala 1:250.000): Documento síntese*, 2nd ed. (Rio Branco: SEMA, 2010): 356, http://www.amazonia.cnptia.embrapa.br/publicacoes_estados/Acre/Fase%202/Documento_Sintese.pdf.
[2] Governo do Estado do Acre, *ACRE: Acre em números 2017* (Rio Branco: SEPLAN. 2017): 182.

2008 and 2018, Acre advanced a low carbon economy policy, which combined valuation of forest assets with a State System of Incentives for Environmental Services (SISA), expanding efforts to combat climate change and mitigate climate-related risks through forest conservation.

During the public consultations for the creation of SISA, several issues were debated, relating to historical recognition of indigenous peoples and their efforts to maintain the standing forest, to guaranteeing them the management of their territories and food security, to socio-environmental safeguards, to the just partition of benefits, and to their autonomy in the decision-making process. The consultations led to a Charter of Principles developed by indigenous leaders, based on national legal frameworks and international treaties and conventions that were relevant for the good governance and functioning of SISA.

Contributions of indigenous peoples and organizations were fundamental for the creation of the REDD+ State Program as a part of SISA (State Law n. 2308, 22 October 2010).[3] The program takes a carbon stock and flow approach, compensating those who protect the existing forests (stock), such as the indigenous peoples, as well as those who reduce deforestation through good practices like agroforestry or sustainable agricultural production.

In 2012, the state of Acre signed a contract with the government of Germany through the KfW Development Bank. It was the first jurisdiction to receive financial resources based on the results of reductions in greenhouse gas emissions, verified by the REDD Early Movers (REM) program. This innovative initiative rewards the pioneers, whether countries or subnational jurisdictions, that engaged in early initiatives for forest conservation and climate change mitigation. As such, it is a pilot initiative of REDD+, in accordance with commitments made in the United Nations Framework Convention on Climate Change (UNFCCC) (1994).

The indigenous focus of the REDD+ Program in Acre had visible impacts. Active participation of indigenous peoples in the consultations and construction of SISA in 2010 was crucial for consolidating the jurisdictional REDD+ program, which is in effect today in the state. Similarly, indigenous participation in workshops was important for defining Acre's standards in the system of socio-environmental safeguards that today supports the implementation of SISA.

The Charter of Principles developed by Acre's indigenous leaders served as the basis for the Principles of Collaboration between subnational governments, indigenous peoples, and local communities.[4] In 2018, those Principles were endorsed by the Governors' Climate and Forests Task Force (GCF), a coalition of 38 subnational governments working to protect forests and the climate.

As a collegial forum for discussion, consultation, agreement, governance, and social oversight for the state government's climate policies, the Indigenous Working Group, currently called the Indigenous Technical Advisory Chamber (Câmara Temática Indígena), has been fundamental for strengthening

[3] UN REDD Program, https://www.un-redd.org.
[4] "GCF TF Unveils Guiding Principles Of Collaboration And Partnership," GCT Task Force, 25 September 2019, https://www.gcftf.org/post/gcf-unveils-guiding-principles-of-collaboration-and-partnership.

environmental and territorial management. The Chamber's decisions resulted in many priority actions, including a call for proposals that led to the approval of 17 projects; grants to 149 Indigenous Agroforestry Agents (Agentes Agroflorestais Indígenas, or AAFIs) and the training of 43 new AAFIs; and continuing education of leaders and communities on topics related to climate change, environmental services, SISA, and specific strategies for its implementation in indigenous lands.

Indigenous lands are the most conserved areas of Acre's territory. Agents' activities range from fieldwork and partnership with schools and families, to guarding territory.

In addition, the exchange of experiences in workshops enables leaders to learn how other indigenous lands are working out conflicts and overcoming challenges. Today, indigenous peoples are strong leaders in their lands, playing an important role in the food security of their people, guaranteeing the protection of their lands, the recovery of their cultures, their traditions, their spirituality, and fortifying their relationship with the forest and generating new knowledge.

Cattle grazing deforested land in Pará, Brazil, part of the Amazon Basin (Shutterstock)

07

Perceptions of Climate Change and the Role of Religion[1]

by Amy Erica Smith

Amy Erica Smith was a Wilson Fellow at the Brazil Institute from January to June 2020. She is an associate professor of political science as well as a Liberal Arts and Sciences Dean's Professor at Iowa State University, and currently holds an Andrew Carnegie Fellowship. Her most recent book is Religion and Brazilian Democracy: Mobilizing the People of God *(2019, Cambridge University Press); her current book project examines religion and public opinion related to climate change in Brazil and Latin America.*

What does the Brazilian public think about environmental problems? In developed countries, especially the United States, scholarship on public opinion related to climate change has focused on skepticism and denial regarding whether a problem even exists. But in Brazil, the climate skeptic movement has until recently been relatively weak, despite its prominence within the Bolsonaro administration. The movement's anemia might in part be due to the fact that climate change has already had a substantial impact on life in Brazil: personal experience of heat, drought, and flooding might limit skepticism. Yet my research also suggests a difference in the way Brazilian evangelical groups perceive climate change and their role as stewards of the environment, compared to their North American peers, with implications for the future of the environmental movement in Brazil.

Climate Change Concerns: Do Brazilians Believe There is a Problem?

Surveys show that the great majority of Brazilians perceive climate change as a real and serious concern. In the nationally representative 2017 AmericasBarometer survey, 80 percent of respondents said that climate change was a "very serious problem," and another 10 percent said that it was "somewhat serious." Only 4 percent said that it was "not at all serious." Qualitative data from my own focus groups and clergy interviews in a variety of urban and rural environments across the state of Pernambuco in March 2019 are consistent with the quantitative data.[2]

Moreover, Brazilians of all backgrounds are strikingly consistent in believing that climate

[1] Research discussed here comes from working papers with Robin Globus Veldman, Jaimie Bleck, and Lauren Honig, as well as a solo-authored book project. The research was funded in part by a 2014 Fulbright Postdoctoral Scholarship for Brazil, a 2018–2019 Project Launch Grant from the Global Religion Research Initiative, and a 2018–2019 College of Liberal Arts and Sciences Seed Grant in the Social Science. Thanks to the Latin American Public Opinion Project and its major supporters (the United States Agency for International Development, the Inter-American Development Bank, and Vanderbilt University) for making the AmericasBarometer data available.

change is a problem. Only age and news attention significantly affect climate change concern in the AmericasBarometer data. Among those who pay attention to news daily, 82 percent express the highest level of concern about climate change, compared to 66 percent of those who never pay attention to the news. The most concerned demographic is aged 26 to 45, about 83 percent of whom say climate change is a "very serious" problem. The least concerned are those over the age of 66, 70 percent of whom still say climate change is very serious (just 10 percent of this age group denies the problem). The results for age, however, partially contradict results from my qualitative interviews in Pernambuco, where I found that the oldest citizens were often best able to describe eloquently the changes they had personally witnessed over their own lifetimes.

Support for Environmental Action

However, concern does not automatically lead to action. To what extent do Brazilians prioritize public efforts on this issue? Here, views are decidedly mixed. When the 2017 AmericasBarometer asked Brazilians whether "protecting the environment" or "promoting economic growth" should be a higher priority, 39 percent of citizens favored the environment, 41 percent chose the economy; and the remainder chose both equally. Even among citizens who said climate change is a "very serious problem," 38 percent nonetheless thought the government should give higher priority to the economy. By contrast, 62 percent of those who said climate change was "not at all a problem" wanted to prioritize the economy. These views could either reflect or influence elites' views in public debates. In the 2018 election campaign, for instance, environmental issues appear to have received relatively little discussion from the candidates, compared to other issues such as the economy and sexuality politics.

Analysis of the AmericasBarometer data indicates that ideology (that is, identifying as a rightist or a leftist) predicts Brazilians' priorities. More interestingly, age does as well. Among Brazilians between the ages of 16 and 25, 69 percent wanted the government to prioritize the environment as much as or more than the economy. By contrast, only 45 percent of those 55 or over thought the environment should be a priority.

The Role of Religion in Perceptions of Climate Change

How does religion factor into this discussion? Religion can influence citizens' perceptions of the severity of climate change, as well as its causes and solutions. Religion shapes people's understandings of the nature of material reality, physical and geological processes, and the likely future of the earth and humanity. Religious narratives about everything from the creation of the earth to its potential eventual apocalyptic destruction become a filter for understanding and accepting scientific narratives. In addition, religion affects people's views about what kinds of action people can and should take to address collective problems.

Scholarship based primarily on the United States argues that religion tends to make citizens skeptical of climate change and

[2] Out of 76 citizens and eight clergy interviewed by the author, only three respondents expressed any degree of skepticism or denial; the remainder believed in and were concerned about climate change.

Illegal deforestation inside the Amazon Rainforest (Shutterstock)

resistant to environmental action. This research dates to a 1967 article in the journal Science, in which the historian Lynn White asserted that the Christian narrative holding God gave humans "dominion" in the Garden of Eden encouraged exploitative behavior.[3] A large body of empirical evidence from the United States confirms that evangelicals and other conservative Protestants are less environmentally concerned than other citizens.[4]

However, findings from the United States once again fail to travel to Brazil. Research shows that Brazilian evangelicals are often highly concerned about the environment. As an Assembly of God pastor explained in 2014, "God made the universe, and he took one celestial body that he made the earth. He put fish of all colors: yellow fish, green fish, red fish, blue fish. He put trees, all sorts of little birds. Every year he sends flowers to us in that beautiful garden. And human beings throw it away. Now man in his sinfulness destroys it all. He kills the little birds, he burns down the forests." In quantitative analysis, some surveys show no differences between religious groups in environmental concern, while others show that evangelicals are actually more concerned about the environment than members of other religious groups. In any case, it is clear that Brazilian evangelicals care a great deal about the environment.

These views make Brazil's evangelical groups an important potential ally of the environmentalist movement. Evangelicalism

[3] Lynn White, "The Historical Roots of Our Ecologic Crisis," *Science* 155, no. 3767 (1967): 1203–7, https://science.sciencemag.org/content/155/3767/1203.
[4] See, for example, Bron Taylor, Gretel Van Wieren, and Bernie Zaleha, "Lynn White Jr. and the Greening of Religion Hypothesis," *Conservation Biology* 30, no. 5 (April 2016): 1000-9, https://doi.org/10.1111/cobi.12735.

may rise to close to a third of the population by the 2020 census.[5] Evangelical and Catholic congregations may well be the most important civil society groups in Brazil, in terms of their reach, frequency of contact with adherents, and potential for collective action. Moreover, evangelicals have become highly politically engaged, and often sponsor candidates for office; this group was critical to Jair Bolsonaro's 2018 presidential victory.[6] Although evangelical leaders have prioritized conservative social issues such as sexuality and gender in their political activism, Brazilian evangelicals' attitudes about the environment are potentially highly influential. Environmental issue framing that takes into account evangelical ways of understanding the world could help the movement attract new grassroots allies and reshape environmental politics in Brazil.

The vast majority of Brazilians believe that climate change is a significant problem; the challenge has been turning concern into policy action. Deeper and more systematic partnerships with religious leaders could dramatically expand the reach of Brazil's environmental movement—and in the process, perhaps help to save Brazil's own lush Gardens.

[5] Amy Erica Smith, *Religion and Brazilian Democracy: Mobilizing the People of God* (New York: Cambridge University Press, 2019).
[6] Ibid.

08

An Eternal Struggle: Civil Society Mobilization for Forest Conservation

by Solveig Aamodt

Solveig Aamodt is a Senior Researcher at CICERO Center for International Climate Research in Oslo. She has a PhD in Political Science from the University of Oslo and has worked as a guest researcher at the University of Brasilia. Her research concentrates on Brazilian and Indian climate and energy policymaking, and she has followed Brazil's domestic and international climate politics closely since 2012. Aamodt specializes in comparative analysis of policy processes, the role of political institutions, stakeholders, and civil society.

Long before "climate change" became part of mainstream vocabulary, Brazilians were civically engaged to reduce deforestation and protect the peoples and biodiversity of the Amazon. Civil society campaigns convinced the Brazilian government to create the first indigenous territory in 1961, the Xingu Indigenous Park. In the 1970s, during the military dictatorship, pressure from environmental activists and growing international attention to environmental issues led to the creation of a national environmental agency in 1973, which was upgraded to an environmental ministry in 1985. However, the history of environmental mobilization in Brazil is not one of uninterrupted progress or of easy victories.

The efforts of Brazilian environmentalists first drew significant international notice in 1988, following the murder in Acre of rubber tapper union leader Chico Mendes, who had fought for the preservation of the Amazon and the rights of poor and Indigenous people.[1] Brazil is the most dangerous country in the world for environmental activists—more than 600 activists have been killed in the last two decades alone[2]—but the murder of Chico Mendes shocked the international community into action. Brazilian environmental NGOs gained international supporters willing to fund the fight against deforestation. Saving the Amazon was placed high on international environmentalists' agendas. Yet, during the same period, resource extraction and the expansion of agricultural land were central to Brazil's ambitions of economic growth and prosperity. In 1995, deforestation rates

[1] For a thorough analysis of the history of Brazilian environmentalism, see Kathy Hochstetler and Margaret Keck, *Greening Brazil: Environmental Activism in State and Society* (Durham: Duke University Press, 2007).
[2] Nick Kilvert, "Environmental Activist Killings Double as Corruption Identified as Key Driver," *ABC Science*, 5 August 2019, https://www.abc.net.au/news/science/2019-08-06/defending-environment-deadly-risk/11373130.

spiked, with almost 30,000 square kilometers deforested in one year.[3]

Around the turn of the millennium, scientists increased their focus on the effects of deforestation on carbon release to the atmosphere. Formerly a "soft" political question of Indigenous peoples' rights and biodiversity, the Amazon became connected to one of the main current issues of global governance: climate change mitigation. A small group of researchers became personally engaged in the task of informing the public in Brazil and internationally about the importance of forest conservation. Cooperation among researchers, research NGOs, environmental groups, and activists in both Brazil and the Global North enabled targeted science communication, raising awareness of deforestation in Brazil and making it a salient political issue.[4] Brazilian environmental activists also organized lobbying events at the yearly United Nations (UN) climate negotiations (the COPs, or Conferences of Parties), and were active in discussions of the establishment of what is currently the international Reducing Emissions from Deforestation and Forest Degradation mechanism (REDD+; see Chapter 9).

In response, the Brazilian government started to prioritize deforestation. In 2003, environmental activist Marina Silva, a former colleague of Chico Mendes, became the environmental minister in Luiz Inácio Lula da Silva's first government (2003-2006), and brought in a team of activists and scientists to lead the ministry's work against deforestation. In 2004, the government launched the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm), an important breakthrough for the Brazilian environmental movement.[5] However, strong opposition to environmental protections continued. That same year deforestation again spiked to close to 30,000 square kilometers in one year, and, in February 2005, the American-Brazilian environmental activist Sister Dorothy Stang was killed by ranchers in the state of Pará. The murder of the 73-year-old nun again placed the lawless conditions in the Amazon on the international radar, increasing pressure on Lula's government for action—not just talk—on reducing deforestation.[6] In close cooperation with civil society and local governments, the Lula government managed to implement the PPCDAm and reduce deforestation rates significantly. In 2009 Brazil adopted a Climate Law drafted by the environmental ministry. At the climate negotiations (COP15) in Copenhagen that same year, Brazil, for the first time, presented national climate change mitigation targets to the international community. By 2012, the deforestation rate fell below 5,000 square kilometers in one year, for the first time on record.

[3] The cutoff date for deforestation rates is July 31, so, for instance, the rate for 1995 is the deforestation from August 1994 to July 1995. For an overview of yearly deforestation rates, see Rachel Biderman and Ruth Nogueron, "Brazilian Government Announces 29 Percent Rise in Deforestation," World Resources Institute, 9 December 2016, https://www.wri.org/blog/2016/12/brazilian-government-announces-29-percent-rise-deforestation-2016.

[4] Solveig Aamodt, "The Ability to Influence: A Comparative Analysis of the Role of Advocacy Coalitions in Brazilian Climate Politics," Review of Policy Research 35, no. 3 (2018): 372–397, https://doi.org/10.1111/ropr.12282.

[5] Fernanda Viana de Carvalho, "A posicão brasileira nas negociacões internacionais sobre florestas e clima (1997–2010): Do veto a proposicão," PhD diss,. University of Brasilia, 2011, https://repositorio.unb.br/handle/10482/8449.

[6] Hochstetler and Keck (2007).

The environmental movement's direct influence on policymaking was short-lived, however. Lula's successor, Dilma Rousseff (2011-2016), formally maintained structures for civil society engagement on forest conservation, but her government was less focused on cooperation with these groups and activists found fewer opportunities for interaction and policy advocacy. As the Rousseff administration came into office, Marina Silva's team inside the environmental ministry was replaced, and activists and researchers had to continue their work from less central positions in NGOs, universities, and governmental institutions. Rousseff was known for her need to control policy processes. An activist environmental ministry with close bonds to civil society was regarded as too unpredictable, and Rousseff selected a career civil servant as minister. The government continued implementing forest protection policies, but the Ministry of the Environment went from being an ambitious climate policy advocate to aligning more with the traditional climate policy stance of the Ministry of Foreign Affairs (Itamaraty).[7] This stance is linked to developments in international negotiations. Itamaraty has argued that developed countries historically responsible for climate change need to take climate action first, and that Brazil already contributes sufficiently to mitigation through its current policies and high share of renewable (i.e., hydroelectric) energy.

Meanwhile, in Congress, the growth-oriented bloc gained seats in the 2010 general elections, and national economic difficulties made it harder for the government to ignore calls for expanding extractive economic activities in the Amazon. International support for reducing deforestation continued, enabling continued civil society mobilization, but it proved difficult to keep deforestation low. Rousseff's main concern was to maintain domestic stability during a deep economic recession and ongoing corruption scandal. In 2012, she brokered the new Forest Code as a compromise between agribusiness and environmentalists, but most of the environmental gains were later watered down by Congress.[8] In preparation for the upcoming climate negotiations in Paris in 2015 (COP21), Brazil had to develop intended Nationally Determined Contributions (iNDCs). Although civil society lobbied for more ambitious goals, activists considered it a victory that Brazil became the first developing country to adopt an absolute mitigation target, committing itself to a fixed emissions reduction. However, since 2015, yearly deforestation rates in the Legal Amazon have been well above their low point in 2012; and in 2019, almost 10,000 square kilometers were deforested.[9]

Tensions between environmental activists and the government have increased significantly since President Jair Bolsonaro took office in early 2019. One of Bolsonaro's first decisions was to withdraw Brazil's planned hosting of the UN COP25 in 2019. Although both Rousseff and her successor Temer were criticized for ignoring civil society and for allowing deforestation rates to increase, many experts fear that the current environmental minister, Ricardo Salles, is actively undermining measures that protect the Am-

[7] Solveig, Aamodt, "Environmental Ministries as Climate Policy Drivers: Comparing Brazil and India," J*ournal of Environment & Development* 27, no. 4 (2018), 355–381, https://doi.org/10.1177%2F1070496518791221.
[8] Sérgio Sauer and Franciney Carreiro de França, "Código florestal, função socioambiental da terra e soberania alimentar," *Caderno CRH* 25, no. 65 (2012), 285–307, https://doi.org/10.1590/S0103-49792012000200007.
[9] Herton Escobar, "Brazil's Deforestation is Exploding – and 2020 will be Worse," *Science*, 22 November 2019, https://www.sciencemag.org/news/2019/11/brazil-s-deforestation-exploding-and-2020-will-be-worse.

azon. After just a few weeks in office, Salles communicated that cooperation between the Ministry of the Environment and NGOs would be put on hold.[10] In addition, the president is in open dispute with the National Institute for Space Research (INPE), which is responsible for collecting and presenting yearly data on deforestation, saying their deforestation reports are damaging Brazil's reputation. Most recently, leaked footage of a cabinet meeting showed Salles saying that media preoccupation with the ongoing COVID-19 crisis provided a good opportunity for environmental deregulation.[11]

Given frequent political changes, and high turnover in national and local government, civil society organizations have become the principal stewards of environmental regulations in Brazil. And these organizations depend on donations. International attention has channeled funding to Brazilian NGOs and researchers in order to document and reduce deforestation. In the process, deforestation has become the core issue of environmental mobilization in Brazil. Issues like nuclear power, wind power, water security, and environmental disasters such as the 2019 Brumadinho dam collapse mobilize local protests and national attention; however, funding for mobilization on these issues is much smaller than deforestation-related funding. Other environmental issues thus risk falling into the shadow of the massive donations available to address deforestation. With a government that is consistently growth-focused and lenient on environmental protection, environmental activists need strategies for uniting with other societal actors across sectors to create strategies promoting both environmental protection and economic gain.

While the polarized debate over the environment and climate has created parallel echo chambers in social media, deforestation rates and violence against environmental activists have both increased dramatically in the last couple of years. The Brazilian environmental movement is currently politically marginalized and policymakers are ever more distant from activists. The fight is not over, but the current violence against Brazil's environment will cause irreparable damage to people, biodiversity, and the global climate if allowed to continue.

[10] Daniele Bragança and Sabrina Rodrigues, "Ricardo Salles suspende todos os contratos e parceiras con ONGs," *((o))eco*, 15 january 2019, https://www.oeco.org.br/noticias/ricardo-salles-suspende-todos-os-contratos-e-parcerias-com-ongs/.
[11] Emanuel Colombari and Patrick Mesquita, "Salles cita foco da imprensa na covid para 'passar boiada' e aprovar leis," *Notícias UOL*, 22 May 2020, https://noticias.uol.com.br/politica/ultimas-noticias/2020/05/22/salles-cita-foco-da-imprensa-na-covid-para-passar-boiada-no-meio-ambiente.htm.

09

Carbon Markets and Forest Conservation in the Brazilian Amazon

by Christopher Schulz

Christopher Schulz is a Research Associate in the Department of Geography at the University of Cambridge, UK. He specialises in environmental policy and governance, conservation and development, and science-policy relations. He holds a PhD and MSc in Environment and Development from the University of Edinburgh, UK, and, among others, has conducted research in the Brazilian Pantanal and the Peruvian Amazon.

The world's largest contiguous area of tropical rainforest can be found in Brazil's Amazon region. This fact alone gives the country central importance in discussions about global forest conservation policy. Despite its remoteness and low population density, the Amazon basin and its forests have featured centrally in key global debates about the environment and development, illustrating the need to protect biodiversity, safeguard indigenous people's rights, and mitigate climate change.

While there is no doubt that Brazilian politics shapes the context for forest conservation in the Amazon, many of the main drivers of deforestation follow an economic logic. The growth of cattle ranching, the expansion of agricultural areas, road construction, mining, and other infrastructure projects may all cause deforestation in the Amazon, alongside illegal logging.[1] Historically, many of Brazil's governments have incentivized such activities to "bring development" to the Amazon frontier and assert national sovereignty over a region with little state presence; but agriculture and cattle ranching could not be sustained over the longer term without also being economically attractive to investors.[2]

Thus, it is not surprising that the proposal to pay private entities to avoid deforestation in the Amazon via global carbon markets has attracted significant interest in Brazil.[3] The main mechanism to access these funds is called REDD+, which was developed by the parties to the United Nations Framework Convention on Climate Change (UNFCCC). REDD initially stood for "Reducing Emis-

[1] Philip Fearnside, "Deforestation in Brazilian Amazonia: History, Rates, and consequences," *Conservation Biology* 19, no. 3 (2005): 680-688, https://doi.org/10.1111/j.1523-1739.2005.00697.x.
[2] Sérgio Sauer, "Soy expansion Into the Agricultural Frontiers of The Brazilian Amazon: The Agribusiness Economy and Its Social and Environmental Conflicts," *Land Use Policy* 78 (2018): 326-338, https://doi.org/10.1016/j.landusepol.2018.08.030.
[3] Christopher Schulz, "Forest Conservation Through Markets? A Discourse Network Analysis of the Debate on Funding Mechanisms for REDD+ in Brazil," *Environmental Communication* 14, no.2 (2020): 202-218, https://doi.org/10.1080/17524032.2019.1631869.

sions from Deforestation and Fforest Degradation"; it has since been expanded to include "the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries," becoming REDD+. The Paris Climate Agreement recognizes the role of REDD+ in global climate change mitigation efforts,[4] and at COP21 in Paris, Brazil formally presented its national REDD+ strategy (ENREDD+), which is coordinated by a national REDD+ commission (CONAREDD+) under the leadership of the Ministry of the Environment.[5]

At its most basic, REDD+ aims to conserve forests through payments and financial incentives for forest stewardship, that is, keeping existing forests standing. Given its origin in climate change conferences, REDD+ has a primary focus on the carbon content of forest ecosystems, rather than other benefits such as biodiversity, although there may be some synergies.[6] Early proponents envisioned that funds could be raised in genuine market transactions, so that a buyer's payment could be directly linked to a seller's quantifiable reduction of carbon emissions. There was hope that translating emission reductions into credits for international cap-and-trade carbon markets would meet significant demand in industrialized countries, thus generating the necessary funds to implement REDD+.[7]

Cap-and-trade implies that the total amount of emissions in a specified regulatory arena is limited to meet emission reduction targets. The world's largest such market is the European Union's Emissions Trading System (ETS). The U.S. state of California has also developed a market to offset carbon emissions, and has expressed interest in cooperating with the Brazilian state of Acre on REDD+.[8] Another funding source is voluntary carbon markets, through which buyers aim to offset emissions on an individual basis, independent of emission reduction targets.[9] One example is the voluntary carbon offsets that are sometimes offered with the purchase of flight tickets.[10]

In practice, progress towards funding forest conservation through carbon markets has been slow. Most existing REDD+ projects are instead funded through bilateral or multilateral development assistance. In Brazil, the Amazon Fund, which is administered by the Brazilian Development Bank (BNDES), has received financial assistance of several hundred million U.S. dollars from the Norwegian and German governments following

[4] Danae Maniatis et al., "Toward REDD+ Implementation," *Annual Review of Environment and Resources* 44 (2019): 373-398, https://dx.doi.org/10.1146/annurev-environ-102016-060839.
[5] "A Estratégia Nacional para REDD+ do Brasil," Ministry of the Environment of Brazil, updated 19 November 2019, http://redd.mma.gov.br/pt/estrategia-nacional-para-redd.
[6] Celia A. Harvey, Barney Dickson, and Cyril Kormos, "Opportunities for Achieving Biodiversity Conservation Through REDD," *Conservation Letters* 3, no. 1 (2010): 53-61, https://doi.org/10.1111/j.1755-263X.2009.00086.x.
[7] Amy E. Duchelle et al., "What Is REDD+ Achieving on the Ground?," *Current Opinion in Environmental Sustainability* 32 (2018): 134-140, https://doi.org/10.1016/j.cosust.2018.07.001.
[8] Ernesto Roessing Neto, "Linking Subnational Climate Change Policies: A Commentary on the California–Acre Process," *Transnational Environmental Law* 4, no. 2 (2015): 425-437, https://doi.org/10.1017/S2047102515000138.
[9] Richard G. Newell, William A. Pizer, and Daniel Raimi, "Carbon Markets: Past, Present, and Future," *Annual Review of Resource Economics* 6, no. 1 (2014): 191-215, https://dx.doi.org/10.1146/annurev-resource-100913-012655.
[10] The dynamics around these may soon change with the adoption of the "Carbon Offsetting and Reduction Scheme for International Aviation" (CORSIA) by the aviation industry.

Legally harvested logs in the Amazon Basin (Shutterstock)

its creation in 2008. Thus far, results have been mixed, due to the complexities of designing a novel institutional infrastructure from scratch.[11] The Norwegian and German governments suspended payments to the Amazon Fund in 2019, following disagreements about its governance structure with the new Bolsonaro government and a surge in deforestation, causing further setbacks for REDD+. Earlier that year, Brazil had received its first results-based payment for REDD+ from the UN's Green Climate Fund (GCF), but this was again unrelated to carbon markets.[12]

Financing forest conservation via carbon markets raises multiple questions, which have been intensely debated among Brazilian policy-makers, researchers, and stakeholders. First, it is surprisingly difficult to quantify avoided carbon emissions for market transactions. Few REDD+ projects are thus based on an accurate science of carbon, which would allow results-based payments. Second, REDD+ payments are not always sufficiently targeted, and may go towards areas without a serious risk of deforestation.[13] This runs counter to the goal of reducing deforestation, but could create

[11] Juliano Correa, Ricard van der Hoff, and Raoni Rajão, "Amazon Fund 10 Years Later: Lessons From the World's Largest REDD+ Program," Forests 10, no. 3 (2019): 272, https://doi.org/10.3390/f10030272.
[12] Sarah Sax, "Brazil to Receive First-Ever Results-Based REDD+ Payment, But Concerns Remain," Mongabay Series: Global Forests, 1 March 2019, https://news.mongabay.com/2019/03/brazil-to-receive-first-ever-results-based-redd-payment-but-concerns-remain.
[13] Peter H. May, Brent Millikan, and Maria F. Gebara, "The Context of REDD+ in Brazil: Drivers, Agents and Institutions," Occasional Paper 55, 2nd ed. (Bogor, Indonesia: CIFOR, 2011).

the false appearance of a conservation success story. Third, much of the deforestation in the Brazilian Amazon is already illegal anyway, so payments for avoiding it seem legally and morally questionable. Fourth, as long as REDD+ schemes cover only relatively small areas, REDD+ runs the risk of simply shifting deforestation to other, unprotected areas, resulting in no overall conservation gains.

Fifth, offsetting carbon emissions via REDD+ carries the risk that emission reductions are outsourced from industrialized countries, where they are most needed. As a result, funding forest conservation through carbon markets may slow down industrialized states' transition toward a low-carbon economy, potentially impeding needed technological innovations. Sixth, even where forests are successfully protected through market payments, there is no guarantee that this protection continues once a contract ends. Seventh, market funding for REDD+ raises significant challenges for equity, since the poorest residents of forested areas face the highest barriers towards successful participation.[14] If not managed carefully, such mechanisms may accelerate the concentration of land ownership in the Amazon and further social inequality. Eighth, making forest conservation conditional on financial incentives may crowd out alternative motivations for forest stewardship, including ones rooted in local culture and ethical systems.[15] Undermining existing moral foundations in this way could contradict the initial objective of conserving forests.

These are just some of the challenges that have been discussed in relation to carbon markets. While raising funds for forest conservation is clearly a positive objective, they do require serious consideration in the Brazilian Amazon and beyond. At COP25 in Madrid, Ricardo Salles, Brazil's current Minister of Environment, has expressed his support for carbon market-based funding for REDD+.[16] Yet, considering his government's skepticism about multilateral approaches to tackle environmental and other global challenges, the potential for carbon markets and REDD+ to contribute to forest conservation in the Amazon seems more uncertain than ever.

[14] Joyeeta Gupta, "Glocal Forest and REDD+ Governance: Win–Win Or Lose–Lose?," *Current Opinion in Environmental Sustainability* 4, no. 6 (2012): 620-627, https://doi.org/10.1016/j.cosust.2012.09.014.
[15] Esteve Corbera, "Problematizing REDD+ as an Experiment in Payments for Ecosystem Services," *Current Opinion in Environmental Sustainability* 4, no. 6 (2012): 612-619, https://doi.org/10.1016/j.cosust.2012.09.010.
[16] Daniela Chiaretti, "Na Cop-25, Salles diz que Alemanha 'já topou' novo Fundo Amazônia," *O Globo*, 5 December 2019, https://oglobo.globo.com/sociedade/na-cop-25-salles-diz-que-alemanha-ja-topou-novo-fundo-amazonia-24118886.

10

Political Economies of Energy Transition: Wind and Solar Power in Brazil

by Kathryn Hochstetler

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Building renewable energy, such as wind and solar power, is one of the most promising ways to achieve sustainable development. In the last global economic crisis, governments around the world turned to renewable energy promotion as a strategy for rebuilding economies, and even opening up new pathways for innovation.[1] The fastest way to reduce greenhouse gas emissions is to electrify as much as possible, and then build low-carbon forms of electricity like wind and solar, according to the Intergovernmental Panel on Climate Change, which sifts through peer-reviewed research to offer recommendations for global climate negotiations.[2] A final endorsement came from President Jair Bolsonaro: a review of the pro-environmental positions of the 2018 presidential candidates in Brazil shows that promoting renewable energy was the only one he favored.[3]

Brazil has a long history of promoting renewable energies. Its primary source of electricity has always been hydropower, and it developed biofuels years before most other countries did. Yet its transition to wind and solar power has not been as smooth as leaders' praise for renewable energy might suggest. Figure 1 shows that wind power had an early start, but then stagnated before it took off, now comprising 10 percent of Brazil's electricity capacity. Solar power was severely delayed, although it is now also beginning to develop and is already nearly equal in scale to nuclear and coal-powered electricity together. (Brazil's energy balance is mostly hydropower, with a rising share of gas-powered electricity.) What accounts for these slow starts and the eventual rise in both wind and solar?

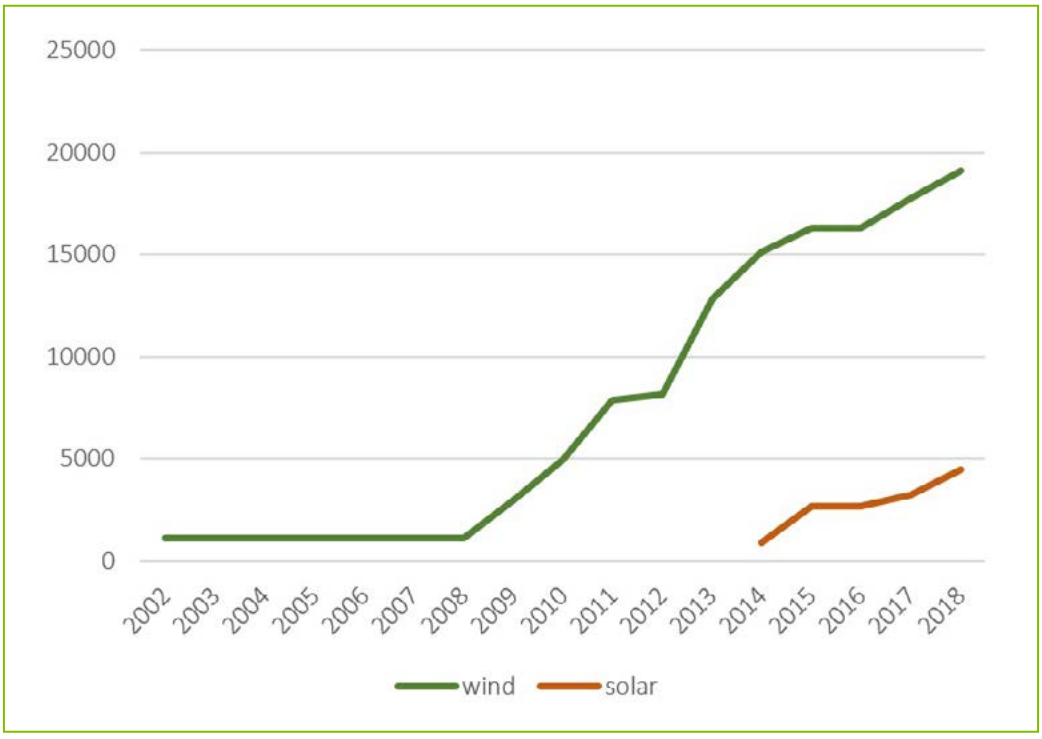
My new book investigates these outcomes for wind and solar power in Brazil and South

[1] Vinod K Aggarwal and Simon J. Evenett, "Industrial Policy Choice During the Crisis Era," *Oxford Review of Economic Policy* 28, no. 2(2012): 261-283.
[2] "Intergovernmental Panel on Climate Change: Summary for Policymakers," in *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. O. Edenhofer et al. (Cambridge: Cambridge University Press, 2014): 20.
[3] Andrea Vialli, "O Que Seu Candidato vai Fazer a Respeito do Aquecimento Global?," Observatório do Clima, 14 September 2012, http://www.observatoriodoclima.eco.br/o-clima-nas-eleicoes/.

Africa.[4] I argue that investment in renewable energy involves the political economies of four different policy arenas: climate policy, industrial policy, electricity consumption, and siting policy. Each of these arenas has a different basic constellation of interests, and each convokes participants from a different set of government agencies, the private sector, and civil society. Renewable energy outcomes result from the intersection of these four political economies, which may reinforce or undermine each other. Thus, environmental ministries may work with environmental actors to promote wind and solar power to address climate change, but they may be supported or blocked by simultaneous actions that economic ministries are taking with private firms and labor to develop industrial policies for the energy sector. Public utilities and consumers will follow a third set of considerations. Local communities, in the fourth policy arena, may accept or resist the environmental impact assessments that allow these infrastructure projects in their backyards.

In sketching the results, it becomes clear that debates around climate change have

Figure 1. Contracted capacity of wind and solar power in Brazil in cumulative installed megawatts (2002-2018)



Source: calculated from ANEEL documents at http://www.aneel.gov.br/resultados-de-leiloes and PROINFA results.

[4] Kathryn Hochstetler, *Political Economies of Energy Transition: Wind and Solar Power in Brazil and South Africa* (Cambridge: Cambridge University Press, forthcoming).

done little to shape Brazil's outcomes for wind and solar power. After all, climate change considerations call for building as much of both as possible, not for building a great deal of wind power and little solar power, especially in a sunny, tropical country. Brazil has had heated climate change debates, but they have focused on deforestation, historically Brazil's largest contribution to climate emissions. Wind and solar power have been fairly peripheral to this debate.

Similarly, the siting of projects also explains little of the outcomes. Wind power installations have been quite contentious in Northeast Brazil, where about one-quarter of host communities have mobilized against their impact on dunes and coastal areas, birdlife, rights to access land, and cultural communities like the *quilombola* communities.[5] Conversely, there have been no mobilizations yet against solar power. As such, this political economy cannot account for the pattern of building a great deal of wind and not much solar power.

Industrial policy considerations and consumer costs, however, do play a role in accounting for outcomes. The first program to promote wind power came under President Fernando Henrique Cardoso, in the aftermath of the droughts and hydropower crisis of 2001. The team in the Ministry of Energy calculated that wind power could be built quickly and, while very expensive at the time, could have its costs compensated by building a domestic industry in wind power manufacturing alongside the installations. Solar power was set aside because it was costlier and showed much less potential for building a domestic industry. Following the 2002 elections, President Lula da Silva's incoming administration adopted Cardoso's plan and implemented it.

Requirements stipulating a minimum percentage of domestic content in manufacturing slowed early wind development, as it took years to even begin establishing an industry. Lula's government eventually chose competitive auctions where public and private actors could bid to provide wind power to the national grid. As demand expanded through those auctions and global costs dropped, the Brazilian development bank, BNDES, pushed industry development with its own local manufacturing content requirements—and the industry came. After 2014, a version of these developments began in solar power as well, although it has never been as extensive. Especially in wind power, Brazil has begun to show a "green spiral," where environmental and industry dynamics become mutually reinforcing.[6] This creates a firmer basis for expanding renewable energy than either of the motivations could on their own, and represents a possible way of achieving more sustainable development. While the economic crisis has reduced the need for building more electricity since 2018, the Bolsonaro government has proudly showcased Brazil's wind and solar power achievements on international trips, even as it decries essentially all other environmental policies as anti-growth.

[5] Quilombolas as a self-declared ethno-racial group. Although some are direct descendants of escaped African slaves who established settlements in the Brazilian interior, not all are.
[6] Nina Kelsey and John Zysman, *The Green Spiral. In Can Green Sustain Growth? From the Religion to the Reality of Sustainable Prosperity*, eds. J. Zysman and M. Huberty (Stanford: Stanford Business Books, 2014).

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11

Appendix A

by Anushree Lamsal[1] and Amy Erica Smith

What follows is a brief summary of relevant sections of the May 2020 report from the UN Economic Commission for Latin America and the Caribbean, The Climate Emergency in Latin America and the Caribbean: The Path Ahead – Resignation or Action?*, by Alicia Barcena, Jose Luis Samaniego, Wilson Peres, and Jose Eduardo Alatorre.*

The Paris Agreement set a goal of a global average temperature increase below 2° C and closer to 1.5° C. In the Agreement, each country voluntarily committed to a nationally determined contribution (NDC), or planned reduction in emissions. Under a business-as-usual model, based on Brazil's GDP and its growth rate of carbon emissions from 1990 to 2014, Barcena et al. project that Brazil would have emission outputs of 1,320.1 tons of CO2 equivalent by 2030. If Brazil fulfills its NDC, it would reduce emissions to 1,165.1 tons by 2030—a 12 percent reduction. However, this is above the output that the authors calculate would be needed to contribute to the overall global temperature objectives of the Agreement. To get to a global 1.5° C goal, Brazil's emissions would need to drop to 816.1 tons of CO2 equivalent by 2030—a 38 percent reduction. A 2° C objective would require Brazil's emissions to drop to 1,112.9 tons, or a 16 percent reduction.

What policies can help Brazil achieve emissions reductions? The authors argue that countries must distribute and enforce responsibilities across various sectors and markets, reducing overall compliance costs. This report identifies three potential initiatives: low-carbon ranching, environmental taxes, and climate financing.

The low-carbon livestock sector focuses on carbon sequestration, the extraction of carbon from the atmosphere in order to be stored in other forms, the integration of livestock into the bioeconomy by using animal byproducts, and grassland reclamation. All of these work to increase sustainability and productivity over time. A 2018 study of various beef cattle production systems in Brazil found that processes using grassland reclamation technologies and integrated procedures, where animal waste is utilized through biotechnology in various economic sectors, had much higher rates of carbon sequestration. Through utilizing animal products in different steps of the production process, Brazil was able to employ 53,943 people in 2014. Brazil has already taken steps towards implementing these systems by creating a line of credit for farmers to reform production methods.

Environmental taxes, particularly carbon tax policy, can incentivize consumers and producers to reduce their carbon use, as taxes

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cause people to internalize environmental externalities. Fuel taxes are the most widely used environmental tax, while private urban transport taxes are becoming more common in Latin America. The authors recommend that Brazil should have a gasoline tax of approximately 45 cents per liter in order to account for environmental externalities. An effective carbon tax should be between $40 and $80 per ton of CO2 in 2020, and between $50 and $100 in 2030, and it should be designed to increase progressively over time.

Brazil also plays a big role in the third policy, climate financing, as Brazil holds the largest share of Latin America's financial flows. In 2017, Brazil accounted for about 39 percent of all regional financial resources. One straightforward form of climate financing is green bonds, which, unlike other sources of climate financing, are issued with the explicit purpose of funding projects intended to create environmental and climate benefits. Green bonds have been criticized for a lack of transparency, as it is often not disclosed where funds are sourced from, or if they are being used properly. Brazil has already issued millions of dollars' worth of green bonds. In hopes of increasing transparency, the Brazilian Federation of Banks and the Brazilian Business Council for Sustainable Development published a guide to issuing green securities.

12

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