A Light in the Forest

Brazil's Fight to Save the Amazon and Climate-Change Diplomacy

Jeff Tollefson

Across the world, complex social and market forces are driving the conversion of vast swaths of rain forests into pastureland, plantations, and cropland. Rain forests are disappearing in Indonesia and Madagascar and are increasingly threatened in Africa's Congo basin. But the most extreme deforestation has taken place in Brazil. Since 1988, Brazilians have cleared more than 153,000 square miles of Amazonian rain forest, an area larger than Germany. With the resulting increase in arable land, Brazil has helped feed the growing global demand for commodities, such as soybeans and beef.

But the environmental price has been steep. In addition to providing habitats for untold numbers of plant and animal species and discharging around 20 percent of the world's fresh water, the Amazon basin plays a crucial role in regulating the earth's climate, storing huge quantities of carbon dioxide that would otherwise contribute to global warming. Slashing and burning the Amazon rain forest releases the carbon locked up in plants and soils; from a climate perspective, clearing the rain forest is no different from burning fossil fuels, such as oil and gas. Recent estimates suggest that deforestation and associated activities account for 10-15 percent of global carbon dioxide emissions.

But in recent years, good news has emerged from the Amazon. Brazil has dramatically slowed the destruction of its rain forests, reducing the rate of deforestation by 83 percent since 2004, primarily by enforcing land-use regulations, creating new protected areas, and working to maintain the rule of law in the Amazon. At the same time, Brazil has become a test case for a controversial international

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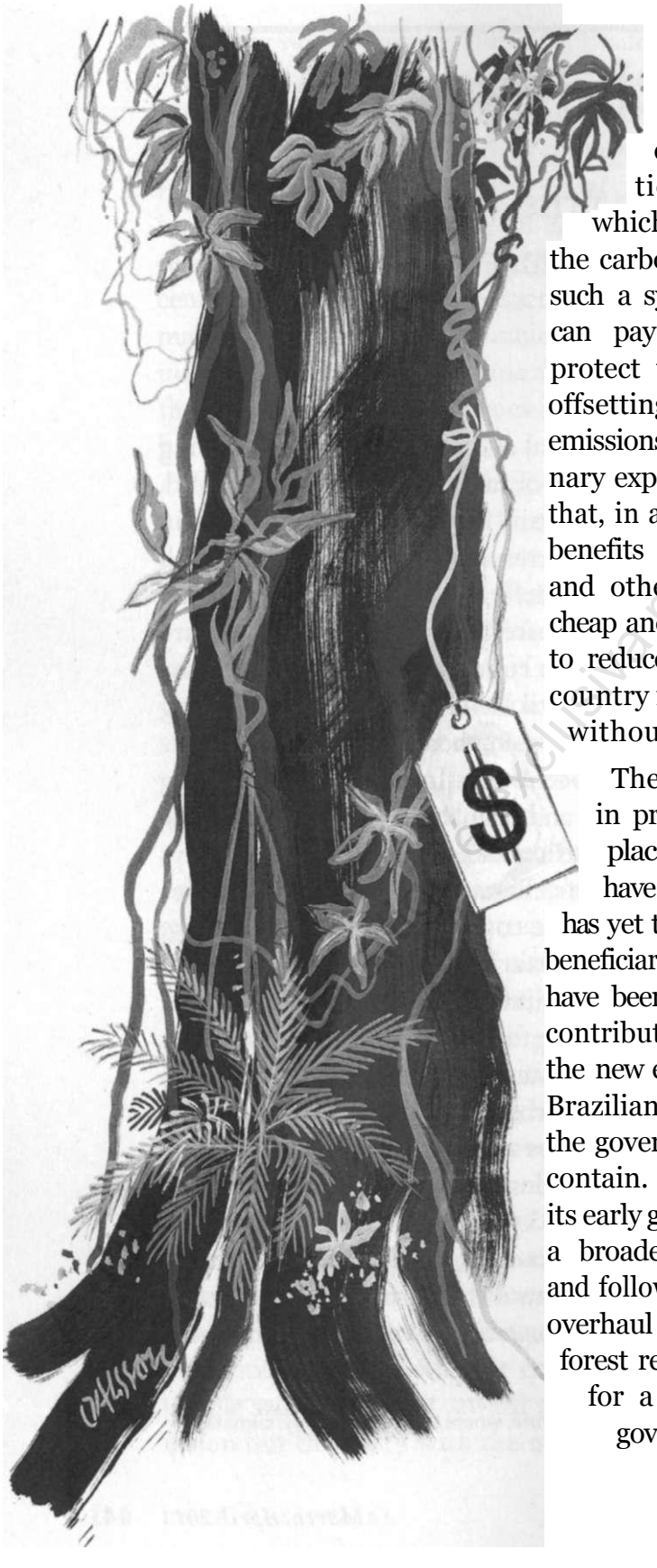

climate-change prevention strategy known as REDD, short for "reducing emissions from deforestation and forest degradation," which places a monetary value on the carbon stored in forests. Under such a system, developed countries can pay developing countries to protect their own forests, thereby offsetting the developed countries' emissions at home. Brazil's preliminary experience with REDD suggests that, in addition to offering multiple benefits to forest dwellers (human and otherwise), the model can be cheap and fast: Brazil has done more to reduce emissions than any other country in the world in recent years, without breaking the bank.

The REDD model remains a work in progress. In Brazil and other places where elements of REDD have been applied, the funding has yet to reach many of its intended beneficiaries, and institutional reforms have been slow to develop. This has contributed to a rural backlash against the new enforcement measures in the Brazilian Amazon—a backlash that the government is still struggling to contain. But if Brazil can consolidate its early gains, build consensus around a broader vision for development, and follow through with a program to overhaul the economies of its rainforest regions, it could pave the way for a new era of environmental governance across the tropics.

For the first time, perhaps, it is possible to contemplate an end to the era of large-scale human deforestation.

LULA GETS TOUGH

The deforestation crisis in Brazil ramped up in the 1960s, when the country's military rulers, seeking to address the country's poverty crisis, encouraged poor Brazilians to move into the Amazon basin with promises of free land and generous government subsidies. In response, tens of thousands of Brazilians left dry scrublands in the northeast and other poor areas for the lush Amazon basin—a mass internal migration that only increased in size throughout the 1970s and beyond.

But the government did not properly plan for the effect of a population explosion in the Amazon basin. The result was a land rush, during which short-term profiteering from slash-and-burn agriculture prevented anything resembling sustainable development. Environmental and social movements arose in response to the chaotic development, but it was not until the 1980s, when scientists began systematically tracking Amazonian deforestation using satellite imagery, that the true scale of the environmental destruction under way in the Amazon became apparent. The end of military rule in 1985 and Brazil's transition to democracy did nothing to slow the devastation; the ecological damage only worsened as road-building projects and government subsidies for agriculture fueled a real estate boom that wiped out forests and threatened traditional rubber tappers and native peoples. Meanwhile, the total population of the Amazon basin increased from around six million in 1960 to 25 million in 2010 (including some 20 million in Brazil), and agricultural production in the Amazon region ramped up as global commodity markets expanded.

Things began to change in 2003, when Luiz Inácio Lula da Silva, the newly elected Brazilian president, known as Lula, chose Marina Silva as his environment minister. A social and environmental activist turned politician, Silva hailed from the remote Amazonian state of Acre and had worked alongside Chico Mendes, a union leader and environmentalist whose murder in 1988 at the hands of a rancher drew global attention to the issue of the Amazon's preservation. With Lula's blessing, Silva immediately set about doing what no Brazilian government had previously attempted: enforcing Brazil's 1965 Forest Code, which had set forth strong protections for forests and established strict limits on how much land could be cleared. Doing so represented

a major shift in domestic policy and was equally striking at the international level: Brazil chose to act at a time when most developing countries were resisting any significant steps to combat global warming absent the industrialized world's own more aggressive actions and provision of financial aid.

After peaking in 2004, when an area of rain forest roughly the size of Massachusetts was mowed down in a single year, Brazil's deforestation rate began to fall. Then, in late 2007, scientists at Brazil's National Institute for Space Research warned that the rate of deforestation had spiked once again. The increase coincided with a sudden rise in global food prices, which created an incentive for landowners in the Amazon to illegally clear more forest for pasture and crops. This suggested that the earlier decline in the rate of deforestation might have been driven by market forces as much as by government intervention, but Lula nevertheless doubled down on enforcement. The government deployed hundreds of Brazilian soldiers in early 2008 to crack down on illegal logging, issuing fines to those who broke the law and in some instances hauling lawbreakers to jail.

The following year, Brazil announced that its rate of deforestation had hit a historic low, and Lula pledged that by 2020 the country would reduce its deforestation to 20 percent of the country's long-term baseline, then defined as the average from 1996 to 2005. His plan to achieve that goal was based on one version of the REDD model, which had vaulted onto the international agenda several years earlier as scientists made advances in quantifying the impact of tropical deforestation on climate change.

GREEN-LIGHTING REDD

Politicians and commentators usually describe global warming as a long-term threat, but scientists also worry about transgressing invisible thresholds and thus provoking potentially rapid and irreversible near-term changes in the way environmental and biological systems function. During the past decade, based in part on the results of intensive climate modeling, some scientists began to grow concerned that the Amazon could represent one of the clearest examples of such tipping points.

Think of the rain forest not as a collection of trees but as a hydrologic system, a massive machine for transporting and recycling water in which trees act as pumps, pulling water out of the ground and then injecting it, through transpiration, into the air. This process ramps up

as the sun rises over the Amazon each day; as the forest heats up, evaporation increases, and trees transpire water to stay cool, simultaneously increasing the amount of water they take up through their roots. By constantly replenishing the atmosphere with water vapor, the Amazon helps create its own weather on a grand scale.

Humans interfere with this process whenever they chop down rain forests, and at some point, the system will begin to shut down. And this is not the only threat. Studies suggest that the Amazon could also be susceptible to rising temperatures and shifting rainfall patterns due to global warming. The nightmare scenario is known as "Amazon dieback," wherein the rains decrease and open savannas encroach on an ever-shrinking rain forest. The resulting loss of fresh water could be catastrophic for communities, agriculture, and hydropower systems in the Amazon, and dieback would have drastic effects on biodiversity and the global carbon dioxide cycle. The Amazon stores some 100 billion metric tons of carbon, equivalent to roughly a decade of global emissions. Converting carbon-rich rain forests into open savannas would pump massive quantities of carbon dioxide into the atmosphere, making it even harder for humans to prevent further warming.

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Roughly 20 percent of the Amazon has been cleared to date, and there is already evidence that precipitation and river-discharge patterns are changing where the deforestation has been most intense, notably in the southwestern portion of the basin. And some scientists fear that the shifting climate may already be exerting an influence. In the past seven years, the Amazon has suffered two extremely severe droughts; normally, such droughts would be expected to occur perhaps once a century. One of the most comprehensive modeling studies to date, conducted in 2010 under the auspices of the World Bank, suggests that even current levels of deforestation, when combined with the impacts of increasing forest fires and global warming, are making the Amazon susceptible to dieback.

Such projections have heightened the sense of urgency in climate policy circles and helped focus attention on the REDD model. The concept has been around in some form for more than 15 years, but it was first placed on the international agenda in 2005 by the Coalition

for Rainforest Nations, a group of 41 developing countries that cooperates with the UN and the World Bank on sustainability issues. At the core of the model is the belief that it is possible to calculate how much carbon is released into the atmosphere when a given chunk of forest is cut down. Fears that this would prove impossible helped keep deforestation off the agenda when climate diplomats signed the Kyoto Protocol in 1997. Scientists are steadily improving their methods for estimating how much carbon is stored in forests, however, and most experts agree that carbon dioxide can be tracked with enough accuracy to calculate baseline figures for every country.

Under various proposed versions of the REDD model, wealthy countries or businesses seeking to offset their own impact on the climate would pay tropical countries to reduce their emissions below their baseline levels. There is no consensus about the best way to design such a system of payments; since REDD was formally adopted as part of the agenda for climate negotiations at the UN Climate Change Conference in Bali, Indonesia, in 2007, dozens of countries and nongovernmental organizations have put forward a range of ideas. Most of these call for the creation of a global market that, like the European carbon-trading system, would allow industrial polluters to purchase carbon offsets generated by rain-forest preservation. Some environmentalists and social activists worry about the validity and longevity of such credits, as well as the prospect of banks and traders entering the conservation business. One fear is that "carbon cowboys," a new class of entrepreneurs specializing in the development of carbon-offset projects, would sweep through forests, trampling the rights of indigenous and poor people by taking control of their lands and walking away with the profits. This concern is valid, as there is always a danger of bad actors. But civil-society groups and governments, including Brazil's, are aware of the problem and are working on safeguards.

Brazilian officials have also expressed worries that the ability to simply purchase unlimited offsets would allow wealthy countries to delay the work that needs to be done to reduce their own emissions. An alternative backed by Brazil's climate negotiators and others would be a state-based funding system, in which money would flow from governments in the developed world to governments in the developing world, which would guarantee emissions reductions in return.

NORWEGIAN WOOD

In 2008, Lula, perhaps hoping to preempt an interminable debate over how best to design a global REDD system, announced the establishment of the Amazon Fund, calling on wealthy countries to contribute some $21 billion to directly fund rain-forest-preservation measures. The proposal went against the market-based approach being pushed by the Coalition for Rainforest Nations. Based on a more conventional system of government donations, the Amazon Fund would allow Brazil to control the money and manage its forests as it saw fit. To the fund's backers, the resulting reductions in emissions would represent offsets of a sort.

Only one country decided to take up Lula's challenge: Norway, which stepped forward with a commitment of up to $1 billion. Coming well in advance of any formal carbon market and the international treaty that many hoped would be signed at the UN climate summit in Copenhagen in 2009, Norway's pledge was largely an altruistic vote of confidence in Brazil's approach, with donations conditioned on measurable progress. Since 2010, when the funding began, the Brazilian Development Bank, which manages the fund, has undertaken 30 projects, costing nearly $152 million. These projects include direct payments to landowners in return for preserving forests and initiatives to sort out disputes over landownership, educate farmers and ranchers about sustainability, and combat forest fires.

Although environmentalists and scientists have criticized some delays in the program, Brazil's deforestation rate has continued to plunge. Each year from 2009 to 2012, the country registered a new record low for deforestation; in 2012, only 1,798 square miles of forest were cleared. That is 76 percent below the long-term baseline, leaving Brazil just four percent shy of its Copenhagen commitment with eight years to go. Recent calculations by Brazilian scientists suggest that the cumulative release of carbon dioxide expected as a result of deforestation in the Brazilian Amazon dropped from more than 1.1 billion metric tons in 2004 to 298 million in 2011—roughly equivalent to the effect of France and the United Kingdom eliminating their combined carbon dioxide emissions for 2011.

REDD remains a distant promise for most landowners and communities, and the precipitous drop in deforestation in Brazil is more a function of broader government policy than the result of any individual project. Still, the Amazon Fund is demonstrating the promise

and practicality of the REDD model. Although the actual cost of preventing emissions remains unclear, Brazil is offering donors carbon offsets at a discounted price of $5 per metric ton of carbon dioxide, intentionally underestimating how much biomass its forests contain in order to avoid arguments over the price. Of course, implementing the REDD model could prove significantly more expensive elsewhere. But the price would nonetheless be significantly cheaper than for many other methods of cutting emissions, such as capturing carbon dioxide from a coal-fired power plant and pumping it underground, which could cost upward of $100 per metric ton in the initial stages.

ROUSSEFF AND THE RURALISTAS

Lula was succeeded by his protege and former chief of staff, Dilma Rousseff, in 2011. Although environmentalists have been critical of her broader development agenda in the Amazon and beyond, Rousseff has upheld Lula's deforestation policies. And she has done so despite intense pressure from the so-called *ruralista* coalition of landowners and major agricultural interests, which currently exercises tremendous influence in Brasilia.

In the spring of 2012, the Brazilian Congress passed a bill that would have eviscerated the country's vaunted Forest Code by scaling back basic protections for land alongside rivers and embankments and offering outright amnesty to companies and landowners who had broken the law. Rousseff fought back, and a prolonged tussle ensued. The final result was a law that is generally more favorable to agricultural interests but that nonetheless retains minimum requirements for forest protection and recovery on private land.

More troubling than the new law itself, perhaps, is the political polarization that accompanied its passage. Brasilia now seems divided into rigid environmentalist and agricultural factions. Fierce opposition to Brazil's rain-forest-preservation efforts is sure to persist, and many observers fear that landowners, impatient with the slow pace of progress on REDD, will ultimately begin to test the limits of the newly revised Forest Code. As if on cue, last September, Brazilian scientists announced that deforestation was 220 percent higher in August than it had been in August of 2011. But it is too early to tell what this latest outbreak might mean. After all, prior spikes have incurred a government response, and each time the damage has been contained.

It is also worth noting that not only has Brazilian deforestation decreased overall, but the size of the average forest clearing has also decreased over time. The powerful landowners and corporate interests responsible for large-scale deforestation have apparently decided that they can no longer cut down rain forests with impunity. The upshot is that for the first time ever, in 2011, the amount of land cleared in the Brazilian Amazon dropped below the combined amount cleared in the surrounding Amazon countries, which make up 40 percent of the basin. In those countries, the trend is not so encouraging: deforestation in the non-Brazilian Amazon increased from an estimated annual average of 1,938 square miles in the 1990s to 2,782 square miles last year, according to an analysis published by the World Wildlife Fund.

MISSING THE FOREST FOR THE TREES?

There was very little progress on REDD at the most recent UN climate summit, in Doha, Qatar, last November. Negotiators left the door open to a full suite of REDD-style models, from government-to-government financial transfers to a privatized carbon market, but failed to agree on the details. Regardless of which particular models are codified in a hypothetical future treaty on climate change, countries need to focus on making the money flow: some studies suggest that halving deforestation would cost $20-$25 billion annually by 2020. So far, governments have committed several billion dollars to forest protection through various bilateral and multilateral agreements. Through the UN, the industrialized countries have also made impressive commitments to combating climate change in the developing world, promising to contribute up to $100 billion annually by 2020, a portion of which could fund forest protection.

But it is not at all clear that this money will materialize, due in part to the current weakness of the global economy. And there is a limit to government largess. Advocates of rain-forest preservation are now trying to convince governments to commit money from revenue streams that do not depend on annual appropriations, which are more vulnerable to political and economic pressure. But that, too, is an uphill battle. Indeed, forest-preservation advocates cannot rely on governments alone; they will ultimately need to attract private-sector investment.

In the meantime, the fight against deforestation will rely on a patchwork of international partnerships and initiatives. Most significant, perhaps, Norway has transferred the model it developed with Brazil

to Indonesia, which now ranks as the largest emitter of carbon dioxide from tropical deforestation. Just as in Brazil, the promise of REDD helped inspire some bold political commitments by Indonesian authorities, who have agreed to reduce their greenhouse gas emissions—most of which come from deforestation—by up to 41 percent by 2020 if international aid materializes. But Indonesia has neither the monitoring technology nor the institutional wherewithal of Brazil, so Norway's $1 billion commitment is aimed at helping the country build up its scientific and institutional capacity. Progress has been slow, but the advantage of a results-based approach, such as REDD, is that these initiatives cost money only if they yield positive results.

Brazil's experience offers some lessons for other tropical countries. The first is that science and technology must be the foundation of any solution. Brazil's progress has been made possible by major investments in scientific and institutional infrastructure to monitor the country's rain forests. Nations seeking to follow suit must invest in tools that will help them not only monitor their forests but also estimate just how much carbon those forests store. Working with scientists at the Carnegie Institution for Science, the governments of Colombia and Peru are deploying advanced systems for tracking deforestation from readily available satellite data. Combined with laser-based aerial technology that can map vast swaths of forest in three dimensions, these systems will be able to more accurately calculate and monitor stored carbon across an entire landscape—a feat that could allow these countries to leapfrog Brazil.

Brazil's Amazon Fund also shows that it is possible to move forward despite lingering scientific uncertainty about how to quantify the carbon stored in forests. Some critics of the REDD model have worried that it could draw attention away from the enforcement of existing forestry laws, ultimately increasing the cost of conservation and rewarding wealthy lawbreakers. But Brazil's experience shows that the two approaches can go hand in hand. Indeed, most of Brazil's progress to date has come from simply enforcing existing rules. The government has also created formal land reserves, outlawing development on nearly half its territory, and environmental groups have played a role by rallying public opinion and partnering with industry groups to improve agricultural practices. Still, enforcement can go only so far with the smaller landholders and subsistence farmers who are responsible for an increasingly large share of the remaining

deforestation. Brazil must focus the Amazon Fund and other government initiatives on projects that will create more sustainable forms of agriculture for these small-scale farmers and ranchers.

The government also needs to look ahead. Cities in the Amazon are booming, and larger populations will translate into additional demands for natural resources and food. The Brazilian government has sought to increase agricultural productivity across the basin, recognizing that there is more than enough land available to expand production without clearing more of it. But Brazil should also encourage more forest recovery, which would bolster the Amazon's ability to produce rain and absorb carbon dioxide from the atmosphere. Globally, forests currently absorb roughly a quarter of the world's carbon emissions, thanks to the regrowth of forests cut down long ago in places such as the United States, and they could provide an even larger buffer going forward. Roughly 20 percent of the areas once cleared in the Amazon are already regrowing as so-called secondary forest. Scientists have calculated that if the government can increase that figure to 40 percent, the Brazilian Amazon will transition from a net source of carbon dioxide emissions to a "carbon sink" by 2015, taking in more carbon dioxide than it emits.

Deforestation is just one of many challenges buffeting the Amazon region, and improvements on this front should not obscure the ongoing problems of poverty, violence, and corruption. But at a time when expectations for progress on climate change are falling, Brazil has given the world a glimmer of hope. In many ways, the hard work is just beginning, but the results so far more than justify continuing the experiment.

Fonte: Foreign affairs, New York, v. 92, n. 2, p. 141-151, Mar./ Apr. 2013.