

19-15 The Amazon Is a Carbon Bomb: How Can Brazil and the World Work Together to Avoid Setting It Off?

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Global warming is widely and correctly blamed for wildfires around the world. But the Amazon fires in Brazil represent a specific government policy failure over many years, especially recently, as Brazilian public agencies that are supposed to curb man-made fires have been deliberately weakened. Fires are set by farmers, cattle owners, and others every year to clear land, but they have risen in number and severity in 2019—since President Jair Bolsonaro took office on January 1 and set about fulfilling his campaign pledge to ease environmental, land use, and health regulations.

The fires in Brazil are a classic case of what sociologists call the “tragedy of the commons,” what happens when shared resources are exploited by users pursuing their

own livelihoods at the expense of the common good. The Amazon fires are a tragedy, but they could also be an opportunity for the governments of Brazil and the United States to stop denying climate change and cooperate on strategies to preserve the rainforest and develop ways to sustainably use its natural resources. Such cooperation has already yielded positive results. For example, there is a history of collaboration between NASA and Brazil’s National Institute for Space Research (INPE) employing state-of-the-art technologies to monitor deforestation. It is conceivable that at some point there is a return to the model of Brazil working with the United States—and the other signatories—to implement the Paris Climate Agreement.¹

Scientists, NGOs, and environmental activists oppose Bolsonaro’s policies, warning that they could set the stage for disaster. Societies know how to deal with this problem: through collective action and government regulation. It is possible to accommodate competing demands of economic interests, food security, and saving or even restoring the Amazon rainforest, along with its life-sustaining rainfall, for Brazil and the world at large. This Policy Brief presents the following major policy recommendations.

- The United States should rejoin the Paris Climate Agreement and immediately establish a joint action plan with Brazil to implement steps to preserve and restore the rainforest.
- Brazil should adopt and enforce regulations on land use in the Amazon region that would allow farming and cattle grazing in some areas to sustain the livelihoods of local and indigenous people while cracking down on illegal uses, such as logging and mining, and on incursions on public lands. To combat destructive activities, the government should encourage livestock rearing and cultivation in nonsensitive areas while formally registering land and allocating property ownership rights more systematically in the rainforest itself.

1. The Paris Agreement of the United Nations Framework Convention on Climate Change is available at <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement> (accessed on October 5, 2019).

- Brazil should restore conditional rural credit policies to fight deforestation. These policies were very successful in 2009–11.
- Brazil should lead an international effort to foster the diversity of native vegetation in the Amazon region while preserving the rainforest and also creating jobs and reducing poverty and income inequality. Sustainable production of livestock and soybean is already happening in areas outside the Amazon region. These activities could be expanded to areas adjacent to the rainforest following an effort to demarcate land and enforce property rights.
- The international community should work with Brazil to revive and expand the Amazon Fund, created in 2008 but now in limbo, to raise international donations for investment in sustainable activities that protect the rainforest.

OVERVIEW

The Amazon region covers 60 percent of Brazil’s land area—3.3 million square miles—and is home to 18 million people. Legal Amazon,² an administrative political concept adopted in the 1950s to designate the region, comprises nine states (Acre, Amapá, Pará, Amazonas, Rondônia, Roraima, Mato Grosso, Tocantins, and Maranhão) and three biomes (the Amazon rainforest, the transition between forest and savannah known as the Cerrado, and parts of the wetlands of Pantanal). It is the largest continuous tropical forest in the world and harbors 20 percent of the planet’s plant and animal species.

About 49 percent of Legal Amazon is in areas protected by legislation—these are conservation units or indigenous lands—and the remainder is equally split into private properties and unregistered areas. All private properties in Brazil are governed by the Brazilian Forest Code of 2012, considered one of the strictest environmental laws in the world. According to the code, private properties in Legal Amazon must preserve 80 percent of their land in the form of native vegetation, allowing only 20 percent to be used for agriculture, livestock rearing, or other economic activities. Given these strict limitations, many farmers have found it difficult to comply with the code, and several governments have failed to rigorously enforce the law, bowing to pressures from producers.

The trees of the Amazon store 60 billion to 80 billion tons of carbon. The rainforest is often wrongly called “the lungs of the world.” It stores carbon, but that is not what fights climate change. It would be more apt to describe it as

a “carbon bomb”: Setting fire to the forest for deforestation may release as much as 200 million tons of carbon into the atmosphere a year, which would spur climate change at a much faster rate, not to mention associated changes in rainfall patterns that may result from deforestation.³

The Amazon region has a rich diversity of native vegetation but also the nation’s highest levels of poverty.⁴ To promote economic development, Brazilian authorities have encouraged the building of roads, ports, hydroelectric power plants, and other infrastructure projects, as well as logging, soybean production, mining, and cattle ranching in Legal Amazon.⁵ The resulting deforestation and land degradation prompted the Brazilian government in 2004 to launch the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm), aimed at monitoring deforestation activity, regulating land rights, and promoting sustainable development. The plan helped reduce deforestation rates by more than 80 percent over the previous ten years (figure 1).⁶

The reduction in deforestation between 2004 and 2014 reflected the Brazilian government’s commitment and the collaboration between Brazil and the United States, which contributed by helping to strengthen monitoring mechanisms and law enforcement (Bettwy 2005). A modern satellite-based enforcement system, the System for Real Time Detection of Deforestation (DETER), was created in collaboration with NASA and is managed by INPE. It uses high-frequency satellite imagery to monitor recent changes in forest cover and sends alerts to the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), which, as the administrative arm of the Brazilian Ministry of the Environment, is responsible for law enforcement and the application of fines and other penalties. The effective functioning of INPE and IBAMA is crucial for combating deforestation and is now under threat by Bolsonaro’s changing policies.

In 2009 the Brazilian government set an ambitious target of reducing deforestation by another 80 percent by

3. Some studies find that these emissions could represent as much as 3 percent of global net emissions. See Azevedo-Ramos (2007).

4. Data on poverty rates in the Amazonian states are available at the Brazilian Institute of Geography and Statistics (IBGE), www.ibge.gov.br.

5. According to several studies by Brazil’s National Institute for Space Research (INPE).

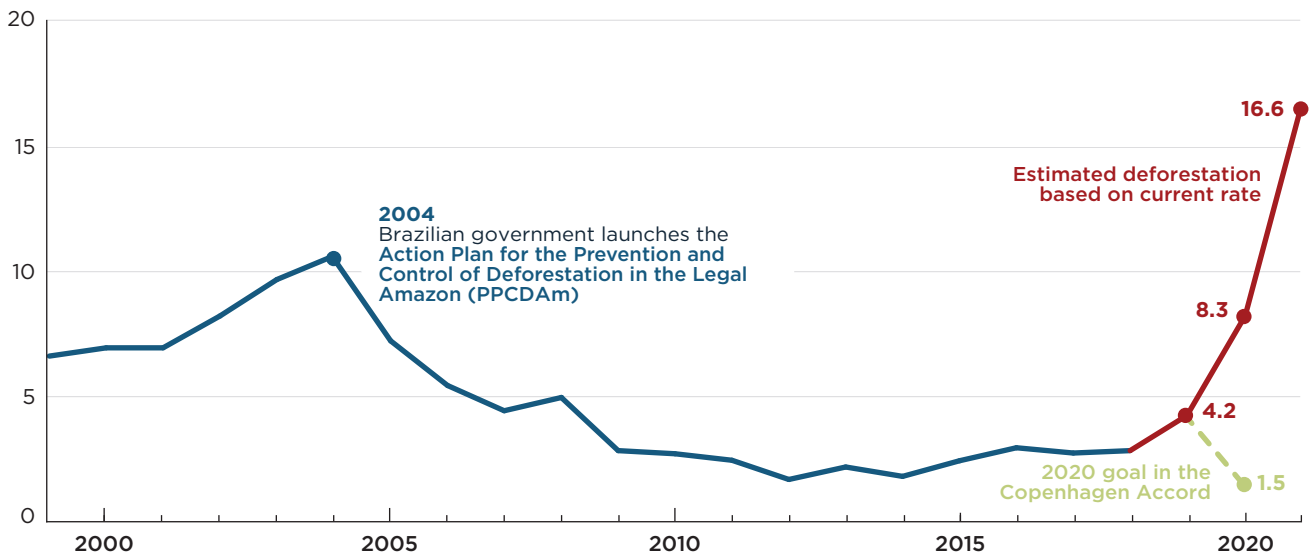
6. Some researchers have argued that the reduction in deforestation between 2004 and 2014 is not primarily attributable to government action but rather to market-related factors, such as economic growth in urban areas, that cause less migration to the frontier between the rainforest and agricultural lands.

2. The terms “Legal Amazon” and “Amazon region” are used interchangeably for the purposes of this Policy Brief.

Figure 1

Amazon deforestation is fast approaching tipping point when it can no longer sustain itself

deforestation in thousands of square miles



Note: The estimates for 2019 to 2021 were calculated by the author maintaining the rate of increase in deforestation estimated between January and August 2019 by INPE.

Source: Brazil's National Institute for Space Research (INPE) and author's calculations.

2020 under the Copenhagen Accord⁷ (shown in green for 2020 in figure 1). But according to INPE, deforestation has been rising since 2014.

The rise in deforestation in 2015–16 may be attributed to Brazil's deep economic recession, which at the time slashed GDP by nearly 8 percent. Tight government finances during and after the recession led to expenditure cuts, which affected environmental monitoring and enforcement. Ongoing political turbulence and the pressing need to adjust the fiscal accounts continued into 2018, affecting the budgets of environmental agencies and hindering attempts to curb deforestation. The electoral victory of far-right president Bolsonaro has made a difficult situation worse with the adoption of policies intentionally aimed at undoing environmental progress made under previous governments. In August 2019 INPE estimated that total deforestation was 222 percent higher than it was in August 2018.

The estimate for 2019 shown in figure 1 is based on my calculation that maintains for the rest of the year the increase in deforestation calculated by INPE between January and August 2019. The estimated increase in deforestation of

roughly 4,200 square miles exceeds the 10-year (2009–18) annual average of 2,500 square miles of observed deforestation. Although it may not seem like much, especially when stacked against alarming media reports about the Amazon fires, I calculate that maintaining the current rate of deforestation⁸ through the rest of 2019 and over the next few years would bring the Amazon dangerously close to the estimated “tipping point” as soon as 2021 (shown in red in figure 1), beyond which the rainforest can no longer generate enough rain to sustain itself.

The Brazilian Amazon is hardly the world's only region affected by an increase in man-made fires in 2019. Widespread use of the slash and burn method—where trees are cut down to dry off and then set ablaze to clear land—has been on the rise in Indonesia and Malaysia as big corporations and small-scale farmers alike clear native vegetation for the production of palm oil, pulp and paper, and other activities. Indonesia is the world's largest producer of palm oil, and deforestation during much of 2019 is directly related to a rise in global demand for the product.

7. Delegates at the 15th session of the Conference of Parties (COP 15) to the UN Framework Convention on Climate Change agreed to “take note of” the Copenhagen Accord in December 2009. The document is available at <https://unfccc.int/documents/6103#beg> (accessed on October 5, 2019).

ENVIRONMENTAL POLICIES UNDER BOLSONARO

President Bolsonaro's government has intentionally backed away from efforts to combat climate change and preserve the environment, in keeping with his far-right nationalist campaign promising to ease environmental regulations and possibly repudiate Brazil's participation in the Paris Climate Agreement. (Recently, however, the government has affirmed its commitment to comply with the agreement.⁸)

Bolsonaro's positions on climate change and the environment were foreshadowed in his campaign against government regulations and public agencies that he claimed were taking "draconian actions" against producers and exporters. He often declared that the Amazon should be explored by

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Brazilian producers to further the country's economic interests, and he even accused environmentalists and NGOs of setting the recent fires, without presenting any evidence for the claim.

The Bolsonaro government has weakened the PPCDAm 2004 and the capacity of the environmental agencies that monitor and penalize perpetrators of illegal activities in the rainforest. It has cut funding, dismissed personnel, and weakened oversight and enforcement. The Brazilian leader has questioned the data and scientific evidence produced by these agencies, particularly INPE, and has called the law enforcement activities of public environmental agencies excessive, referring to the agencies as "factories of fines and other penalties."

In March 2019, Senator Flavio Bolsonaro, the president's son, proposed legislation to eliminate the so-called legal reserve requirement that rural properties in the Amazon region maintain native vegetation on 80 percent of their land, allowing the remaining 20 percent to be used for agriculture or cattle grazing. He set aside the measure in the wake of the Amazon fires.

One target of the president's inflammatory rhetoric is the Amazon Fund, created by then president Luiz Inácio Lula da Silva to collect donations for nonreimbursable investments in efforts to prevent, monitor, and fight defor-

estation in the eight countries of the Amazon basin.⁹ The Amazon Fund was among the first UN REDD+ initiatives to provide international funding to projects that successfully **Reduce emissions from deforestation and forest degradation**. It is managed by BNDES, Brazil's state-owned development bank. Since the fund's inception, Norway has been its largest contributor, accounting for 94 percent of its resources, followed by Germany (5 percent), and the Brazilian oil company Petrobras (1 percent). Some 60 percent of the fund's \$500 million in disbursements to date have gone to the federal government, the nine Brazilian states spanned by the rainforest, and the two major agencies responsible for regulation and oversight of natural resources, IBAMA and INPE. The remaining 40 percent has been given to universities engaged in environmental research and NGOs. An additional \$500 million has not been disbursed and could be returned to donors if the fund is terminated.¹⁰

In May 2019 the Bolsonaro administration announced its intention to change the rules of the Amazon Fund that allow for compensation of Brazilian landowners who lose their properties, on the grounds that the landowners were not in compliance with the country's environmental codes. The Norwegian government responded by suspending \$500,000 in transfers to the fund. Germany also suspended donations. Bolsonaro further declared plans to change the composition of the fund's steering committee to pack its membership with members from his inner circle.

In August, as the Amazon fires captured international attention, the G-7 pledged \$20 million in financial aid at its meeting in Biarritz.¹¹ Bolsonaro rejected the funding as coming from vested interests and was reported to have persuaded President Donald Trump to vote against the funding, which he did on the grounds that Brazil needed to be better consulted (Nakamura 2019). It was a strange turn of events, given that recent polls show the Brazilian public overwhelmingly in favor of international aid for the Amazon.¹²

9. Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, and Venezuela.

10. Although Bolsonaro has not called for shutting down the Amazon Fund, his environment minister has mentioned several times his preference for replacing it by creating a privately-funded vehicle for investments in the Amazon.

11. The aid was pushed by President Emmanuel Macron of France, who somehow managed to overlook the fact that predatory exploration of the Amazon rainforest is also rising in French Guiana, a department of France. (Another place of concern is Bolivia, where President Juan Evo Morales Ayma has accused environmental NGOs of having "opaque interests" in the region.)

12. Poll results from one of Brazil's largest pollsters, Datafolha, September 1, 2019.

8. A statement to this effect was made by Bolsonaro during the G-20 meetings in June 2019.

At the United Nations General Assembly in September 2019, Bolsonaro defended his environmental policies in a fiery speech and hit back at criticism of his handling of the Amazon fires by calling it an assault on Brazilian sovereignty. While Bolsonaro's views may well emphasize his nationalist stance, he may have a partial point. The global social value of

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the Amazon cannot be overestimated, and yet the world pays nothing for its preservation apart from the small amount contributed to the Amazon Fund by Norway and Germany. Mechanisms for aligning the interests of Brazil and the world at large with a view to forest conservation and reforestation have yet to be designed. Attacking the Bolsonaro administration, as some governments have done, without considering cooperation and the provision of incentives to avert deforestation has put Brazil's government in a confrontational position, which does not serve anyone's interests.

CHALLENGES: BEEF PRODUCTION, PROPERTY RIGHTS

Brazilian administrations past and present have been unable to create a sustainable strategy for developing the Amazon region while preserving the rainforest. But many experts say that progress could be made through "regularization" of land use—clearly demarcating who owns what land and what the rights of squatters, or "invaders," should be. Moreover, policies should be designed to provide the right incentives for assessing land value: Currently, a few hectares of deforested land are worth a lot more than land with native vegetation on it, inducing deforestation for land speculation.

The answers are not easy. Many of the farming and grazing activities on lands demarcated for public use are illegal or informal, even though they have been carried out by generations of families, some of them engaging in subsistence farming. Illegal activities on these lands also include logging and mining, but cattle grazing seems to be the major problem. Some analysts maintain that the main obstacle to progress is the Brazilian economy's reliance on beef produc-

tion, but that claim is an oversimplification. Most of Brazil's beef producers graze their cattle in areas outside the rainforest, where they have a record of respect for preserving forests and biodiversity. This is not to say that in areas adjacent to the rainforest beef production cannot be improved. Many studies have shown that by raising the number of animals that graze on a given patch of land from one to three or even four could significantly reduce incentives to clear more land area and increase efficiency.

Rainforest conservation can yield economic benefits, but these have rarely been measured. In 2018 Brazilian and American scientists, economists, and agricultural engineers published a study showing that a standing rainforest as opposed to a depleted one can generate more than \$8 billion annually from activities such as rubber extraction and nut harvesting (Strand et al. 2018). The figure includes gains from the prevention of carbon emissions, which would help combat climate change and preserve the rainforest, thus maintaining the Amazon's rainfall cycle (the rainforest is responsible for generating at least 50 percent of the rain it needs and its rainfall cycle also influences hydrological patterns in much of Brazil and the Southern Cone). Regulating rainfall patterns is vital for farming and livestock, not to mention hydroelectric power generation.

Furthermore, deforestation and forest degradation have been shown to potentially cost agribusiness and the beef sectors \$400 million annually, outweighing the short-term gains of destroying land for cattle and soybean cultivation (e.g., Strand et al. 2018). Beef production does exist in areas adjacent to the rainforest, where some land is degraded to make way for large but low-yielding pasture areas. But outside the Amazon, many cattle producers enjoy adequate property rights and employ sophisticated production techniques, which have made Brazil one of the world's largest beef producers and exporters, combining high productivity with environmental sustainability. These more sophisticated livestock producers know that they can follow environmentally sustainable production practices and also boost business and revenues while gaining access to financing. They are also keenly aware that deforestation-induced changes in rainfall cycles in the Amazon region can damage their livelihoods. They are consequently among the staunch supporters of conservation of the Amazon and harsh opponents of deforestation.

Brazil has ample opportunity to mobilize the government and major stakeholders to learn from the latest research on cattle ranching (e.g., Sathler, Adamo, and Lima 2018) and expand this sector of the economy. But the Amazon region poses difficult challenges related to land rights. Several studies (e.g., Strand et al. 2018) show

that since 2010, an estimated two-thirds of the Amazon's deforested area comprises public lands (30 percent) and undesignated areas (25 percent). Squatters and invaders are the main culprits in cutting down the rainforest for illegal logging, mining, and cattle grazing. Also, family units have been using previously cleared land for subsistence farming for generations—they are, for the most part, not responsible for deforestation.

Fighting deforestation should include efforts to promote land regularization to combat irregular occupation, squatting, land conflicts, and uncertainty regarding property rights (Fetzer and Marden 2017). But distinguishing invaders from informal land users is no easy task. One solution would be to grant amnesty to all, providing them with land titles and property rights. However, many environmentalists and other civil society groups are strongly against such amnesty as it would compensate invaders for past and present criminal activities—squatters and invaders tend to have close ties with organized crime (drugs and arms trafficking) in the region. The alternative would be to strip those with no legal title of their land and possessions, but this would likely hurt very poor families who ultimately do little or no harm to the forest. Successive Brazilian administrations have been unable to overcome these obstacles.

ROLE OF ECONOMIC POLICY: CONDITIONAL RURAL CREDIT AND DEFORESTATION

While much of Brazil's success in reducing deforestation between 2004 and 2014 is attributed to monitoring and law enforcement, economic policies also played an important role. In 2008 the Brazilian National Monetary Council introduced Resolution 3545, which conditioned rural credit in Legal Amazon to proof of compliance with legal and environmental regulations. Rural credit in Brazil is largely subsidized and provided by public banks, particularly in the Amazon. This facilitates the implementation of conditional rural credit, especially in a region where financial constraints are tight because of several factors, notably the lack of property rights.

However, policies that would increase credit availability unconditionally might lead to more deforestation. This possibility is directly related to the negotiation of contracts for the conservation of forests based on market-based incentives as envisaged by REDD initiatives. For donors—international or domestic—to reach an agreement with landowners to switch from deforestation to conservation, one needs to know who actually owns the land, an issue that is far from trivial in most developing countries, and particularly in the Amazon region (e.g., Alston and Andersson 2011). Limiting conservation incentives to de jure landowners may lead de facto landowners to exploit the land before they are formally

excluded from doing so, increasing deforestation and land degradation—and relaxing credit constraints to de jure landowners could lead to more deforestation for the same reasons.

Establishing who the rightful contracting party should be—that is, effectively distinguishing between de jure and de facto landowners—may be prohibitively costly. It might make more sense to allocate financial resources to all parties conditionally, making credit available only to those who comply with environmental norms without trying to establish who owns the land, rather than to try to provide financial incentives through credit availability. The former does not require establishing ex ante who the contracting party is, but rather discovering, through credit constraints, who actually needs those resources to produce. Resolution 3545 was effectively designed to address these issues.

The literature on credit and deforestation is still scarce. However, using data at the municipal level from Legal Amazon, a recent study shows that without Resolution 3545 deforestation in some areas could have been as much as 18 percent higher in 2009–11 than what was observed (Assunção et al., forthcoming). The result is particularly impressive if one takes into consideration that during that time deforestation had been reduced by 74 percent compared with the peak in 2004 (see figure 1).

Resolution 3545 is still in effect, and the government could once again adopt conditional credit policies to curb deforestation if it had the political will to do so.

POLICY RECOMMENDATIONS AND AREAS FOR COOPERATION BETWEEN BRAZIL AND THE UNITED STATES

Combating illegal deforestation is crucial for Brazil's international reputation as well as for promoting its vibrant agribusiness sector and protecting its share of global markets. The fires of the summer of 2019 demonstrate, however, that protecting the Amazon rainforest is a global cause (Strand et al. 2018). The international community should, therefore, revive and expand the Amazon Fund to invest in ways to reduce deforestation through the possible use of payments for environmental services. Such payments are envisioned under Brazil's 2012 Forest Code but have yet to be regulated.¹³ There is great potential¹⁴ in growing the fund by diversifying its donor base to include more countries,

13. Valuing payments for environmental services (PES) has its own complications since the benefits from conservation accrue to many, while the costs of not deforesting accrue only to the landowner.

14. The potential is predicated on adequately establishing a rural registry for property rights. REDD initiatives can be effective only after property rights have been sorted out (see Alston and Andersson 2011).

including the United States. These resources could also be used to improve monitoring and oversight capabilities, create well-functioning carbon markets in Brazil, and boost reforestation efforts. Reforestation activities already provide jobs to some 4 million workers in the Amazon region, or to some 20 percent of the region's impoverished population.¹⁵

One recent study shows that reforestation of the Amazon has high job creation potential (Scaramuzza et al. 2017): As many as 200 jobs may be created directly or indirectly for each 1,000 hectares of land in recovery. Under the Paris Climate Agreement, Brazil has committed to restoring 12 million hectares of native vegetation, a process that could create millions of jobs. But this effort requires an expansion of monitoring efforts: current Brazilian satellite monitoring systems detect loss of primary vegetation only, ignoring areas that could be coming back to forested status (Assunção and Gandour 2019). Tracking forest regeneration is central to compliance with the 2012 Forest Code and the goals established in the Paris Agreement.

Finally, the Brazilian Constitution allows the economic exploitation of indigenous lands in cooperation with local communities and with a focus on sustainability. However, use of these lands is yet to be formalized through effective

regulation—98 percent of designated indigenous lands are located in the Amazon. Lack of regulation has also led to an increase in predatory mining in areas equivalent to 20 percent of the Amazon, or 14 percent of Brazilian territory. The United States, with its experience in formulating and applying similar regulations, can play a key role in advising the Brazilian government on such rules.

CONCLUSION

The rise in Legal Amazon's deforestation precedes President Bolsonaro's electoral victory. But the dismantling of environmental agencies INPE and IBAMA on his watch and his rhetoric on environmental issues have emboldened farmers, loggers, and other players to engage in predatory behavior in the rainforest. The international attention to the Amazon fires provides an opportunity to return to and enhance policies to promote sustainable development strategies in the region. At least one mechanism to foster cooperation and provide financial incentives for sustainable use of the Amazon's resources exists in the form of the Amazon Fund.

Although the Amazon fires should be condemned, it is time for the international community to leave aside its justified grievances with the Bolsonaro administration and cooperate on a strategy to provide the resources to conserve and develop the planet's largest continuous rainforest.

15. According to data from IBGE.

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