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# Global Futures Bulletin



## THE AMAZON CLIMATE BOMB



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## THE AMAZON CLIMATE BOMB

### Abstract

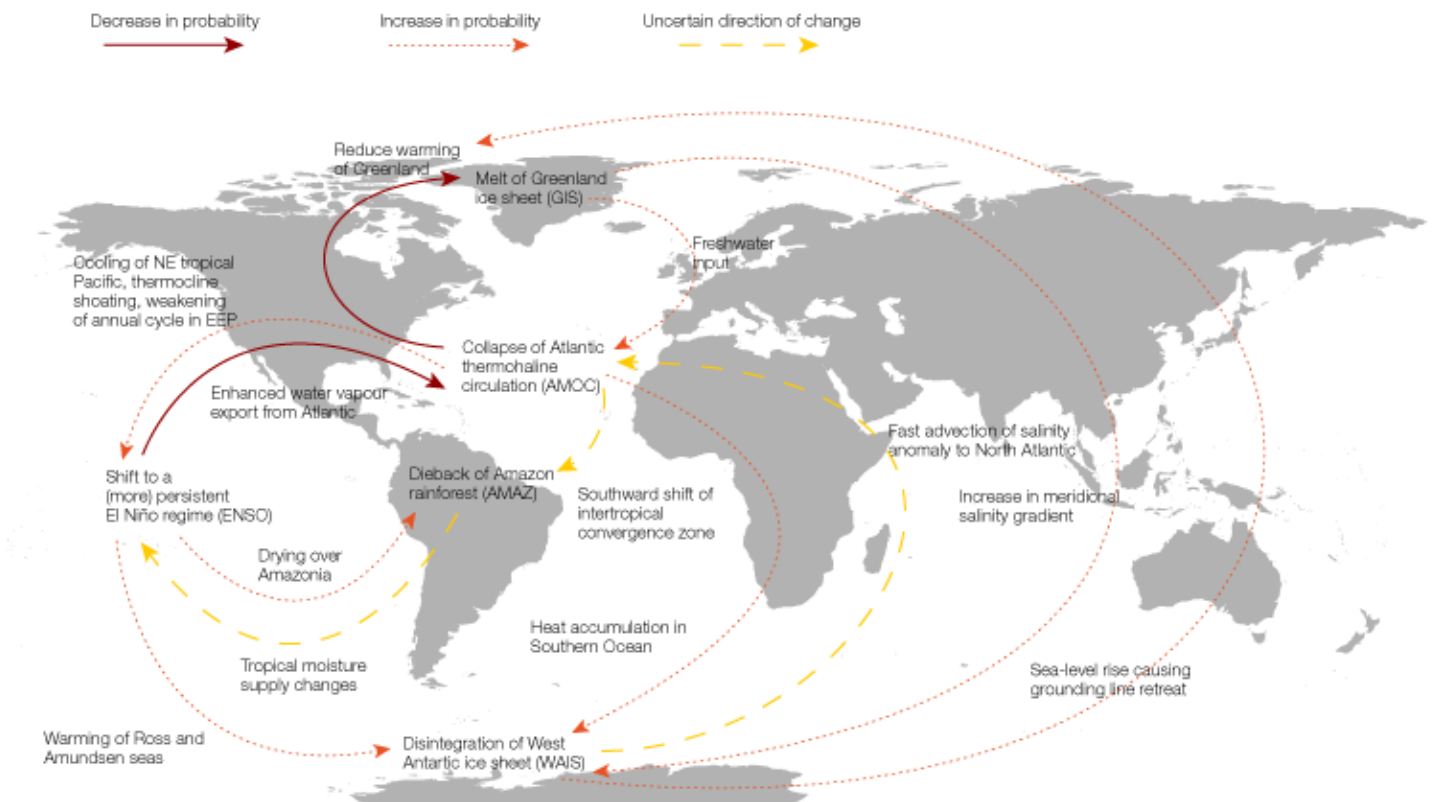
Rampant deforestation and degradation [over the past five years](#) are pushing the Amazon Basin to a dangerous tipping-point. Die-back in the world's largest rainforest could jeopardize the Biome's vast carbon capture and water producing potential, with dire global consequences for South America and the world. Crucially, the destruction is driven by a veritable ecosystem of criminal actors and facilitated by conditions of impunity and corruption. For example, satellite monitoring alerts in 2021 indicated that as much as [98 percent](#) of all deforestation in the Brazilian Amazon was irregular if not outright illegal. The increasing presence of organized crime groups from Brazil, Colombia, Peru and surrounding countries could supercharge environmental crime and, more ominously, hasten the collapse of the Amazon rainforest. Containing the threat will take global, regional and national cooperation across the public, private and non-profit sectors. Countries that share the Amazon must wield both sticks and carrots to stop the plunder and consolidate the rule of law. At the same time, regional authorities must provide viable alternatives to clearcutting by promoting opportunities for sustainable development and the bioeconomy designed to value the standing forest and help biodiversity flourish.

# Introduction

Planetary stability is under threat from waves of intersecting geopolitical and climate threats with uncertain knock-on effects. Top of mind is the Russia-Ukraine war and its potential for catastrophic escalation, including the use of nuclear weapons. Other looming concerns are escalating tensions between North Korea and its neighbors and the growing tensions between China and the US. And while global powers must spare no effort to prevent a nuclear exchange, another existential threat looms increasingly large: the Amazon climate bomb. The climate bomb describes a slower-moving process whereby the world's largest tropical forest converts into savannah releasing billions of tons of CO<sub>2</sub> in the process. While not as spectacular or immediate as its nuclear counterpart, the destruction of the rainforest will detonate over time, bringing no less devastating consequences for the global climate, biodiversity and all the conditions that make the planet habitable.

# The implications of the Amazon bomb

The portents of the Amazon climate bomb are global in scope and scale. Scientists estimate that forest fires alone are already releasing as much as 1.7 billion tons of carbon dioxide into the atmosphere every year, speeding-up global warming. Left unchecked, irreversible destruction of the Amazon would further degrade the world's largest carbon sink, reducing the river basin's ability to retain carbon and produce oxygen and water. Third, triggering of the Amazon bomb would accelerate major biodiversity loss and mass extinction events, not just in the Amazon but across the continent and in other parts of the world. Fourth, we would likely see a speedier collapse of the Gulf Stream and other Atlantic currents. Indeed, the combined effects of rising emissions and temperatures would roil monsoons and endanger the integrity of Antarctic ice sheets. All of this combined would imperil one of the planet's largest agriculture producers, deepening food insecurity for billions of people.

**Figure 1.** Climate systems in a warming world

Source: [Cai et al \(2016\)](#)

There are essentially two ways to defuse the Amazon climate bomb. The first involves preventing and reversing global warming, a core priority of the 2015 Paris Climate Agreement. The second entails ending deforestation, for which there are more limited global commitments and uncertain leadership. Compounding the challenge, time is rapidly running out to clip these two trip wires. Leading climate scientists Carlos Nobre and the late Thomas Lovejoy projected that if 20-25 percent of the Amazon's primary growth is deforested and degraded, the clock on the bomb could start to tick. They also estimated that 17 percent of the pan-Amazon basin has already been deforested, including approximately 20 percent of the Brazilian Amazon. While some scientists believe that detonation is decades

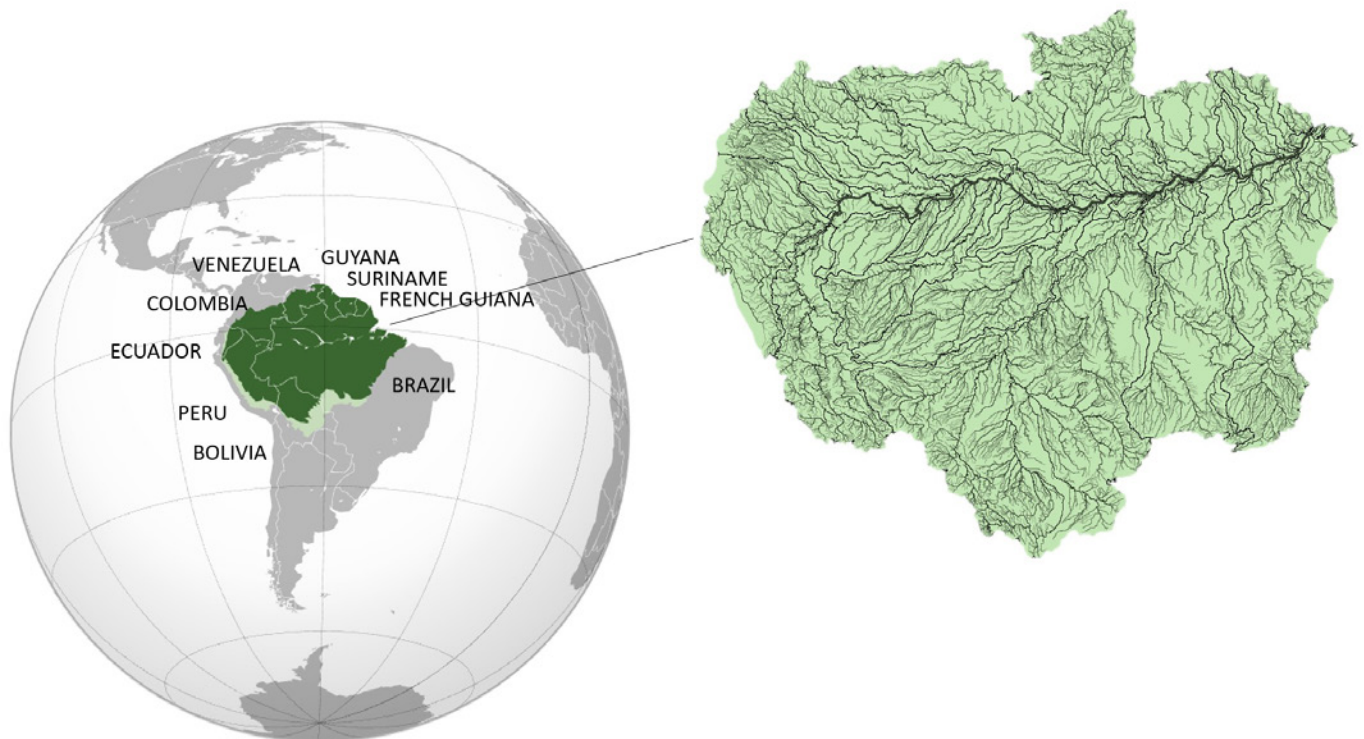
away, others contend that a slow motion detonation may already be underway. At present, no one can say when or where the tipping point will occur, or how intense the feedback loops will be. Most advocates agree, however, that keeping the bomb from igniting is a planetary imperative.

# The world's largest tropical basin

One reason why the Amazon Basin is so fundamental to planetary health is its sheer size. The Basin spans eight countries and one territory and straddles over 7 million km<sup>2</sup> of territory. It is the biggest rainforest on Earth and harbors [more than half](#) of the world's primary forests, [20 percent](#) of all known freshwater reserves and [10 percent](#) of global biodiversity. The Amazon is bigger

than Western Europe and dwarfs other major global biomes, such as the Congo Basin or the Sundaland rainforests in Southeast Asia. The region is extraordinarily diverse in flora and fauna, home to a mosaic of ecosystems including rainforests, seasonal forests, flooded forests and savannas. More than [40,000](#) plant species make their home in the lands drained by the Amazon and its affluents. In the past few years alone, another [600](#) new species of plants and animals were discovered.

**Figure 2.** Amazon Basin



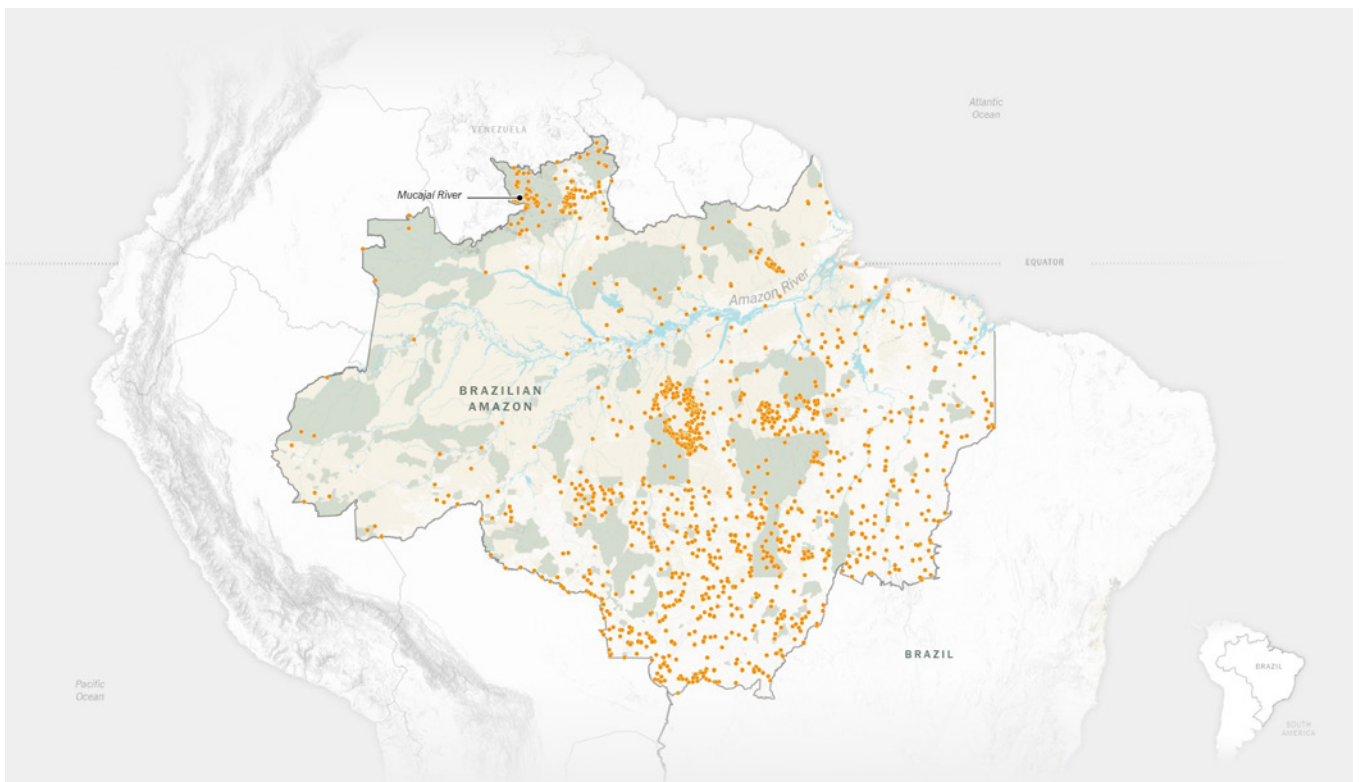
Source: [DAAC](#) (2022)

Another crucial feature of the Amazon Basin is its capacity to generate rainfall and regulate atmospheric conditions. The Basin's eponymous river is also the world's largest in terms of total discharge. The lifelines of the Amazon are its more than 1,100 tributaries, 17 of which are over 1,600 km long. Add to that the so-called flying rivers, massive airborne bodies of water transported by clouds and wind currents across the continent. The Amazon produces the equivalent of 20 billion metric tons of water daily. Without these extraordinary water generation and transportation mechanisms much of the Amazon, indeed large parts of South America, would be little more than deserts.

## The penetration of the Amazon

Yet this is not some unpeopled primal garden. Indeed, approximately 30 million people live in the Amazon, including as many as 385 indigenous groups. The first people to inhabit the region settled thousands of years before the arrival of Europeans in the mid-1500s. In the twentieth century, however, ambitious governments turned the Amazon into a frontier. During Brazil's dictatorship era (1964-1985), for example, waves of migrants were sent into the Amazon under the slogan: "a land without men and men without land". Governments across the region sought to occupy and domesticate the Amazon, investing in large-scale infrastructure, hydroelectric and agricultural schemes.

**Figure 3.** Airstrips in the Amazon



Source: [NYT](#) (2022)

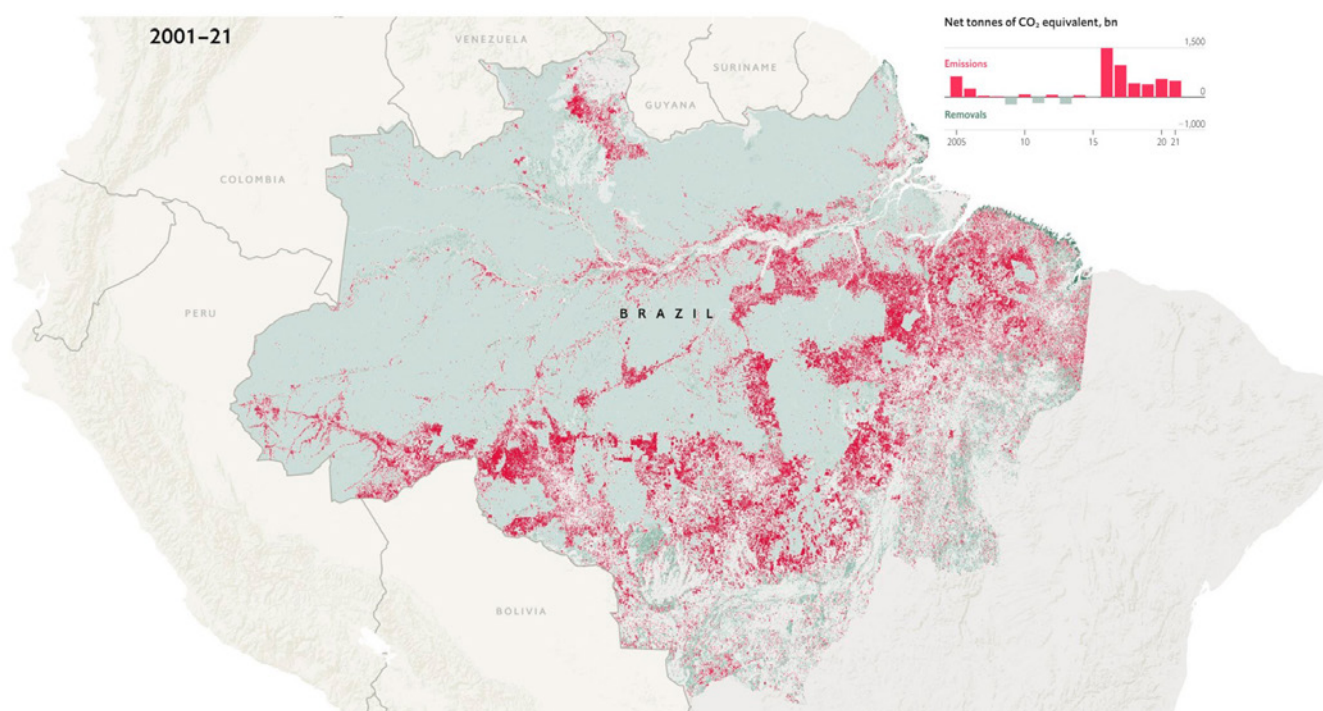


Central to the exploitation of the Amazon is the development of road and air corridors. Major road systems were constructed from the 1970s onwards opening up swathes of the Amazon to farmers, ranchers and miners. The BR230 was one of the first major road schemes developed by the Brazilian authorities and runs east-west for more than 4,000 km. The BR319 was another infamous trans-Amazon highway running north-south across about 870 km. There are also more than 1,200 unregistered airstrips scattered across the Brazilian Amazon, many of them funneling fuel, equipment and people to mine, including on protected and indigenous lands.

## Amazon die-back risks

All of this expansion into the Amazon Basin has accelerated deforestation and degradation. In the early 1970s, just 0.5 percent of the Basin's primary growth forest had been cleared. Over subsequent decades the combination of road construction, migration of settlers, expansion of cattle, agriculture, mining, land grabbing and timber extraction pushed deforestation to almost 20 percent. The 2019-2022 period registered the highest levels of deforestation in 10 years, with more than 10,000 km<sup>2</sup> removed just between January to November 2021, an area seven times that of the city of São Paulo. Indeed, Brazilian deforestation increased by over 70 percent over the past four years. Similar rates are recorded in neighboring Colombia, Peru, Bolivia and Venezuela. The combination of global warming, local droughts and rampant deforestation is contributing to die-back and could convert the world's largest rainforest into its biggest savanna.

**Figure 4.** Deforestation of the Amazon



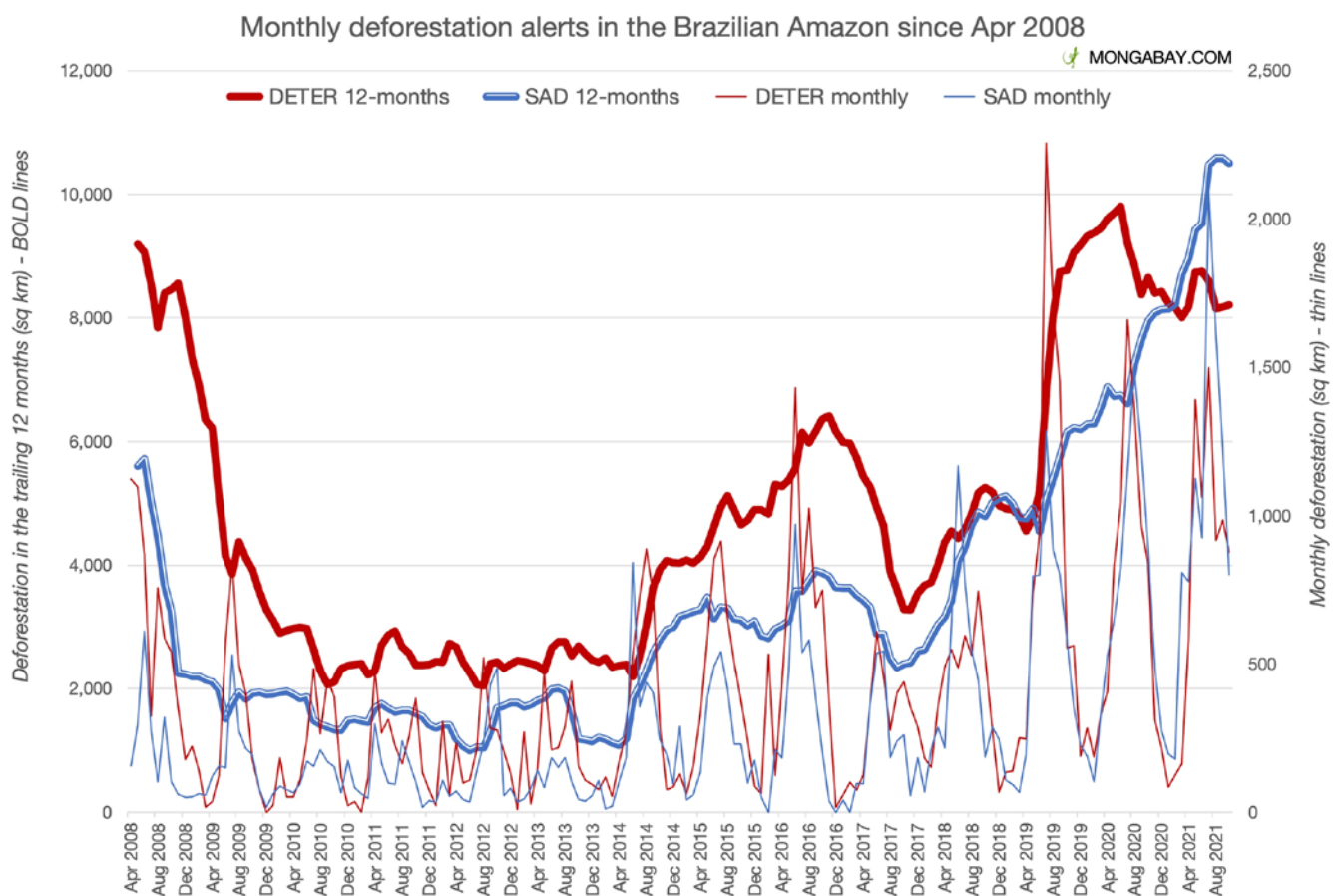
Source: [Economist](#) (2022)



Nowhere are the prospects of dieback more dire than Brazil, home to approximately 60 percent of the entire Amazon Basin. It is useful to conceive of the Brazilian Legal Amazon not as a single ecosystem but rather a mosaic of multiple distinct biomes. Some of these biomes are more prone to die-back than others. For example, the [south and eastern regions](#) of the Brazilian Amazon are already heavily deforested - approaching [20%](#) by

some estimates. That means they are already experiencing die-back and appear to be [net carbon emitters](#). In these regions rainfall is slowing, ecosystems are transitioning to dryland forests and destabilizing feedback loops are accelerating. By contrast, the western Amazon is comparatively more intact with fewer obvious signs of die-back.

**Figure 5.** Deforestation in the Brazilian Amazon - 2008-2021



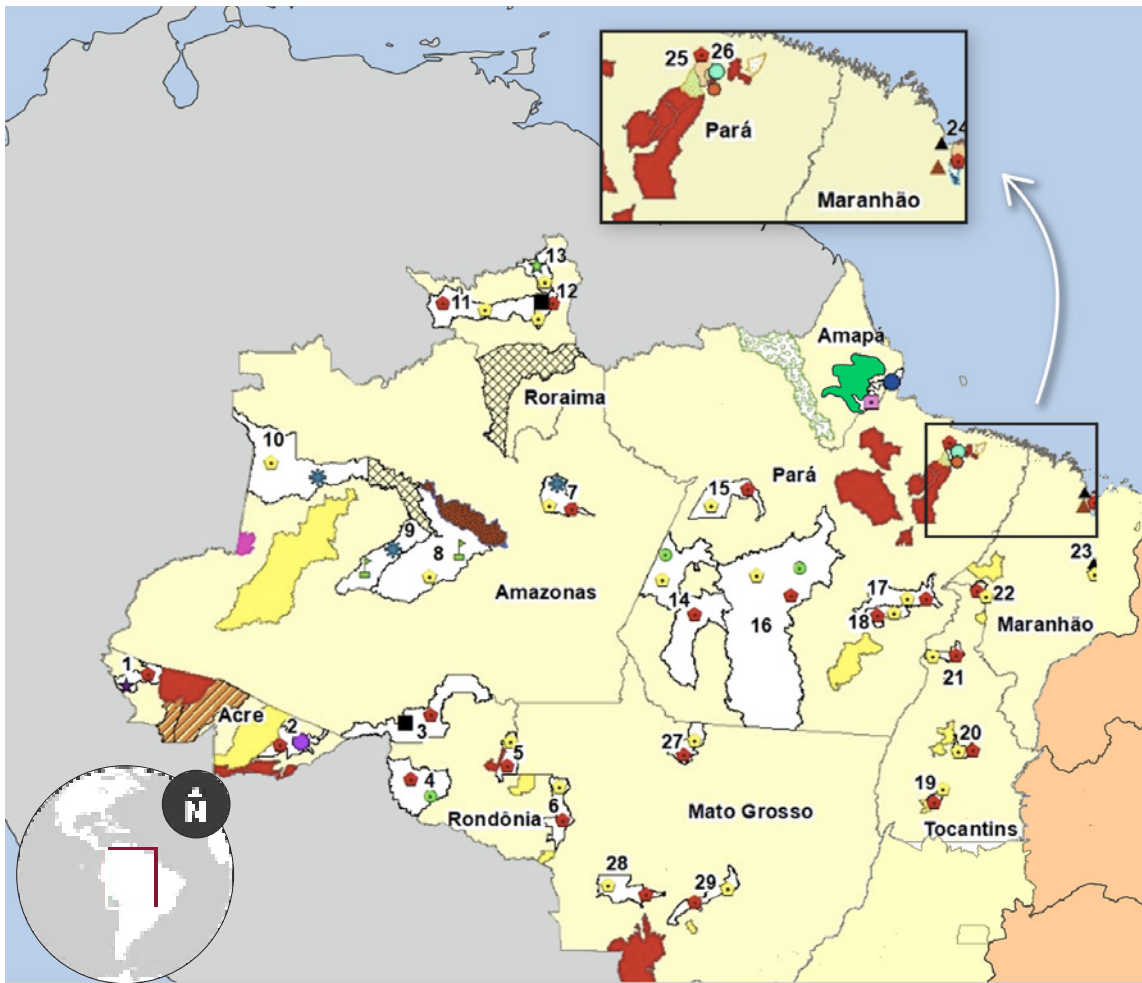
Source: Imazon's SAD system and INPE's DETER system, and the graphic was published by [Mongabay](#) (2022)

Virtually all Amazon Basin deforestation and degradation is connected to global and domestic appetite for commodities. Chief among these are beef, soy, palm, minerals, wood and even, albeit to a lesser degree, coca. The starting point is typically land grabbing and clearance of forest cover to make way for pasture. Indeed, Brazil is the world's largest producer of beef and responsible for about a quarter of all global exports. And while most Amazon beef is still bound for domestic markets, [exports are rising](#). Brazil has [three beef packers](#) which are global players with investment from the biggest investment funds, major countries and sovereign funds. Brazil is also the world's largest soy producer and accounts for roughly one third of global exports with the backing of the major global commodity traders. Insatiable demand for raw minerals ranging from copper and iron to gold is also [driving](#) deforestation and degradation. Timber extraction is common across Brazil, Colombia and Peru, with all countries reporting staggering levels of [logging](#), most of it illegal. And then there is coca production, the key ingredient of cocaine, which has remained persistent in Colombia, Peru and Bolivia, which often coincides with illegal airstrips and roads that facilitate other types of environmental crime, including illegal deforestation.

## An ecosystem of crime

At the center of deforestation and degradation in the Amazon Basin is organized and disorganized crime. Indeed, as much as [98 percent](#) of all recorded deforestation in the Brazilian Amazon is a result of illicit practices - from appropriation and clearing of land for pasture to the laundering of illegally sourced commodities through global supply chains. Flourishing alongside the plethora of environmental crimes is a vast web of conventional crimes ranging from targeted assassinations and extortion to fraud and money laundering. Hence, Amazon deforestation is driven by a sprawling criminal underworld with interests in cattle, agriculture, mineral and timber sectors as well as land speculation and drug trafficking. Understandably, preventing and reducing environmental crimes is a complex and risky business. This explains why countries that share the Amazon, particularly Brazil and Colombia, are among the most dangerous places in the world for environmental defenders and indigenous rights activists.



**Figure 6.** Organized crime in the Amazon (Brazil)**Areas dominated by criminal groups**

- Municipality with more than one criminal group
- Bonde dos 13
- Bonde dos 30
- Comando Vermelho
- Família Terror do Amapá (FTA)
- Família do Coari
- Família do Norte (FDN)
- Os Crias
- PCC
- Primeira Guerrilha do Norte
- Primeiro Comando do Maranhão
- União criminosa do Amapá
- States of the Brazilian Amazon
- Other states of Brazil

**Spots where groups are clashing**

- Al Quaeda (Bairro do Jurunas em Belém)
- Bonde dos 13
- Bonde dos 40
- Comando Classe A
- Comando Vermelho
- Equipe Rex
- Facção Trem do Aragua (Venezuela)
- Família Terror do Amapá
- Família de Coari
- Família do Norte
- IFARA
- PCC
- Primeiro Comando Panda
- Primeiro Comando do Maranhão
- União Criminosa do Amapá

**Clashes between criminal groups**

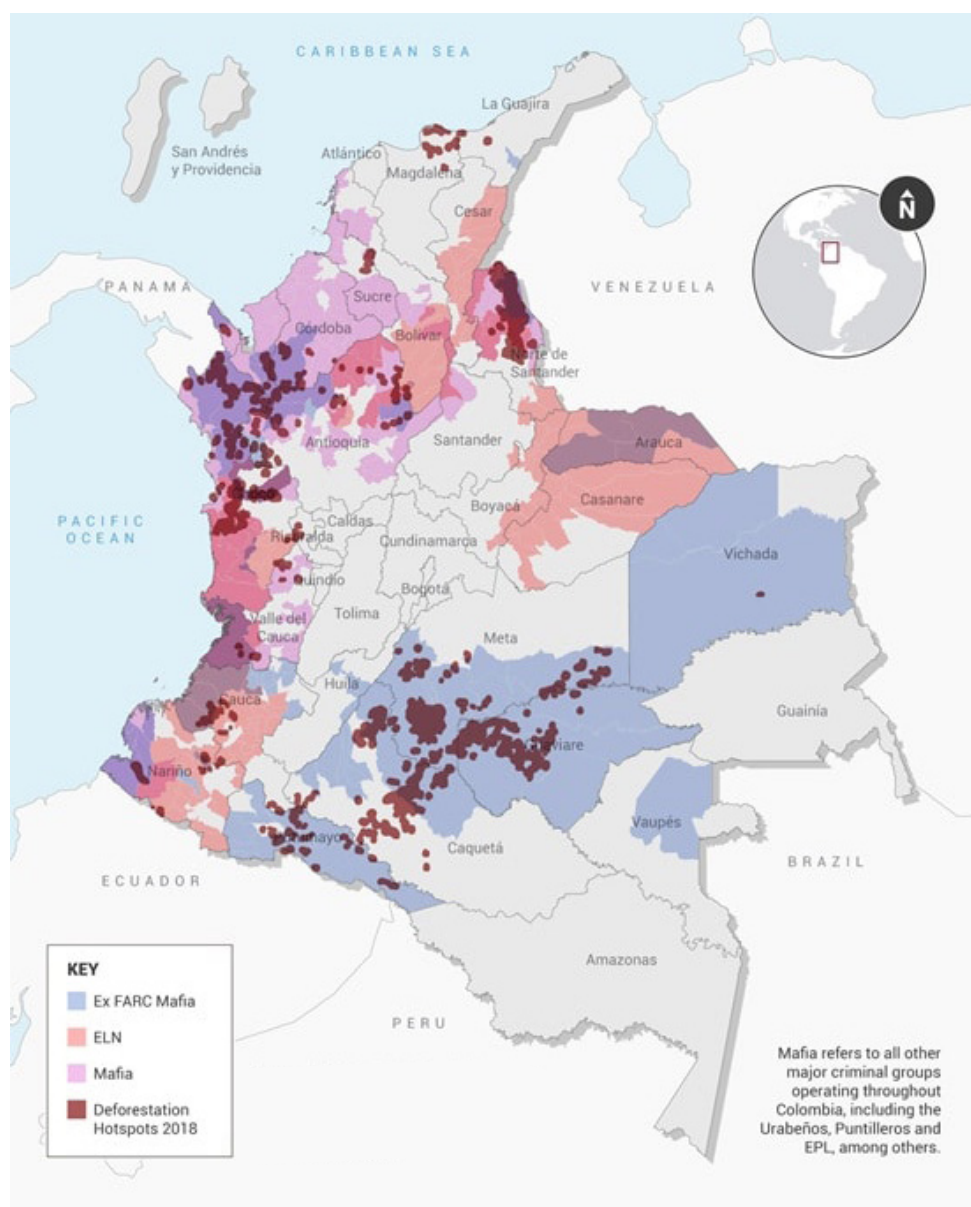
- 1- Comando Vermelho e IFARA - Cruzeiro do Sul
- 2- Comando Vermelho e Bonde dos 13 - Rio Branco
- 3- Comando Vermelho e Primeiro Comando Panda - Porto Velho
- 4- Comando Vermelho e Comando Classe A - Guajará Mirim
- 5- Comando Vermelho e PCC - Ji-Paraná
- 6- Comando Vermelho e PCC - Vilhena
- 7- Comando Vermelho, Família do Norte e PCC - Manaus
- 8- Família de Coari e PCC - Coari
- 9- Família do Norte e Família de Coari - Tefé
- 10- Família do Norte e PCC - Japurá
- 11- Comando Vermelho e PCC - Alto Alegre
- 12- Comando Vermelho, PCC e Primeiro Comando Panda - Boa Vista
- 13- PCC e Facção Trem do Aragua (Venezuela) - Pacaraima
- 14- Comando Vermelho, PCC e Comando Classe A - Itaituba
- 15- Comando Vermelho e PCC Santarém
- 16- Comando Vermelho, PCC e Comando Classe A - Altamira
- 17- Comando Vermelho e PCC - Marabá
- 18- Comando Vermelho e PCC - Parauapebas
- 19- Comando Vermelho e PCC - Gurupi
- 20- Comando Vermelho e PCC - Palmas
- 21- Comando Vermelho e PCC - Araguaína
- 22- Comando Vermelho e PCC - Imperatriz
- 23- Comando Vermelho e PCC - Codó
- 24- Bonde dos 40, Primeiro Comando do Maranhão e Comando Vermelho - São Luís
- 25- Comando Vermelho, Equipe Rex, Al Quaeda - Belém
- 26- Comando Vermelho e Galera do Aurá - Ananindeua
- 27- Comando Vermelho e PCC - Alta Floresta
- 28- Comando Vermelho e PCC - Tangará da Serra
- 29- Comando Vermelho e PCC - Rosário Oeste

Source: Aiala Colares / Cartography of Violence in the Amazon research project / [Mongabay](#) (2022)

Environmental crime in the Amazon involves an intricate network of actors and entities. Destitute land grabbers and impoverished residents are just the weakest links in the illicit supply chain. Nor are sketchy farmers, slash-and-burn ranchers and wildcat gold prospectors the only suspects. Rather, Amazon crime reaches across overlapping layers of interests spanning the Amazon Basin and the world. The only way to get to zero deforestation is by focusing broadly on the entire illicit ecosystem rather than zooming in on isolated offenders. This means addressing the individuals involved in land encroachments and forest clearances, many of them recruited by wealthy backers.

It also requires disrupting those who build illegal roads and airstrips, or truckers and pilots who are paid to move illegal products. The enforcement dragnet must also be spread to catch investors from cities across South American companies who bankroll the appropriation of land and extraction of commodities. Nor can Amazon authorities ignore the vast array of investors, traders and retailers who say the right things while also turning a blind eye to crime in their supply chains. And of course there are also corrupt public authorities - from mayors and elected officials to licensing officers, police and customs officials who help grease the wheels of criminal markets.

**Figure 7.** Organized crime in the Amazon (Colombia)



Source: [InSight Crime](#) (2019)



Environmental crimes in the Amazon, as in other parts of the world, are not committed in a vacuum. Far from it, they thrive in lands afflicted by high levels of social and economic inequalities, extreme impunity and widespread informality. What is more, these crimes typically also beget more crimes, generating feedback loops of their own, corrupting local economies and normalizing cultures of illegality. Indeed, many towns and cities across the Amazon Basin have grown highly dependent

on markets in everything from illegally-sourced gold to illicit freshwater fish. In many urban centers and outlying settlements the rule of law is fragile and unevenly applied. This helps explain why several Amazon cities are among the most homicidal on the planet, and registering steadily increasing rates of criminal violence.

**Figure 8.** Environmental organized crime in the Amazon (Peru)



Source: [Igarapé Institute and InSight Crime](#) (2022)

Making matters more complicated, the Amazon's already challenging environmental crime problem is rapidly worsening. The key reason for the decline is the emerging role of powerful drug trafficking groups in everything from the production, transshipment and retail of illegal products to selling protection. In Brazil, a constellation of criminal factions representing a veritable [rainforest mafia](#) are getting into the game, including the notorious Primeiro Comando Capital (PCC), the Comando Vermelho (CV) and a cluster of second tier gangs and armed militia groups. In Colombia, breakaway factions of legacy guerilla groups such as the FARC and ELN have joined other common criminal groups to produce coca leaf for the cocaine trade as well as exploit illegal timber and command gold mines. Peruvian crime families are diversifying their business interests beyond cocaine to timber and precious metals. Even Mexican cartels, the Italian mafia and Balkan gangsters are getting into the mix. These entities are not only well organized and financed, they are also exceptionally good at procuring and shipping contraband around the world and deploying violence.

While some [field-based law enforcement](#) operations have proven effective, most of the security-led responses to environmental crime are falling short. Part of the challenge is that police and armed forces are [under-staffed and under-resourced](#). Moreover, the Igarape Institute's recent study, '[The Ecosystem of Environmental Crime in the Amazon: An analysis of Illicit Rainforest Economies in Brazil](#)', suggests that the reduced presence of law enforcement in the Amazon is strongly correlated with increased deforestation, degradation and biomass burning, or forest fires. The Institute's review of [369 separate federal police operations](#) in Brazil between 2016-2021 also found that environmental crimes often interconnect with so-called convergent crimes, including money laundering and financial crime. While environmental crimes tended to cluster in a small number of Amazonian states, the Institute identified a network of criminal actors across 24 of 26 Brazilian states.

## Leadership gaps

Despite the escalating emergency, regional and national leadership on preventing and reversing environmental crime in the Amazon are still in short supply. Indeed, Brazil's president Jair Bolsonaro campaigned with the promise to open up the Amazon Basin to extractive industries. Between 2019 and 2022 [the Bolsonaro administration dismantled safeguards](#) of protected areas, nature reserves and indigenous territories; provided amnesties for illegal deforesters and wildcat miners; de-funded environmental and indigenous affairs agencies such as IBAMA and FUNAI; [packed key environmental and mining authorities with loyalists](#); and stands accused of inciting the region's farmers and ranchers to set the forests ablaze.

These measures earned Bolsonaro support from some elements of the mining and farming sectors, especially among ranchers and meat packers. They also assured robust support among many rural voters, some of whom benefited from his tenure and resented complying with Brazil's cumbersome environmental regulations. These same rural constituencies never accepted the rules of Brazilian land tenure, which reserved large tracts of land and rivers to indigenous groups. However the Bolsonaro administration also came under heavy criticism, including from foreign governments, major investment groups and activists who accused him of perpetrating ["ecocide" if not outright genocide](#).

By contrast, the new-elected and previous two-term Brazilian president - Luiz Inácio Lula de Silva - presided over a dramatic and unprecedented reduction in deforestation. As president between 2003 and 2010 his then Environment Minister - Marina Silva - introduced a series of measures that saw deforestation drop by over [80 percent](#) between



2004 and 2012, extending the green bonus into the term of Lula's successor, Dilma Rouseff and her Minister of Environment Izabella Teixeira. They locked in these gains through an Action Plan for the Prevention and Control of Deforestation in the Amazon. The Lula administration also set aside major protected areas in the Legal Amazon, creating more than [500,000 km<sup>2</sup>](#) of conservation units, at both federal and state levels. The government also imposed a moratorium on unsustainable soy farming, banning grain traders from purchasing harvests grown on recently deforested land. Brasilia went on to introduce a series of incentives for companies and communities not to deforest, created a national digitized land registry, and set-up a world class monitoring system to track deforestation in real time. Unlike the Bolsonaro administration, they also enforced the law, empowering environmental authorities to penalize illegal deforestation.

Yet protecting the Amazon over the coming years requires an even more comprehensive approach. Even if Brazil and countries such as Colombia or Peru were to introduce the most aggressive zero deforestation policies tomorrow, major risks still loom over the Amazon. For one, the Russian-Ukraine war is introducing a host of pressures on Amazon Basin countries to expand food production and mineral extraction. Also, because Brazil is highly dependent on Russia and Ukraine for fertilizer, there is considerable pressure to ramp-up domestic production of potash, including from known deposits in the Amazon. Another potential risk for Amazon sustainability is – paradoxically – the global transition to a greener economy. A [scramble is underway](#) to source critical minerals like lithium and rare earths that are key to building batteries, cathodes and magnets for renewable energy production. As it happens, sizable reserves of those critical resources lie within the Amazon region.

## Solutions from the global to the local

Notwithstanding the many drivers of deforestation and degradation in the Amazon, a few green shoots are emerging. For one, there is growing international, regional and national awareness about the nexus of interlocking threats facing the Amazon Basin, including from criminal networks. Some countries in the region are already joining forces to commit to zero deforestation and ramp up protection efforts, with support from financial institutions such as the Inter-American Development Bank and the World Bank. Encouragingly, for the first time, the Amazon question was also squarely on the agenda during election campaigns in both Brazil and Colombia in 2022. There is also lively advocacy and increasing commitments from governors and mayors across the region, some of them agitating for action in global fora such as COP26 and COP 27 as well as in the boardrooms of major corporations and investment banks. Importantly, there are also signs that indigenous voices are being heard, a critical development since they are the most effective defense against the criminal denuding of the Amazon forests.

At the global level, action stalled in the wake of the President Bolsonaro administration between 2019 and 2022. The Norwegian and German government's decision to suspend a [USD \\$1.2 billion](#) Amazon Fund that supported nature-based solutions during Bolsonaro's tenure put the Brazilian government on notice. The European Union (EU) and US governments also started to push back against Amazon deforestation, strongly so starting in 2020. For example, the EU passed a law banning the import of productions linked to deforestation, degradation and human rights violations in the river basin. The US is weighing similar

legislation - a [Forest Act Bill](#) - that would hold global suppliers of meat, soy, wood, palm oil and other products accountable for illegal deforestation. Facing divestment campaigns and consumer backlash, a group of [168 investors with assets of over \\$17 trillion](#) also issued commitments to clean-up their supply chains and eliminate environmental crime. The extent to which these commitments will be enforced is still an open question, but they suggest a growing level of international awareness and engagement.

Regionally, there are also indications of mobilization to reduce environmental crimes driving deforestation. While critics fault many of these measures for lacking adequate enforcement and resources, they point to growing political alignment on a shared agenda. Consider the [Leticia Pact](#) signed in 2019 which brings together seven countries to cooperate on reducing deforestation and protecting biodiversity. Colombia also implemented a 2021 [environmental crime law](#), although some activists fear the new regulations could disproportionately penalize poor farmers while letting the big players escape punishment. Peru also established an [environmental criminal court](#), undoubtedly an important step, although there are concerns it is not being used for key cases. Meanwhile, three key Brazilian banks and an assortment of equity investors from across the region have set-up an [Amazon Plan](#) to encourage zero deforestation targets. An under-used body is the [Amazon Cooperation Treaty Organization](#), ACTO, which could play a role in helping coordinate activities. Likewise, international organizations ranging from Interpol to UNODC are supporting national counterparts to improve law enforcement and investigatory capacities to disrupt multiple environmental crimes.

Carrots are also needed to achieve zero deforestation. This begins with developing a sustainable and responsible green economy in the Amazon, one that benefits the residents first and foremost. Several movements are underway, including among scientists, entrepreneurs, investors and activists to

stimulate sustainable agroforestry, bioeconomy and pro-nature economic activities. There are also signs of European as well as subnational Amazon Basin governments and businesses seeking to invest in reforestation, restoring and recovering degraded forests, and building back ecosystems. Financial institutions and companies are also expanding support for green funds and nature-positive investment, while interest in carbon and biodiversity credits and nature-based solutions is soaring. Of course, the risks of greenwashing - when the government and companies try to look as if they are taking action while not actually cutting emissions - are real. Ethical impact investing and environmental, social and governance (ESG) metrics thus need to be linked to operations on the ground and measurable, transparent and enforced if they have any hope of diminishing crime in supply chains.

Given the scale of the challenges, there is a risk that advocates for the Amazon become overwhelmed, lose momentum and fall into despair. That would be a mistake. Indeed, there must be an all-hands effort to fundamentally re-imagine the Amazon, and double down on what works to make the most of the region's enormous untapped potential. Rather than treating forests and people as frontier assets to be conquered and pillaged, we need an Amazon reset – a bold new vision for protecting this singular biome and building a sustainable green economy. Some scientists and advocates refer to this as [Amazon 4.0](#). This means ensuring that forested land is accorded more value than cleared territory. It also requires acknowledging that today, virtually all deforestation is illegal, a result of environmental crime and that the global networks enable it. Solutions must be co-designed with the people who make their homes and livelihoods in the Amazon. This may be the last best path to reach zero deforestation, halt the criminal violence, and dismantle the climate bomb while there is still time.





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The Igarapé Institute is an independent think and do tank focused on public, climate and digital security and their consequences for democracy. Its objective is to propose solutions and partnerships for global challenges through research, new technologies, communication and influence on public policymaking. The Institute works with governments, the private sector and civil society to design data-based solutions. Prospect Magazine named Igarapé Institute the best Human Rights NGO in 2018 and the best think tank on social policy in 2019.

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