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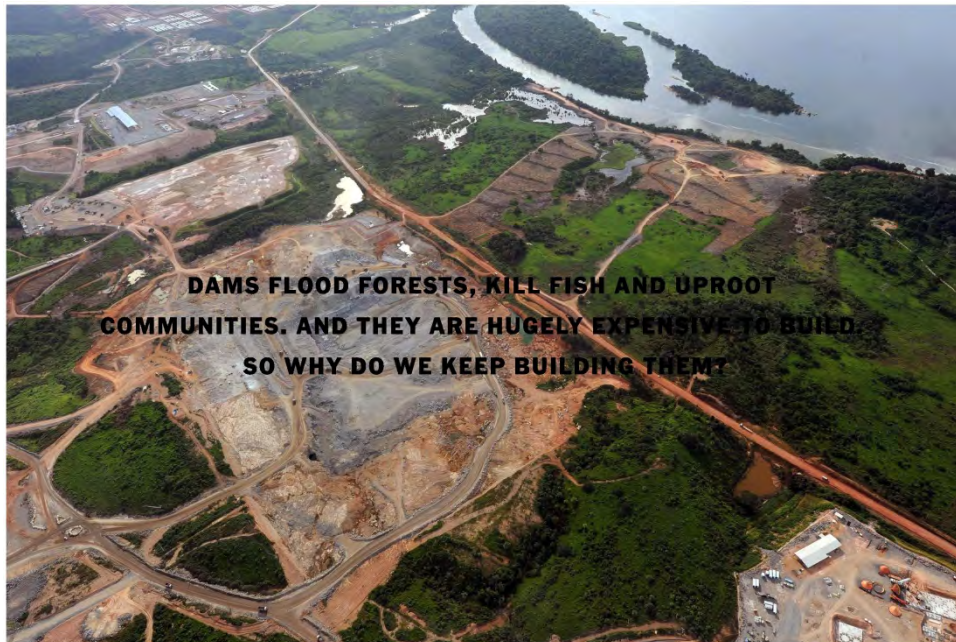
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Opinion

Many Rivers, Too Many Dams

By Philip Fearnside

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This article is part of the Opinion series [The Amazon Has Seen Our Future](#), about how the people of the region are living through the most extreme versions of our planet's problems.



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Where rivers run free, dams are intruders.

Perhaps nowhere these days are they more threatening than in the Amazon basin. Its namesake river is fed by more than 1,100 tributaries, many of them major rivers themselves, and forms the largest drainage system in the world. About one-fifth of all of the water that runs off the surface of the Earth ends up in it.

The flows of these rivers can generate a lot of electricity, so it's not surprising that the Amazon River basin is seen by governments, speculators and industries as a vast, untapped frontier for hydroelectric power and the development that dams attract. At least 158 dams are either operating or under construction now in the river basin, according to [a study](#) last year in the journal *Nature Communications*, and an additional 351 have been proposed.

The study's authors called the Amazon a "hot spot for future hydropower expansion."



The Xingu River flowing near the area where the Belo Monte dam complex was under construction in 2012. Credit...Mario Tama/Getty Images

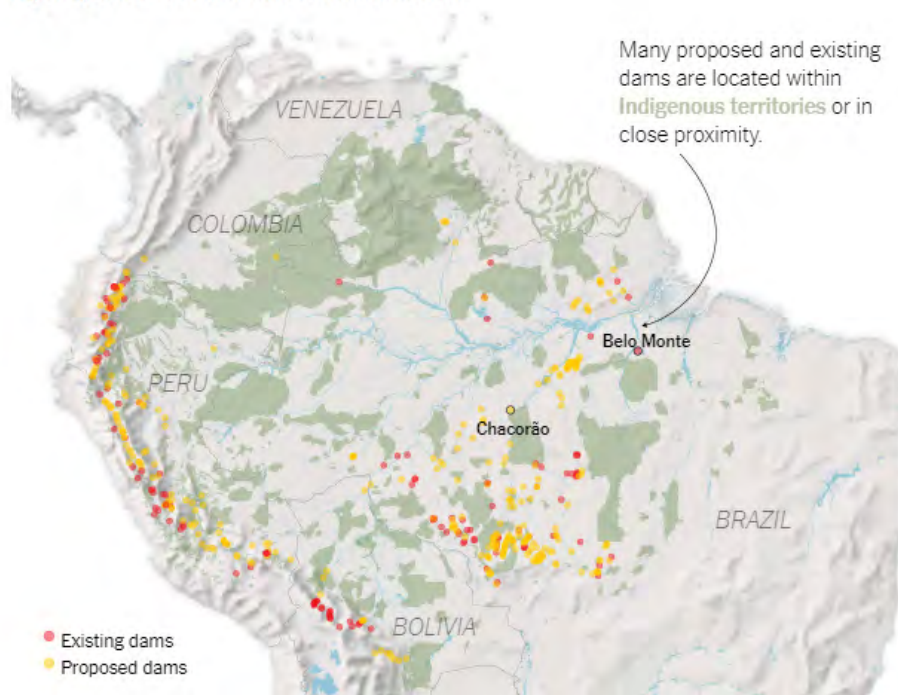
But it is hard to know, really, what lies ahead. Plans for these big, disruptive projects are often shrouded in secrecy, especially in Brazil, which includes about [two-thirds](#) of the basin, because of the controversy they generate over the environmental destruction and injustices they cause. New projects can appear out of nowhere and dormant plans are sometimes resurrected as sudden priorities — so-called vampire projects rising from the dead.

What is clear, as I argued in a 2017 [article](#) for the online magazine Yale Environment 360 — even before Brazilians elected as their president Jair Bolsonaro, who has been [predictably disastrous](#) for the Amazon — is that the dam building is “driven by the country’s agricultural and heavy industrial interests, is being carried out with little regard to the impacts on Indigenous people and the environment, is proceeding with little effort to capitalize on the nation’s vast renewable energy potential, and is often fueled by corruption.”

One dam that [appeared](#) out of nowhere last year is the centerpiece of the Barão do Rio Branco infrastructure project proposed soon after Mr. Bolsonaro took office in January 2019. This project calls for a 2,000- to 3,000-megawatt dam on the [Trombetas River](#), an Amazon tributary that flows through an isolated and mineral-rich region of northern Brazil.

Hydropower dams in the Amazon basin

Hydropower dams in the Amazon basin



Sources: "Reducing greenhouse gas emissions of Amazon hydropower with strategic dam planning" by Rafael M. Almeida et. al. (dams); RAISG (Indigenous territories)

The proposed dam would flood Quilombola lands upstream from the dam. These lands were [established](#) by runaway slaves. The inundation would conflict with Brazil's often-violated and easily amended Constitution, which prohibits the removal of Quilombola and Indigenous peoples from their lands. (The government says it will consult with potentially affected communities, a promise that has proved mostly hollow in other dam projects.) This dam would also threaten one of Amazonia's largest beaches for turtle reproduction, which lies downstream.

Not coincidentally, Mr. Bolsonaro is dismantling the country's [environmental agencies](#) and licensing system for infrastructure projects, and is reducing protections for Indigenous peoples.

This has set the stage for a spree of dam building that could be enormously destructive to a region of incredible biological diversity. At the same time, Amazonia's rain forests are being cleared for cattle ranges and soy farms, often illegally.



A barge navigating a lock of the Tucuruí Dam. Credit...Paulo Santos/Reuters

Every year Brazil's Ministry of Mines and Energy publishes an energy plan that includes large dams of at least 30 megawatts of installed capacity to be completed within 10 years. The [most recent plan](#), which runs through 2029, lists three dams: the Tabajara in Rondônia, the Castanheira in Mato Grosso and the Bem Querer in Roraima.

This last dam would block the Rio Branco, known as the White River for its color, which is caused by the high load of sediments it carries. These sediments created and maintain the [Anavilhanas Archipelago](#), a national park whose 400 islands in the Rio Negro just downstream from the confluence with the Rio Branco make up one of the world's largest riverine archipelagos. Its wetland ecosystems depend on the sediments from the Rio Branco and are considered of [international importance](#) for their biological diversity.

In addition to that plan, Brazil's most recent "National Energy Plan," which goes through 2050, includes the Chacorão Dam on the Tapajós River, which would flood part of the Munduruku Indigenous Land, as well as dams on the Tapajós and its tributary Jamanxim River, which would inundate part of Sawré Muybu, another Munduruku area that so far has been denied designation as an Indigenous land precisely to make way for these dams.

Peru, Bolivia and Ecuador also have big plans for Amazonian dams. In 2010, Peru and Brazil [agreed to six large dams](#) in Peru, to be built by Brazilian contractors and financed by Brazil's national bank. Most electricity from them would be exported to Brazil. When this will happen is unclear: The main contractor has since been [swept up](#) in an unrelated corruption scandal, along

with some political figures in Brazil. But the dams remained listed on Brazil's [2050 energy expansion plan](#).

In Brazil, there is a constant testing of the legal limits, to see which laws will be enforced and which will be ignored. The Belo Monte Dam, the biggest hydroelectric project in the Amazon, stands as a concrete monument to this reality. It became operational in 2016 after [storms of protest](#) from Indigenous peoples, environmentalists and much of the public. The dam flooded roughly 200 square miles of lowlands and forest, uprooted more than 20,000 people and has caused [extensive damage](#) to the river ecosystem.

A federal judge originally [ruled](#) that the license for the dam was illegal because the people in the Indigenous lands affected were not consulted as required by law. But construction was allowed to proceed and the dam stands today. [The project](#), which consists of two dams, removes 80 percent of the water from a 45-mile stretch between them along which two Indigenous lands are. Despite an estimated \$18 billion price tag, the dam's economic viability was always in question. The natural seasonal cycle of the Xingu River includes a long low-flow period that prevents Belo Monte from using many of its expensive turbines during much of the year.

The study in Nature Communications found that some lowland dams in the Amazon actually may exceed the carbon emissions rates of fossil fuel plants. Beyond that, these tropical dams cause environmental damage that is much more serious than their proponents admit, for benefits that are far less than claimed.

River ecosystems are turned into reservoirs, for instance, [damaging aquatic diversity](#). Dams can block annual fish migrations, like that of the giant catfish of [the Madeira River](#). According to one analysis, after Brazil built one dam on the Madeira, [in 2011](#), and another [in 2013](#), fish catches in what had been the world's second greatest riverine fishery [plummeted](#) in Brazil, Bolivia and Peru. Thousands of people lost their fishing-based livelihoods, and the steep decline in fishing also led to social tensions in the region that persist today.

Another problem results when nutrient-rich sediments carried by these rivers are [trapped behind dams](#) rather than carried downstream and deposited on flood plains, where they are essential for agriculture. The nutrients also [support the food chain](#) that fish downstream depend on, compromising catches along thousands of miles of Amazonian rivers.

These huge impoundments also destroy forests, which drown in the sprawling reservoirs behind them and are cut down to make way for the accompanying development and to clear paths for transmission lines strung across vast distances to deliver electricity to faraway consumers and industries. The rising waters behind these dams can also displace thousands of people from their homes, as they have done time and again in the Amazon.

Some proposed dams are important components of planned [waterways](#) that will allow for the transportation of soybeans and other products by barge. This would accelerate the clearing of forest and the transformation of cattle pasture

for soy cultivation. This switch from pasture to soy fields is already a [key driver](#) of deforestation as cattle ranchers sell their lands to soy farmers and buy cheap land deeper into forest areas to clear for new ranches.

There are more subtle consequences, too.

Mercury that occurs naturally in the soil as well as in runoff from gold mining operations that can often be found upriver of dams can be transformed into highly poisonous methylmercury through a chemical reaction at the bottom of reservoirs, where there is almost no oxygen in the water. High levels of mercury have been found in the hair of people living around the [Tucuruí Dam](#) in Pará and [the Balbina Dam](#) in Amazonas.



Dead trees in a reservoir near the the Balbina Hydroelectric Dam in 2007. Credit...Andre Penner/Associated Press

And the lack of oxygen at the bottom of these reservoirs also causes another chemical reaction that [produces methane](#), a highly potent greenhouse gas. It bubbles up to the surface, where it is released into the atmosphere. The gas also enters the atmosphere when reservoir water passes through the [turbines and down the spillways](#) of dams.

What all this adds up to is clear: The countries of the Amazon should be extremely wary of damming more rivers in pursuit of electricity they mistakenly see as clean and cheap. These projects are enormously expensive, wreak havoc on the environment and are an injustice to the people who live near them. Moreover, they often don't add up financially. A [2014 study](#) in the journal *Energy Policy* warned that "in most countries large hydropower dams will be too costly in absolute terms and take too long to build" to make sense.

Brazil has other ways to generate electricity — offshore turbines and solar power, for instance — with the existing hydropower plants available to provide backup. There are also ample opportunities to cut electricity use through conservation and to redirect the economy from industries that are electricity-intensive, like [aluminum production](#), for export.

Amazonia's free-flowing rivers are the lifeblood of its biologically rich forests and the Indigenous peoples who have depended on them for centuries. Treating Amazonia as a sacrifice zone for resource extraction is unjust and unnecessary. The human and environmental costs are too high.

Philip Fearnside is an ecologist at the National Institute for Research in Amazonia in Brazil.

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