

DAMNING THE AMAZON

THE RISKY BUSINESS OF
HYDROPOWER IN THE AMAZON

GREENPEACE

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Cachoeira Seca Indigenous Land, Pará State. © Daniel Beltrá/Greenpeace

A GLOBAL TREASURE UNDER THREAT FOR PROFIT

Brazil's Amazon region, which includes most of the world's largest remaining area of rainforest, is under attack by uncontrolled economic exploitation. Mainly as a result of industrial agriculture, cattle ranching, mines and infrastructure projects such as hydropower dams, and the illegal loggers and settlers that follow in their wake, over 750,000 km² of forest have already been cleared, putting at risk the region's unparalleled biodiversity, driving traditional forest communities from their land and threatening serious impacts for the world's climate.

From 2004 deforestation slowed, but in 2012 the Brazilian congress passed legislation that created a climate of impunity for illegal deforestation and since then the rate of destruction has shown some sharp rises. Now the government of President Dilma Rousseff, obsessed with economic development at any cost, is pushing a further massive expansion of hydropower in the Amazon.

Among the areas liable to be worst affected is the basin of the Tapajós River, one of the Amazon's last unobstructed major tributaries, which has been called one of the most biodiverse regions in the world. Over 40 medium-sized to large dams are currently planned or under construction in this unique area, which is also threatened by utterly inappropriate plans for an industrial waterway to transport soybeans from Mato Grosso to the Atlantic. Among the new schemes is a complex of five dams on the Tapajós River and its tributary the Jamanxim. The largest of these, the São Luiz do Tapajós (SLT) dam, is expected to drown nearly 400 km² of pristine rainforest and lead to a further 2,200 km² of deforestation.

TURNING A BLIND EYE TO ENVIRONMENTAL DEVASTATION

Experience of previous and ongoing Amazon hydropower projects has shown that dams can wipe out huge areas of habitats such as alluvial forest that are dependent on seasonal flooding, and have devastating impacts on populations of fish and aquatic reptiles and on the life cycles of mammals such as turtles, caimans, otters and river dolphins. These effects can sometimes be felt hundreds of kilometres upriver and downriver from the dam and may even lead to extinctions. The new roads and other infrastructure associated with dam developments also act as a magnet to settlers and destructive industries such as mining and large-scale agriculture, driving further deforestation.

An environmental impact assessment (EIA) commissioned by a consortium of companies expected to bid for the SLT dam project identified over 2,600 species near the dam site, including many that are at risk of extinction, as well as several birds and primates that appear to be new to science – emphasising the area's huge importance in wildlife terms. However, according to a 2015 independent study commissioned by Greenpeace, this EIA had multiple failings, including insufficient sampling of key habitats, a total failure to look at areas downriver from the proposed dam, a lack of analysis of the risks to the species recorded, and inadequate measures proposed to mitigate the impacts on wildlife. The study urges the licensing authority IBAMA to reject both the EIA report and the associated summary report that presents a distorted picture to decision-makers and the public, glossing over many of the EIA's findings about rare and endangered species. So far, however, IBAMA

has not done so. The same study emphasises the need for an integrated basin-wide assessment of the cumulative impacts of the dam and industrial waterway developments proposed for the basin, something that the government has cynically resisted despite its being required by the country's National Environmental Council.

STEAMROLLING TRADITIONAL COMMUNITIES

In addition to its environmental impacts the SLT dam, along with two other dams upriver, is set to flood large areas of land belonging to the indigenous Munduruku people (including sacred sites) and to traditional riverside communities that have lived in the area since the 19th century. What is more, these populations' livelihoods and health are likely to be severely impacted by loss of fisheries, reduced fertility of floodplains as a result of interrupted sediment flows, and lower water quality. Mass fish deaths and health problems apparently linked to contaminated water have already been reported from other dams in the Tapajós basin, as well as the part-completed Belo Monte dam complex on the Xingu River.

Faced with these pressures, populations near the SLT dam may be forced to migrate to nearby towns, which can also expect to receive an influx of migrants in search of work on the dam or other opportunities. As the experience of Belo Monte has also shown, such large and rapid movements of people can overwhelm the infrastructure of the towns concerned and tear apart their social fabric through massive increases in drug use, violence and prostitution, condemning residents and incomers alike to a precarious future.

The Brazilian state is obliged by both the Federal Constitution and international agreements such as the International Labour Organisation's Convention 169 and Article 19 of the UN Declaration on the Rights of Indigenous Peoples to consult Indigenous Peoples on matters that affect them, and to guarantee their right to give or withhold their free, prior and informed consent (FPIC) to activities that will impinge on their territory, livelihoods or rights. It must also safeguard their inalienable rights to their traditional territories and resources, and it has a constitutional duty to demarcate indigenous land, granting it formal legal recognition. One might therefore expect that when proposing a development that threatened to deprive the indigenous population of land and livelihood, the least that the state would do is to ensure that they were properly consulted and given an opportunity to have their say on the project.

However, when it comes to hydropower development the Brazilian government has little time for such niceties. When in November 2014 the public prosecutor's office succeeded in a legal challenge to force the government to carry out a

consultation process on the SLT dam, the Chief of Staff of the Presidency of the Republic stated publicly that the consultation would make no difference to the government's intention of going ahead with the project. In any case the inadequacy of available information on the dam's likely impacts, and the climate of fear resulting from the use of the Federal Police and National Guard to intimidate indigenous opponents of dam projects in the region, would make meaningful consultation impossible. In fact no consultation has yet been conducted, and it seems likely that the dam contract will be awarded without the Munduruku's FPIC, violating their rights over their ancestral territory – whose demarcation the government has persistently obstructed, most recently with a legal instrument supposed to be used only on grounds of national security.

THE MYTH OF CHEAP, CLEAN HYDROPOWER

Enthusiasts of Amazon development try to justify such woeful environmental and social impacts by claiming that hydropower dams are a carbon-neutral source of energy that will help to save the world from climate change. Unfortunately, such claims do not stand up to analysis. Besides the energy embodied in building a large industrial installation in a remote location, dams emit considerable amounts of greenhouse gases – both carbon dioxide and the much more potent methane – as a result of the decay of flooded vegetation and soil. Rules requiring vegetation to be removed are rarely observed, and in any case the soil accounts for at least three-quarters of the emissions. While the SLT dam is not predicted to be by any means among the highest-emitting Amazon dams (some of which may have emissions comparable to fossil fuels), a study nevertheless suggests that its contribution to global warming could be as much as half that of an equivalent gas-fired power station, and far more than the equivalent wind or solar capacity, over a 20-year period – the timescale within which decisive action is needed to prevent dangerous climate change.

In addition to Amazon dams not offering a clean energy solution, it is far from clear that they are a viable or necessary solution to the country's energy security needs. As a result of climate change, rivers in the region are predicted to undergo dramatic reductions in flow (up to 30% in the vicinity of the SLT site), making new dams unlikely to attain anything like the annual energy output that they have been designed to achieve. Seasonal flow variation is also expected to increase, reducing output drastically for much of the year. Brazil saw severe electricity rationing in 2001 as a result of drought – why would a country whose energy security is already compromised by overreliance on hydropower aim to increase that reliance still further?

This uncertainty, along with the likelihood of significant construction cost overruns (of which Amazon dams have a

long history), also weakens the economic case for investment in Amazon hydropower, as projects are unlikely to achieve their predicted financial returns – despite legislation passed in 2015 in an attempt to featherbed the industry against drought-related problems by means of higher consumer prices and a centralised hedge mechanism. In any case, it has been argued that Brazil's target to install 73 gigawatts (GW) of new generating capacity by 2024 – one-third of it large-scale hydropower – is based on inflated demand projections that assume an unrealistically high level of economic growth, and has more to do with a desire for massive expansion of heavy industry than with 'keeping the lights on'. According to one estimate as much as 40% of the proposed new capacity would be unnecessary if some effort were directed towards energy efficiency.

GLOBAL BUSINESS MUST STOP PROFITING FROM AMAZON DESTRUCTION

Despite the many questions hanging over it, the SLT project has already attracted the interest of a number of Brazilian and foreign energy companies (including such well-known names as EDF and ENGIE), which have formed two consortia to carry out preliminary studies into the project and are thus expected to bid

for the contract. It is likely that global engineering companies with extensive Amazon hydropower experience such as General Electric, Voith Hydro, Siemens and Andritz, as well as insurers already deeply involved in the sector such as Munich Re, Allianz and Mapfre, will also become involved. Finance can be expected to come mainly from the national development bank BNDES (which collaborates with the development banks of China, Germany and Japan, among others).

But despite the air of respectability lent by these major international companies and institutions, Brazil's dash for Amazon hydropower is destined to fail its people while enriching the few. It is a legacy of an inflexible dictatorial mindset that the country needs to shake off if it is to develop an energy system that is fit to address both climate and development challenges. Banks, insurers, suppliers and contractors that become involved in these projects face serious financial and reputational risks. Accordingly Greenpeace is demanding that the Brazilian government cancel its plans for Amazon hydropower projects such as the SLT dam, and is urging companies and banks considering involvement in these projects to focus instead on helping Brazil to develop a clean energy future.



Aerial view of the Tocantins River north of Marabá, Pará state. © Daniel Beltrá/Greenpeace



Lake on a river island near the confluence of the Jamanxim River with the Tapajós River, Pará State. © Valdemir Cunha/Greenpeace

DAMNING THE AMAZON

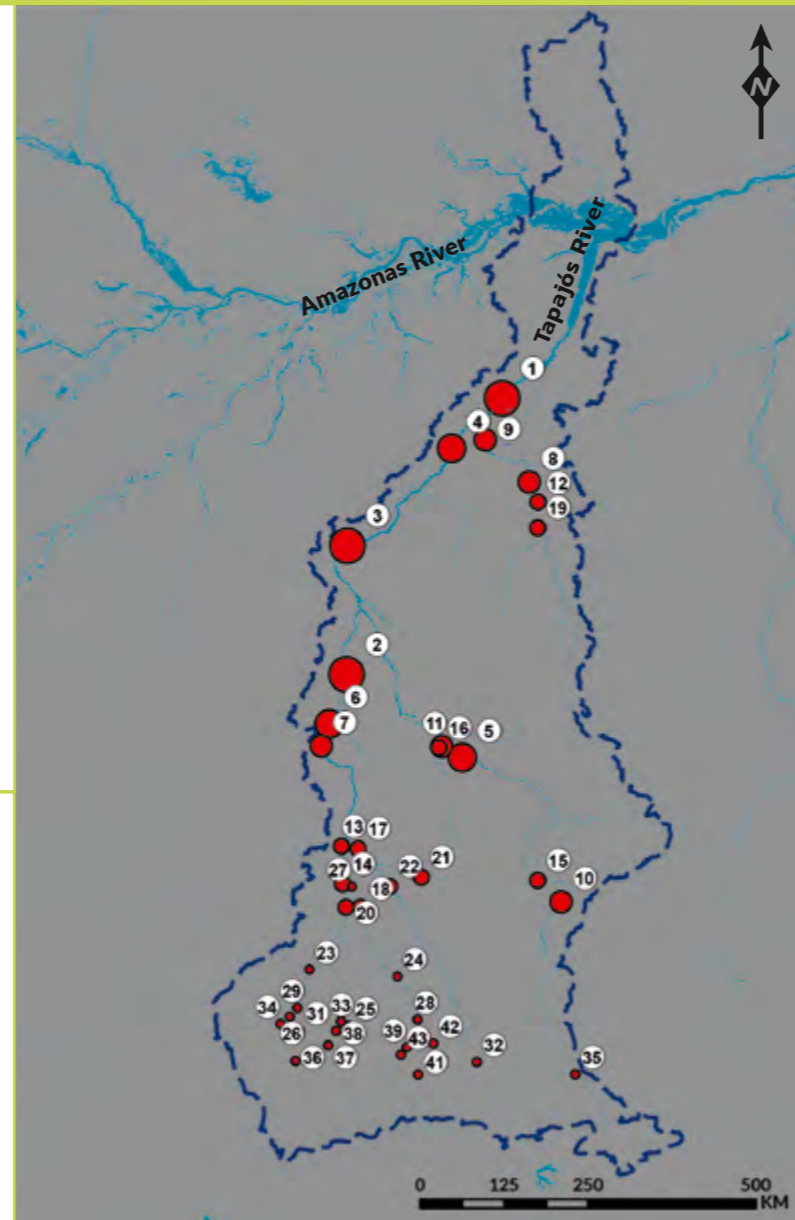
**THE RISKY BUSINESS OF
HYDROPOWER IN THE AMAZON**

HYDROPOWER DAMS PROPOSED OR UNDER CONSTRUCTION IN THE TAPAJÓS RIVER BASIN

- | | |
|------------------------|-------------------------|
| 1 São Luiz do Tapajós | 23 Enawenê-Nawê |
| 2 São Simão Alto | 24 Roncandor |
| 3 Chacorão | 25 Foz de Sacre |
| 4 Jatobá | 26 Foz de Formiga Baixo |
| 5 Teles Pires | 27 Tapires |
| 6 Salto Augusto Baixo | 28 Parecis |
| 7 Escondido | 29 Nambiquara |
| 8 Jamanxim | 30 Foz de Buriti |
| 9 Chachoeira do Caí | 31 Cachoeirão |
| 10 Sinop | 32 Barra do Claro |
| 11 São Manoel | 33 Buriti |
| 12 Cachoeira dos Patos | 34 Jacaré |
| 13 Tucumã | 35 Magessi |
| 14 Erikpatsá | 36 Juruena |
| 15 Colíder | 37 Aqua Quente |
| 16 Foz do Aplacás | 38 Tirecatanga |
| 17 Travesão dos Índios | 39 Paiaçuá |
| 18 Kabiara | 40 Matrinxã |
| 19 Jardim de Ouro | 41 Ponte de Pedra |
| 20 Fontanilhas | 42 Garça |
| 21 Apiaká-Kayabi | 43 Baruito |
| 22 Castanheira | |

PROPOSED CAPACITY OF HYDROPOWER DAMS IN MW

- 18 - 150
- 150 - 528
- 528 - 1248
- 1248 - 2338
- 2338 - 6130
- Tapajós River Basin



THE AMAZON IS UNDER THREAT

The vast river system of the Amazon is the largest on earth, holding a fifth of the world's fresh water. Its basin extends over some 6.9 million km² (about 5% of the planet's land surface), with more than half lying inside Brazil.¹ Its biodiversity is unparalleled: it holds nearly a quarter of all known land and freshwater species, including around 40,000 different plants, 3,000 fish, 1,300 birds and 1,200 mammals, reptiles and amphibians.² The rainforest that occupies most of the basin

is also the world's largest. The hundreds of thousands of indigenous people³ who live in the forest depend on it for food, clean water, shelter and medicines, and it is central to their cultural and spiritual lives.

Nevertheless, the Amazon rainforest is being laid waste by uncontrolled economic exploitation. To date over 750,000 km² of the Brazilian Amazon has been deforested⁴ for industrial agriculture, cattle ranching, mines or infrastructure

projects such as hydropower dams. The roads that serve these developments open up the forest to illegal logging and colonisation by unauthorised settlers, bringing about further deforestation.

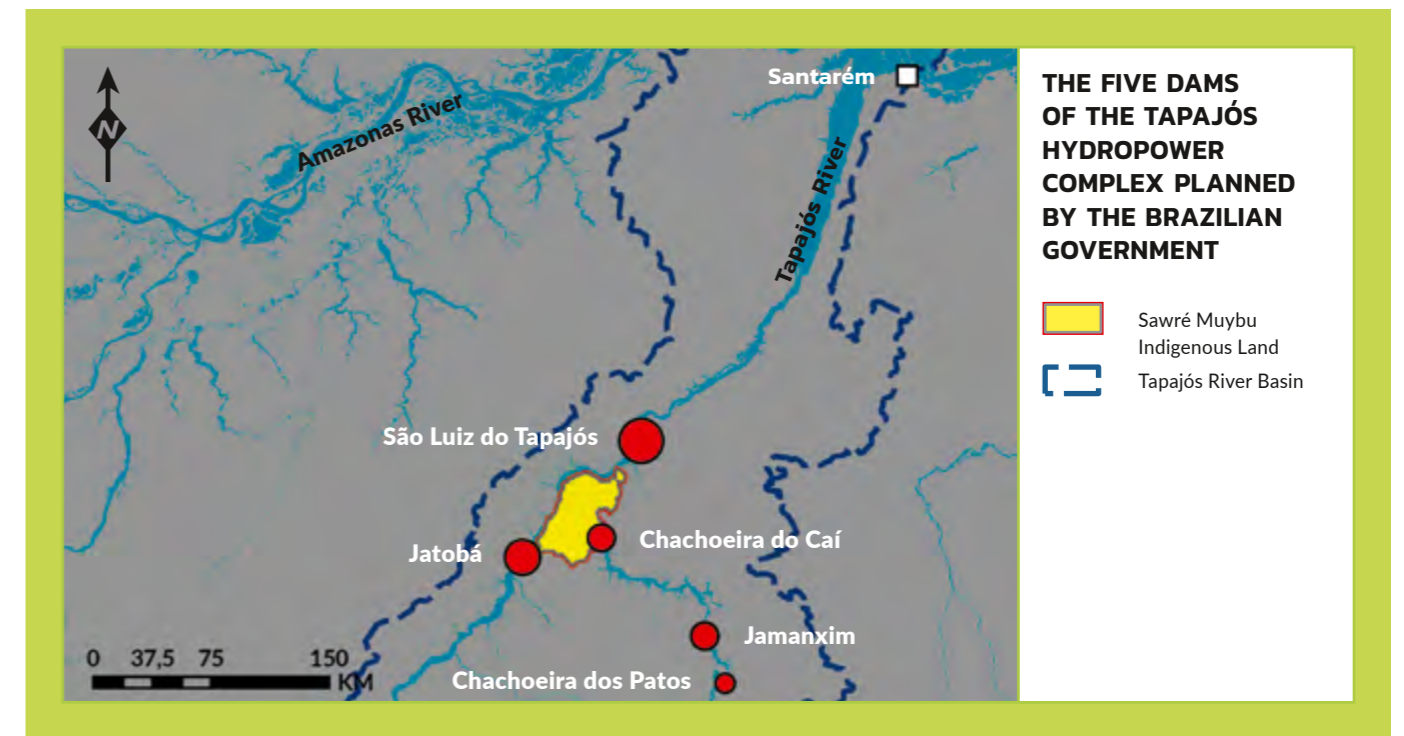
And it is not only the forest itself that is in crisis – as well as driving deforestation, dams interrupt the natural flow of rivers, while mines and oil and gas extraction pollute them, devastating aquatic ecosystems and the communities and regional economies that depend on them. Meanwhile forest communities frequently find themselves subjected to violence by developers or even by the security services, brought in to enforce developments of questionable legality. As a result of all these pressures, indigenous and traditional populations are pushed off their lands and species driven to extinction.

The destruction of the forest also poses a serious threat to the global climate. The Amazon rainforest is one of the world's largest terrestrial carbon stores, containing more than 175 billion tonnes of carbon – over a quarter of all the carbon stored in forests worldwide.⁵ But as cleared vegetation decays or is burnt, it gives off greenhouse gases: the total forest loss to date is estimated to represent a net contribution of about 1.8 parts per million of atmospheric CO₂, or 1.5% of the increase in the CO₂ level since the beginning of the industrial era.⁶ At the same time, deforestation makes the remaining forest more vulnerable to the impacts of climate change, such as drought-induced fires, which add to emissions, fragment the

forest further and make it liable to colonisation by grassland vegetation. It is feared that this vicious cycle may culminate in a 'tipping point' in which the forest undergoes a rapid transition to savannah.⁷ Such a dramatic change would in turn lead to disastrous losses both of biodiversity and of the vital ecosystem services currently provided by the forest, including climate regulation.

Due to a mixture of government control efforts,⁸ campaigns by Greenpeace and others to stop deforestation by the soya and cattle industries, and falling commodity prices,⁹ the rate of forest loss slowed significantly during much of the past decade. However, between 2012 and 2013 deforestation in the Legal Amazon¹⁰ shot up again by almost 29%, and after a fall the following year, it increased by a further 16% between 2014 and 2015.¹¹

The resurgence of forest destruction has undoubtedly been facilitated by Brazil's new Forest Code. Passed into law in 2011–12 with the support of the overwhelming majority of the country's Congress, it severely curtailed decades-old protections contained in the country's previous code.¹² By allowing landowners an amnesty for illegal deforestation, it also created a climate of impunity. In addition to the continuing expansion of agriculture, cattle ranching and logging,¹³ proposals are under consideration to allow mining in protected areas and indigenous lands or reduce the size of these areas, and to lift a ban on sugarcane plantations in the Amazon.¹⁴





Top: Mundurucu warrior standing in the Tapajós River, Pará State. | Bottom: Amazon forest near the Tapajós River, Pará State. © Valdemir Cunha/Greenpeace



Despite the nominal safeguard of an environmental impact assessment (EIA) process and public hearings into development proposals, the government appears committed to a philosophy of development at any cost, with major projects decided in advance of expert or civil society input and subsequently regarded as irreversible.

This certainly appears to be the case with the government's grandiose, if secretive, plans for dozens of new hydropower plants, which fly in the face of huge environmental and social concerns. No fewer than five dams are planned for the Tapajós hydropower complex on the Tapajós River in Pará State, one of the Amazon's last remaining unobstructed major tributaries, and its own tributary the Jamanxim.¹⁵ The largest of these schemes, the massive 8,040 MW São Luiz do Tapajós (SLT) dam, is expected to drown nearly 400 km² of pristine rainforest¹⁶ and lead to a further 2,200 km² of indirect deforestation as a result of roads and other infrastructure related to the construction works and migration to the area,¹⁷ destroying the habitats of rare species and forcibly displacing thousands of indigenous people and other traditional riverside dwellers.

Nevertheless, the SLT dam is one of five schemes that the government regards as top priorities, and not only from the perspective of responding to the country's energy demand. The government's Growth Acceleration Programme (PAC) aims to transform the Tapajós River into an industrial waterway and shipping hub, with the ultimately goal of allowing soybeans produced in Mato Grosso to be shipped to the Atlantic Ocean and onward to foreign consumer markets.

All too predictably, therefore, the EIA process for the scheme has so far been inadequate and the authorities have until now failed to consult the indigenous population as they are legally obliged to do. Instead, they have obstructed the local Mundurucu people's demarcation of their Sawré Muybu territory, and at the same time have de-designated formerly protected areas of forest, while attempting to ride roughshod over due process so as to enable the project to flout the requirement for an integrated environmental assessment of basin-wide development impacts. This manoeuvring on the part of the Brazilian authorities is entirely typical of their approach to Amazon development.

In the following pages Greenpeace shows that the Brazilian government's Amazon hydropower projects, and the SLT dam in particular, not only promise social and environmental disaster but are economically unjustifiable and unnecessary. Claims that Amazon dams represent a clean energy source are demonstrably false – in addition to their expected direct impacts on biodiversity, forest inhabitants and water quality, their projected greenhouse gas (GHG) emissions in some cases equal those of fossil fuel plants. They are very expensive and, due to changing rainfall patterns, offer an unreliable solution to an energy need that could be met more efficiently and less destructively by truly clean renewable technologies. Moreover the history of hydropower in the Amazon has been characterised by breaches of national law and international agreements, official interference in judicial process and widespread corruption.

In short, Amazon hydropower represents an outdated attitude towards the region's environmental heritage and the indigenous populations who have for centuries been its guardians. Brazil's new hydropower projects are destined to fail its people while enriching the few. They are a legacy of an inflexible dictatorial mindset that the country needs to shake off if it is to develop an energy system that is fit to address both climate and development challenges. Banks, insurers, suppliers and contractors that become involved in these projects face serious financial and reputational risks. Accordingly Greenpeace demands that the Brazilian government cancel its plans for Amazon hydropower projects such as the SLT dam, and urges potential stakeholders of these dams to focus instead on helping Brazil to develop a clean energy future.



Top: Member of the Mundurucu indigenous community in Pará State. © Lunae Parracho/Greenpeace | Bottom: Mundurucu child with achiote painting, Pará State. © Valdemir Cunha/Greenpeace



- | | |
|---|--|
| 1 IBGE (undated b) | Rondônia, Roraima and Tocantins), the state of Mato Grosso and the municipalities west of the 44° meridian in Maranhão State. See IBGE (undated c) |
| 2 Da Silva (2005): 689 | 11 OBT (undated) |
| 3 IBGE (undated a) | 12 Fearnside (2016b): 7–8 |
| 4 Nobre (2014): 22–23 | 13 Fearnside (2016b): 6 |
| 5 FAO (2011): 22, table 8 | 14 Wroblewski (2015); Nobrega (2013) |
| 6 Exbrayat and Williams (2015) | 15 Portal Brasil (2014) |
| 7 IPCC (2014): 15, 32, 81 | 16 CNEC Worley Parsons (2014a): Vol. 13 Part 1:149 |
| 8 Fearnside (2016b): 6, citing Barreto (2011) | 17 Barreto (2014) In: de Sousa Júnior (2014): 147–173 |
| 9 Fearnside (2016b): 6 citing Assunção et al (2012) | |
| 10 "Legal Amazon" is the political and administrative designation of the area comprising the states of the North Region (Acre, Amapá, Amazonas, Pará, | |

HYDROPOWER DAMS IN THE AMAZON ARE NOT A CLEAN ENERGY SOLUTION

THE PROPONENTS OF THE 40-PLUS DAMS' CURRENTLY UNDER CONSTRUCTION OR PROPOSED IN THE TAPAJÓS BASIN HOLD THEM UP AS A KEY PART OF THE SOLUTION TO BRAZIL'S ENERGY NEEDS, BUT THIS IS FAR FROM BEING THE CASE. IN ADDITION TO HUGE POTENTIAL FOR REDUCING DEMAND BY INVESTING IN ENERGY EFFICIENCY, THERE ARE OTHER FAR LESS HARMFUL WAYS TO GENERATE AS MUCH ENERGY AS THE COUNTRY NEEDS – WAYS THAT CAN BE BROUGHT INTO OPERATION MORE QUICKLY THAN A TYPICAL HYDROPOWER PROJECT. MOREOVER, IT IS EXTREMELY DOUBTFUL WHETHER HYDROPOWER REPRESENTS EITHER A RELIABLE OR A COST-EFFECTIVE APPROACH TO GENERATION, MAKING AN ENERGY FUTURE BASED ON DAMS A POTENTIALLY DISASTROUS MISTAKE. IT IS NOT EVEN CLEAR THAT BRAZIL NEEDS ANYTHING LIKE THE LEVEL OF INCREASED CAPACITY THAT THE AUTHORITIES CLAIM IS NECESSARY.

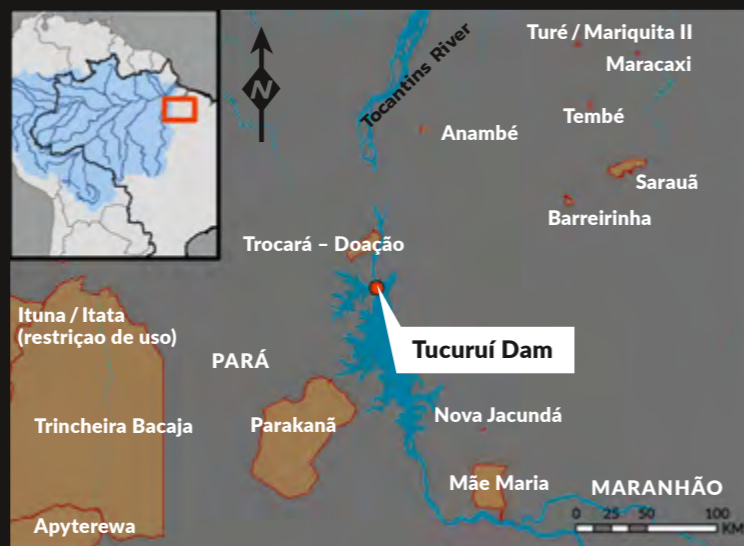


Construction site of the Belo Monte hydropower dam complex, Pará State.

© Carol Quintanilha / Greenpeace

TRANSMISSION INFRA-STRUCTURE: THE CHALLENGE OF REMOTE LOCATIONS

The Tucuruí hydropower plant on the lower Tocantins River in Pará State is an example of the particular challenges posed by the building of transmission lines to take electricity from remote dams. Construction of the lines to connect the plant to Manaus and Macapá was hampered by the dense forest, the low water level and the lack of infrastructure. In the end, since neither road vehicles nor conventional barges could access the construction sites, canoes had to be used.²



DEMAND INFLATION DRIVES DEVELOPMENT

The forecasts of electricity demand produced by the Brazilian authorities are extremely questionable. The government has certainly been influenced by the threat of electricity shortages as a result of drought affecting output from hydropower,³ which provided 65% of the country's electricity supply in 2014.⁴ Drought led to severe electricity rationing in 2001⁵ and the government has started a rush to install new generating capacity, no matter the costs or impacts. The aim is to install a further 73 GW of capacity by 2024, with one-third of this total to come from large hydropower plants.⁶

However, these plans are based on what one study judges to be unrealistically inflated economic forecasts, with around 40% of this new capacity considered to be unnecessary if demand continues to grow at the same level as over the past decade and some efforts are directed towards energy efficiency.⁷ Another study concludes that the pressure to increase capacity comes from the Ministry of Mines and Energy (MME) and the state electricity company Eletrobras, with its focus being almost entirely on "maximizing generating capacity to accompany an expected exponential increase in demand", which is often erroneously portrayed as 'need' for electricity, but is in reality partly a reflection of "plans for an expansion of electro-intensive export industries", in particular aluminium production.⁸ As a result, Brazil's hydropower plans must be seen less as a prudent investment in 'keeping the lights on' and more as part of the government's broader economic growth plans, pandering to the demands of powerful industrial interests. The SLT plant certainly cannot be justified on the grounds of national security, even though this argument has been cynically used to stall legal opposition to it (see p. 39).

THE LIKELIHOOD OF COST OVERRUNS

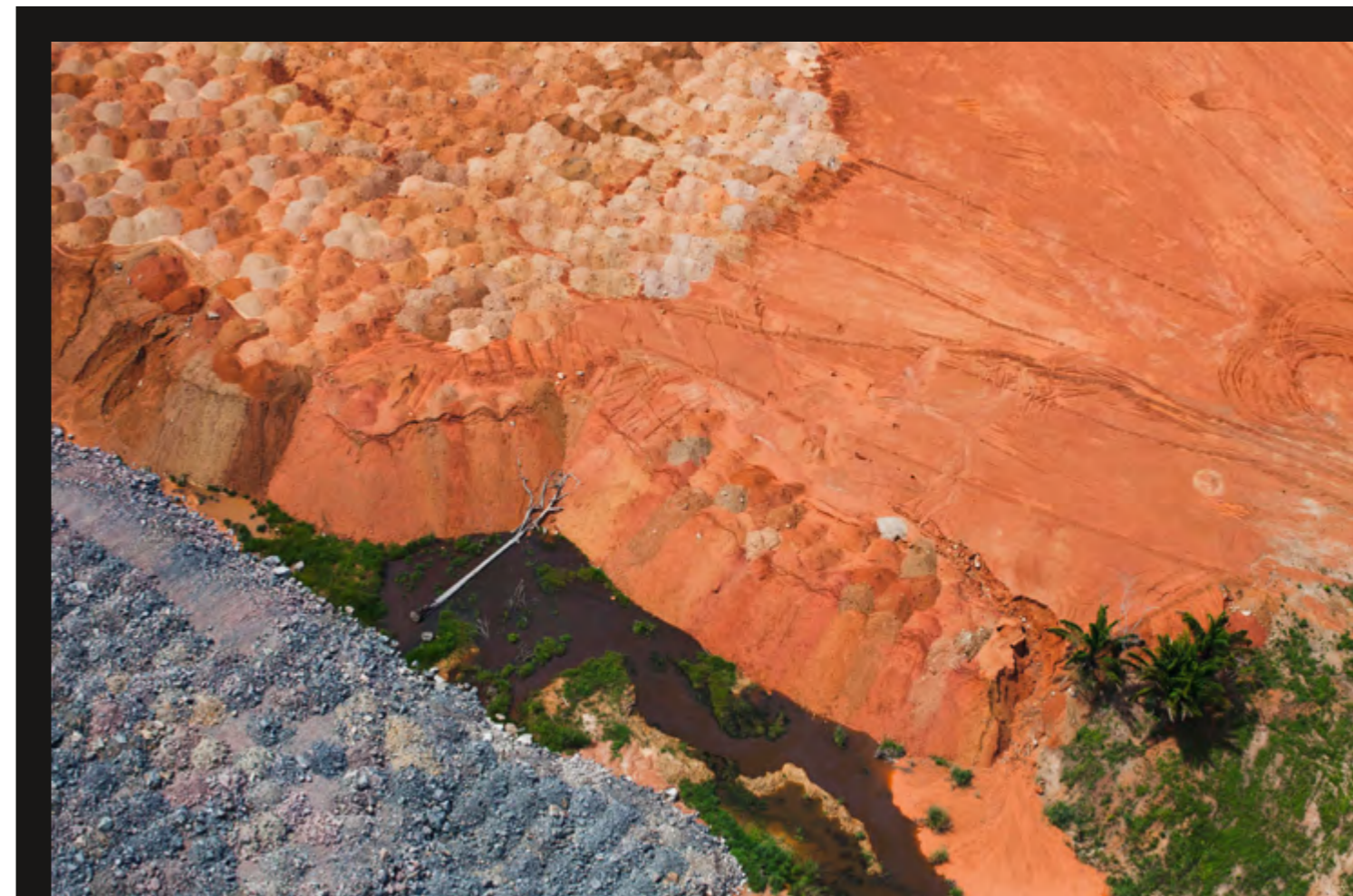
The plans for the SLT hydropower plant include a 7.6 km wide dam which would provide an installed capacity of 8,040 MW and which is expected to deliver an average output of 4,012 MW.⁹ The first turbine is expected to become operational five years after the start of construction work on the project, with the last one coming into operation at the end of the seventh year.¹⁰ It is estimated that the project will cost about R\$ 28 billion¹¹ (approximately US\$ 8.4 billion).¹²

However, experience has shown that hydropower plants tend to have much higher final costs than originally foreseen (due in part to delays in construction) and that these costs are very difficult to predict. On the basis of information available for recent hydropower dams, Greenpeace believes that the SLT project may well end up costing almost twice the estimate – as much as R\$ 52 billion (US\$ 15.6 billion).¹³ Indeed, the estimated cost may already have increased by the time the contract is auctioned. In the case of the Belo Monte dam (see p. 34), for example, the initial estimate of R\$ 16 billion (US\$ 4.8 billion) had already risen to R\$ 19 billion (US\$ 5.7 billion) by the time of the auction – though the current estimate is close to R\$ 30 billion (US\$ 9 billion).¹⁴

The iconic Itaipu hydropower plant on the Paraná River, on the border of Brazil and Paraguay, is another case in point. In 1974, the direct costs of the project were estimated at US\$ 2.9 billion, while the actual construction costs had more than doubled to US\$ 6.2 billion by 1992, the end of the period in which most of the investment took place.¹⁵ More recently, in 2006, the cost of the Santo Antônio dam on the Madeira River in Rondônia State was estimated at R\$ 9.5 billion (US\$ 2.8 billion).¹⁶ By 2015, the estimate had more

than doubled to R\$ 19.9 billion (US\$ 6 billion).¹⁷ Similarly, the cost estimate for the Jirau dam, about 100 km upstream on the same river, was R\$ 8.7 billion (US\$ 2.6 billion) in 2007¹⁸ but had reached R\$ 16.6 billion (US\$ 5 billion) by 2015.¹⁹ Moreover, although the majority of costs of large hydropower generation result from the construction of the hydropower plant itself, the often difficult conditions found in remote areas of the Amazon basin can add significantly to the cost of constructing the transmission infrastructure, not included in the above figures. In the case of Belo Monte two transmission lines have been contracted – both longer than 2,000 km – with an initial estimated cost of around R\$ 12 billion (US\$ 3.6 billion).²⁰ The majority state-owned electricity company Eletrobras and/or its subsidiaries are likely to be among the companies involved in the SLT project if it goes ahead (see p. 45) This means Brazilian taxpayers may end up having to pay for a proportion of any construction cost overruns that occur, given that public money is used to finance state-owned companies.

The phenomenon of soaring dam costs is by no means confined to the Amazon: a recent study of 245 large dams worldwide concludes that three-quarters suffered a cost overrun, with actual costs being on average 96% higher than estimated costs. The study attributes this to a mixture of "delusion" (overoptimistic forecasting of costs, benefits or project schedules by overconfident experts) and "deception" (deliberate misrepresentation for political reasons).²¹ In particular, the study finds that planners fail to allow sufficiently for unforeseen problems with site geology and unexpectedly large changes in exchange rates, inflation and interest rates. It remarks that while geological risks can be anticipated, it is difficult to hedge against them, since "exhaustive geological investigation for a large dam can cost as much as a third of the total cost; at which point still remains a considerable chance of encountering unfavourable conditions that go undetected during the ex ante tests". Meanwhile the effect of unanticipated inflation is increased by slippage of project schedules, which the study finds to be more likely in projects involving longer dam walls (of which the SLT project, with its huge 7.6 km wall, would be a prime example).²²



Construction site of the Belo Monte hydropower dam complex near Altamira, Pará State. © Daniel Beltrá/Greenpeace

According to the same study, larger projects and those with longer implementation schedules appear to be more prone to larger cost overruns (“bigger projects entail uncontrollable risks, which even when anticipatable cannot be adequately hedged”), while projects in countries such as Brazil with higher long-term inflation rates also tend to suffer larger overruns (even when corrected for inflation). The study concludes that smaller-scale forms of energy generation, that can be implemented “without tremendous time lags”, and that are less dependent on site-specific characteristics, are to be preferred.²³

CLIMATE THREATS TO HYDROPOWER VIABILITY

One of the key mistakes made by proponents of new hydropower schemes in the Amazon is to assume that the climate regime will remain the same. Brazil has already experienced increased drought frequency²⁴ and suffered electricity rationing as a result of drought in 2001, as noted above. In fact, global warming is predicted to lead to significantly different climate patterns in the region, with higher temperatures causing snow and ice to melt in the Andes but lower rainfall also expected, leading to more frequent and severe low-water events in large rivers.²⁵ A study commissioned by the Brazilian government to estimate climate change impacts on hydrology by 2040 predicts dramatic reductions in river flows in the Amazon region, including falls of between 25 % and 55 % in the vicinity of the Belo Monte dam and between 20 % and 30 % at São Luiz do Tapajós.²⁶

Such reduced flows will make new dams unlikely to attain anything like the annual energy output that they have been designed to achieve. Seasonal variation of flows and thus of generation potential is also liable to increase.²⁷ These factors in turn mean that the economics of new Amazon hydropower projects are at best speculative, at worst fictional, since it is unlikely that they will give anything like the forecast return on investment, despite legislation passed in November 2015 in an attempt to featherbed the industry against drought-related problems by means of higher consumer prices and a centralised hedge mechanism.²⁸ In any case, even if the national energy demand forecasts prove to be correct, in a country whose energy security is already compromised by overreliance on

hydropower it seems reckless to spend vast sums on increasing that reliance still further. It is hydropower’s very susceptibility to drought that has precipitated the country’s energy crisis, so far as there is one. What is more, reduced flows and increased river temperatures are also expected to compromise the operation of water-cooled thermal (including fossil-fuel and nuclear) power plants,²⁹ making them equally unsuitable candidates to ensure Brazil’s future energy security.

THE CLEAN ALTERNATIVES

All the above factors combine to emphasise the desirability of meeting what genuine need there is for new capacity by switching to renewable sources such as wind, solar and biomass and promoting energy efficiency. As an example of how an alternative renewable energy future could take the place of Brazil’s destructive hydropower plans, Greenpeace Brazil has developed electricity generation scenarios for far cleaner and less damaging renewable energy sources that could be commissioned instead of the SLT project, delivering the same amount of power to the grid. According to Greenpeace’s calculations, the best alternative options would be to adopt a combination of two or more of wind, solar (photovoltaic) and biomass generation,³⁰ as shown in the table below.³¹ Any of these combinations would be feasible, provided the government were to allow a 50 % increase in the total capacity of contracts auctioned each year for these renewable energy sources.

The costs assumed for these renewable sources in our scenarios are conservative and do not take into account that these technologies are expected to show further decreases in costs and increases in efficiency.³² For example, in the space of a few years wind power has become one of the cheapest energy sources in Brazil.³³

In addition, according to a recent presentation to the country’s National Electricity Agency (ANEEL), investment in energy efficiency has the potential to reduce Brazil’s overall electricity demand by about 11 % of 2014 demand, or 52.6 TWh, a year, in the very short term³⁴ – equivalent to almost half the government’s efficiency savings target for 2030 (106 TWh a year).³⁵



OVERVIEW OF RENEWABLE ENERGY SCENARIOS TO REPLACE THE PROPOSED SLT HYDROPOWER PLANT

| Power plant combination | Guaranteed average power output (MW) | Total construction period (years) | Investment (US\$ billion) |
|-------------------------------|--------------------------------------|-----------------------------------|---------------------------|
| Photovoltaic + Wind | 4,425 | 8 | 15.12 |
| Photovoltaic + Wind + Biomass | 4,093 | 7 | 13.54 |
| Wind + Biomass | 4,185 | 8 | 10.66 |

- 1 ANEEL (undated a) and ANEEL (undated b)
- 2 Amazônia (2014)
- 3 Prado et al (2016)
- 4 MME (2015): 40
- 5 Prado et al (2016)
- 6 EPE and MME (2015): 82, 85
- 7 Prado et al (2016)
- 8 Fearnside (2016b): 6
- 9 CNEC Worley Parsons (2014a): Vol. 13 part 1: 12, 179
- 10 MME (2015): 9
- 11 CNEC Worley Parsons (2014c): 324
- 12 All figures in US\$ are converted against the average exchange rate for 2015, as this is the most recent full year average available. We have also used the same exchange rate for older hydropower dams to ensure consistency.
- 13 According to the Growth Acceleration Programme (PAC) of the Federal Government, 2015 estimates of investment in Belo Monte, Jirau and Santo Antônio are on average 84 % higher than initially planned. Current investment estimates are available via PAC (2016) and initially planned investments are in the auction notices for the projects available via ANEEL (2015a).
- 14 Perreira (2013)
- 15 1992 figure expressed in 1974 terms. Oxilia et al (2015)
- 16 ANEEL (2007): 3
- 17 Estimates from 31 December 2015. Source: PAC (2016)
- 18 ANEEL (2008): 3
- 19 Estimates from 31 December 2015. Source: PAC (2016)
- 20 ANEEL (2015b); ANEEL (2014) and Ministério do Orçamento, Planejamento, Orçamento e Gestão (2016)
- 21 Ansar et al (2014): 44, 45, 48
- 22 Ansar et al (2014): 51–55
- 23 Ansar et al (2014): 49, 53
- 24 See e.g. Marengo et al (2011)
- 25 Castello and Macedo (2015): 8
- 26 Angelo and Feitosa (2015)
- 27 Belt (2015)
- 28 Presidência da República, Casa Civil, Subchefia para Assuntos Jurídicos (2015)
- 29 Vliet et al (2016)
- 30 The biomass generation included in the different scenarios involves sugarcane bagasse (waste) from the south-east of Brazil. Only a small amount of biomass is necessary: in the scenario where the substitution for SLT is complete within seven years, biomass accounts for 900 MW of installed capacity. In the scenario where the substitution takes eight years, biomass accounts for 1,200 MW of installed capacity.
- 31 Other scenarios involving different levels of contracts and combinations of sources were also developed. The table only shows the optimal scenarios for the replacement of the SLT project.
- 32 Greenpeace International et al (2015): 68–69
- 33 According to auction outcomes that can be accessed on Câmara de Comercialização de Energia Elétrica (CCEE). www.ccee.org.br
- 34 Aguiar (2015): 5
- 35 Governo Federal. Comitê Interministerial Sobre Mudança Do Clima (2007): 9, 52

THE HUMAN AND ENVIRONMENTAL COST

OF THE SÃO LUIZ DO TAPAJÓS DAM

While the economic basis of the SLT project is extremely questionable, it is certain that it would have devastating impacts on the Amazon rainforest, its wildlife and its human population if permitted to go ahead. Moreover, its credentials as a 'green' carbon-neutral development do not stand up to scrutiny. However, the threats that the project poses have been whitewashed by means of a deeply flawed EIA process.



ENVIRONMENTAL IMPACTS

One of the most worrying aspects of the potential impacts of the SLT project and other Amazon dams on biodiversity is how little they are understood. As the authors of an independent analysis of the SLT EIA point out (see below), most knowledge of the hydrological and biodiversity effects of dam schemes is based on studies in temperate regions, while lack of distribution data for species potentially affected by a scheme and poor understanding of their ecological needs pose further difficulties.³

Nevertheless, it is acknowledged that the environs of Amazonian rivers include a range of habitats with unique and irreplaceable characteristics, which “play fundamental roles in the landscape and provide ecosystem services that go far beyond their geographic limits”.⁴ Land cover change, mining and global climate change are already degrading freshwater ecosystems through changes to the hydrological cycle.⁵ But damming can irreversibly alter these and surrounding habitats, changing both their plant communities and their associated fauna.

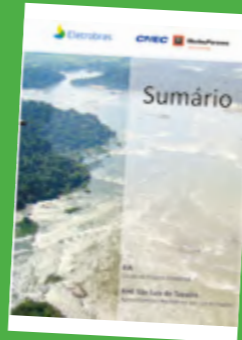
Upstream of the dam, permanent or semi-permanent flooding kills off terrestrial vegetation,⁶ while hydrological changes tend to favour generalist aquatic species and threaten specialist endemic ones, reducing the river’s biodiversity.⁷ Downstream, dams alter the seasonal pattern of flooding on which habitats such as alluvial forest depend for their very existence.⁸ This may be the last straw for these forests, already expected to be severely impacted by reduced flooding as a result of climate change, which will favour less flood-tolerant species and increase the severity of forest fires that alluvial forest trees are poorly adapted to survive.⁹ Dams also interrupt the downstream passage of sediment, “which plays a fundamental role in creating and maintaining riparian ecosystems, primarily in the formation of islands, which serve as special habitat for numerous species of animals”. These ecological effects can be felt not just in the immediate vicinity, but hundreds of kilometres both upstream and downstream from the dam, and may result in local, regional or even global extinctions.¹⁰

An inadequate Environmental Impact Assessment process

In 2015, Greenpeace commissioned a team of scientists to produce an independent critical analysis of the EIA report for the SLT hydropower project, which had been carried out by consultants CNEC Worley Parsons Engenharia S.A.¹ on behalf of the Grupo de Estudos Tapajós, one of the two consortia currently expected to bid for the contract for the dam.

This analysis found a whole range of flaws in the EIA process, including:

- omission of information fundamental to evaluating the environmental impact of the project
- a sampling design and methodology that were only partially adequate, being insufficient to sample groups of organisms that will be most affected by the dam, and that were poorly implemented by the consultant
- inadequate analysis and treatment of data for almost all the groups
- lack of predictions of expected impacts
- inadequate proposals to mitigate and compensate for impacts on fauna, flora and communities
- lack of regional contextualisation of the results
- conclusions that lack scientific support.



Together, these shortcomings mean that the EIA failed to evaluate the environmental effects of the project in the way it was supposed to. The analysis also found that the public-facing report on the EIA (known as a RIMA), rather than being a balanced document that could help stakeholders and the general public make up their minds about the proposals, was in effect “a marketing tool that fails to inform society, in an objective manner, about the consequences of the project and minimizes predicted impacts”.

The authors of the analysis recommend that “both of these documents should be rejected by the licensing agency, since they do not fulfil the role established in the licensing procedure for a project with the technical, political, economic, and environmental importance of the São Luiz do Tapajós Hydroelectric Project”. They also emphasise “the need to integrate the environmental impact studies planned for other infrastructure projects slated for the Tapajós Basin (hydroelectric plants and industrial waterways) as a fundamental part of evaluating the effects of any of these projects on biodiversity”, in order to take account of “cumulative effects that cannot be evaluated individually”. An article recently published in the prestigious journal *Science* strongly asserts that such basin-scale analysis and planning are both necessary and achievable with new analytical methods, and insists that they should be required by “institutions that permit and finance hydro-power development”.²



Top: Hoatzins in the Amazon rainforest near the Tapajós River, Pará State. | Bottom: Titi monkey and Cuvier's dwarf caiman in the Tapajós river basin, Pará State. © Valdemir Cunha/Greenpeace

In many cases, as at Belo Monte (see p. 31–32) there will also be significant deforestation in the area around the dam, both in the context of its construction and as a result of an influx of migrants attracted by the opening up of the area to economic development (see “Indirect deforestation”, p. 26).

Turning to specific impacts on fauna, large dams “block movements that connect populations and enable migratory species to complete their life cycles”, with fish passages constructed to alleviate this problem proving in practice to be “unsuccessful and even harmful”. Moreover the dams’ delaying and attenuation of seasonal flood pulses “reduc[es] fish access to floodplain habitats [including the aforementioned alluvial forest] that are essential nursery areas and feeding grounds”.¹¹ Mass fish deaths have been linked to sudden variations of river level (see p. 25). Turtles, caimans, otters and river dolphins, all found in the Tapajós River in the vicinity of the SLT dam site,¹² also have life cycles dependent on access to seasonally flooded forest areas, which are in addition important feeding grounds and migratory corridors for many terrestrial species and birds.¹³ Dams also alter river temperatures, with potential impacts on the reproduction and development of fish and turtles.¹⁴

The study carried out for the SLT EIA found an enormous variety of species in the vicinity of the dam site, including 1,378 plant species, approximately 600 birds, 352 fish, 109 amphibians, 95 mammals and 75 reptiles. Many of these species were endemic to the region and/or threatened with extinction, while taxa new to science, including possible new species of primates and birds, were also discovered.¹⁵ Many of the species recorded occur in habitats such as alluvial forests





Anhinga in the Amazon rainforest, Tapajós basin, Pará State. © Valdemir Cunha/Greenpeace

and beaches that would be directly impacted by the dam,¹⁶ which is expected to inundate 376 km² of forest.¹⁷ However, according to the independent analysis of the EIA such habitats were inadequately sampled.¹⁸

Indeed, the EIA shows a large number of omissions and inadequacies, many of them in direct contravention of the terms of reference set by the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA). Despite the high plant and fish species counts, plants (both terrestrial and aquatic) and fish, along with bats and river-bed invertebrates, were among the groups of organisms that the independent analysis considered had not been adequately surveyed, as a result of factors including “inappropriate sampling or methodologies, insufficient sampling efforts, and lack of specialists capable of identifying species correctly”. The consultants cut corners rather than following the terrestrial sampling methodology set out in the terms of reference. There was a complete lack of sampling downstream from the dam site, despite the potential for direct and indirect impacts there. There was also insufficient sampling of habitats close to the river bank, while data collected from transects along the flooding gradient (i.e. from plots at different elevations) was lumped together for analysis, making it impossible to determine which species will be directly affected by the reservoir. The EIA report does not define which species live exclusively in the riverside habitats or are liable to be directly affected by the dam (again in contravention of the terms of reference), and gives little quantitative information about the fauna present along the river. The assessment of

the number of endangered species present does not use the most up-to-date Ministry of Environment (MMA) endangered species lists, and there is no analysis of the risks to the previously undescribed species found. As a result of all these omissions and inadequacies, the information provided in the EIA report does not make it possible to gauge the dam’s environmental impacts. In short, “the study serves more as a biological inventory than as a report predicting environmental impact, to enable the development of mitigating measures”.¹⁹

The proposed mitigation measures themselves were also deemed insufficient by the independent analysis, with a “generic and superficial” approach to monitoring and a proposal for relocating fauna that amounts to “driving away animals so that they can move to other areas, which are already saturated by existing populations”. In addition, the independent analysis found that “the project to transform the river into an industrial waterway makes practically all of the mitigating measures of this hydroelectric facility in particular impracticable”, emphasising again the inadequacy of an approach that treats individual projects in isolation, ignoring the much wider cumulative impacts of all the infrastructure developments proposed for the Tapajós basin, which according to the analysis “will completely and definitively change the landscape of one of the most biodiverse regions in the world”.²⁰

One particularly alarming aspect of the interruption of river flows by dams is the potential for the accumulation of high concentrations of toxic methylmercury, where mercury is entering watercourses as a result of artisanal miners using

it to recover gold from ore. Methylmercury is produced from mercury by anaerobic bacteria and absorbed in increasing concentrations by animals higher up the food chain. As a result fish taken from affected waters can be dangerously toxic, posing a threat to both predators and humans. By interrupting the downstream flow of water, dams allow mercury to accumulate, while the anoxic conditions often found in dam reservoirs promote methylmercury production, thus increasing the risk of poisoning.²¹ Despite the critical importance of this factor to riverine residents, however, the EIA’s assessment of the risk posed was entirely inadequate. According to the independent assessment, data was gathered by means of inconsistent and inappropriate methodologies and was “not evaluated in a biogeochemical and epidemiological context”, nor “integrated with other components of the physical environment, essential for the analysis of its impact”. Furthermore, as with other aspects of the EIA, no attempt was made to assess the cumulative effects of all the dams planned for the Tapajós basin.²²

Finally, the independent analysis of the EIA found that the RIMA (the summary report on the EIA intended to communicate its findings to decision-makers, stakeholders and the general public) “is extremely tendentious, summarizing in just a few lines results presented in various volumes ... withholding fundamental information from decision makers, such as the presence of species that are endemic, threatened and restricted to the stretches of the Tapajós River that will be seriously impacted by the project”. A particularly shocking example is the RIMA’s assertion that of the reptiles and amphibians recorded, only one species is vulnerable to extinction, while omitting to mention that up to 16 species new to science have been discovered, any or all of which may exist only within the project area. Similarly, the RIMA claims that the area is of little importance for turtle reproduction, despite the EIA’s admission that the sampling period did not cover the reproductive season of the regionally endangered tracajá (*Podocnemis unifilis*), the most abundant turtle species in the area.²³

The impacts of increased mining



Mining site near the Tapajós River, Para State. © Daniel Beltrá/Greenpeace

Mining is relevant to a consideration of the hydropower proposals in the Tapajós basin in two respects. First, it is one of the key existing threats to the rivers and rainforest, and as such poses a strong reason to discourage further large-scale infrastructure development in the area. Second, the threats posed by mining are actually being amplified by the dam projects.

Illegal small-scale gold mining operations already constitute one of the main sources of environmental degradation in the Tapajós basin. Water contamination due to the use of toxic substances such as mercury and cyanide to recover gold from ore is a recognised problem (which the dams threaten to exacerbate – see above). In addition, the use of machinery such as backhoes to boost productivity is increasing the impact on the forest, while the number of

boats used to mine the riverbed has also risen sharply since protected areas were reduced to remove a legal obstacle to the construction of the Jatobá and SLT hydropower plants. Meanwhile, alongside the small-scale illegal mining, the construction of the dams and the paving of the nearby BR-163 road are prompting established mining companies to take an interest in the region, despite the scattered nature of the region’s gold deposits. The environmental licensing procedure has already started for one project in the nearby town of Itaituba.

While gold mining may continue to expand and its environmental impacts increase, the bigger threat of industrial-scale mining in the region may come from elsewhere. Anglo American, one of the world’s 10 largest mining companies, is reported to have been researching a copper deposit in an area covering over half of the protected Jamaxim National Forest, upriver from the SLT site. There have been allegations that the company began surveying without the appropriate authorisation, while the MMA agency ICMBio was reported in 2014 to be considering reducing the protected area of the forest by at least 200,000 hectares.²⁴



SOCIAL IMPACTS

Much of the SLT dam site lies within the territory of the Munduruku people, and the dam will inundate around 7% of their Sawré Muybu land, including a number of their sacred sites – despite their inalienable rights to their traditional territories and their persistent efforts to have these territories officially demarcated, which the government has thwarted at every turn (see p. 39). At least two other dams upriver from São Luiz do Tapajós, the Jatobá and Chacorão dams, are set to flood extensive areas of Munduruku territory, as well as land belonging to *ribeirinho* (traditional riverside) communities.²⁵

Although the 1988 Federal Constitution forbids the removal of indigenous groups from their land except in the case of a disaster or in the interests of national sovereignty, the report of the EIA commissioned by the Grupo de Estudos Tapajós ignores this, while quoting a law dating back to the days of the military dictatorship to the effect that “the federal government can intervene in indigenous areas to carry out public works of interest to national development.” It also relies on a discredited map (used a decade ago in an attempted corporate land grab, since thrown out by the courts) to downplay the extent of *ribeirinho* community land ownership in the area to be flooded.²⁶

Top: Amazon rainforest near the Tapajós River, Pará State. © Valdemir Cunha/Greenpeace
Bottom: Munduruku women at the General Assembly, Pará State. © Fábio Nascimento/Greenpeace



Victims of the SLT dam: the Munduruku and the *ribeirinhos*

With an estimated population of 12,000 people spread across 128 villages, the Munduruku are the most numerous indigenous group in the region where the SLT hydropower dam is planned. Other indigenous groups also live in the region, as well as some 2,500 traditional riverside dwellers (*ribeirinhos*), along with more recent settlers and urban residents. The importance of the Tapajós River and its surroundings to both the indigenous population and the *ribeirinhos* is succinctly stated in a submission to the UN Human Rights Council by a group of NGOs:

Indigenous peoples and ribeirinhos rely on healthy rivers and watersheds for their subsistence, due to their importance for fishing, extractive resources in seasonally flooded forests, drinking, bathing and transportation. Rivers are closely linked to the cultural identities of indigenous peoples, as illustrated by the existence of numerous sacred places.³⁴

The ribeirinhos have lived near the Tapajós and other Amazon Basin rivers since the second half of the 19th century. Their livelihood is based on artisanal fishing and hunting activities and small-scale subsistence farming. Accordingly, the river plays a fundamental role in their lives, including as a connection to the rest of the world.³⁵

The Munduruku have lived in the area for centuries. Over that time they have demonstrated an extraordinary cultural resilience which has guaranteed their survival until today – 248 years after their first contact with non-indigenous groups.³⁶ Known for their warrior spirit, for generations the Munduruku have managed to protect their land from the threats posed, first by rubber tapping, then more recently by logging and mining. They have been resisting the government’s plans for dams on the Tapajós River for at least 30 years, starting with the Teles Pires and Jurena dams.³⁷

However, as explained above, the direct impact of flooding the dam is expected to have much wider effects on the hydrology and ecology of the surrounding area, and it is these that pose perhaps the greatest threat to the Munduruku and the *ribeirinhos*, potentially compromising their water supply and their main sources of food: the floodplains and the rivers themselves. In addition to the ecological effects already noted with implications for local populations – such as interference with fish migration, drying of alluvial forests, deforestation and increased risk of mercury poisoning – trapping of sediment by large dams has the potential to “impact agriculture, fisheries, and human settlements”.²⁷ The nutrients that are brought by seasonal inundation of the Amazon’s floodplain areas (which can stretch tens of kilometres from the riverbank) are key to their high biological productivity, as a result of which the food and other resources of riverside zones can represent a large proportion of riverside communities’ income.²⁸ The loss of such nutrient inputs as a result of sediment trapping and reduced flood pulses may thus have severe impacts on the livelihoods of Indigenous Peoples and *ribeirinhos*. In fact, the impacts of Amazon dams on fisheries yields may go beyond the local, having “the potential to threaten regional income and food security.”²⁹ Besides these impacts of the dam itself, deforestation of riverside areas reduces filtration of water flowing from the land into the river, leading to lower water quality downstream.³⁰

According to a submission to the UN Human Rights Council by a group of NGOs, dam schemes upstream from the SLT site, on the Teles Pires and Juruena rivers, “have already demonstrated devastating consequences for indigenous peoples and other traditional groups, particularly with regard to fisheries, housing,

water quality, flooded forests and sacred cultural sites”. Sudden floods and dry spells are said to have killed tonnes of fish, while turbid water makes it impossible for people to fish with bow and arrow as they are accustomed to do. Villages near the dams are also suffering from health problems apparently due to contaminated water.³¹ Mass fish deaths and health problems potentially linked to water quality have also been reported in the vicinity of the Belo Monte dam (see p. 31). Nevertheless, the independent analysis of the EIA for the SLT project found that it “presumes that the river and its resources, like fish, will remain essentially unaltered, and that the rates of deforestation will fall, indicating that the traditional and indigenous communities have no reason to worry about their means of subsistence”.³²

In reality, as their lands are drowned or deforested, or become too unproductive to inhabit, the likelihood is that populations displaced from riverside areas will gravitate towards the neighbouring town of Itaituba, which will probably also receive an influx of migrants associated directly or indirectly with the dam project. As the experience of Belo Monte has shown (see p. 33–34), such large movements of people, when not anticipated and properly prepared for, have the potential to overwhelm the infrastructure of the towns concerned and have serious negative impacts on their social fabric, as well as condemning the incomers – both economic migrants and those displaced by the dam – to a precarious future. Nevertheless, the independent analysis of the EIA found that “the social impacts expected and common to large construction projects, such as prostitution, drugs, alcohol and crime, were not discussed in the manner they merit.”³³



Achioté fruit, Amazon rainforest, Pará State. © Valdemir Cunha/Greenpeace

INDIRECT DEFORESTATION

In addition to the environmental and social impacts that hydropower dams have on rivers and their surrounding habitats as a result of their operation, they also give rise to deforestation – not just on the site of the dam and its reservoir, but also as a result of the construction of new access roads, the migration of workers to the site and the infrastructure needed to accommodate them.³⁸ Further indirect drivers of deforestation include increasing local food demand and rising land values as a result of the prospect of investment in the area.³⁹ A recent study into the vulnerability to deforestation of the wider Tapajós basin concludes that the impacts of existing drivers of deforestation in the region, such as soya farming and the paving of the BR-163 road that crosses it, “are likely to be compounded by the land speculation, in-migration, and higher cost of goods and services resulting from the expectation of future hydropower development in the region”. The study also notes the risk that hydropower projects may “lead to the downsizing, downgrading or degazetting of existing protected areas”, bringing about further deforestation.⁴⁰

With 43 medium to large hydropower projects currently planned or under construction in the Tapajós basin, the study further predicts that hydropower projects and their associated infrastructure such as roads could bring about an increase of over 40% (9,500 km²) in the deforestation anticipated in the municipalities of the basin between 2014 and 2030, amounting

to a total 32,068 km² of deforestation, even if all protected areas are maintained. Moreover, the study anticipates that the currently less degraded areas in the centre and north of the basin, which contain much indigenous and conservation land, are likely to be disproportionately affected by the indirect deforestation impacts of hydropower projects. One of the two areas that it identifies as most vulnerable is “the un-registered lands north of Itaituba, which are susceptible to deforestation as a result of land speculation and land-grabbing induced by the construction of the São Luiz do Tapajós plant”.⁴¹ Indeed, it has been estimated that the SLT dam could lead to as much as 2,235 km² of indirect deforestation,⁴² in addition to the area that will be inundated.

THE CLIMATE IMPACT

The proponents of hydropower schemes often present them as a green energy source on the grounds that they are nearly carbon-neutral, but in fact this is far from being the case. When a reservoir is flooded for the first time, the drowned vegetation and soil begin to decay and degrade, giving off greenhouse gases (GHGs) – not only carbon dioxide, but also the much more potent methane. Emissions from tropical reservoirs are considerably higher than those from reservoirs in temperate and boreal regions, where most existing dams are located, which one authority considers has led to a downplaying of the emissions risks from hydropower schemes in the tropics.⁴³

Brazilian environmental rules require vegetation to be removed from the area of the reservoir before it is flooded; the cleared vegetation will still decay, of course, but should give off little or no methane, which is produced only in the absence of oxygen. However, at the Belo Monte dam, clearance of vegetation was not carried out as it should have been, and IBAMA initially refused the final licence for the dam because Norte Energia had failed to fulfil this obligation.⁴⁴ In the case of other recently built dams such as Santo Antônio and Teles Pires, it has been reported that only the most valuable timber was removed and the rest of the vegetation was not cleared at all.⁴⁵ But even without such flagrant disregard for the rules, inefficient clearing and regrowth prior to flooding mean that some vegetation will still be flooded, as a recent study that endeavours to estimate the GHG emissions of future Amazon hydropower schemes points out. Furthermore, it estimates that even in the absence of clearance it is the soil decay that emits the bulk of the GHGs – some three-quarters of the methane and nearly four-fifths of the carbon dioxide.⁴⁶ To prevent these emissions it would be necessary to remove all the soil from the area of the reservoir,⁴⁷ something that unsurprisingly no authority has ever demanded.

The same study referred to above finds that “these emissions could be higher than currently assumed and, under specific conditions, could even be comparable to those of fossil-based power plants”. It goes on to stress that “most of the reservoir simulations resulted in lower emission factors⁴⁸ when compared to those of thermal power plants, but higher when compared to those of solar or wind projects”.⁴⁹ This conclusion seems cautious alongside that of a 2012 review which found that tropical dams had emissions factors ranging from slightly more than the maximum for coal power, the highest-emitting thermal power source, to two-and-a-half times this level.⁵⁰

While the study estimating future Amazon emissions does not predict SLT to be among the highest-emitting dams, its emissions factor is still estimated to be as much as half that of natural gas generation, and far higher than those of solar and wind power, when measured over a 20-year timescale.⁵¹ Dam emissions factors are higher over this timescale than over the 100-year timescale because of the large peak in emissions in the first few years after the reservoir is filled and because methane, though a far more powerful GHG, remains in the atmosphere for a much shorter time than carbon dioxide. The 20-year horizon is arguably more relevant than the 100-year horizon because emissions reductions over the next two decades are key to global efforts to prevent global warming exceeding 2 °C and the dangerous climate change that would result.⁵²



Manioc flour production in Sawré Muybu village, Pará State. © Valdemir Cunha/Greenpeace

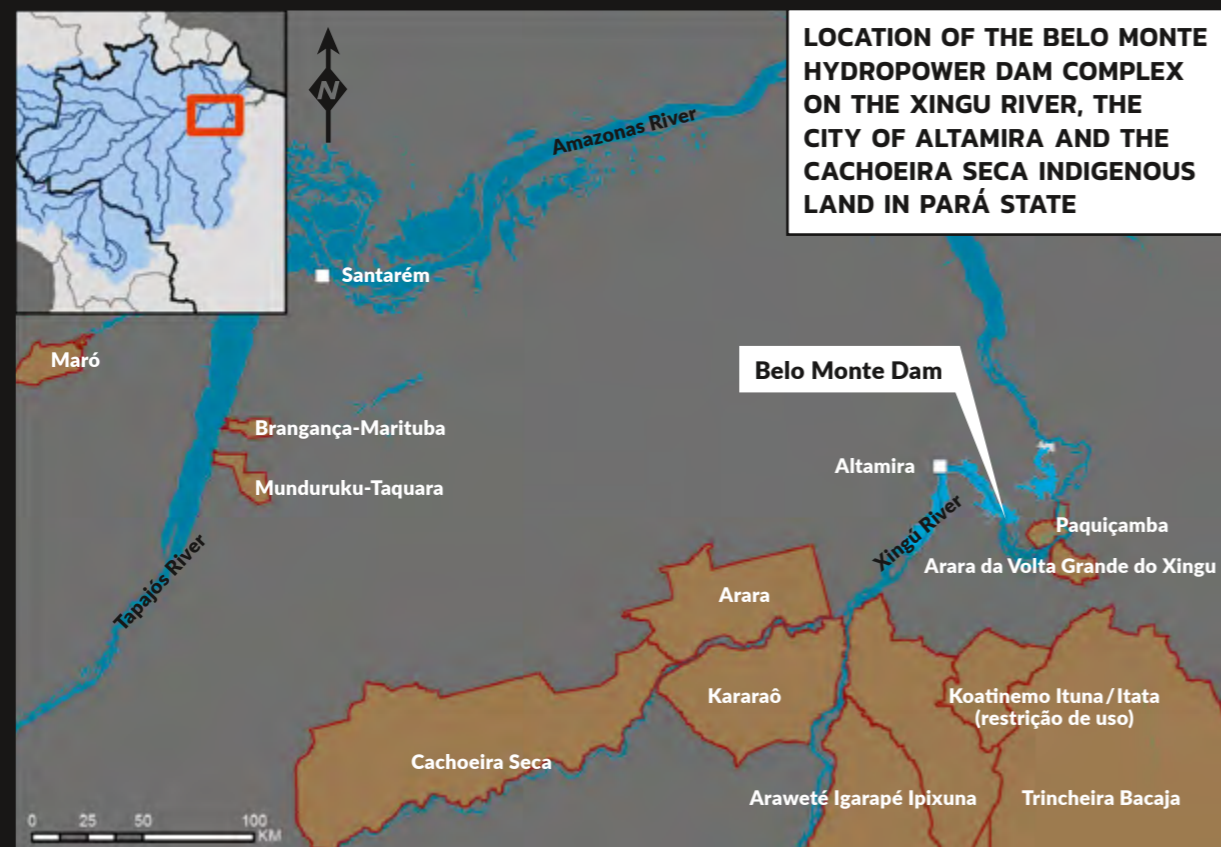
- | | |
|---|---|
| 1 Naka et al (2015a) | 30 Castello and Macedo (2015): 9 |
| 2 Winemiller et al (2016) | 31 France Libertés et al (2015b): 4, 8–9 |
| 3 Naka et al (2015a): 5 | 32 Naka et al (2015a): 7 |
| 4 Naka et al (2015a): 5 | 33 Naka et al (2015a): 7 |
| 5 Castello and Macedo (2015): 1–2 | 34 France Libertés et al (2015b): 3 |
| 6 Naka et al (2015a): 5 | 35 Morim (2014) |
| 7 Castello and Macedo (2015): 10 | 36 Instituto Socioambiental (2003) |
| 8 Naka et al (2015a): 5 | 37 MPF (2015a) |
| 9 Castello and Macedo (2015): 9 | 38 Munduruku, J S (2014) |
| 10 Naka et al (2015a): 5 | 39 Alencar et al (2015): 51 |
| 11 Winemiller et al (2016) | 40 de Sousa Júnior (2014): 149 |
| 12 CNEC Worley Parsons (2014a): Vol. 13 part 1: 131–132 and part 2: 15–18 | 41 Alencar et al (2015): 50–54 |
| 13 Castello and Macedo (2015): 4 | 42 Alencar et al (2015): 55 |
| 14 Castello and Macedo (2015): 5,9 | 43 de Sousa Júnior (2014): 159 |
| 15 Naka et al (2015a): 6 | 44 Fearnside (2016a): 1–2 |
| 16 Naka et al (2015a): 6 | 45 Diniz (2015) |
| 17 Naka et al (2015b): 10 | 46 Locatelli (2015) |
| 18 Naka et al (2015a): 6 | 47 de Faria et al (2015): 2, 6 |
| 19 Naka et al (2015a): 8–10 | 48 Locatelli (2015) |
| 20 Naka et al (2015a): 10–11 | 49 The emissions factor represents the emissions per unit of energy generated, measured in terms of carbon dioxide equivalent, i.e. taking account of the much greater global warming potential of methane. |
| 21 Castello and Macedo (2015): 7–8 | 50 Steinhurst et al (2012) cited in Fearnside (2015): 226 |
| 22 Naka et al (2015a): 7 | 51 Steinhurst et al (2012) cited in Fearnside (2015): 226 |
| 23 Naka et al (2015a): 12–13 | 52 de Faria et al (2015): 8, 10 |
| 24 Barros (2014) | 53 Fearnside (2016a): 1–2 |
| 25 France Libertés et al (2015b): 6 | |
| 26 Naka et al (2015a): 7 | |
| 27 Winemiller et al (2016) | |
| 28 Castello and Macedo (2015): 3–5 | |
| 29 Castello and Macedo (2015): 10 | |



BELO MONTE

THE MYTHS AND THE REALITY OF AMAZON HYDROPOWER

Construction site of the Belo Monte hydropower dam complex, Pará State. © Daniel Beltrá/Greenpeace



LOCATION OF THE BELO MONTE HYDROPOWER DAM COMPLEX ON THE XINGU RIVER, THE CITY OF ALTAMIRA AND THE CACHOEIRA SECA INDIGENOUS LAND IN PARÁ STATE

THE PROMISES OF BELO MONTE

In 2011, in the face of legal challenges and opposition from threatened communities, the Brazilian government gave the go-ahead for the massive Belo Monte dam complex on the Xingu River, the Amazon's easternmost main tributary, to be located in an area containing 13 indigenous lands.¹ The project is being built by a consortium, Norte Energia, that includes Eletrobras and its subsidiary Eletronorte (both also involved in the SLT project),² and is supposed to be fully operational by 2019.³

Although the project is set to be the world's third-largest hydropower plant in terms of installed generating capacity, a far larger scheme was originally proposed for the Xingu river basin, involving seven huge dams that would have flooded 18,000 km².⁴ After opposition from Indigenous Peoples and their supporters, this was replaced by the current project, involving two dams and two reservoirs linked by a huge canal, which will bypass a 100-km stretch of the river known as the Big Bend, leaving it nearly dry. Though the complex is to have an installed capacity of over 11,000 MW, in practice it

is expected to generate 4,500 MW on average.⁵ However, in 2008, Eletronorte's president admitted in an interview that output during the low-water season (up to half the year) would potentially be a mere 800 to 1,000 MW.⁶

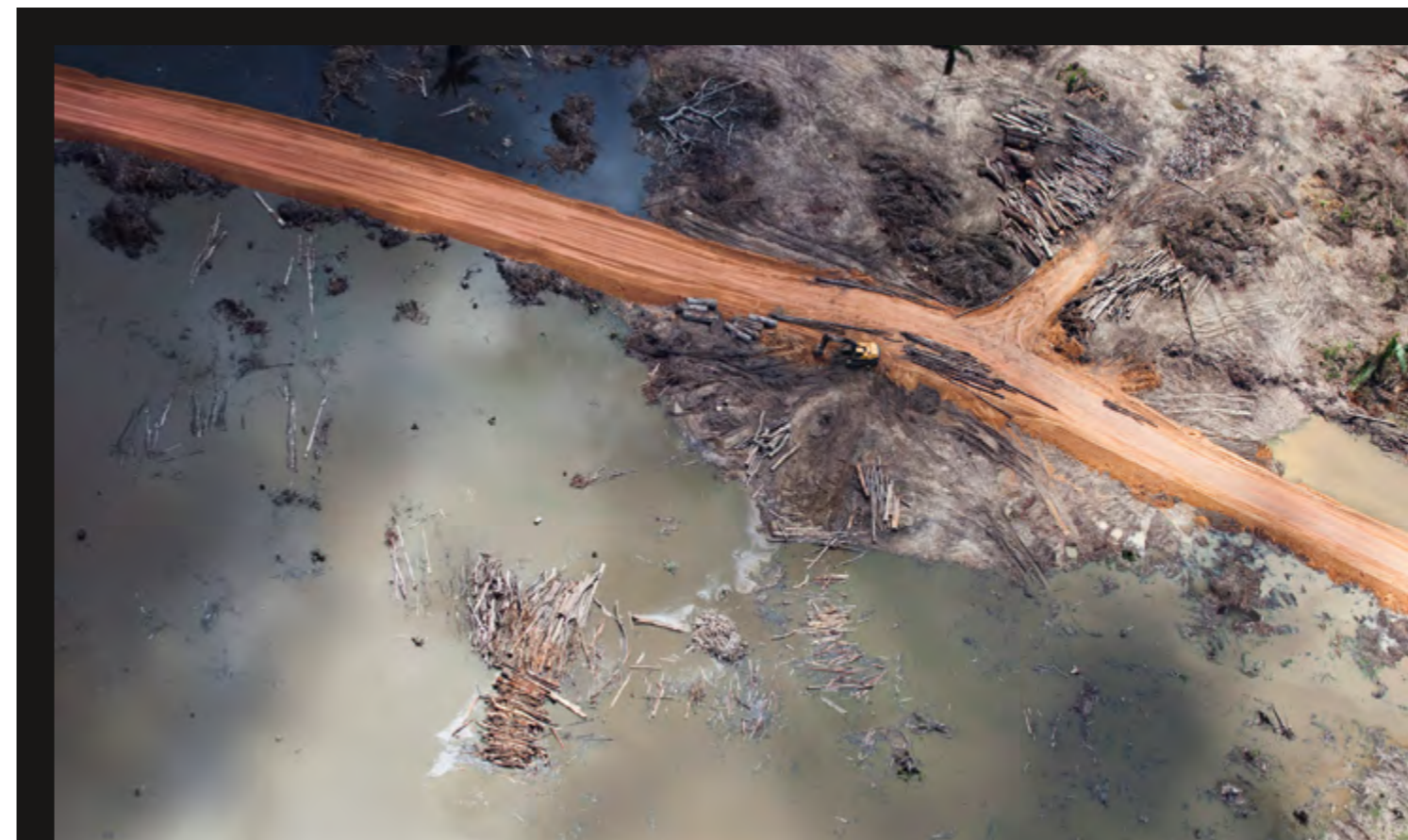
Even though the construction of the complex was almost complete, in 2015 both the Brazilian public prosecutor's office (Ministério Público Federal - MPF) and the Brazilian government agency responsible for Indigenous Peoples' affairs, the National Indian Foundation (FUNAI), advised against granting it an operational licence, as Norte Energia had yet to meet many licensing conditions intended to mitigate adverse social and environmental impacts. At the request of the MPF, an inter-ministerial fact-finding mission was carried out in June 2015 and made 55 specific observations concerning the lack of implementation of mitigation measures to protect against adverse human rights impacts. Nevertheless, despite the concerns expressed, IBAMA granted the operational licence on 24 November 2015.⁷

ENVIRONMENTAL IMPACTS

According to a 2009 independent analysis of the project's EIA, the severe reduction in river flows will decimate fish stocks and impede migration.⁸ Among the nearly 450 fish species occurring in the Xingu river basin, at least 44 are considered endemic, one-third of which are directly threatened with extinction by the construction of the dam.⁹ In addition, reduced flows are expected to impact the breeding grounds of threatened turtles downstream. Terrestrial species, including endangered primates, are also expected to be seriously affected.¹⁰

An investigation carried out by the newspaper *O Estado de São Paulo* between 24 November 2015 (when the reservoir began to be filled) and 18 February 2016 uncovered more than 16 tonnes of dead fish in Vitória do Xingu, in the Altamira region, one of the municipalities expected to be most affected by the complex. Norte Energia had hidden the fish in a landfill area within its construction site, as a result of which it was fined R\$8 million (approximately US\$2.4 million) by IBAMA. The agency also announced that it was going to carry out a new assessment of potential environmental violations.¹¹

There is evidence that the Belo Monte dam complex is already driving illegal deforestation.¹² According to the project's basic environmental plan,¹³ timber cleared from the site was supposed to have been used on site, but this has not occurred – the wood has been left to rot and by the end of 2012 some 17,000 m³ of timber had been bought from external suppliers. It is known that much of the wood sold in the region comes from illegal logging. Logging rates within protected areas in the vicinity of the project have shot up.¹⁴ Once Amazon construction contracts terminate, the suddenly unemployed construction workers often join other migrants and resort to exploitative activities such as illegal deforestation.¹⁵ A 2015 FUNAI report states that "since 2010, the pressure of migrants and the competition for natural resources in the vicinity of the Cachoeira Seca Indigenous Land [belonging to the Arará people and situated about 200 km to the southwest of the Belo Monte dam complex – see map p. 30] have intensified due to population growth in the Altamira region, following the construction ... of Belo Monte", while the public prosecutor of Altamira considers that the Cachoeira Seca has become



Construction site of the Belo Monte hydropower dam complex, Pará State, seen from the air. © Daniel Beltrá/Greenpeace

“a centre for the illegal extraction of wood”.¹⁶ A few months after the aforementioned FUNAI report appeared, Greenpeace exposed illegal loggers in the Cachoeira Seca.¹⁷ Greenpeace’s findings were confirmed by a 2015 IBAMA surveillance operation, leading to a seizure of trucks, tractors and cut wood that was ready for transport to sawmills in the wider region (Santarém and Uruará).¹⁸

Meanwhile, owing to a disagreement between Norte Energia and the water company in the nearby city of Altamira over responsibility for sewerage, the city’s houses have not been connected to the drainage system that the consortium was required to build as part of its licensing agreement, and raw sewage has consequently continued to be dumped straight in the river.¹⁹

The Belo Monte dam complex will also have a major secondary impact in facilitating expansion in regional mining operations for bauxite, nickel, copper and gold. For example, a massive 1,305 km² gold mining concession has been granted

to a Canadian company²⁰ in the bed of the Big Bend, which will be exposed by the diversion of the river’s flow.²¹ The company, Belo Sun Mining Corporation, plans to develop the country’s largest opencast gold mine within 16 km of the hydropower plant to take advantage of its cheap energy supply.²² The industrial mining operation will necessitate the removal of tonnes of arsenic-bearing soil and rock. As much as 7 kg of highly toxic arsenic can be released into the environment per gram of gold that is extracted. Leakage of arsenic into the river could have fatal consequences for the indigenous Yudja and Arará communities, as the example of an industrial gold mine in Minas Gerais State has shown.²³ As well as severe health impacts on local communities and species as a result of river contamination with heavy metals, mining tends to have environmental impacts on forest ecosystems, via activities such as the removal of vegetation and canopy cover and road-building, which may result in habitat fragmentation and increased access to remote areas.²⁴



Construction site of the Belo Monte hydropower dam complex, Pará State. © Carol Quintanilha/Greenpeace



Juarez Saw Munduruku, Cacique (chief) of Sawré Muybu village, watches the construction site of the Belo Monte hydropower dam complex from the air.

© Fábio Nascimento/Greenpeace

SOCIAL IMPACTS

The Belo Monte dam complex is expected to inundate an area of more than 500 km² (the reservoir) and to affect another 1,000 km² directly (the construction site).²⁵ It is predicted to drive between 20,000 and 40,000 people from their homes, as well as jeopardising the lands and livelihoods of thousands more, including *ribeirinhos*, urban dwellers and some 800 indigenous people,²⁶ despite assurances from the president of the state-owned Energy Research Company (EPE) that Indigenous Peoples will not be affected.²⁷ According to the 2009 analysis of the EIA, Indigenous Peoples living along the Big Bend, as well as losing the fish on which they depend, will no longer be able to travel by boat to Altamira to sell produce or buy staple goods, while communities upriver of the upper dam will lose migratory fish. The lowered water table will destroy agriculture in the region, affect water quality and probably kill off the area’s rainforests, while stagnant pools left behind by the falling river will make perfect breeding grounds for malaria-carrying mosquitoes and waterborne diseases.²⁸

The latter predictions may be borne out by evidence that in the first year after work on the complex commenced in 2011, the number of seriously underweight indigenous children rose by 53 %, while between 2011 and 2013 cases of intestinal parasites increased by 244 %.²⁹

In addition to those displaced by the complex, it has been predicted that the city of Altamira will attract up to 100,000 migrants, all competing for an insufficient number of low-paid jobs – at most 40,000 jobs were expected to be created at the height of construction, with only 2,000 of those being long-term.³⁰ Most of the unsuccessful incomers are expected to move out to the surrounding forest to eke out a living, leading to further deforestation and impacts on wildlife and Indigenous Peoples.³¹ By 2014, the population of Altamira had already risen by around 50,000 (a 50 % increase) since 2011,³² and since then it has jumped from 100,000 to 140,000,³³ overloading health facilities and schools ill prepared for the sudden influx.³⁴ The use of crack cocaine has skyrocketed

and violent crime, prostitution and human trafficking have increased.³⁵ The process of resettling displaced populations has been chaotic, with *ribeirinhos* being resettled in urban areas and so forced to abandon their way of life, and an absence of advice resulting in many families refusing resettlement in favour of financial compensation that is insufficient to buy a new home.³⁶ The new houses promised to relocated families by Norte Energia and the government have proved to be substandard and take no account of the specific housing needs of families of different sizes.³⁷

These and other failings, such as Norte Energia's provision of a temporary container unsuited to the local climate in response to its obligation to build a school in Altamira as a condition of its licence, were confirmed by a 2015 UN Working Group on Business and Human Rights mission to the region.³⁸ Meanwhile, about 700 legal actions from small farmers who have lost their land to Norte Energia are currently before the courts.³⁹ The human rights violations associated with the Belo Monte complex have been so severe that a spokesperson for the MPF referred to it as "an attack on the Brazilian Constitution".⁴⁰ The consultation of indigenous populations has been heavily criticised by the International Labour Organisation (ILO),⁴¹ the Inter-American Commission on Human Rights (IACHR)⁴² and the UN Special Rapporteur on the Rights of Indigenous Peoples⁴³ as inadequate and in breach of international agreements.⁴⁴

COST OVERRUNS

The government initially estimated the cost of the complex at R\$16 billion (US\$4.8 billion), but at the time of the auction for the project the estimate had already risen to R\$19 billion (US\$5.7 billion) – with a current value close to R\$30 billion (US\$9 billion).⁴⁵

Uncertainties over cost and generating capacity have made private investors wary, and the complex – potentially a hugely expensive and destructive white elephant – has ended up being largely funded by the Brazilian government using public pension funds.⁴⁶

TOO IMPORTANT A LESSON TO BE IGNORED

All in all, it would be hard to imagine a worse advertisement for the viability and sustainability of Amazon hydropower projects than the Belo Monte complex. If it is too late for the government to pull the plug on Belo Monte, it is nevertheless vital that it learns the lesson of this disastrous project and halts its plans for the Tapajós basin.

- 1 UN Human Rights Office of the High Commissioner (2015)
- 2 International Rivers (2012)
- 3 Kleiber and Russau (2014): 10
- 4 Instituto Socioambiental (undated)
- 5 International rivers (2012)
- 6 MPF (2009): 2
- 7 UN Human Rights Office of the High Commissioner (2015)
- 8 International Rivers (2012)
- 9 Lees et al (2016): 459 citing unpublished data and Isaac (2008)
- 10 International Rivers (2012)
- 11 D24am (2016)
- 12 Globo (2015a)
- 13 After obtaining its initial permit (licença prévia), a company building a dam is required to present a basic environmental plan (PBA – Plano Básico Ambiental). Its purpose is to: (i) set out specific programmes to prevent and control environmental and social impacts, (ii) define the specific actions and the associated costs, schedule, and responsibilities for each programme, and (iii) establish the basis for the formulation of an Environmental Management System. See IBAMA (undated)
- 14 Instituto Socioambiental (2015): 13–14
- 15 Lees et al (2016): 462 citing Fearnside (2008): 23
- 16 BBC Brazil (2015)
- 17 Greenpeace Brazil (2015)
- 18 Globo (2015b)
- 19 Instituto Socioambiental (2015): 30–31
- 20 Poirier (2012): fig. 3
- 21 Lees et al (2016): 451
- 22 Beta (2013): 30
- 23 MPF (2015c)
- 24 WRI (undated): Appendix 2:3
- 25 Acselrad et al (2009): 31
- 26 International Rivers (2012)
- 27 Kleiber and Russau (2014): 11
- 28 International Rivers (2012)
- 29 Palmquist (2013)
- 30 Amazon Watch (undated)
- 31 International Rivers (2012)
- 32 Instituto Socioambiental (2015): 5, 26–29
- 33 Folha de São Paulo (2013)
- 34 Instituto Socioambiental (2015): 5, 26–29
- 35 Kleiber and Russau (2014): 18
- 36 Instituto Socioambiental (2015): 32–35
- 37 Kleiber and Russau (2014): 11, 18
- 38 UN Human Rights Office of the High Commissioner (2015)
- 39 Kleiber and Russau (2014): 15
- 40 Kleiber and Russau (2014): 16
- 41 ILO (2011)
- 42 IACHR (2011)
- 43 UN Human Rights Council (2010): 46–53
- 44 GegenStrömung et al (2015): 2
- 45 Perreira (2013)
- 46 Amazon Watch (undated)



Aerial view of the Belo Monte hydropower dam construction site. © Fábio Nascimento/Greenpeace



THE QUESTIONABLE LEGALITY OF THE SÃO LUIZ DO TAPAJÓS DAM

CONSTITUTIONAL AND LEGAL NORMS WITH WHICH THE PROJECT MUST COMPLY

Both Brazil's Constitution and international laws and treaties place certain legal obligations on the country's government with regard to its treatment of Indigenous Peoples and its handling of development proposals that may affect their interests. As a joint NGO submission to the UN Human Rights Council denouncing hydropower development in the Tapajós basin put it in October 2015, "the Brazilian State is required to consult indigenous peoples on matters that affect them and to guarantee their right to Free, Prior and Informed Consent (FPIC) in situations where their territorial integrity, livelihoods and rights are at stake."¹ The obligation to consult is enshrined in Article 231 of the country's Constitution² and reinforced by a range of international agreements to which Brazil is a party. Article 15 of the International Labour Organisation's (ILO's) Convention 169, which Brazil ratified in 2002, requires governments to consult Indigenous Peoples "in order to determine whether and to what extent their interests are affected before they conduct or approve of programs for the exploration or exploitation of ... resources on their lands."³ Article 19 of the UN Declaration on the Rights of Indigenous Peoples (UNDRIP), adopted by the UN General Assembly in September 2007, stipulates that "States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free, prior and informed consent before adopting and implementing legislative or administrative measures that may affect them."⁴ In addition the case law of the Inter-American Court of Human Rights, to whose jurisdiction Brazil has voluntarily submitted,⁵ has established standards for consultation and FPIC of indigenous communities.⁶

The same authorities enshrine Indigenous Peoples' inalienable rights to their traditional territories. Article 231 of the Brazilian Constitution guarantees recognition of Indigenous Peoples' "original rights to the lands they

traditionally occupy."⁷ In terms of international law, Article 14 of ILO Convention 169 requires that "rights of ownership and possession of the peoples concerned over the lands which they traditionally occupy shall be recognized" and guaranteed "effective protection" by governments,⁸ while UNDRIP Article 26 states that "the indigenous population has the right to own, utilize, develop, and control the land, territories and resources they traditionally inhabit and use."⁹ All three documents extend similar protections to the cultural values of indigenous populations (Article 4 §1 of ILO 169;¹⁰ Article 8 of UNDRIP;¹¹ Articles 215 §1 and 216 of the Constitution);¹² while all three, along with the International Covenant on Economic, Social and Cultural Rights (ICESCR),¹³ guarantee the right to food and health (Article 7 of ILO 169;¹⁴ Articles 21 and 29 of UNDRIP¹⁵; Articles 11 and 12 of ICESCR;¹⁶ Articles 6, 196 and 216 of the Constitution).¹⁷ In addition, Article 225 of the Constitution sets out the broader duty of the government and society to defend and preserve an ecologically balanced environment for the present and future generations.¹⁸

Despite being a signatory to these agreements, the Brazilian government has failed to abide by its obligations under them in the broader context of its ambitions for hydropower development and specifically in the case of the SLT dam. Its failures were highlighted by a visit to Brazil of the UN Special Rapporteur on the Rights of Indigenous Peoples in March 2016. In her subsequent statement, she deplores the fact that, since the visit of her predecessor eight years ago "there have been extremely worrying regressions in the protection of indigenous peoples' rights, a trend which will continue to worsen unless decisive action is taken on the part of the government to reverse it". She explicitly refers to the cases of the Belo Monte and Tapajós River hydropower schemes, criticising "The lack of consultation and the absence of demarcation of indigenous lands impacted by the Tapajós dam complex".¹⁹



FAILURE TO CONSULT AND ABSENCE OF CONSENT

Decisions on dam sites in the Brazilian Amazon, based purely on considerations of generation potential, have repeatedly been taken with no attempt at consultation. For example, in 2011 the National Council on Energy Policy (CNPE) approved a resolution to designate four large hydropower schemes in the Tapajós basin, including SLT, as “strategic projects in the public interest”, although no FPIC process had been conducted and three of the four dams would inundate large swathes of Munduruku territory as well as land belonging to *ribeirinhos*.²⁰

In response to a judicial decision on a legal challenge mounted by the laudably independent public prosecutor’s office (MPF), the government announced in November 2014 that it would launch a process of consultation of the Munduruku people. However the Chief of Staff of the Presidency of the Republic, who made the announcement, declared the very same day that the consultation would make no difference to the government’s intention of going ahead with the SLT dam²¹ – a breathtaking admission of the authorities’ contempt for both Indigenous Peoples’ rights and due process.

In any case, as of October 2015 no further steps had been taken to carry out the promised consultation.²² A protocol setting out a culturally appropriate consultation process submitted to the President’s office by the Munduruku in January 2015 has simply been ignored.²³ Far from engaging the affected populations in appropriate consultation, the Grupo de Estudos Tapajós has actually employed consultants to tell affected communities that the decision has already been taken to proceed with the SLT and Jatobá dams and to use offers of individual compensation to undermine the communities’ resistance.²⁴ Although the awarding of the contract for the SLT dam, which was to have occurred in November 2015, has been postponed until 2016,²⁵ it seems all too likely that the project will go ahead without any real consultation, as has already happened with dams on the Teles Pires River in the Tapajós basin²⁶ and the Belo Monte dam on the Xingu River.²⁷

Even if consultation had gone ahead by this stage, however, it would have been fatally flawed by the inadequacy of information available to enable the indigenous consultees to give their *informed* consent. As the previous pages have shown, the EIA for the SLT dam fails comprehensively to address the range of environmental and social impacts that can be expected from the scheme. Its inadequacies, and those of the public-facing summary report (RIMA), are such that the authors of the independent analysis commissioned by Greenpeace called for both documents to be rejected by the licensing agency (IBAMA). In addition to the inadequacy of the EIA process for the SLT project itself, the government has obstructed a legal demand for assessment of the cumulative impacts of all dams proposed for the Tapajós basin (see next page), contravening a

A familiar tale – the Brazilian government undermines the principles of consultation and consent

The Brazilian government’s derisive attitude to its obligations to ensure FPIC over the SLT project is depressingly familiar. In the case of Belo Monte, the Inter-American Commission on Human Rights (IACHR) intervened in April 2011 in response to a petition submitted a few months earlier on behalf of indigenous communities threatened by the project, drawing attention to the fact that they had not given their FPIC. The IACHR issued “precautionary measures”³¹ calling on the Brazilian government to suspend the licensing and construction of Belo Monte until an FPIC process could be conducted.³² However, the government flatly denied that any infringements of indigenous rights had occurred and refused to carry out the precautionary measures. Furthermore it recalled its ambassador from, and withheld its financial contributions to, the Organization of American States (the IACHR’s parent body) and temporarily withdrew its candidate for a post on the IACHR, in a blatant attempt to strong-arm the organisation into submission.³³ In the wake of these actions the IACHR weakened the precautionary measures regarding Belo Monte³⁴ and adopted systemic “reforms” that have made it more difficult for it to issue precautionary measures in the future.³⁵

resolution of the National Environmental Council (CONAMA), which makes such integrated environmental assessments mandatory during the licensing process.²⁸ Moreover, the results of such studies as have been carried out have not been translated into indigenous languages, making them inaccessible to many potential consultees.²⁹ It is also hard to see how consultation could possibly have culminated in the indigenous population’s *freely given* consent, when the federal police and National Guard have been used to intimidate indigenous opponents of dam projects in the region as an international coalition of NGOs has pointed out to the UN Human Rights Council.³⁰

VIOLATION OF LAND RIGHTS AND SUBVERSION OF DUE PROCESS

The utter lack of community consultation and FPIC is not the only respect in which legality is being flouted in order to ensure that the SLT dam project goes ahead. It is certain that the project, like other dam schemes before it, will violate Indigenous Peoples’ rights to their land and culture and to food and health, as enshrined in national and international law (see above). Moreover, steps taken by the government to ensure that those rights do not interfere with the construction of the dam have involved the subversion of due legal process.

The Munduruku people have been attempting since 2001 to have their Sawré Muybu territory demarcated by the Brazilian government, as is their constitutional right. However, the government has repeatedly obstructed the demarcation of the land, which stands in the way of the SLT dam, in flagrant violation of its obligation under Article 231 of the Constitution to demarcate the traditional lands of Indigenous Peoples. First, after FUNAI had found in 2013 that the territory fulfilled the legal requirements for demarcation, the MME intervened to

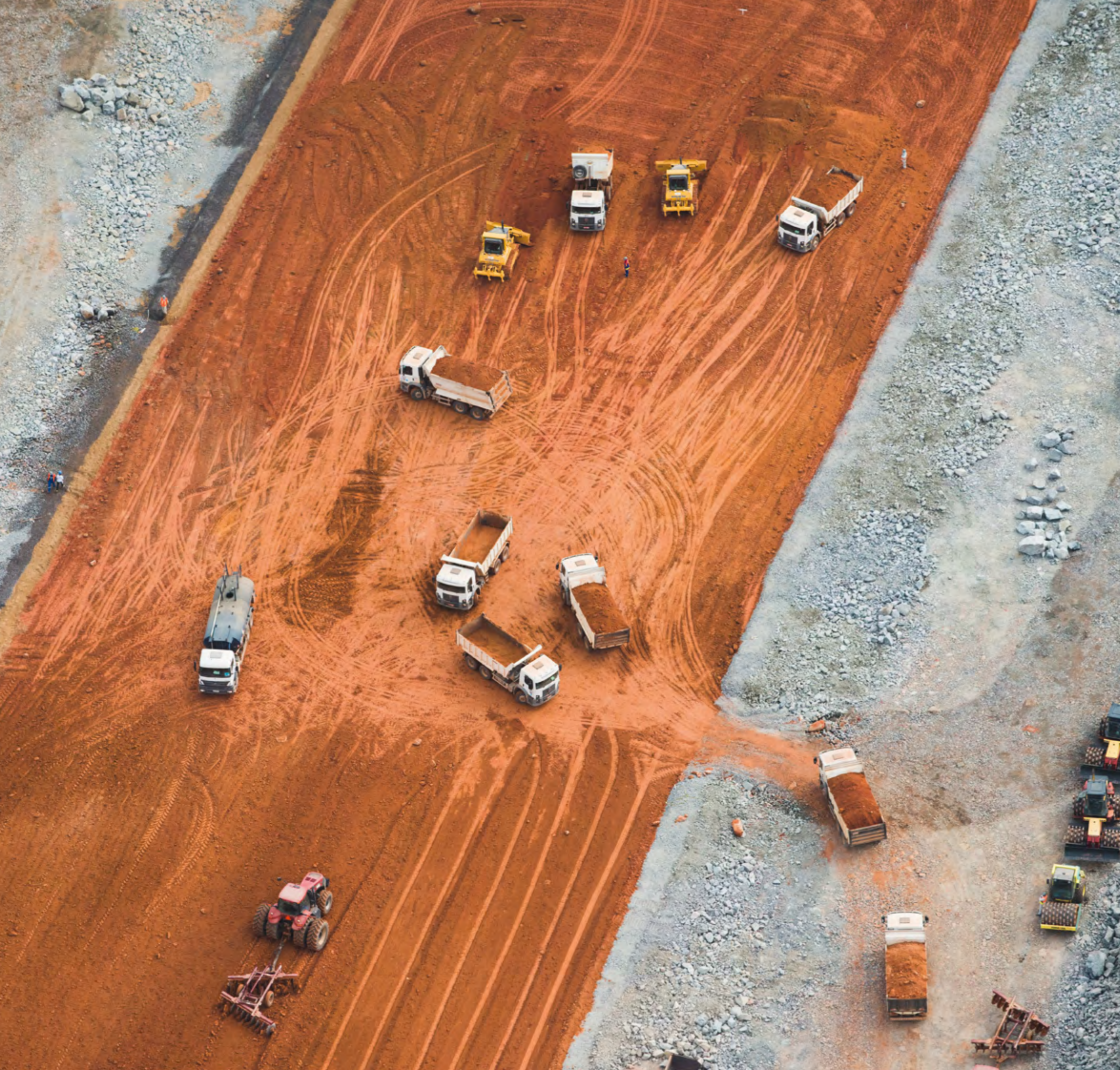
force it to halt the process.³⁶ Then, when legal proceedings initiated by the MPF culminated in an October 2014 judicial decision that FUNAI should decide whether demarcation should be executed or not, confirmed the following year,³⁷ the government requested a federal appeal court judge to issue a *Suspensão de Segurança* (security suspension), a notorious legal instrument dating from Brazil’s period of military dictatorship that suspends a judicial decision, ostensibly on grounds of national security – in this case the spurious claim that failure to build dams will plunge the country into blackouts and economic crisis. Another blatant case illustrating the misuse of the *Suspensão de Segurança* occurred in April 2013,³⁸ when the government successfully requested the suspension of an injunction issued by the Court of First Instance in favour of the MPF’s July 2012 request that IBAMA suspend the licensing process for the SLT dam until an integrated environmental assessment had been carried out covering the entire Tapajós basin, including all 43 dams planned by the government.³⁹ The *Suspensão de Segurança* has become the Brazilian government’s preferred method of steamrolling due process to ensure that destructive infrastructure projects can ride roughshod over indigenous land rights while valid legal objections to them are held in limbo. Thus the government is actively misusing the legal system to flout its own legal obligations.⁴⁰

In a joint written statement to the UN Human Rights Council in May 2015, a coalition of NGOs and other organisations (including the American Association of Jurists) blamed this systematic undermining of the rule of law on the “powerful interests of a longstanding alliance between the Ministry of Mines and Energy, political parties and private construction companies”, an alliance that it claimed is “closely linked to massive corruption schemes”.⁴¹ As the box on page 45 illustrates, there is some reason to believe that this claim is justified.

- | | | | | | | | |
|---|---|----|---|----|--|----|--|
| 1 | France Libertés et al (2015b): 5 | 8 | ILO (2011) | 22 | France Libertés et al (2015b): 6-7 | 32 | IACHR (2011) |
| 2 | "Hydric resources, including energetic potentials, may only be exploited, and mineral riches in Indian land may only be prospected and mined with the authorization of the National Congress, after hearing the communities involved." See Biblioteca Digital da Câmara dos Deputados (2010): 152-153 | 9 | UN (2008) : 10 | 23 | France Libertés et al (2015b): 7 | 33 | Cerqueira (2015) |
| 3 | ILO (2011) | 10 | ILO (2011) | 24 | France Libertés et al (2015b): 8 | 34 | IACHR (2011) |
| 4 | UN (2008) : 8 | 11 | UN (2008): 5 | 25 | Borges (2015) | 35 | Salazar and Ciqueira (2015): 174 |
| 5 | IACHR (1969) | 12 | Biblioteca Digital da Câmara dos Deputados (2010): 145-147 | 26 | Kayabi, Apiaká, Munduruku and Rikbaktsa Indigenous Peoples (2015) | 36 | FUNAI (2013) |
| 6 | France Libertés et al (2015b): 5-6 citing Inter-American Court of Human Rights (2007) | 13 | UN Human Rights Office of the High Commissioner (1966) | 27 | Instituto Socioambiental (2013) | 37 | MPF (2015b) |
| 7 | Biblioteca Digital da Câmara dos Deputados (2010): 152-153 | 14 | ILO (2011) | 28 | France Libertés et al (2015b): 7 | 38 | Superior Tribunal de Justiça (2013) |
| | | 15 | UN (2008) : 9; 11 | 29 | France Libertés et al (2015b): 7-8 | 39 | MPF (2012) |
| | | 16 | UN Human Rights Office of the High Commissioner (1966) | 30 | France Libertés et al (2015b): 8 | 40 | France Libertés et al (2015b): 9 citing MPF (2015d). For an explanation of the concept of Suspensão do Segurança and details of its use in the cases of the Belo Monte, Teles Pires and Jirau dams, see Instituto Sociambiental (2013) |
| | | 17 | Biblioteca Digital da Câmara dos Deputados (2010): 137; 146-147 | 31 | Precautionary measures are a mechanism by which the IACHR, in order to protect human rights, can require certain actions on the part of a state subject to its jurisdiction. As a signatory of the American Convention on Human Rights, Brazil is legally obliged to | 41 | France Libertés et al (2015a): 2 |
| | | 18 | Biblioteca Digital da Câmara dos Deputados (2010): 150 | | | | |
| | | 19 | Corpuz (2016) | | | | |
| | | 20 | France Libertés et al (2015b): 6, citing MME (2011) | | | | |
| | | 21 | Fellet (2014); Aranha (2015) | | | | |

Below / Right: Construction site of the Belo Monte hydropower dam complex. © Daniel Beltrá/Greenpeace





THE SÃO LUIZ DO TAPAJÓS PROJECT:

WHO STANDS TO PROFIT?

Many companies from a range of different sectors are involved in the construction of hydropower dams like the SLT project: utility companies that oversee the building of the dam and then operate it and sell the electricity it generates; contractors that undertake the construction work; suppliers of materials, equipment and services; and the project's insurers and financiers. The annex of this report lists all the main companies involved in the Belo Monte hydropower scheme, giving an indication of how broad the scope is of those that seek to profit from such projects. Although some of the companies listed have already made it clear that they want to be part of the SLT project, it is hard to predict how many others will join.

Below, we detail the members of the two consortia that have already shown an interest in bidding to construct and operate the SLT project, and highlight some of the key players involved in the other critical sectors for new hydropower schemes. Some of these companies, as specified below, have been linked to, or investigated in the context of, major corruption scandals, including around other large hydropower projects in Brazil. Nearly all of them have environmental and human rights policies that should oblige them to steer clear of the SLT project and the rest of the Tapajós hydropower complex. Will they stand by those policies and refrain from being involved in the SLT project?



Construction of the Belo Monte hydropower complex, Pará State.. © Carol Quintanilha/Greenpeace

IN THE FRAME: THE CONSTRUCTION CONSORTIA

In Brazil, contracts for new hydropower schemes are awarded via auctions through the Electricity Regulatory Agency (ANEEL). The MME is responsible for signing the concession contract with the winning bidder.¹ Companies (or consortia) bid to be the energy generator, which includes the rights to construct and operate the dam and to commercialise its electricity. The winner of the auction is the bidder that undertakes to produce electricity at the lowest price.

The successful bidder must also meet the construction and operating costs of the dam, though companies often receive large loans from BNDES (see p. 54) to help finance dam projects.

Although it is not yet clear how many consortia will bid to undertake the SLT dam project, current information suggests that there are at least two that are preparing bids:

The Grupo de Estudos Tapajós (Tapajós Study Group)

Grupo de Estudos TAPAJÓS

The Grupo de Estudos Tapajós currently consists of eight companies: Eletrobras (which leads the consortium), Eletronorte (a subsidiary of Eletrobras), ENGIE, Camargo Corrêa, Cemig, Copel, Électricité de France (EDF) and Neoenergia.² It has submitted an EIA and RIMA for the SLT dam to IBAMA, which is a clear indication that it is planning to bid. However, it has not explicitly

announced that this is the case, and maintains that at present it is simply engaged in studies regarding the viability of the dam. It also states that there is nothing to prevent the companies in the consortium from bidding together or separately for the project, and that other companies not yet in the consortium may join it in future.³

Enel Brazil, formerly Endesa Brazil until June 2015 and a subsidiary of Italian energy company Enel, withdrew from the Grupo de Estudos Tapajós in 2016. Enel, citing new priorities following a change of management, recently stated that it was not interested in investing in Tapajós and would not participate in any further activity related to the SLT project.⁴

China Three Gorges (CTG) and Furnas

CTG

In July 2014 Furnas (another subsidiary of Eletrobras) signed a strategic cooperation agreement with CTG to carry out a feasibility study for the construction of the SLT dam. The agreement was signed, alongside another 30 Sino-Brazilian agreements on areas including transportation, trade, infrastructure and education, at a ceremony attended by Brazilian President Dilma Rousseff and Chinese President Xi Jinping, as well as by the presidents of Furnas and Eletrobras.⁵ CTG has confirmed that it is preparing a bid for the dam.⁶

THE COMPANIES INVOLVED

Eletrobras (subsidiaries Eletronorte, Furnas)



Eletrobras

Created in 1962, Eletrobras is the coordinator of the Grupo de Estudos Tapajós⁷ and claims to be the biggest company in the Latin American electricity sector. Eletrobras shares are traded on the São Paulo, Madrid and New York stock exchanges and the majority stockholder is the Brazilian federal government.⁸ As noted on p. 44, two subsidiaries of Eletrobras are also involved in the consortia preparing to bid for the SLT dam contract: Eletronorte, which is part of the Grupo de Estudos Tapajós, and Furnas in partnership with CTG. Eletronorte is an energy company that supplies electricity to the nine Amazon states in northern Brazil.⁹ Furnas describes itself as a “mixed economy company” engaged in the production and transmission of electricity across Brazil.¹⁰

Eletrobras claims in its sustainability policy that it will “establish ethical and transparent relationships with all stakeholders” and will “respect human rights set forth under laws, treaties and national and international conventions”.¹¹ The company also participates in the UN Global Compact (see box p. 55), and has committed to the responsible use of natural resources and respect for biodiversity.¹²

There have been accusations of corruption relating to projects led by Eletrobras and its subsidiaries, such as Belo Monte and the Angra 3 nuclear power station, as a result of which two investor class actions have been filed against the company in the USA.¹³ One of these actions is being led by the municipal corporation of Providence, Rhode Island on behalf of anyone who acquired Eletrobras public stock between August 2010 and June 2015. The lawsuit cites testimonies from Operação Lava Jato (see box below) that Eletrobras senior executives and subsidiaries profited from bribery and money laundering associated with various projects, including the Belo Monte, Jirau, Santo Antônio and Teles Pires dams.¹⁴

In response to the allegations of corruption Eletrobras has hired law firms Hogan Lovells (USA) and WFaria Advogados (São Paulo), along with Kroll (a US-based risk consulting firm) and three independent commissioners, to investigate graft allegations relating to Eletrobras projects, including several hydropower schemes.¹⁵

Brazil’s biggest corruption scandal reaches the Amazon: the Lava Jato investigation

The corruption investigation known as Lava Jato (car wash) has mushroomed from a local operation to uncover money laundering at petrol stations into the biggest corruption scandal in Brazil’s history, with estimates that billions of dollars have been embezzled. The investigation, which began early in 2014, has centred on the majority state-owned oil company Petrobras,¹ which has lost two-thirds of its market value since the start of the investigation,² racking up debts of more than US\$ 126 billion.³ Rating agency Moody’s has downgraded the firm’s credit to junk status, commenting that it faces “serious near-term liquidity pressure”.⁴

The Lava Jato investigation has now engulfed many of Brazil’s biggest building companies, as well as its lawmakers and political elite. As the corruption scandal widens and continues to evolve at a rapid pace, hydropower dams and in particular the Belo Monte project are playing an increasingly prominent part in it. In June 2015 the former head of the Camargo Corrêa Group (see p. 47) claimed that the company had paid R\$ 20 million (US\$ 6 million) in bribes to obtain its 15 % stake in the construction of the Belo Monte project;⁵ while in March 2016 senator Delcídio do Amaral, the former government leader in the Senate, admitted that R\$ 30 million (US\$ 9 million) had been siphoned off from the Belo Monte project to fund election campaigns.⁶ According to the senator, the corruption associated with the Belo Monte project included the exerting of pressure by politicians to ensure that contracts were awarded to companies such as IMPSA, Siemens and Alstom.

1 Petrobras (2016) accessed on 31 March 2016 | 2 Kamm (2015): 3 | 3 Blount and Nogueira (2016) |

4 Kamm (2015): 3 | 5 BomfimC (2015) | 6 Folha de São Paulo (2016)

ENGIE (subsidiaries Tractebel Engineering, Tractebel Energia)

ENGIE

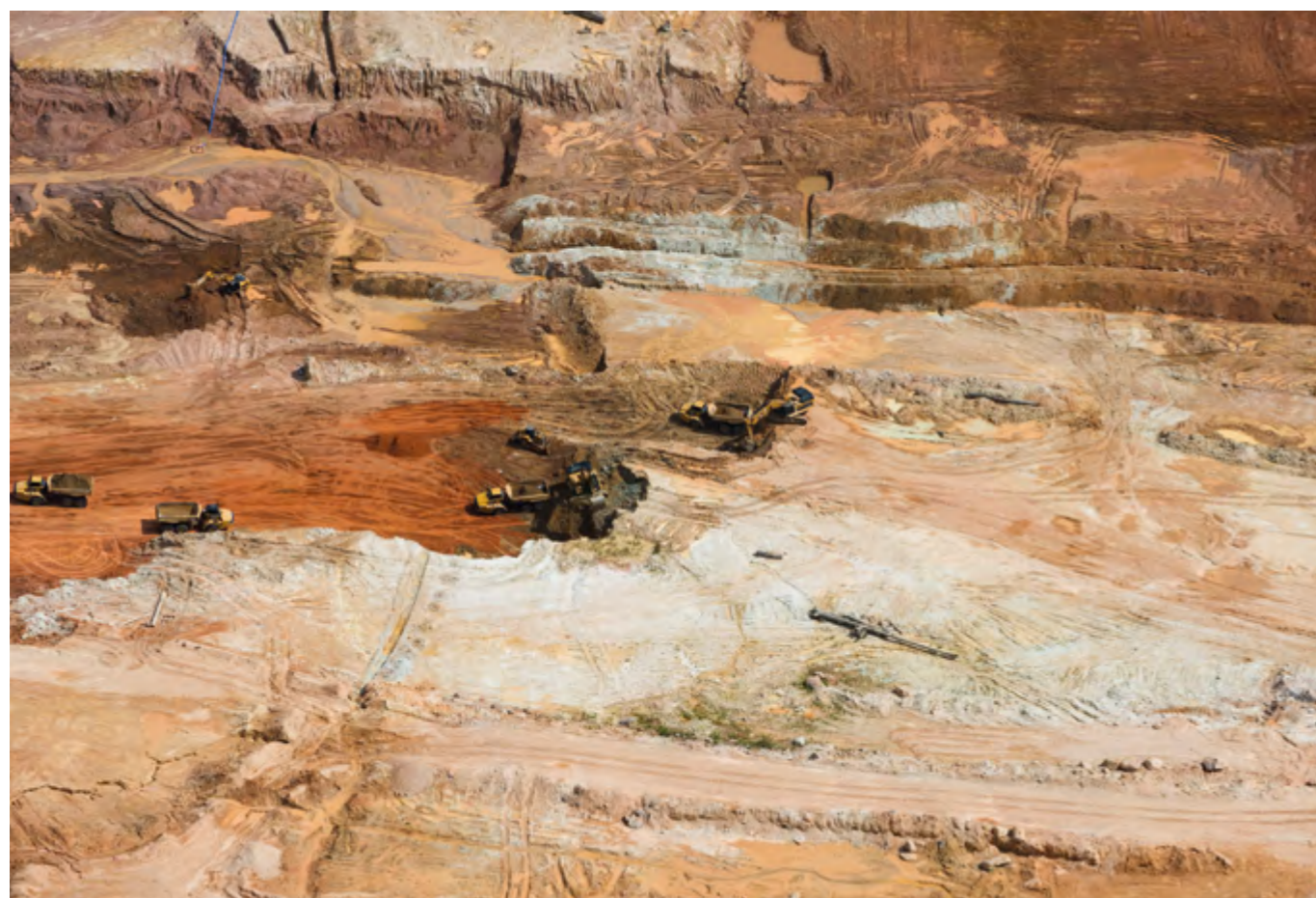
ENGIE (known as GDF Suez prior to April 2015) is a multinational utility company

operating worldwide in the three areas of electricity, natural gas and energy services.¹⁶ Its largest shareholder is the French government.¹⁷ ENGIE claims to be a “major player” in hydropower through its subsidiaries, which include Tractebel Engineering (Belgium) and Tractebel Energia (Brazil). The former is a business unit of ENGIE Energy Services, one of ENGIE’s key business lines, offering engineering and consultancy services to energy, water and infrastructure projects including hydropower dams;¹⁸ while the latter is the largest independent energy producer in Brazil, with 6 % of the country’s installed generation capacity, and has been constructing the Jirau dam on the Rio Madeira.¹⁹

In its human rights policy document, ENGIE claims that its approach “ensures the local population takes part in the

planning process, however diverse or changeable their views”. The company further claims to ensure that “its activities do not infringe upon the rights of local communities surrounding its sites” and states that it will pay particular attention to impacts on living standards, including water, food, and housing, and will take into account vulnerable groups such as Indigenous Peoples. In the event of displacement of people, it states that it will ensure that international principles have been implemented and that displaced people have given their free and informed consent and received fair compensation.²⁰ ENGIE became a participant in the UN Global Compact in 2000.²¹

In response to Greenpeace demands that it commit to playing no part in the SLT dam, Tractebel Engineering absolved itself of any responsibility and stated that it was up to the Brazilian government to authorise the project via its agencies responsible for the environment and Indigenous Peoples.²²



Construction site of the Belo Monte hydropower complex, Pará State.. © Daniel Beltrá/Greenpeace

Électricité de France



Headquartered in France and largely owned by the French state, EDF claims to be the “world’s biggest electricity generator” with

38.5 million customers and nearly € 73 billion (US\$ 80.3 billion)²³ in annual revenue. The company’s website states that it aims to reconcile economic growth with climate protection.²⁴

Among its commitments EDF claims that it refuses to “tolerate any violation of human rights”,²⁵ is committed to “transparency and dialogue” and regards protecting biodiversity as a “group priority”.²⁶ EDF became a participant in the UN Global Compact in 2012.²⁷

Camargo Corrêa



The Camargo Corrêa Group claims to be one of Brazil’s largest private sector businesses, with operations

including engineering, construction, cement, energy and transport.²⁸ The company is acknowledged to be a major player in the construction of hydropower plants.²⁹

In its Amazon guidelines, the company claims to be committed to ensuring dialogue with and respect for the values of traditional communities as well as developing solutions that minimise the social and environmental impact of projects. The company goes on to state that it will act with transparency and proactively communicate its initiatives to stakeholders.³⁰ In its sustainability guidelines, the company aims to meet the demands of civilisation “in harmony with all the living creatures on our planet”.³¹

The company’s former president, vice-president and chairman were all arrested in 2014 as part of Operação Lava Jato (see box p. 45) and were subsequently convicted of corruption, money laundering and participation in a criminal conspiracy.³² The former president Dalton Avancini told the police that Camargo Corrêa had paid R\$ 20 million (US\$ 6 million) in bribes to get its 15 % stake in the construction of the Belo Monte dam.³³

Cemig

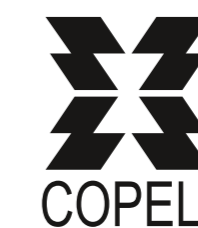


Cemig is a major player in the Brazilian energy market. It claims to be the largest electricity distribution company

in Brazil and the third-largest in terms of electricity generation and transmission.³⁴ It owns or has stakes in 214 companies and 18 consortia. The company is controlled by the state government of Minas Gerais and its shares are traded on the São Paulo, New York and Madrid stock exchanges.³⁵

Cemig’s “Statement of Ethics Principles and Code of Professional Conduct” states that the company “emphasizes protection of the environment in all its processes and installations” and regards it as necessary to aid “social development of the populations in the locations in which it is present” and to act in such a way as to “retain respectful and cooperative relationships with the community”.³⁶ Cemig became a participant in the UN Global Compact in May 2009.³⁷

COPEL

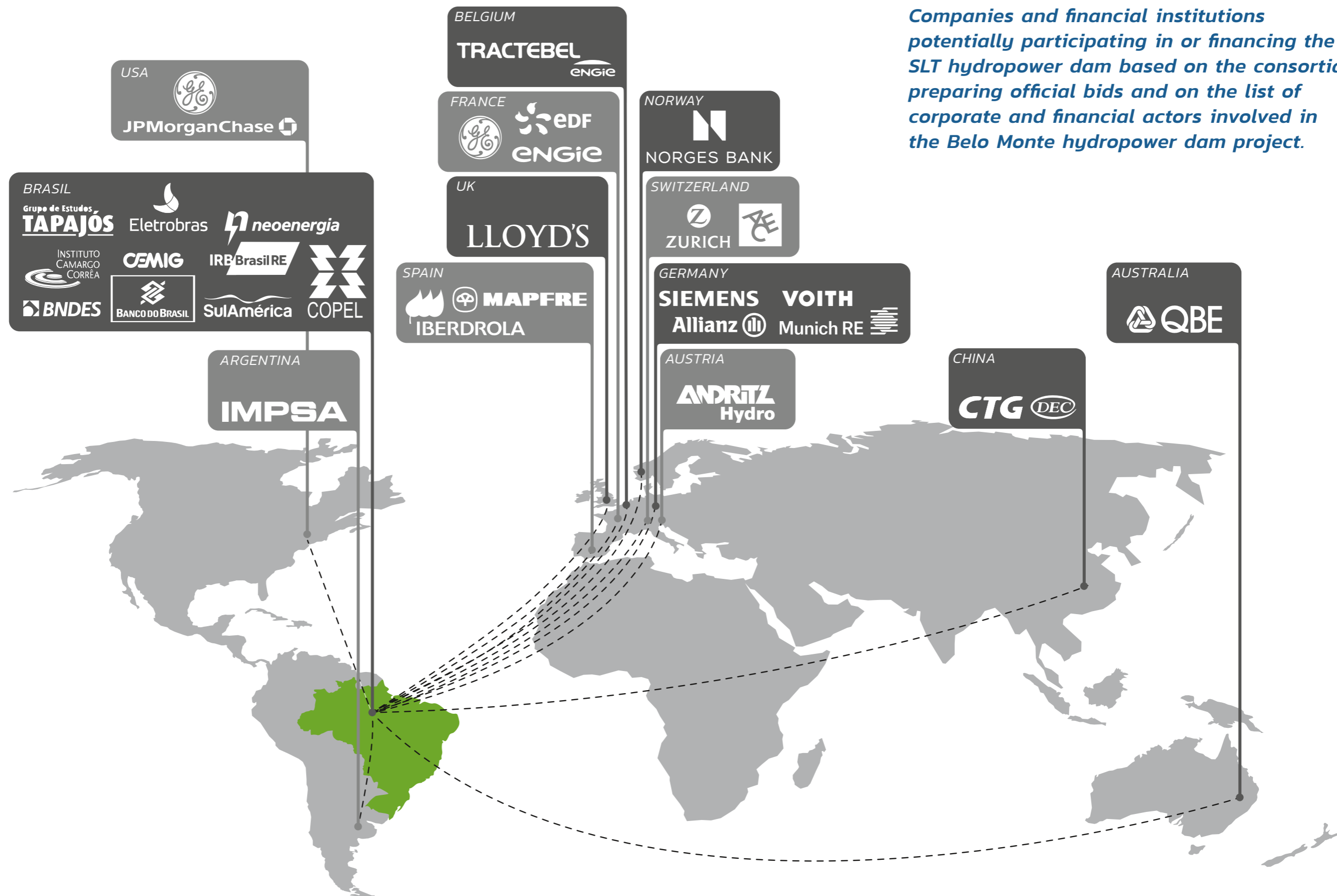


COPEL is a Brazilian company which states that its mission is to “supply electricity and solutions to promote sustainable development”.³⁸ It owns 18 hydropower plants in Brazil.³⁹ COPEL is listed on the New York Stock Exchange, but the Brazilian State of Paraná has a controlling interest in the company⁴⁰ and

owns 31 % of its stock, while BNDESPAR, the investment arm of BNDES, owns 24 % of the company and Eletrobras 0.6 %.⁴¹

COPEL claims that it is committed to “valuing, conserving and defending the environment”, and that it will maintain a constant dialogue with communities affected by its activities and apply best practice in environmental conservation, minimising and compensating for the socio-environmental impacts of its activities. Furthermore the company states that it will take into account in all its actions the importance of maintaining the biodiversity of natural ecosystems, in particular endangered species.⁴² COPEL became a participant in the UN Global Compact in 2000.⁴³

However, COPEL is currently being investigated by the federal police as a result of allegations of its implication in a 2002 corruption scandal involving the Paraná state government. It has been claimed by Alberto Youssef, who was at the centre of the money laundering scandal that was uncovered by the Lava Jato investigation⁴⁴ (see box p. 45) that over 20 deputies received R\$ 20 million (US\$ 6 million) in bribes from the company.⁴⁵



Companies and financial institutions potentially participating in or financing the SLT hydropower dam based on the consortia preparing official bids and on the list of corporate and financial actors involved in the Belo Monte hydropower dam project.



Housing for construction workers near the Belo Monte hydropower complex, Pará State © Daniel Beltrá/Greenpeace

Neoenergia



Neoenergia is a Brazilian energy company that has worked on many hydropower dams, including recent and ongoing projects such as Teles Pires and Belo Monte. The company claims on its website that including new ventures it will account for approximately 2.7 % of Brazil's installed electricity generating capacity.⁴⁶ Spanish energy company Iberdrola holds a 39 % stake in Neoenergia.⁴⁷ Iberdrola has been a participant in the UN Global Compact since 2002.⁴⁸

China Three Gorges



CTG is a Chinese state-owned energy company⁴⁹ that built the Three Gorges Dam on the Yangtze River in China,⁵⁰ displacing nearly 1.5 million people.⁵¹

The company is expanding its business into Europe and North America, as well as into emerging markets such as Brazil and Africa.⁵² It recently acquired a 30-year concession to operate two hydropower plants in Brazil, the Jupia and Ilha Solteira dams.⁵³

CTG claims to be committed to environmental protection and the long-term safeguarding of natural resources, and states that in its operations in Brazil its relationships with stakeholders are "based on respect in order to contribute to the development of people and the environment".⁵⁴

SUPPLIERS – WAITING IN THE WINGS

The consortia and companies that build dams in the Brazilian Amazon rely on international suppliers for some key components of their hydropower plants. A case in point is the turbine-generator sets that harness the energy of the flowing water to generate electricity. There are several companies that regularly supply hydropower turbines to large dam projects in Brazil.

Alstom (whose hydropower business has been part of a joint venture with General Electric since 2015 – see p. 52), Andritz and Voith Hydro (partly owned by Siemens) have been key suppliers of turbines and generators for many hydropower dams across the globe. In Brazil, these companies have formed consortia with each other and with other companies to supply turbines for dams in the Amazon, such as the recent Santo Antônio,⁵⁵ Jirau⁵⁶ and Belo Monte dams,⁵⁷ all of them controversial. Given initial reports of negotiations between these companies and the members of the two consortia expected to bid for the SLT contract,⁵⁸ and in view of their history of working on large hydropower projects, particularly in the Amazon, it is likely that one or more of these companies will be awarded contracts for turbines and generators for the SLT dam if the go-ahead is given for its construction.

Voith Hydro and Siemens

VOITH SIEMENS

Voith GmbH is a German engineering corporation active in the energy, oil and gas, paper, raw materials, and transport and automotive sectors. The company employs more than 20,000 people, with annual sales of €4.3 billion (US\$4.7 billion) in more than 60 countries, making it one of the biggest family-owned companies in Europe.⁵⁹

Voith Hydro GmbH is a joint venture between Voith GmbH and Siemens AG (also based in Germany), with Voith holding 65 % of the equity.⁶⁰ Voith Hydro supplies turbines, generators and maintenance services to the hydropower industry, and claims to have installed 40,000 turbines and generators worldwide.⁶¹ Voith Hydro's biggest ever contract⁶² has been for work on the Belo Monte dam, supplying four turbines, four generators, electrical and mechanical auxiliaries, the automation system and the complete engineering services for the project.⁶³

Siemens calls itself a "global powerhouse" working on electrification, automation and digitalisation. The company offers a wide range of products and services, being a leading supplier of systems for power generation and transmission as

well as medical diagnosis, with 348,000 employees in more than 200 countries, generating €75.6 billion (US\$83.1 billion) in annual revenue in 2015.⁶⁴ Siemens has a wide portfolio of work on hydropower dams but does not itself produce turbines.⁶⁵ These are generally supplied by Voith Hydro, with Siemens supplying other key components, particularly the generators to partner the turbines.

Voith claims that it is "aware of its responsibility to society, and ... acts accordingly", that it recognises "the duty of our company and our employees to serve the common good", and that it "respects human rights worldwide".⁶⁶ It states that it "is in regular contact with NGOs on environmental and social issues, such as the World Wide Fund for Nature (WWF)".⁶⁷

Siemens has been a participant in the UN Global Compact since 2003, and states that it expects not only its employees but also its suppliers and partners worldwide to observe the Compact's guidelines, especially regarding "human rights, basic workers' rights, environmental protection, and the fight against corruption". Siemens also states its support for the Universal Declaration of Human Rights, the European Convention on Human Rights, the ILO's Declarations of Principles, the Organisation for Economic Cooperation and Development (OECD) Guidelines for Multinational Enterprises, Agenda 21 on sustainable development and the UN Convention against Corruption.⁶⁸

Siemens claims that, far from merely talking about sustainability, it has made "sustainable development ... the cornerstone of all our activities".⁶⁹ The company also says that it is resolved "to act responsibly on behalf of future generations to ensure economic, environmental and social progress"⁷⁰ and that it listens to stakeholders and integrates their perspectives into its business priorities and decision-making processes.⁷¹

However, Siemens has been involved in several corruption and market collusion scandals, including a case in which it was accused of corruption to obtain federal contracts from the Brazilian Post Office and Telegraph Corporation between 1999 and 2004. As a result, in 2014 Siemens received a five-year ban on bidding for or signing federal contracts.⁷² However, according to an official journal the ban was suspended in July 2015,⁷³ although a final decision on the case is still to be taken by the Supreme Court.⁷⁴

In response to a Greenpeace demand that Siemens should not get involved in the SLT project, the company has merely stated that it will act in compliance with national and international laws and that it supports initiatives to help reduce the effects of such projects on the environment and society.⁷⁵ Voith responded that it maintains its right to participate in the tendering process.⁷⁶

General Electric Renewable Energy



In November 2015 the US-based multinational corporation General Electric (GE) completed the acquisition of the French company Alstom's power and grid businesses.⁷⁷ The acquisition included Alstom's energy services, gas power, steam power and onshore wind divisions.

Along with the acquisition GE and Alstom created three 50/50 joint ventures, with GE having operational control, in the fields of grid, nuclear energy and renewables. The renewables joint venture sits within GE's new Renewable Energy division (which also contains the former Alstom onshore wind business acquired by GE); it includes Alstom's hydropower and offshore wind divisions and is headquartered in France.⁷⁸ Jérôme Pécresse, who was President of Alstom Renewable Power, is now President and CEO of GE Renewable Energy and reports to the GE CEO Jeff Immelt.⁷⁹

As of 2015 GE overall had an annual revenue of US\$ 117 billion, and operated in 180 countries with 333,000 employees.⁸⁰ GE claims that its hydropower turbines and generators represent more than a quarter of global installed capacity.⁸¹

The company states that it takes the Universal Declaration of Human Rights as its benchmark⁸² and goes on to say that "human rights violations are unacceptable" in the communities in which it operates.⁸³ Both Alstom and GE began to participate in the UN Global Compact in 2008.⁸⁴

In 2011, Alstom led a consortium including Voith and Andritz that won a R\$ 3.5 billion (US\$ 2 billion) contract to supply turbines, generators, hydro-mechanical equipment, busbars and related gas-insulated substations for Belo Monte.⁸⁵ One source reports that Alstom's share of the contract was US\$ 684 million.⁸⁶ In 2015, consortia of which it was part won two further Belo Monte contracts. On this occasion, despite the well-documented controversies around Belo Monte, a senior company representative described the complex as a "clean energy source".⁸⁷ It appears that GE will honour all existing Alstom contracts.⁸⁸

In December 2014, Alstom pleaded guilty to charges that it had spent tens of millions of dollars bribing government officials around the world, and was handed criminal penalties of US\$ 772 million by the US Justice Department – the largest criminal fine the USA had ever levied against a company for violating foreign bribery laws.⁸⁹ The US Deputy Attorney General remarked that "Alstom's corruption scheme ... was astounding in its breadth, its brazenness and its worldwide consequences."⁹⁰ In a separate case in 2015, a Brazilian court ordered the freezing of more than US\$ 104 million of Alstom's

assets in response to allegations that the firm had made illegal payments to officials in São Paulo⁹¹ to win contracts for transmission substations.⁹² GE has pointed out that none of these cases were related to hydropower plants.⁹³

Despite communication from Greenpeace regarding the likely effects of the SLT dam, GE has not ruled out its participation in the project, and it was reported in 2014 that Alstom had already had discussions with companies from the Grupo de Estudos Tapajós.⁹⁴

Andritz



Based in Austria, Andritz AG is a global engineering company with 250 sites in more than 40 countries, employing 25,000

staff.⁹⁵ In 2014 it took orders worth over € 6 billion (US\$ 6.6 billion), nearly a third of this for hydropower. The company has installed more than 30,000 turbines and claims over 170 years' experience of hydropower (i.e. going back well before the dawn of the hydroelectric era).⁹⁶ In 2011 it was awarded a US\$ 444 million contract to supply nine turbines and other equipment for the Belo Monte project.⁹⁷

Andritz claims to support human rights and calls on its suppliers to act in accordance with international standards and conventions such as those of the ILO, OECD and UN Global Compact.⁹⁸ The company further states that its commitment to sustainable development aims to avoid "compromising the ability of future generations to meet their needs".⁹⁹

IMPESA



IMPESA is an Argentinian company focusing on hydro and wind power in Latin

America, particularly Brazil.¹⁰⁰ In 2011 the company was awarded a US\$ 450 million contract to supply four 624 MW turbines and generators for the Belo Monte project, as well as the penstocks and lifting equipment.¹⁰¹ However, the contract was terminated in December 2014 due to the company being unable to deliver the agreed equipment on time following financial difficulties. The contract was then taken over by Alstom, Andritz and Voith.¹⁰² It is unclear whether IMPESA would currently be in a position to supply the SLT project with turbines and other equipment. IMPESA became a participant in the UN Global Compact in 2006.¹⁰³

Dongfang Electric Corporation



Dongfang Electric Corporation (DEC) is a Chinese company that was awarded a contract in 2009 to supply 18 turbine-generator sets for the Jirau hydropower plant.¹⁰⁴

INSURANCE COMPANIES

Given the substantial risks associated with large-scale hydropower projects, the insurance/reinsurance industry plays a key role in providing financial protection for their constructors and operators. As with the contractors already discussed, we do not yet know which insurance companies will be involved in the SLT project; however, the Belo Monte, Santo Antônio and Jirau projects give us some idea of which companies are likely to be involved.

Munich Re

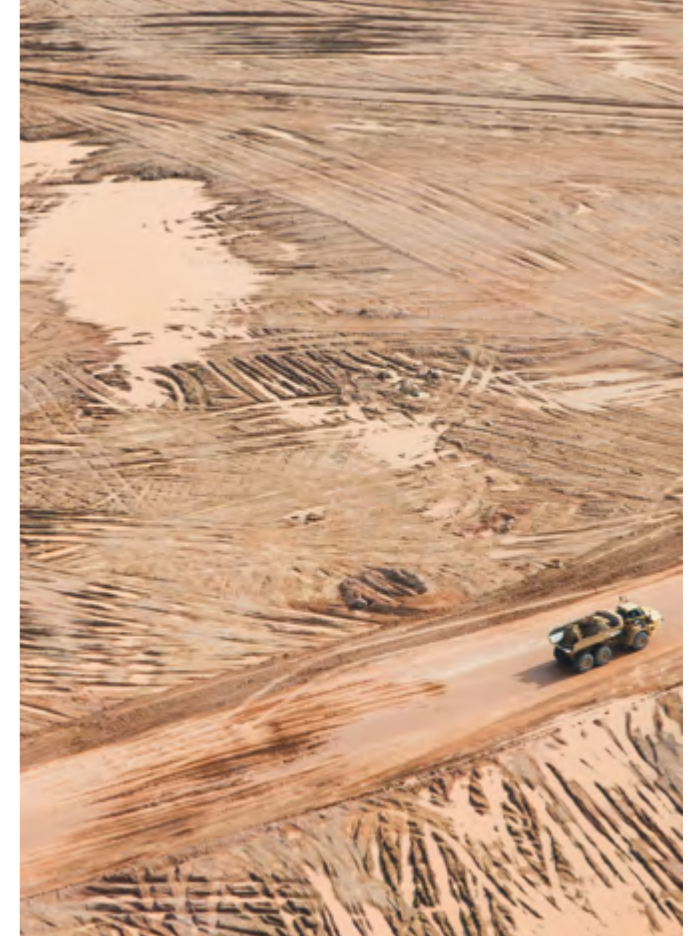


Munich Re is a major German insurance and reinsurance

company that has been present in Brazil for over 30 years. It entered the Brazilian reinsurance market after new regulations introduced in 2008 allowed participation by foreign reinsurance players. With a premium volume of € 172 million (US\$ 189.2 million), Munich Re was the largest foreign reinsurer in Brazil in 2010.¹⁰⁵ Munich Re has played a key role in the insurance of various dam projects in the Amazon, including the Santo Antônio, Teles Pires and Belo Monte dams.¹⁰⁶ In the case of Santo Antônio, Munich Re was consulted in 2008 regarding the best way to reinsure the risk; the company assumed a leading share of the risk and had its local engineers monitor the building of the dam.¹⁰⁷

Munich Re became a participant in the UN Global Compact in 2007.¹⁰⁸ The company has signed the climate declaration of the United Nations Environment Programme Finance Initiative (UNEP FI) and is a founding signatory and board member of the UNEP Principles for Sustainable Insurance (UNEP PSI).¹⁰⁹ However in 2012, as a result of its role in the Belo Monte project, it was removed from the prestigious Global Challenges Index on sustainability.¹¹⁰

In response to a Greenpeace communication concerning the SLT dam, Munich Re stated that it would as usual analyse the risks, as well as environmental and governance issues, before making a decision on whether to join the project.¹¹¹



Construction site of the Belo Monte hydropower complex, Pará State. © Daniel Beltrá/Greenpeace

Allianz



Allianz is a German insurance and asset management company with

85.4 million customers worldwide.¹¹² It is reported that Allianz is underwriting 5 % of the risk in the Belo Monte project¹¹³ and was also among the reinsurers of the Jirau dam that refused to pay out on a claim of R\$ 1 billion (US\$ 300,000) for damage caused by a riot in 2011.¹¹⁴ The company claims to support the UNEP PSI and Principles for Responsible Investment.¹¹⁵ In response to Greenpeace communication regarding the SLT dam, Allianz declined to comment publicly on the project.¹¹⁶

Mapfre (BB e Mapfre in Brazil)



BB e Mapfre, a joint venture between the

Spanish company Mapfre and the state-owned Banco do Brasil (which holds a majority stake), is the leading non-life insurance company in Brazil, with 15.5 % of the market.¹¹⁷ Mapfre is reported to have underwritten 30 % of the insurance risk in Belo Monte.¹¹⁸ The company has participated in the UN Global Compact since 2004¹¹⁹ and claims to support the UN Principles for Responsible Investment.¹²⁰

During a meeting with Greenpeace on 14 March 2016, Mapfre said that, in the event that a proposal regarding the

SLT project were submitted to the company, it would need time to analyse the risks associated with the project and that it would then take a decision together with its partner Banco do Brasil.¹²¹

Others

Other insurance and reinsurance companies and markets reported to be involved in Belo Monte are Lloyds of London (UK), QBE (Australia), IRB (Brazil – to over 20 % of the insurance risk), Ace and Zurich Insurance (Switzerland),¹²² and SulAmérica (Brazil).¹²³ Of these, QBE, Zurich and SulAmérica have all signed up to the UNEP PSI.¹²⁴

BANKS AND INSTITUTIONAL INVESTORS

Funding from banks would have a critical role in the building of the SLT dam, as the consortium that won the contract would need to cover construction costs running to billions of dollars. Much of the funding would undoubtedly come via BNDES.

BNDES



The Brazilian Development Bank (BNDES) is a 100 %

state-owned bank that plays a key role in financing the federal government's industrial and infrastructure projects including several large dams such as the Belo Monte hydropower dam complex.¹²⁵

BNDES raises funding from foreign institutions and markets. It collaborates with the Inter-American Development Bank (Latin America and Caribbean), Kreditanstalt für Wiederaufbau (KfW, Germany), the Japan Bank for International Cooperation, the Nordic Investment Bank and the China Development Bank.¹²⁶ BNDES has also raised nearly US\$ 10 billion since 2008 by issuing international bonds.¹²⁷

In the case of Belo Monte, in 2012 BNDES approved a loan of R\$ 22.5 billion (US\$ 6.7 billion), the biggest loan it had ever made. BNDES loaned money to Norte Energia (the consortium responsible for building Belo Monte) both directly and via other banks such as BTG Pactual and the state-owned bank Caixa Econômica Federal.¹²⁸ BNDES announced its policy on funding for the project six months before the contract auction, in order to enable the bidders to calculate what electricity price they should propose in their bids.¹²⁹

JPMorgan Chase



JPMorgan Chase & Co is a US multinational banking and financial services company specialising in investment banking as well as markets, investor and treasury services.¹³⁰ Under its file on Eletrobras, Bloomberg lists JPMorgan Chase as a holder of 7.81 % of Eletrobras.¹³¹ JPMorgan has clarified that the company acts as a depositary for Eletrobras' American Depositary Receipt (ADR) programmes. This arrangement allows non-US companies to list shares in the US. According to JPMorgan, these shares belong to "thousands of institutional and retail investors".¹³²

Norway's Government Pension Fund Global



In addition to their majority shareholders, the companies mentioned in the previous pages have

NORGES BANK

other institutional shareholders. One of these, Norway's Government Pension Fund Global (GPF), stands out in that as well as it being the world's largest sovereign wealth fund,¹³³ its owner, the Norwegian government, is also the major donor to Brazil's Amazon Fund, a charity set up to "prevent, monitor and combat deforestation" to which it has donated US\$ 1 billion.¹³⁴

The GPF's principles for investment are based on the UN Global Compact, the UN Guiding Principles on Business and Human Rights, the OECD Principles of Corporate Governance and the OECD Guidelines for Multinational Enterprises.¹³⁵ The GPF highlights the relevance of human rights and the need for their integration in risk management.¹³⁶ It also sets out guidelines for companies to engage with stakeholders and provide effective and accessible operational-level grievance mechanisms for those adversely affected by projects,¹³⁷ and calls for climate change risk assessment.¹³⁸

Nevertheless, despite these laudable principles, the GPF has shares in ENGIE and its subsidiary Tractebel Energia, GE, Alstom, Andritz and Siemens.¹³⁹ The GPF should stand by its environmental and human rights commitments and divest from any companies that become involved with the SLT hydropower scheme and similar socially and environmentally destructive projects.

THE UN GLOBAL COMPACT

The United Nations Global Compact is a UN initiative to encourage businesses worldwide to adopt sustainable and socially responsible policies, and to report on their implementation. This voluntary initiative represents a call to companies to align business strategies and operations with universal principles on human rights, labour, environment and anti-corruption, and take actions that advance societal goals. The UN Global Compact is based on ten principles derived from the Universal Declaration of Human Rights, the ILO's Declaration on Fundamental Principles and Rights at Work, the Rio Declaration on Environment and Development, and the UN Convention against Corruption.

The UN Global Compact was officially launched at UN Headquarters in New York on 26 July 2000 and is now the world's largest corporate sustainability initiative, with 8,000 corporate and 4,000 non-business participants from many different countries and business sectors.¹⁴⁰

According to the UN Global Compact's Principles, "businesses should support and respect the protection of internationally proclaimed human rights", making sure "that they are not complicit in human rights abuses". Moreover, "businesses should undertake initiatives to promote greater environmental responsibility and encourage the development and diffusion of environmentally friendly technologies."¹⁴¹ These principles are clearly incompatible with the disastrous consequences that the SLT dam would have for the Mundurucu people and ribeirinhos who live in and around the area that it would affect.

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|----|--|----|--|-----|---|-----|---|
| 1 | Presidência da República, Casa Civil, Subchefia para Assuntos Jurídicos (2004) | 32 | Jelmayer and Magalhaes (2015) | 72 | Webb and Sciaudone (2014) | 109 | Zwick (2014): 2 |
| 2 | Grupo de Estudos Tapajós (undated c) | 33 | Bomfim (2015) | 73 | Grossmann (2015) | 110 | Siegle (2012) |
| 3 | Grupo de Estudos Tapajós (undated b) | 34 | Cemig (2015) | 74 | Russau (2015) and (2016) | 111 | Zwick (2016) |
| 4 | Enel (2016) | 35 | Cemig (undated a) | 75 | Dinkel (2016) | 112 | Allianz (2016a) |
| 5 | Furnas (2014) | 36 | Cemig (undated b): 8 | 76 | Lienhard (2016) | 113 | Poirier (2013) |
| 6 | Macauhub (2016) | 37 | Cemig (undated c) | 77 | GE (2015) | 114 | Winterstein (undated) |
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| 8 | Eletrobras (undated) | 39 | COPEL (2015d): 12 | 79 | GE (2016b) | 116 | Bitterling (2016) |
| 9 | Eletrobras Eletronorte (undated) | 40 | COPEL (2016) | 80 | GE (2016c) | 117 | Allianz (2016b) |
| 10 | Furnas (undated) | 41 | COPEL (2015a) | 81 | GE Renewable Energy (2016) | 118 | Banktrack (undated) |
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| 12 | Eletrobras (2014) | 43 | COPEL (2015b) | 83 | GE (2016d) | 120 | UNEP FI (undated) |
| 13 | Dezem (2015) | 44 | Flueckiger (2015) | 84 | UN Global Compact (undated c) and UN Global Compact (undated a) | 121 | Meeting between Mapfre and Greenpeace Spain on 14 March 2016 |
| 14 | Kennedy (2015) | 45 | Scortecci (2015) | 85 | Brazil Energy (2011) The US\$ figure quoted in the referenced article is based on exchange rates from 2011, when the contract was awarded | 122 | Caixa Seguradora S A (2015): 21 |
| 15 | Stauffer and Berlowitz (2016) | 46 | Neoenergia (2013) | 86 | Power-Technology (undated a) | 123 | Banktrack (undated) |
| 16 | ENGIE (undated a) | 47 | Iberdrola (2015) | 87 | PennEnergy (2015) (undated a) | 124 | UNEP FI (undated) |
| 17 | ENGIE (undated b) | 48 | UN Global Compact (undated d) | 88 | GE (2016a) | 125 | BNDES (2015): 4 |
| 18 | Tractebel Engineering (undated) | 49 | International Rivers (undated) | 89 | Lynch (2014) | 126 | BNDES (undated a) |
| 19 | GDF Suez (2014a) | 50 | International Hydropower Association (undated b) | 90 | Quirke (2014) | 127 | BNDES (undated b) |
| 20 | GDF Suez (2014b) | 51 | BBC (2012) | 91 | AFP (2015) | 128 | BNDES (2012) |
| 21 | UN Global Compact (undated b) | 52 | China Three Gorges Corporation (undated a) | 92 | GE (2016b) | 129 | BNDES (2010) |
| 22 | Develay (2016) | 53 | Moody's (2015) | 93 | GE (2016b) | 130 | JPMorgan (2016) |
| 23 | All figures in US\$ are converted against the average exchange rate for 2015, as this is the most recent full year average available. We have used the same exchange rate across the report to ensure consistency. | 54 | China Three Gorges Corporation (undated b) | 94 | Polito and Facchini (2014): A3 | 131 | Bloomberg (2016) |
| 24 | EDF (undated a) | 55 | Andritz (undated) | 95 | Andritz (2016): 4 | 132 | Martin (2016) |
| 25 | EDF (2014): 12 | 56 | Alstom (2008) | 96 | Andritz Hydro (2015): 9-10 | 133 | Ellyatt and Bishop (undated) |
| 26 | EDF (undated b) | 57 | Ingram (2011) | 97 | Power-Technology (undated a) | 134 | Amazon Fund (undated) |
| 27 | EDF (2014): 12 | 58 | Polito and Facchini (2014) | 98 | Andritz (2015): 1 | 135 | Norges Bank Investment Management (2016c): 1 |
| 28 | Camargo Corrêa (undated a) | 59 | Voith (undated a) | 99 | Andritz (2010): 14 | 136 | Norges Bank Investment Management (2016b): 1-3 |
| 29 | International Hydropower Association (undated a) | 60 | Siemens (2015): 130 | 100 | IMPSPA (undated) | 137 | Norges Bank Investment Management (2016b): 4 |
| 30 | Camargo Corrêa (undated b) | 61 | Voith (undated b): 2 | 101 | Power-Technology (undated a) | 138 | Norges Bank Investment Management (2016a) |
| 31 | Camargo Corrêa (2006) | 62 | Kummer (2012) | 102 | Andrade&Canellas (undated) | 139 | Norges Bank Investment Management (undated) |
| | | 63 | Voith (2015) | 103 | UN Global Compact (undated e) | | This online database has been updated by the NBIM on 31 December 2015 |
| | | 64 | Siemens (undated a) | 104 | Hydroworld (2009) | | 140 Songini and Pistoni (2015): 11 |
| | | 65 | Power Technology (undated b) | 105 | Munich Re (2011): 4 | | 141 UN Global Compact (undated h) |
| | | 66 | Voith (2016): 4; 8 | 106 | Munich Re (2015) | | |
| | | 67 | Voith (2014): 13 | 107 | Munich Re (2011): 4 | | |
| | | 68 | Siemens (undated b) | 108 | UN Global Compact (undated g) | | |
| | | 69 | Siemens (undated c) | | | | |
| | | 70 | Siemens (2010) | | | | |
| | | 71 | Siemens (undated d) | | | | |

CONCLUSION AND DEMANDS

Amazon rainforest, Tapajós basin, Pará State. © Daniel Beltrá/Greenpeace

In April 2015, the Munduruku and three other Indigenous Peoples from the Tapajós basin stated in a joint manifesto that they “are responsible for the conservation of thousands of hectares of forest and of biodiversity ... which the non-indigenous people have proved to be incapable of governing and stewarding”.

The manifesto observes how the government:

builds dams with hastily-prepared and incomplete environmental studies, without seeking to understand the consequences of the destruction of nature for our lives, authorizing the operation of dams without providing a response to indigenous people about how they will continue their lives without fish, without water, without hunting

and alleges that the real purpose of such projects is “not to generate energy, but instead to feed corruption schemes with contractors and political parties”. It reserves particular scorn for the use of the *Suspensão de Segurança* to suspend legal decisions that uphold indigenous rights, referring to this practice as “denying the Judiciary of its independence, allowing projects to proceed that privilege powerful economic and political groups, when the defense of human life, human rights, and human dignity should come first”, and concluding that such decisions “compromise democracy, the Republic, and disgrace the law created by non-indigenous people”.¹ The

Munduruku themselves, in an October 2015 letter to the UN Human Rights Council, describe the situation in the Amazon as one in which “there is no more respect for the Federal Constitution”.²

It is hard to disagree with the Indigenous Peoples’ analysis of the situation. As custodian of much of the world’s largest remaining rainforest and its importance to the global climate, the Brazilian government has a responsibility to the world as a whole. It also has clear-cut duties, set out in national and international law, towards the Indigenous Peoples that inhabit the Amazon biome. However, in recent years its overall approach towards the Amazon has increasingly become one of development at any cost and often with questionable justification – for example promoting mega-hydropower schemes justified by dubious forecasts of energy demand, whose output will be unreliable compared with cleaner renewables that can be built more quickly, with fewer environmental impacts and lower greenhouse gas emissions. The government’s policies encourage profiteering from Amazon destruction by large corporations – an unhealthy relationship thrown into sharp relief by the corruption revelations of the ongoing Lava Jato investigation.

Many of these large construction, engineering and energy companies active in the Amazon, as well as the banks and insurance companies that facilitate their activities, also have

extensive corporate social and environmental responsibility policies. However, all too often these policies appear to be mere window-dressing. Companies talk the talk of environmental sustainability, social responsibility and global citizenship while continuing to engage in projects whose viability is highly uncertain but that nevertheless destroy fragile and irreplaceable ecosystems, endanger the world’s climate and deprive populations of their lands and livelihoods.

The principled and dignified response of the Tapajós basin’s Indigenous Peoples to the threats they face offers a sharp and shaming contrast with the hypocrisy of the Brazilian government and the companies’ disregard of required procedures in their eagerness to force ahead projects that destroy the Amazon. Greenpeace calls on those in power – in the chambers of government and in corporate boardrooms – to hear and attend to the urgent message of the Munduruku and their neighbours. It is time the Brazilian government admitted that clean Amazon hydropower is a dangerous myth that sows misery and destruction while failing to provide energy security; and that corporations acknowledge that the economics of large dam schemes in remote tropical rainforest do not stack up. Instead, government and business should focus their efforts on developing genuinely sustainable energy sources.

THE BRAZILIAN GOVERNMENT SHOULD:

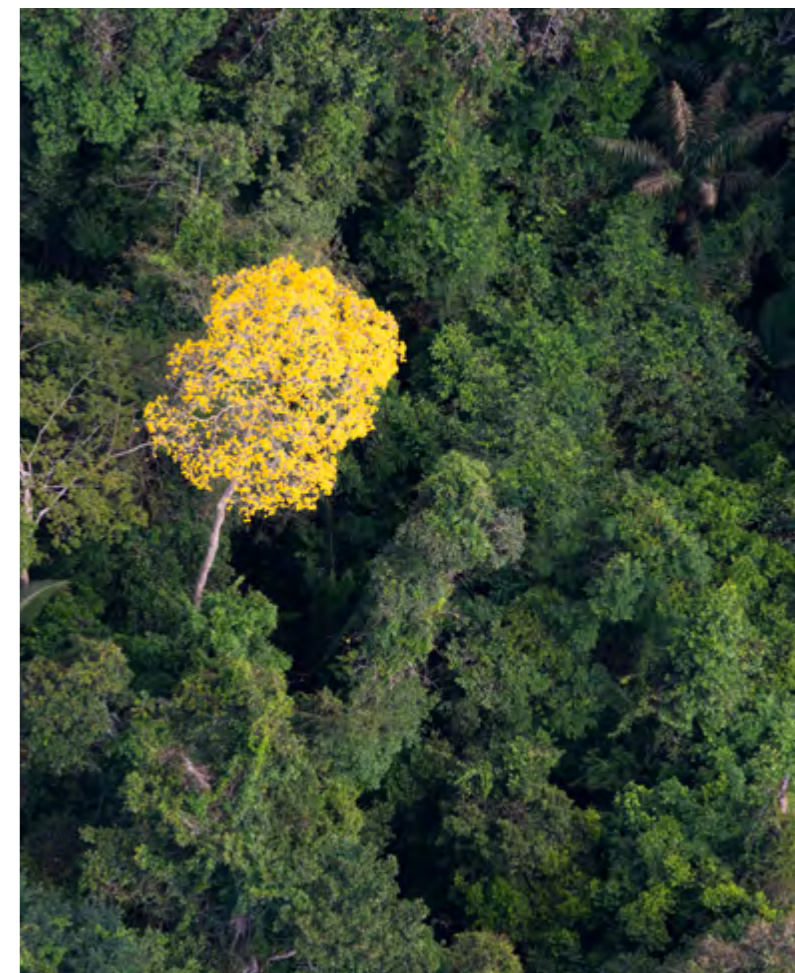
1. Halt the building of new hydropower dams in the Amazon.
2. Demarcate the Munduruku Indigenous Land of Sawré Muybu.
3. Respect all provisions concerning the full observance of human rights, Indigenous Peoples’ rights, protection of the environment and labour rights as enshrined in the Brazilian Constitution, the Universal Declaration of Human Rights, ILO Convention 169 and UNDRIP, and all other treaties, agreements and conventions on such matters that Brazil has ratified or to which it has become adherent.
4. Ensure effective protection of identified priority areas for conservation in the Tapajós basin.
5. Strongly promote clean and renewable energy sources and create public credit lines for the development of distributed renewable energy sources such as solar power.
6. Replace the average power output projected to be produced by the São Luiz do Tapajós hydropower plant by a combination of clean renewable energy sources (solar, wind and/or biomass) as proposed by Greenpeace’s scenarios.
7. Urgently halt corruption in the Brazilian energy sector.

COMPANIES THAT ARE CONSIDERING PARTICIPATING IN OR FINANCING THE SÃO LUIZ DO TAPAJÓS HYDROPOWER PROJECT SHOULD:

1. Dissociate themselves from the project.
2. Avoid participating in other environmentally and/or socially destructive hydropower projects situated amid vulnerable ecosystems such as the Amazon rainforest.
3. Participate in or finance only projects that do not threaten Indigenous Peoples’ rights but fully respect their right to consultation and to give or withhold their FPIC, as enshrined in ILO Convention 169 and UNDRIP.
4. Invest in clean renewable energy solutions such as wind and solar power, along with energy efficiency measures.

1 Kayabi, Apiaká, Munduruku and Ribaktsa Indigenous Peoples (2015)

2 Munduruku Indigenous People (2015)



A flowering ipê tree, Pará State. © Daniel Beltrá/Greenpeace

CORPORATE ACTORS AND FINANCIAL INSTITUTIONS THAT ARE OR HAVE BEEN INVOLVED IN THE BELO MONTE HYDROPOWER DAM COMPLEX

SHAREHOLDERS OF NORTE ENERGIA¹

- Caixa Economica Federal (Brazil)
- Cemig (Brazil)
- Companhia Hidro Eletrica do São Francisco (CHESF) (Brazil)
- Eletrobras (Brazil)
- Eletronorte (Brazil)
- Funcef (Brazil)
- J Malucelli Energia (Brazil)
- Light (Brazil)
- NeoEnergia (Brazil)
- Petros (Brazil)
- Sinobras (Brazil)
- Vale (Brazil)

TURBINES AND GENERATORS²

- Alstom (France)
- Andritz (Austria)
- Impsa (Argentina)
- Siemens (Germany)
- Voith (Germany)

ENGINEERING SERVICES

- Arcadis (Netherlands)³
- Concremat (Brazil)⁴
- ENGECORPS (Brazil)⁵
- Themag (Brazil)⁶
- Tractebel Engineering (LEME) (Belgium)⁷
- WorleyParsons (Australia)⁸

TRANSMISSION LINES⁹

- China State Grid (China)
- Furnas (Brazil)

CONSTRUCTION CONSORTIUM¹⁰

- Andrade Gutierrez (Brazil)
- Camargo Corrêa (Brazil)
- Cetenco (Brazil)
- Contern (Brazil)
- Galvão (Brazil)
- OAS (Brazil)
- Odebrecht (Brazil)
- Queiroz Galvão (Brazil)
- Serveng (Brazil)
- JLT RE (Brazil)²⁴
- Lloyds (UK)²⁵
- Mapfre (Spain)²⁶
- Marlborough Re (Lloyd's) (UK)²⁷
- Munich Re (Germany)²⁸
- QBE Insurance Group Ltd (Australia)²⁹
- SulAmérica (Brazil)³⁰
- Tokio Marine Global (Lloyd's) (Japan)³¹
- Torus (Lloyd's) (USA)³²
- Torus Specialty Insurance Company (USA)³³
- Validus Reaseguros, Inc (Lloyd's) (USA)³⁴
- XL Insurance Company Ltd XL Catlin (previously known as XL Group) (Ireland)³⁵
- Zurich Insurance (Switzerland)³⁶

EQUIPMENT

- Daimler AG (Germany)¹¹
- Metso (Finland)¹²

FINANCIAL INSTITUTIONS

- Banco do Brasil (Brazil)¹³
- BNDES (Brazil)¹⁴
- BTG Pactual (Brazil)¹⁵
- JPMorgan Chase (USA)¹⁶

INSURANCE AND REINSURANCE COMPANIES

- ACE (Switzerland)¹⁷
- Allianz AG (Germany)¹⁸
- Canopus Managing Agents Limited (Lloyd's) (UK)¹⁹
- Chubb Managing Agency Limited (Lloyd's) (USA)²⁰
- Federal Insurance Company (USA)²¹
- HDI - Gerling Welt Service AG (Germany)²²
- IRB-Brazil Re (Brazil)²³

INVESTMENT AND PENSION FUNDS

- Blackrock Inc (USA)³⁷
- Government Pension Fund Global (Norway)³⁸
- Iberdrola Energia S/A (Spain)³⁹
- Mitsui & Co. Ltd (Japan)⁴⁰
- Previ (Banco do Brasil) (Brazil)⁴¹
- Skagen Fondene (Norway)

1 Norte Energia (undated)

2 Norte Energia (2011)

3 Arcadis (2012)

4 Arcadis (2012)

5 Arcadis (2012)

6 Arcadis (2012)

7 Tractebel Engineering (undated b)

8 WorleyParsons (2012)

9 Place (2014)

10 Consórcio Construtor Belo Monte (undated)

11 Jagger (2012)

12 Metso (2012)

13 Russau (2013): 5

14 BNDES (2012)

15 BNDES (2012)

16 Russau (2013): 7

17 Caixa Seguradora S A (2015): 21

18 Poirier (2013)

19 Caixa Seguradora (2015): 21

20 Caixa Seguradora (2015): 21

21 Caixa Seguradora (2015): 21

22 Caixa Seguradora (2015): 21

23 Banktrack (undated)

24 Library of the European Parliament (2013)

25 Beale (2015)

26 Rindebro (2011)

27 Caixa Seguradora (2015): 21

28 Mota (2011)

29 Caixa Seguradora (2015): 21

30 Banktrack (undated)

31 Caixa Seguradora (2015): 21

32 Caixa Seguradora (2015): 21

33 Caixa Seguradora (2015): 21

34 Caixa Seguradora (2015): 21

35 Caixa Seguradora (2015): 21

36 Caixa Seguradora (2015): 21

37 Russau (2013): 6, 8, 9, 11

38 Norges Bank Investment Management (undated) This online database has been updated by the NBIM on 31 December 2015.

39 Iberdrola (2015)

40 Russau (2013): 6, 8

41 Russau (2013): 5

ANEEL Agência Nacional de Energia Elétrica (National Electricity Agency)

BNDES Banco Nacional do Desenvolvimento (National Development Bank)

CCEE Câmara de Comercialização de Energia Elétrica (Power Commercialisation Chamber)

CNPE Conselho Nacional de Política Energética (National Council on Energy Policy)

CONAMA Conselho Nacional do Meio Ambiente (National Environmental Council)

CO₂ carbon dioxide

CTG China Three Gorges

DEC Dongfang Electric Corporation

EDF Electricité de France

EIA Environmental Impact Assessment

EPE Empresa de Pesquisa Energética (Energy Research Company)

€ Euro

FAO Food and Agriculture Organisation of the UN

FPIC Free, Prior and Informed Consent

FUNAI Fundação Nacional do Índio (National Indian Foundation)

GE General Electric

GHG greenhouse gas

GPFG Government Pension Fund Global

GW gigawatt

IACHR Inter-American Commission on Human Rights

IADB Inter-American development Bank

IBAMA Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (Brazilian Institute of Environment and Renewable Natural Resources)

IBGE Instituto Brasileiro de Geografia e Estatística (Brazilian Institute of Geography and Statistics)

ICESCR International Covenant on Economic, Social and Cultural Rights

ILO International Labour Organisation

INPE Instituto Nacional de Pesquisas Espaciais (National Institute for Space Research)

IPCC Intergovernmental Panel on Climate Change

KfW Kreditanstalt für Wiederaufbau

km kilometre

km² square kilometre

m³ cubic metre

MMA Ministério do Meio Ambiente (Ministry of Environment)

MME Ministério de Minas e Energia (Ministry of Mines and Energy)

MPF Ministério Público Federal (Federal Public Ministry)

MW megawatt

NIBM Norge Investment Bank Management

OECD Organisation for Economic Cooperation and Development

PAC Programa de Aceleração do Crescimento (Growth Acceleration Programme)

RIMA Relatório de Impacto Ambiental (Environmental Impact Report)

R\$ Brazilian Real

SLT dam São Luiz do Tapajós dam

TWh terawatt-hours

UN United Nations

UNDRIP UN Declaration on the Rights of Indigenous Peoples

UN PSI UN Principles for Sustainable Insurance

US\$ US Dollar

WWF World Wide Fund for Nature

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