Suspicious minds: Aluminium production in the Amazon

Fig 1. Industrial development in the Amazon has chased hundreds of thousands of people from their lands. These people cannot always find another suitable spot to live, farm and fish. Photo: Author, 2023.

By **Simon Lobach***

The Amazon region in South America extends over nine different countries. It contains vast bauxite deposits, which have been exploited since 1915. During the Second World War, Suriname – then a Dutch colony – was the largest bauxite exporter worldwide, helping the Allied aircraft industry to victory. Aluminium has been produced in the Amazon since the late 1960s, when the first hydroelectric dam was built in Suriname.

In the context of a several-year PhD research project, I have looked at the past and present of aluminium production in the Amazon, and assessed this industry from the perspective of this very fragile and ecologically essential ecological biome. To provide insights into the environmental performance of aluminium production in the Amazon, I performed a SWOT analysis, citing three strengths, three weaknesses, three opportunities and three threats for the industry. This SWOT analysis concerns the full supply chain of primary aluminium, including bauxite mining, alumina production and hydropower generation, besides aluminium smelting.

Five aluminium smelters exist in the Amazon, but only two are currently active. These two are located in the Brazilian Amazon: Albrás in Barcarena (Pará), operated by Norsk Hydro, and Alumar in São Luís (Maranhão), operated by Alcoa. The aluminium smelter in Paranam, Suriname, is permanently closed, while the two aluminium smelters in Venezuela (Alcasa and Venalum, both in Ciudad Guayana) are only producing a fraction of their original capacity, if they produce anything at all. The SWOT analysis below is therefore primarily concerned with the two active smelters, both in Brazil.

Strengths

- Aluminium in the Amazon is produced with hydroelectric energy. As a result, aluminium production in the Amazon emits much less CO_2 than most of the newer aluminium smelters that have been built since the 1990s. And, while early hydroelectric power projects, like Brokopondo (Suriname) and Tucuruí (Brazil) still had very considerable socio-environmental impacts, the more recently built Belo Monte hydroelectric dam is designed to have a smaller impact on the environmental functioning of the river and the lands of traditional populations.
- The companies active in the Amazon (Hydro, Alcoa) are among the frontrunners in reducing the environmental footprint of aluminium production. This can be concluded from the reforestation projects that both have implemented at bauxite mining sites, alumina plants, and aluminium smelters, but also from technologies like the dry tailing management implemented in Hydro's bauxite mine in Paragominas, and the bauxite slurry pipeline running from Paragominas to Barcarena.
- Whereas community relationships of aluminium producers in the Amazon have been heated and difficult in the past, aluminium companies are increasingly taking their responsibility towards affected populations, through social projects and emergency assistance.

*Centre for International Environmental Studies, Geneva Graduate Institute (Switzerland)

Fig 2. The hydroelectric plant at Tucuruí was built specifically to power the aluminium smelter in Barcarena. Back then, it was built in the middle of the forest. Currently, the entire area around the reservoir has been deforested, with the exception of two Indigenous reserves. Source: Google Maps, 2022.

Weaknesses

This relationship with affected communities is also a weakness. Since the beginning of bauxite mining in the Amazon, aluminium companies have ignored property rights of traditional populations. This was possible because property rights in the Amazon function in different, more informal ways, than in the companies' countries of origin. Thousands of people have been displaced from their ancestral lands where they farmed, fished and lived, in order to make way for bauxite mines, and later for industrial facilities, harbours, and reservoirs for hydroelectric plants. Many of these people are still living close to the production facilities, and if they have not taken up alternative, more polluting activities in order to survive, many of them still claim compensation for what they have lost. **Fig 1**.

The aluminium sector was one of the 'first movers' into the Amazonian space, meaning that the industry built roads and power lines into areas where none of these existed before. While presented as vehicles for progress and development, such roads and power lines also opened forest areas to other sectors, like logging, cattle farming, gold seeking, etc. Especially around the hydroelectric plants that were built exclusively to power aluminium plants, large-scale environmental destruction can be observed, caused by other actors that were inadvertently given access to these areas. **Fig 2**.

As the Amazon is a rather flat region, the hydropower produced in the Amazon is not particularly efficient in terms of the amount of territory flooded for each additional unit of electricity. The large reservoirs in the Amazon produce rather small amounts of energy when compared to reservoirs in mountainous regions elsewhere. Furthermore, these reservoirs have flooded extensive forested areas, which functioned as carbon sinks before. Since the forest cover was not removed when the dams were constructed, these rotting forests continue emitting methane, a much more powerful greenhouse gas than CO_2. As a result, one could put some question marks at claims of hydropower in the Amazon being a 'green' energy source. **Fig 3**.

Fig 3. The rather shallow reservoirs in the flat Amazonian lands cause hydroelectric dams here to be rather inefficient, while the drowned forest continues emitting methane for decades to come. Photo: Ted Sun, 2020.

Fig 4. Amazonian soils provide people with many opportunities for farming, but in order not to exhaust the soil, it is done in a circular fashion. Photo: Author, 2020.

Opportunities

Opportunities abound in the Amazon for companies willing to genuinely improve local environments and living conditions, but they need to adopt a more holistic view to make a positive impact. Amazonian populations are strong and resilient, and their environment provides them with many livelihoods. Their problem is not poverty, but threats to their lands and environmental assets. Insufficient levels of governance, weak institutions and inadequate monitoring play a crucial role herein. Companies that extract riches from the Amazon and wish to return something to the region should not focus on community projects only, but also help improve the overarching institutional structure. This would enable Amazonians to look after their own interests, so they won't need to depend on charity work any longer. In order to

achieve this, aluminium companies in the Amazon should cooperate much more closely together with environmental agencies within governments, and be open to learn from social scientists and research institutions in the region as well as abroad. **Fig 4**.

huge waste problem in the Amazon. This is due to failing waste collection services, while the very substantial rainfall and the fluctuating water levels enable garbage to make its way into ecosystems very quickly. Aluminium, in the form of beverage cans for example, is an important contributor to garbage in the region, but aluminium waste, if collected at all, is currently shipped to far-away recycling plants. Aluminium companies could take up an important responsibility dealing with aluminium and other waste in Amazonian cities.

Threats

■ A major threat caused by aluminium production is 'red mud' deposition in the alumina production stage. Over the past twenty years, several accidents have occurred with red mud leaking into streams and rivers. The resultant water pollution and loss of soil fertility have direly affected local communities.

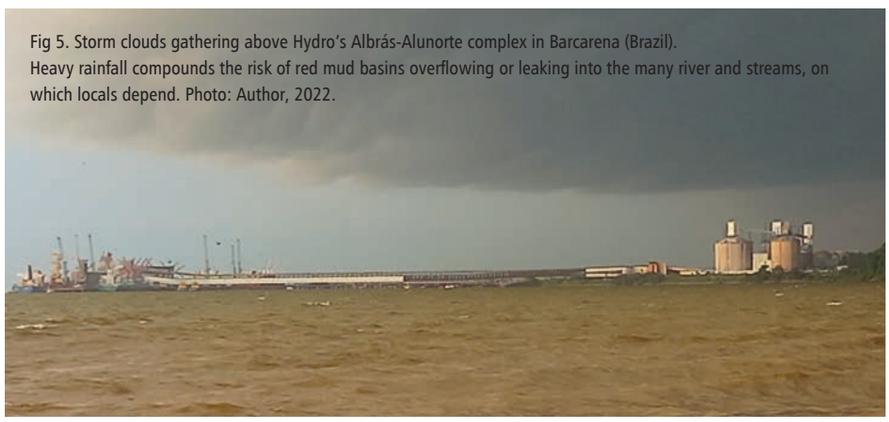

Fig 5. Storm clouds gathering above Hydro's Albrás-Alunorte complex in Barcarena (Brazil). Heavy rainfall compounds the risk of red mud basins overflowing or leaking into the many river and streams, on which locals depend. Photo: Author, 2022.

■ The arrival of foreign companies in the Amazon is normally defended with reference to the supposed 'progress' and 'development' they would bring. Many Amazonians hope to be employed by these companies. The aluminium industry has not yet fulfilled this promise. A major problem of the aluminium industry is that it is energy-intensive, not labour-intensive, while the Amazon is a region that is poor in energy resources but in need of jobs for the many people who for numerous reasons have been displaced from their lands. For this reason, the aluminium industry could make a difference by not only producing aluminium ingots in the Amazon, but also erecting industries for consumer products. In doing so, a leading principle should be to maximise the number of jobs created, while providing the necessary training so that, rather than attracting more in-migration, an Amazonian workforce can take up these opportunities.

■ Another opportunity is linked to the While security of red mud deposits has improved significantly since then, red mud deposition still needs continued close monitoring to prevent it from threatening local populations again. The Amazonian torrential rains, exacerbated even more by climate change, amplify the risks of basins overflowing. **Fig 5**.

■ The monitoring of dangerous substances, like red mud, often stops after an industry has left a country. This may not be on anyone's mind in Brazil today, but sooner or later alumina production will stop here, and it may become unclear who should be responsible for the management of these toxic basins after that, especially if the state lacks the capacity to take this responsibility. The cases of Suriname and Venezuela have taught us that such a moment may arrive sooner than anyone expects. **Fig 6**.

■ Finally, the very difficult historical relation between aluminium industry and traditional populations constitutes a major threat. There is a threat in terms of reputation, as affected communities have become increasingly vocal to bring their concerns to local and international audiences. But discontent can also constitute a physical threat, as the Surinamese case shows, where the power lines linking the hydroelectric dam to the aluminium smelter were blown up by a collective of people whose lands had been flooded by the reservoir. Repairing this relationship is an absolute necessity, because, as Elvis Presley sang, "we can't go on together with suspicious minds".

Overall, the aluminium industry in the Amazon is moving towards increasingly sustainable practices. However, challenges remain that are of extreme importance for local populations. There is a dire need for stronger community relations, mitigation of unintended environmental consequences, and responsible waste management. By seizing opportunities to enhance the region's well-being and livelihoods, the industry can contribute to sustainable development in the Amazon. It has taken the first steps in this direction, but much remains to be done. ■

Elements of this research were funded by the European Research Council (grant 950672).

Fig 6. The smelter in Paranam, Suriname, owned by Suralco/Alcoa, closed in the early 2000s. Who will take care of cleaning up the rustbelt and the red mud deposits? Photo: Author, 2022.