MIGHTY EARTH

THE IMPACT OF THE BAUXITE BOOM ON PEOPLE AND PLANET

A deep dive into the role of bauxite in the global electric vehicle supply chain and the need for responsible mining

Contents

I. Executive Summary and Recommendations

For the first time, this report takes a global look at the bauxite and aluminum industry by reviewing and combining all available literature on the industry and its impact on people and the environment for four specific countries: Australia, Brazil, Guinea, and Indonesia. Each of these countries has substantial reserves of bauxite, much of which is under the forest floor. Each of these countries is also incorporating its vast reserves of bauxite into its pursuit of economic development by implementing government policies to advance bauxite and aluminum production in-country.

Electric vehicle production is a key factor driving the increased demand for aluminum, which is processed from mined bauxite. Automobile manufacturers are generally increasing their utilization of aluminum in their vehicles across the board because it is lightweight and durable. At the same time, automobile manufacturers are also increasingly shifting production to electric vehicles, which require more aluminum than traditional vehicles. Not only is aluminum lightweight and durable, but it also is corrosion resistant and has a high thermal conductivity, which is important for car batteries. As a result, electric vehicles use about 25-27% more aluminum than traditional vehicles,[1] and battery electric vehicles use about 85% more aluminum than their non-battery counterparts.[2]

Although this transition to electric vehicles is needed for a low-carbon future, the unrelenting quest for more aluminum derived from mined bauxite has led to real consequences for the communities and environment surrounding the mines. Over the past several years, the people of Australia, Brazil, Guinea, and Indonesia have protested the mines, filed lawsuits, and advocated for better treatment and healthier environments. This report is an attempt to shed light on those advocacy efforts and the plights of those individuals being negatively impacted by bauxite mining.

There is a path forward for responsible mining of bauxite and the production of aluminum. As the users of this critical mineral, electric vehicle manufacturers and other downstream manufacturers can play a significant role in raising the standards of global supply chains. Governments, too, play an important role in ensuring that their natural resources not only create jobs and boost wages, but also protect the local communities and the environment that surround the mines.

To accomplish this, Mighty Earth makes the following recommendations to mitigate the harm of bauxite mining and aluminum production on local communities.

1. The bauxite mining industry and its customers need to uphold free, prior and informed consent (FPIC) of Indigenous and local communities, including the right to withhold consent to the development of bauxite or aluminum infrastructure. The industry also must ensure adequate compensation for communities who experience harm.
2. We strongly encourage all active players to join the Initiative for Responsible Mining Assurance (IRMA) and adopt its standards. IRMA is the only independent third-party program for assessing industrial-scale mine sites for all mined materials. It is governed equally by the private sector, communities, civil society, and workers.
3. EV manufacturers must audit their full supply chains all the way back to the mines where the bauxite originates.
    a. In the U.S., this audit is required under the U.S. Inflation Reduction Act, and automakers must complete this process if they want their customers to qualify for a $3,750 per vehicle government tax rebate.
    b. In the EU, the EU Battery Regulation originally required this audit for bauxite, but it was eventually removed. It is possible that the EU will modify this rule in the future to include bauxite if the demand for aluminum continues to grow.
4. Bauxite mines and their customers must ensure that the “mitigation hierarchy” of Avoid, Minimize, Restore, Compensate, and Offset is followed.
5. In the four countries examined in this report, each respective government must find ways to enforce and expand existing labor and environmental laws to further minimize the negative environmental impacts on local communities. In some cases, governments should repeal laws that reduce the protections previously provided to local communities.

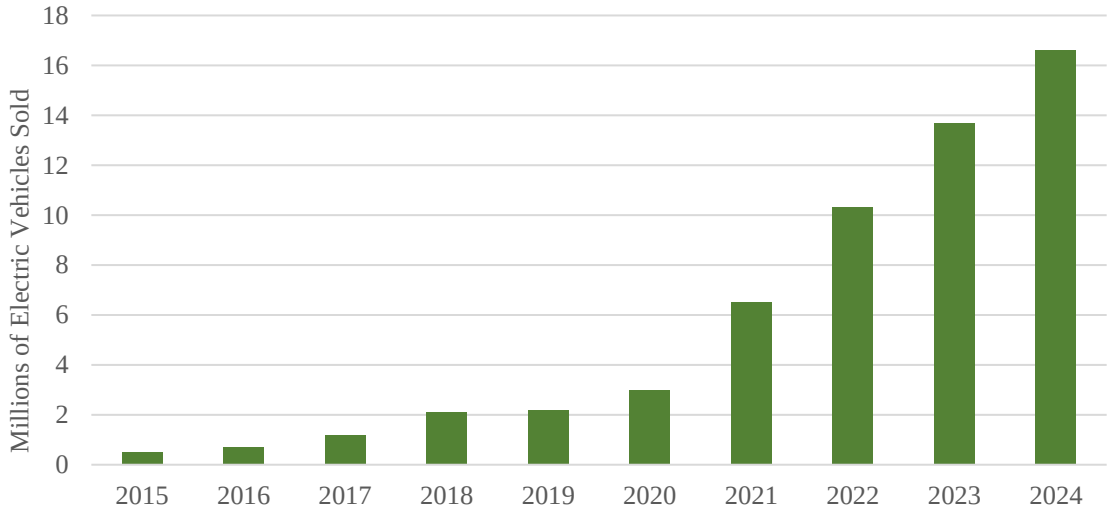
II. Introduction: Bauxite Deforestation and Global Supply Chains

> "*The future of mobility is electric … and the metal enabling this green electric future is aluminum.*"
> European Aluminum Association[3]

> "*It is imperative that manufacturers of electric vehicles understand their bauxite and aluminum supply chains, from mine to vehicle, and that they make a targeted effort to ensure that the metals they are sourcing are not leading to deforestation, polluted waterways, and human rights abuses.*"
> Matthew Groch, Mighty Earth

Electric vehicle production has increased exponentially in recent years, rising from a mere 0.5 million cars sold in 2015 to 16.6 million in 2024 (see Figure 1). This represents a 3,200% increase in electric car sales.[4] Among all new cars sold in 2022, electric vehicles encompassed approximately 14%, rising from 5% in 2020. By 2030, experts predict that a quarter of all new car sales will be electric.[5]

Figure 1: Global Electric Car Sales



Source: International Energy Agency

The advancement in electric vehicle production could significantly reduce the use of fossil fuels and the emission of greenhouse gases, but this production boom also has significant challenges, including its reliance on critical minerals like aluminum, which is derived from bauxite.[6] The shift to more aluminum in automobiles, especially electric vehicles, is due to aluminum being lightweight and durable, allowing for more fuel efficiency and longer driving ranges; it can also help with "thermal conductivity, facilitating heat dissipation and maintaining optimal battery temperatures," which can help prevent overheating.[7] As a result, electric vehicles use about 25-27% more aluminum than traditional vehicles,[8] and battery electric vehicles use about 85% more aluminum than their non-battery counterparts.[9] Car manufacturers today utilize about 18% of all aluminum produced across the globe, and the demand for aluminum is expected to double by 2050.[10]

Aluminum is also recyclable, which can help reduce automakers' reliance on bauxite mining in the future, and there are ongoing efforts to achieve 100% circularity, where old aluminum is recycled and used in new applications without a decrease in performance. However, the industry will continue to need new aluminum in electric vehicle production as overall demand increases. Even if electric vehicles experience a slump in demand, the amount of aluminum needed for traditional vehicles is also increasing. Although a decrease in the number of automobiles is possible with increased investments in public transportation and other measures, the absolute number of automobiles, and therefore aluminum needed, will likely continue to increase.

Turning bauxite into aluminum is a multistep process. For simplicity, there are generally three major steps.[11] The first step is to mine the bauxite. This involves the use of heavy machinery that strips large surface areas to access the bauxite, which can cause significant deforestation if the bauxite is located in forested areas, and the runoff from this open cast mining can lead to the pollution of rivers, streams, and other bodies of water. In fact, one bauxite mine in Brazil resulted in the clearing of 250 football fields of forested area every year for several years.[12]

Once the bauxite is mined, the second step is to refine it into alumina. This takes substantial amounts of water, chemicals, and electricity and creates "red mud" as a byproduct that can further pollute waterways with toxins and radioactive substances. According to one estimate, aluminum

production will create 10 billion tons of red mud globally by 2050.[13] In addition, coal is often used to supply the electricity for this process, which in turn pollutes the air and causes higher greenhouse gas emissions.

The third step is to smelt the alumina into aluminum, which can lead to the release of more greenhouse gases, such as carbon dioxide and perfluorocarbons. Over 100 years, perfluorocarbons are thousands of times more powerful than the climate impact of carbon dioxide. Other prevalent pollutants related to smelting include sulfur dioxide and particulate matter, which can harm local populations and nearby trees.[14] Overall, experts estimate that the aluminum industry is responsible for 1.1 billion tons of greenhouse gases in 2021, or about 4% of global emissions.[15]

The initial material, bauxite, can be found in many areas of the world, but this report focuses on bauxite mined in Australia, Brazil, Guinea, and Indonesia. Together, these countries produced 148 million metric dry tons of bauxite in 2023, and they have 14.6 billion metric tons of bauxite in reserves, representing nearly half of all known reserves (see Figure 2).[16]

Figure 2:	**Bauxite Reserves***
Guinea	7,400,000
Vietnam	5,800,000
Australia	3,500,000
Brazil	2,700,000
Jamaica	2,000,000
Indonesia	1,000,000
China	710,000
India	650,000
Russia	480,000
Saudi Arabia	180,000
Kazakhstan	160,000
Turkey	63,000
United States	20,000
Others	5,100,000

**Units are thousands of metric dry tons.*
Source: United States Geological Survey

III. Indonesia and the Downside of Increased Investment

> *"With the establishment of the ecosystem, it is hoped that Indonesia can enter the global supply chain of EVs."*
> Joko Widodo, President of Indonesia, September 2023[17]

> "*We're not opposed to investors, but the [bauxite mining] company's presence here is impacting the environment*."
> Kristop, head of a local village in Indonesia[18]

Indonesia is the sixth-largest producer of bauxite in the world, producing 20 million metric tons in 2023.[19] Much of the bauxite is used domestically, but Indonesia is one of the top exporters in the world, shipping $623 million, or 17.8 billion kilograms, to the world in 2022 alone.[20] Bauxite mining is expected to expand in Indonesia further, as the government has set a national goal to produce 600,000 electric vehicles by 2030, which would represent a 10,000% increase from what Indonesia was able to manufacture in the first half of 2023.[21]

To accomplish this goal, Indonesia has implemented many new policies over the past several years. Recently, it banned the export of unprocessed bauxite in 2023, following a similar ban on the export of nickel ore in 2020, in order to force corporations to process the minerals domestically.[22] Indonesia has also streamlined the business permitting process and repealed popular environmental and labor laws to incentivize investment, including eliminating the requirement for environmental impact studies for select foreign investments and changing minimum wage laws.[23] In addition, the country passed a new regulation that would provide tax incentives "to companies that have invested in EV plants, are planning to increase their EV investments, or planning to invest."[24]

Indonesia has also passed laws restricting public criticism and protests against mining companies. One such law states that "anyone who hinders or disturbs mining activities by permit holders who have met the requirements … may be punished with a maximum prison term of one year and maximum fines of 100 million rupiah [$7,000]."[25] Initially seen as a warning, it has been used in

practice to silence criticism. In 2021, 10 people were charged with violating this specific provision, out of 53 total people accused of opposing mining companies.[26]

These government regulations not only lowered labor standards, but the increased mining has had a negative impact on the environment as well. In West Kalimantan, Indonesia, in the southern island of Borneo, bauxite mining is booming, with one mine expanding by 2,144 hectares since 2017. Just about 1,500 of those hectares were forest.[27] According to local reports, "Some people, especially children, have developed rashes and boils, which they attribute to heavy metals polluting rivers and streams" from the mines in West Kalimantan.[28] Moreover, the provincial governor blamed the mines' impact on environmental degradation for causing, or at least exacerbating, deadly floods in 2020.[29]

Image 1: West Kalimantan Mine, Indonesia, 2017, Mighty Earth

Image 2: West Kalimantan Mine, Indonesia, 2023, Mighty Earth. This area experienced about 2,144 hectares of deforestation due to bauxite mining since 2017.

In addition to deforestation, air quality has also suffered under bauxite mining. At the end of 2022, Indonesia had 18.8 gigawatts of coal power plants under construction, which is more than all other countries except China and India.[30] Much of the new construction is tied to electric vehicle battery production. In one example, Chinese aluminum producer Shandong Nanshang announced that it would invest $6 billion to expand its aluminum production on the island of Bintan.[31] The company relies on coal to power its current facility, which accounts for about 43% of Indonesia's electricity grid.[32] The company is reportedly planning to construct 31 additional coal-fired power plants in the coming years.[33] It has announced plans to build a solar power facility to switch to green energy at some point in the future, but only after Indonesia promised the company a full waiver of income tax for the next two decades.[34]

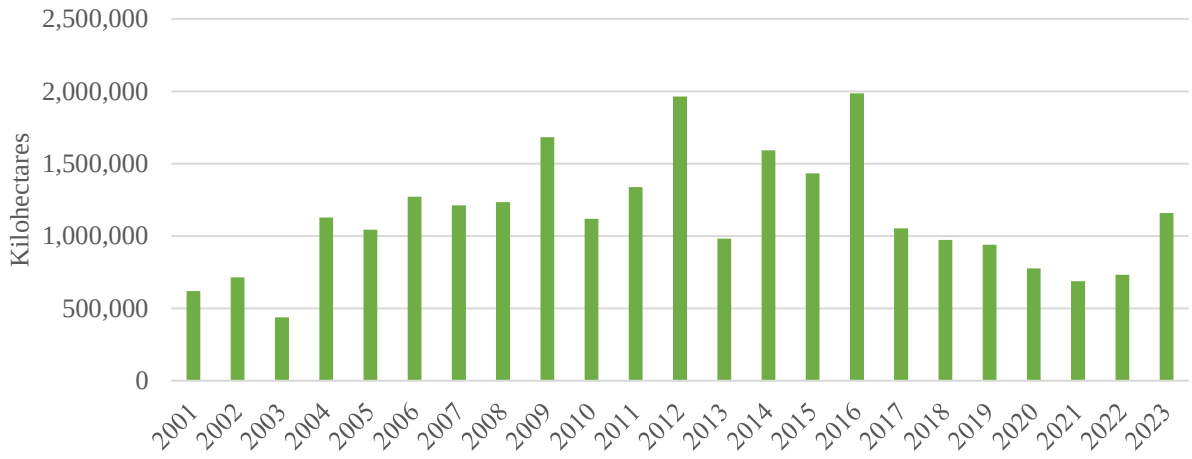
In another part of Indonesia, a local health center examined the impacts of an earlier coal-burning plant and found, "The black particles emitted from the coal burning in Konawe, Southeast Sulawesi, have been observed to spread until three kilometers outside the Konawe regency … Data collected at the Bahodopi community health center in Morowali, Southeast Sulawesi, revealed that in 2018, 52% of the locals who took medical examinations at government facilities suffered from acute respiratory infections."[35]

In yet another example, Adaro Minerals, a major energy producer, pledged to invest capital in Indonesia and signed a Memorandum of Understanding (MOU) with Hyundai to provide it with aluminum, which would lead to the construction of a large coal power plant. According to one think tank, the smelter and coal plant would add 5.2 million tons of carbon dioxide, representing nearly 1% of all of Indonesia's carbon dioxide emissions in 2021.[36] In April 2024, Hyundai ended its agreement with Adaro Minerals after a campaign supported by millions of young K-pop fans called on Hyundai to not procure supplies from Adaro due to its use of coal power plants.[37]

Overall, Indonesia loses a substantial portion of its tree cover each year, mostly due to commodity-driven deforestation, according to Global Forest Watch (see Figure 3).[38] Commodity-driven deforestation is the "long-term, permanent conversion of forest and shrubland to a non-forest land use such as agriculture (including oil palm), mining, or energy infrastructure."[39] Indonesia has made progress in reducing commodity-driven deforestation since its peak in 2016, mostly due to

a reduction in deforestation linked to palm oil production. Still, the annual tree cover loss increased substantially in 2023; automakers need to be vigilant to ensure that the drive to produce more electric vehicles is not contributing to this reversal in Indonesia.

Figure 3: Indonesia's Annual Tree Cover Loss by Commodity-Driven Deforestation



Source: Global Forest Watch

IV. Brazil and Pollution of the Amazon

> "*Today I met with two large companies in the automotive sector to talk about investments in Brazil … These are investments in the future of Brazil and the transition to more modern and less-polluting cars*."
> Lula Da Silva, President of Brazil, January 2024[40]

> "*We cannot have future generations because the children are born and then die. Whole families are contaminated," from the environmental effects of a Norwegian aluminum producer. "I invite these Norwegians to come and bathe in our waters. I challenge them. They have good water there in Norway*."
> Maria do Socorro Silva, head of Cainquiama, Brazil, February 2021[41]

Brazil is the fourth-largest producer of bauxite in the world, producing 31 million metric tons in 2023.[42] Bauxite mining is expected to increase as the Brazilian government enacts policies to boost production. Most recently, the president of Brazil's national mining association stated, "The mining sector is likely to increase investments in the coming years amid a need for greater production of critical minerals to meet demand related to the energy transition."[43]

To increase electric vehicle production domestically, Brazil has announced two key initiatives: import taxes and tax incentives. The former was removed during the COVID-19 pandemic, but the government is planning to reimpose a 12% import tariff for hybrid and plug-in vehicles and a 10% tariff for electric vehicles. Tariffs are set to increase gradually until they reach 35% by 2026.[44] Industry Ministry official Uallace Moreira said about the measure, "What can we do to stimulate local production? Make imports a little more difficult or more expensive."[45]

In addition, the Brazilian government announced plans to launch the Green Mobility Program, which will use tax credits to "stagger the collection of a tax on industrialized products, depending on the energy efficiency of the vehicle models, the recyclability of the products and local

production density."[46] Some estimate this program will cost $3.5 billion reais (about $680 million U.S. dollars) in 2024, some of which will be paid with the newly implemented tariffs on vehicles.[47]

These policies seem to have incentivized investment. In 2024, Chinese company BYD met with Brazil President Lula da Silva to announce a $609 million investment in Bahia, Brazil, with the goal of creating a supply chain for electric vehicles in South America, using Brazil as the hub.[48] On the same day as BYD's announcement, Brazil's president also met with GM, which promised a 7 billion reais (about $1.4 billion) investment over the next five years.[49] Stellanits, an automaker of electrified vehicles for Jeep, Peugeot, and Fiat, promised $6.1 billion between 2025 and 2030, which would be "the biggest (investment) in the history of the Brazilian and South American automobile sector." Altogether, it is estimated that approximately $23.4 billion will flow to Brazil to produce electric and hybrid vehicles in the years ahead.[50]

These new investments will likely lead to an increase in bauxite mining in the Amazon, which covers most of Brazil's 2,700 million metric dry tons of bauxite in reserves. Already, bauxite mining has caused a plethora of problems for the communities surrounding the current mines. An investigative report from Bloomberg in 2023 traced the supply chain of the Ford F-150 sold to U.S. consumers back to the Amazon, where deforestation and pollution have been left unchecked. The report found that much of the aluminum in the vehicles originates from northern Brazil, in Barcarena, where Norsk Hydro dominates aluminum production. Norsk Hydro has been accused of toxic metals pollution in surrounding rivers and streams, which provide water and food for local residents. According to one estimate, waterways were "at levels 57 times greater than what health experts consider safe."[51] Byproducts of the mine are so prevalent that medical staff found at least one woman had "175 times the amount of aluminum considered safe in her hair."[52] Although Norsk Hydro was faced with monetary penalties in the past by the Brazilian government, local residents remain dissatisfied and have filed a lawsuit in the Netherlands.

In that lawsuit, the community is suing for "the incorrect disposal of toxic waste in the Murucupi River, as well as other effects from the presence of Norsk Hydro installations in the region."[53] The lawsuit claims, "Victims have been exposed to toxic residues from the processing of aluminum, which can cause health problems such as increased incidences of cancer, Alzheimer's, skin

diseases, stomach problems and diarrhea." The lawsuit was filed in the Netherlands, due to the filers' frustration at the Brazilian legal system, according to media reports.[54]

Norsk Hydro's Paragominas mine in northern Brazil, in northeast Para, is one of the largest mines in the world. Between 2017 and 2023, this mine expanded by 2,805 hectares, of which 1,861 hectares were once forested, yet much of the area is now covered by orange clay.[55] It was once estimated to have reserves of 1 billion tons of bauxite.[56]

Image 3: Paragominas Mine, Para, Brazil, 2017, Mighty Earth

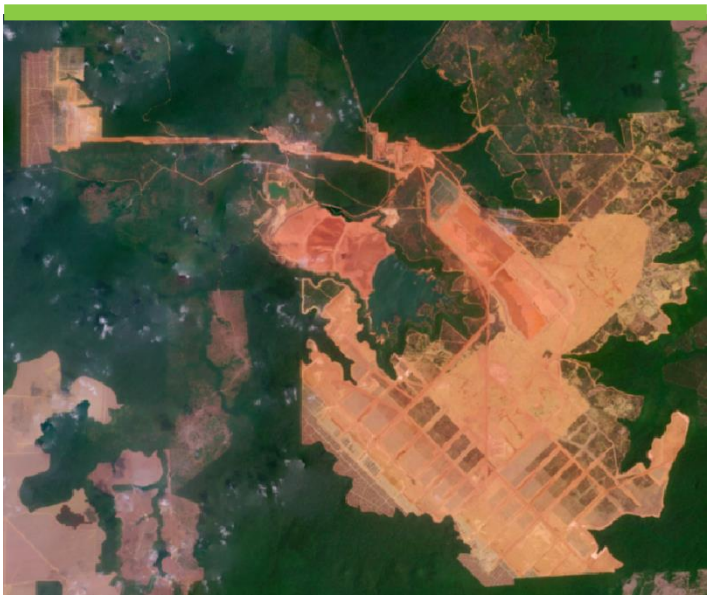
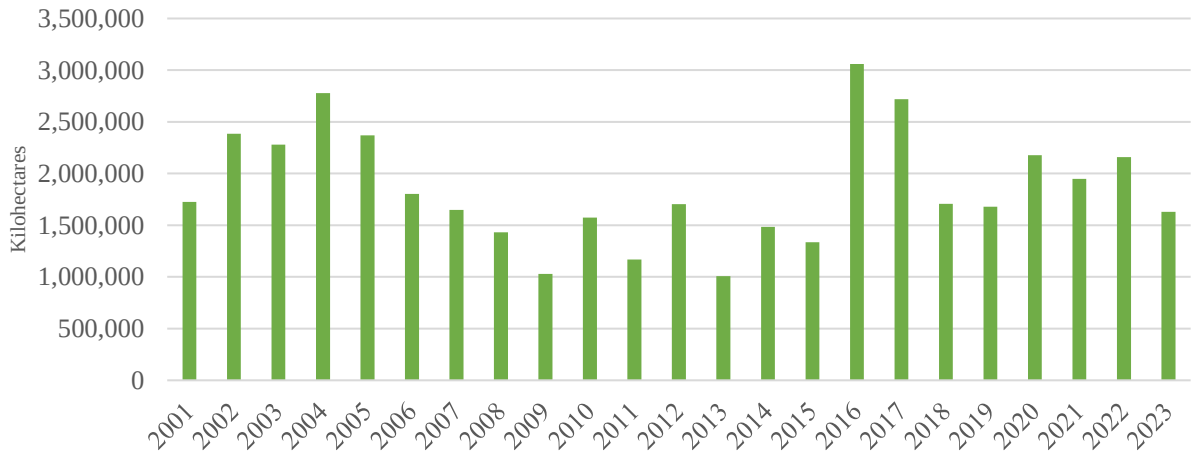


Image 4: Paragominas Mine, Para, Brazil, 2023, Mighty Earth. This area experienced about 2,805 hectares of deforestation due to bauxite mining since 2017.

Increasing the production of electric and hybrid vehicles will require more mined bauxite, potentially leading to further deforestation. According to Global Forest Watch, Brazil has seen a decline in tree cover loss by commodity-driven deforestation by 45% between its peak in 2016 to 2019 (see Figure 4).[57] In recent years, however, commodity-driven deforestation has stabilized,[58] yet it continues to remain the primary cause of deforestation in the country. With Brazil set to increase its production of electric and hybrid vehicles, the demand for bauxite will only rise. It is imperative that locals are not further harmed as Indigenous and traditional communities are already suffering from widescale deforestation, land grabs, and human rights abuses.

Figure 4: Brazil's Annual Tree Cover Loss by Commodity-Driven Deforestation



Source: Global Forest Watch

V. Guinea and the Exploitation of Its Land

> "*Despite the mining boom in the bauxite sector, we have to admit that the expected revenues are below expectations, and [we] cannot continue this game of fools that perpetuates great inequality in our relations.*"
> Mamady Doumbouya, Interim President of Guinea, October 2022[59]

> "*What causes others joy elsewhere is what is causing us to suffer,"* in reference to a bauxite mining company's impact on the local community.
> Aboubacar Dembo Diaby, leader of a village in Guinea[60]

Despite being a relatively small country, Guinea is the second-largest producer of bauxite and has the Earth's largest reserves. Much of the bauxite is exported raw due to the lack of refineries and smelters in the country. In 2023, Guinea exported 48 million metric tons of bauxite ore, most of which went to China. In fact, China – the world's largest bauxite importer – received more than two-thirds of its bauxite from Guinea.[61]

Guinea has had a tumultuous history, most recently in 2021 when military commander Mamady Doumbouya led a coup to oust Guinea's president Alpha Conde. President Doumbouya asserted in 2022 that the profits from mining bauxite were not meeting expectations and pressured mining companies to expedite the construction of bauxite refineries,[62] which can sell refined bauxite for six to seven times more than unprocessed, raw bauxite.[63]

In 2022, Guinea only had one alumina refinery, owned by Russian company Rusal. Guinea's two largest producers of bauxite, Societe Miniere de Boke (SMB) and Compagnie des Bauxite de Guinee (CBG), had no active refineries in the country. The Guinean government in 2022 required both companies to submit plans and detailed timetables for the construction of refineries. "The respect of basic agreements remains a nonnegotiable for us," President Doumbouya told SMB and CBG during a hearing in late 2022. "You and I can no longer continue this fool's game that perpetuates great inequality in our relations."[64]

In 2024, Guinea Alumina Corporation – owned by the United Arab Emirates – announced a plan to build a refinery that would refine 1 million tons of bauxite per year.[65] In addition, SMB also announced a $1 billion investment in Guinea over five years to build out river terminals and to build more ships.[66] Still, Guinea is expected to continue exporting unprocessed bauxite as the construction of refineries and smelters takes years to complete.

Many Guineans have not shared in the benefits of bauxite mining. In Boke, Guinea, for example, mining companies have acquired hundreds of square miles of land – once owned by locals and used for farms – to build roads, railways, and ports to transport mined bauxite across the country. According to one study by the Guinean government, "more than 200,000 acres of farmland and 1.1 million acres of natural habitat" will be eliminated by bauxite mining.[67] Moreover, many residents claim that they have received little to no compensation for the loss of land and livelihoods from farming.[68]

In 2019, 13 Guinean villages filed a complaint alleging that CBG violated their rights and did not provide adequate compensation to local residents. The complaint was filed against the International Finance Corporation (IFC), a division of the World Bank, which provided a $200 million loan to CBG.[69] Three nonprofit organizations filed the complaint on behalf of the villages, vividly expressing the negative impact of bauxite mining on their communities:

> "*Complainants state they have witnessed an unprecedented decline of wildlife and even the total extinction of some species in the region. They believe that water pollution as well as the impacts of mining infrastructure, notably mining roads and the railway lines crossing fields and forests, are probably the main causes. The decline of animals and fish has also significantly contributed to the degradation of livelihoods since communities largely depended on fishing and hunting, in addition to agriculture*."[70]

As satellite imagery shows, Guinea has seen extensive environmental degradation as bauxite mining expanded. In Boffa, Guinea, a town and subprefecture located along the coast, a mine expanded by more than 8,500 hectares since 2017, with more than 6,000 hectares once being forested. Much of the natural habitat and farmland are now filled with orange clay and mud. In

addition to environmental degradation, there have been concerns around labor standards. Protests, for instance, have been fairly common in Boffa, where local residents and miners have demonstrated against mining companies' operations by erecting barriers, citing employment discrimination, low salaries, and unfair dismissals.[71]

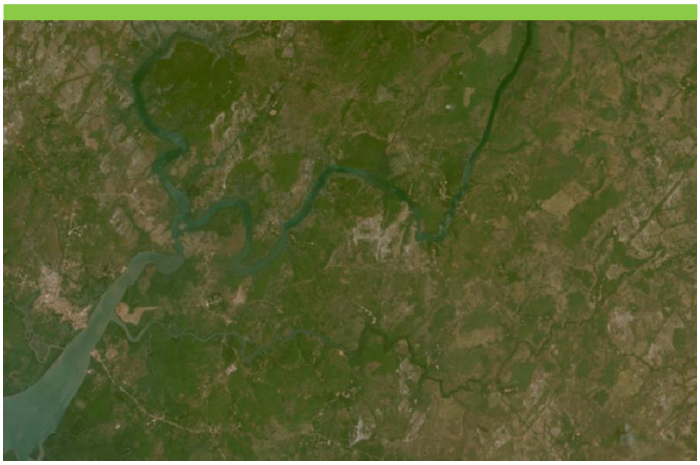


Image 5: Boffa Mine, Guinea, 2018, Mighty Earth

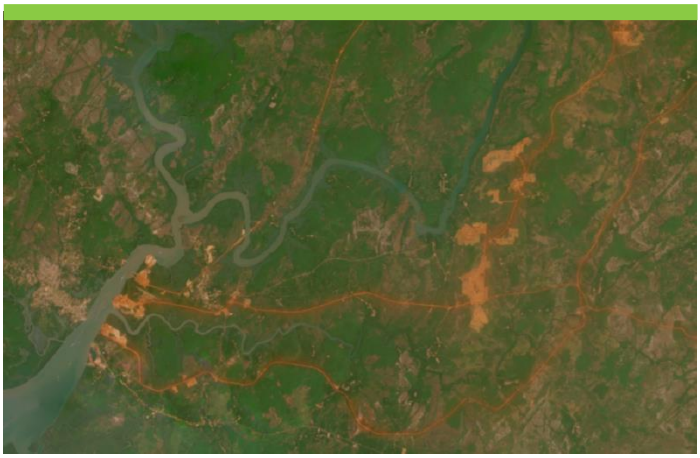


Image 6: Boffa Mine, Guinea, 2024, Mighty Earth. This area experienced about 8,500 hectares of deforestation due to bauxite mining since 2018.

The primary driver of tree cover loss in Guinea[72] is "shifting agriculture."[73] Commodity-driven deforestation has not been a major problem in Guinea historically. Although it is unlikely that Guinea will become a major electric vehicle producer in the near future, Guinea has the world's largest reserves of bauxite. Many electric vehicle producers will source their aluminum produced from bauxite mined originally in Guinea, and this increase in demand will place more pressure on mining companies to extract more bauxite.

VI. Australia and 1,000 Cuts

> "*Australian consumers have spoken – they want access to electric vehicles (EVs). But this appetite to get more EVs on the road has been constrained by supply …* "
> Chris Bowen, Minister for Climate Change and Energy, and Catherine King, Minister for Infrastructure, Transport, Regional Development and Local Government, April 2023[74]

> "*The proposal for one of their two [bauxite] mines directly borders people's property in Dwellingup, and it also encompasses some of our most precious forests … We have had enough of Alcoa and the desecration of our forests over the length of the Darling Range for the last 60 years."*
> Jennie Wise, spokeswoman from the Dwellingup Discovery Forest Working Group[75]

Australia is the largest producer of bauxite in the world and has the third-largest reserves, producing approximately 100 million metric dry tons each year.[76] Unlike other countries discussed in this report, Australia already has an established aluminum industry. In fact, Australia is the largest exporter of alumina, and aluminum is the country's largest manufacturing export.[77]

In 2023, the Australian government published its first National Electric Vehicle Strategy,[78] which has three strategies:

1. Increase the supply of affordable and accessible EVs;
2. Establish the resources, systems, and infrastructure to enable rapid EV uptake; and
3. Encourage increased EV demand.

To do this, Australia is proposing several measures, including a new fuel efficiency standard that would incentivize automakers to sell more fuel-efficient vehicles, and that standard would tighten over time. The government is also focused on establishing standards around recycling, reuse, and stewardship to reduce the need for more mining.

However, very little attention has been given to local and Indigenous residents who may be affected by bauxite mining. In 2020, Alcoa, a bauxite mining company, was in the process of negotiating an expansion of its operations in Western Australia's South West forests. Many local residents strongly opposed the expansion. "The proposal for one of their two mines directly borders people's property in Dwellingup, and it also encompasses some of our most precious forests," said a spokeswoman from a neighboring town.[79] "We have had enough of Alcoa and the desecration of our forests over the length of the Darling Range for the last 60 years."

Despite the opposition, the Western Australian Government approved Alcoa's plan in 2023, allowing the company to clear 800 hectares a year for mining.[80] This land is widely recognized as the world's most biodiverse temperate forest, housing 800 plant species and 10 endangered animal species.[81] "The primary cause of deforestation in Western Australia's South West forests is bauxite mining," according to a new study. "Bauxite mining has cleared at least 32,130 hectares of publicly owned forest … and fragmented 92,000 to 120,000 hectares of the Northern Jarrah Forest up to December 2019, and the rate is accelerating."[82]

Bauxite mining is also prevalent in Northern Australia, where it is increasingly operated on Indigenous-owned land. A 2021 study[83] highlighted this relationship, showing that the mining on Indigenous lands creates "much concern about biocultural, community health, and livelihood impacts from the loss of access to traditional lands and resources, and the ability to 'care for country.'" In addition, "Native vegetation, including commercially valuable forests, is cleared and typically windrowed and burnt," leaving these communities with much less desirable land post-mining. The study finds that many mining companies are expected to rehabilitate the surrounding land after operations are complete, yet "impacted Indigenous communities' expectations for mine rehabilitation are often not integrated into mine completion criteria."[84]

According to the aforementioned study on the Jarrah Forest,[85] more than 30,000 hectares and associated ecosystems have been cleared and about 100,000 hectares fragmented for bauxite mining.[86] Today, two major bauxite miners – Alcoa and South32 – are now seeking to clear more than 11,000 additional hectares and fragment another 70,000 hectares.[87]

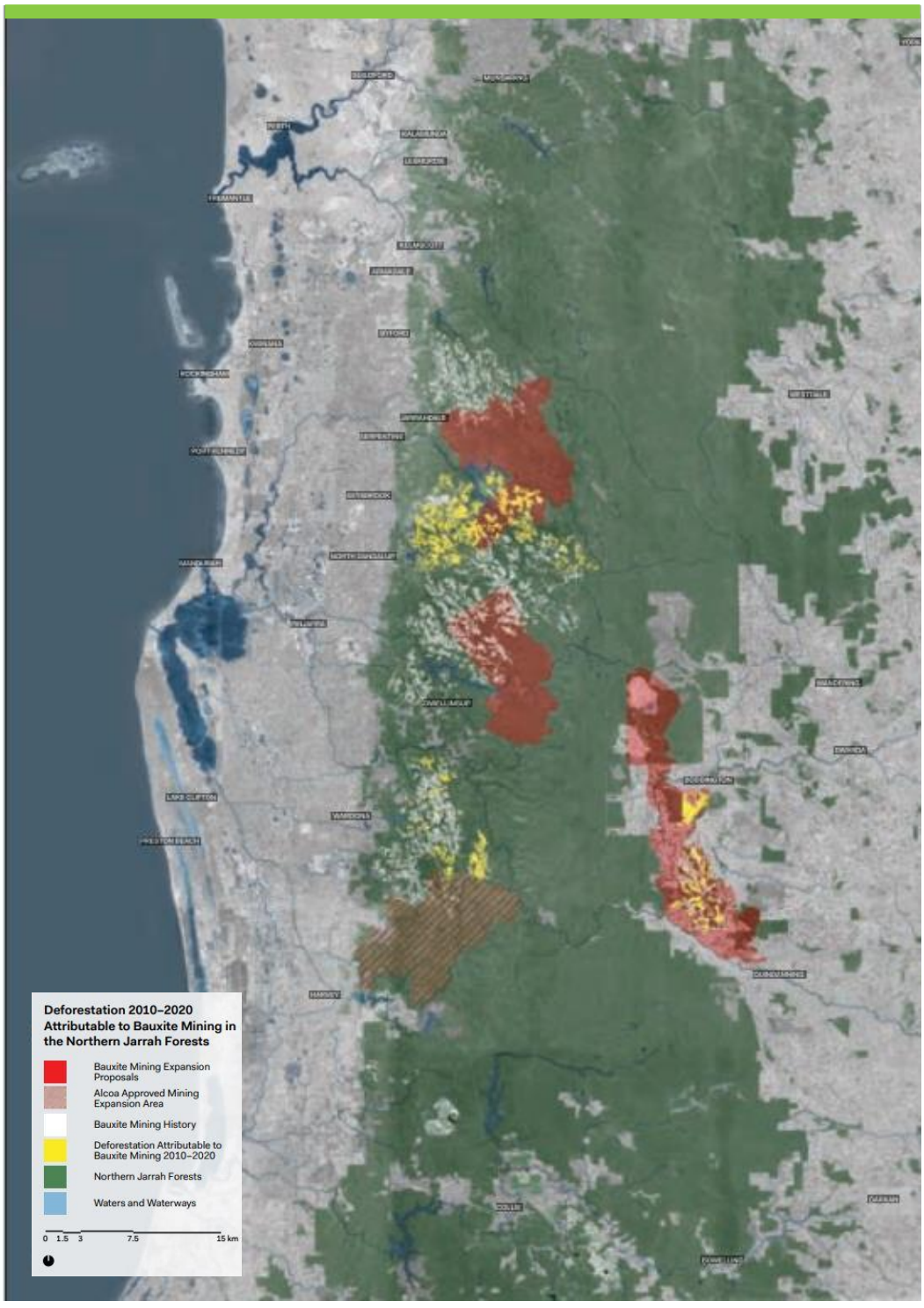


Image 7: The Northern Jarrah Forests Project, "Deforestation 2010-2020 attributable to bauxite mining in the Northern Jarrah Forests."

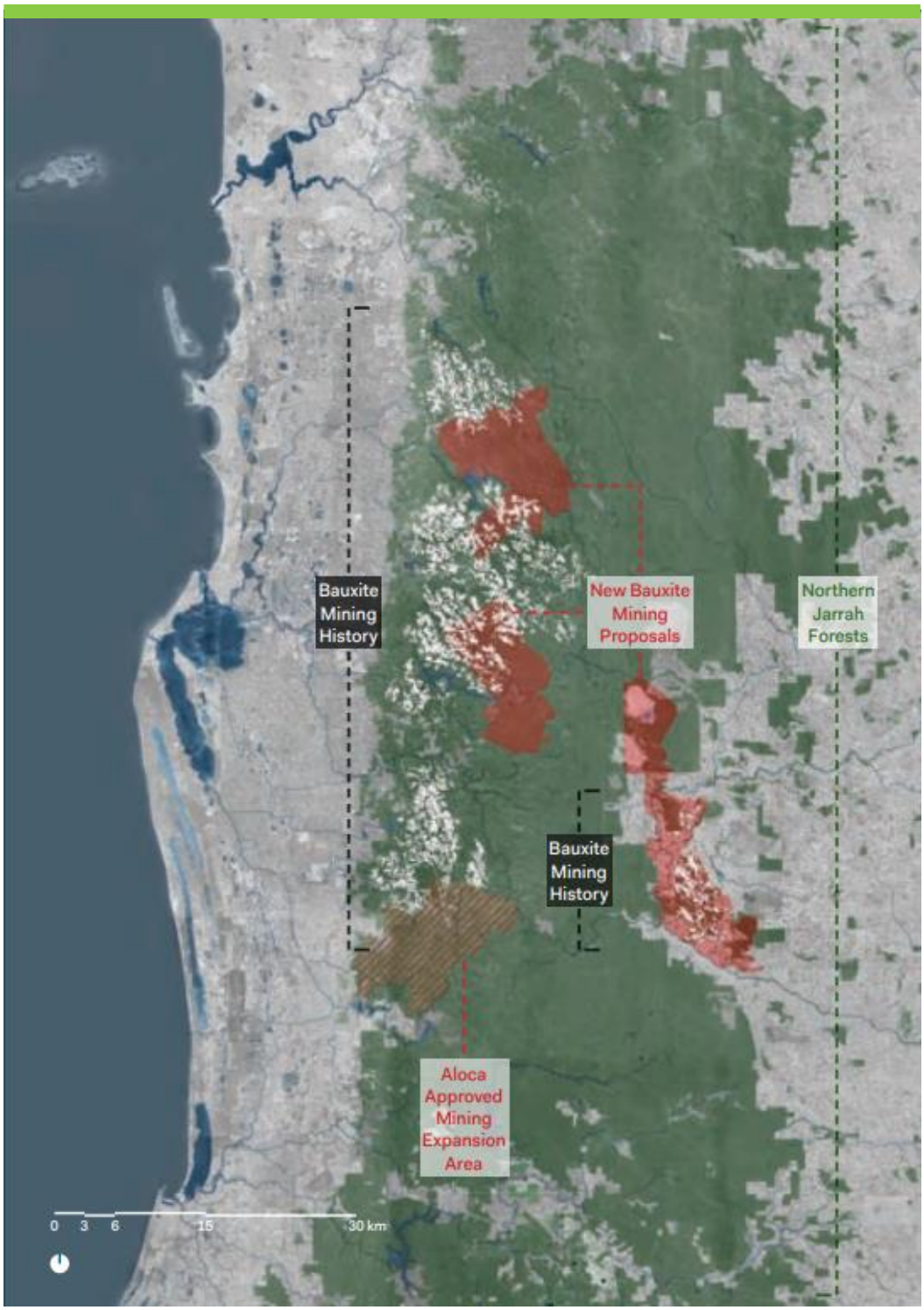
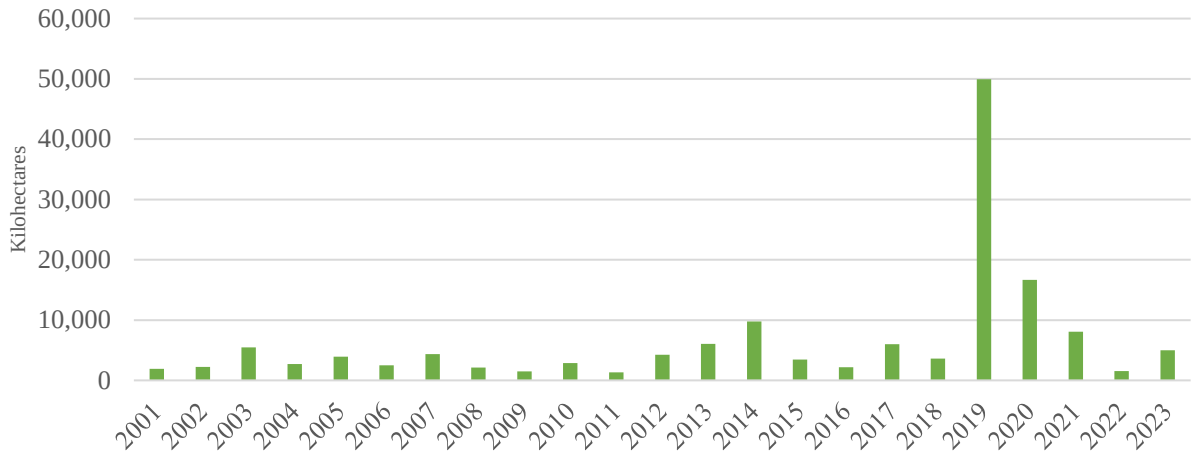


Image 8: The Northern Jarrah Forests Project, "Historic and proposed mining by Alcoa and South32."

The primary driver of deforestation in Australia is a result of forestry and wildfires, which is itself primarily a result of climate change (see Figure 5).[88] Commodity-driven deforestation has not been a major problem in Australia, except in 2019 and 2020. The Australian government already has an established aluminum industry, mining bauxite, refining it into alumina, and smelting it into aluminum. However, Australia's new national strategy may put extra pressure on miners to produce more bauxite. Automakers should monitor the situation and ensure that local residents and the environment are not further harmed in the process to produce more electric vehicles.

Figure 5: Australia's Annual Tree Cover Loss by Commodity-Driven Deforestation



Source: Global Forest Watch

VII. Conclusion

The demand for minerals from the Earth's crust will continue to increase as they become more important in the transition to a decarbonized world. For bauxite specifically, approximately 18% of all aluminum produced is used in automobile production, and electric vehicles utilize about a quarter more aluminum than traditional automobiles. With electric vehicle production increasing exponentially across the globe, including in Australia, Brazil, Guinea, and Indonesia, sourcing aluminum responsibly from bauxite mines is more important now than ever before.

There is a path forward for responsible mining of bauxite and the production of aluminum. Electric vehicle manufacturers and other downstream manufacturers can play a significant role in raising the standards for their supply chains, and national and local governments should strive to ensure their local constituencies are protected from the negative effects of bauxite mining.

Shifting to a decarbonized world is imperative to meet climate and nature goals, but the ends do not always justify the means. The transition from traditional vehicles to electric vehicles should reduce emissions and pollution and make the world a cleaner place. However, it is also important to ensure that this must be a just transition, where local and Indigenous communities are not harmed and responsible mining means precious forests, peatlands, and the environment are protected.

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