

Human Activity behind Unprecedented Wildfire in Brazil: The New Slavery

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Abstract: Wildfires can result from natural causes like lightning, volcanoes, and earthquakes. In Brazil, though, volcanoes and earthquakes are rare. The surge in fires over the past decade is linked to human activities, mainly deforestation driven by foreign interests searching for strategic minerals in low-productivity areas. This extensive mining affects the environment and climate, jeopardizes lives, impacts local birth rates and young women, and ultimately threatens entire populations seeking a dignified life.

Key words: South America wildfire, anthropogenic disturbances, drought, land use, strategic minerals, climate changes.

1. Introduction

Studying wildfire scientifically is quite tricky, even when applying statistical views. Observing the number of wildfires without identifying the area burned will be an incomplete result; it is necessary to know the evolution of the fires and how they changed for a decade or so. If there is dense vegetation somewhere, like in the Amazon, and people start burning the area for many years, the devastation will be smaller or in other places that are not cleared up.

It is necessary to know how agriculture expanded and other human activities, such as mineral exploitation, occurred in the area. The consequent answer from nature is to increase the droughts in the area, stop the water sources, and perhaps increase wildfires. This paper aims to study the enhancement of wildfires in Brazil. Several biomas are being affected by the increase in fires, such as the Amazon, Cerrado, Pantanal, Atlantic Forest, Pampa, and Caatinga biomes [1].

Many of them search for minerals, even oil. Of course, the search differs for each part of Brazil's continental size. Also, people are expanding agriculture with many foreigners and trying to evict the original farmers, buying or invading with the pretense of indigenous

people. Indians in Brazil have been part of the country for a long time and have been assisted by many governments in health and goods. However, some interests outside the country try to destabilize those people, pretending that being alone as a new country would be a better choice if they go ahead. Since those people are not used to the climate or the environment in our wild places, it is difficult for them to manipulate the Indians living further than the cities. Most Indians are supposed to be protected by catholic churches, but it is complicated to move fathers to their secluded places. Instead, they prefer missionaries to bring vaccinations as they did during the COVID-19 time, but they indeed got the disease for those isolated guys [2].

Some variables help us understand the principal component of those wildfires: (1) Fire intensity, (2) Fire recurrence, (3) Burned area size, (4) The mean time interval between fires.

The impacts created by the dry season are an essential variable in this approach, connecting with the enhancement of land use change, with Amazon at 15%, Pantanal at 25%, and Cerrado at 38% [3]. The protected area in Amazon (P.A.'s) is at least 2.5%. Other locations with protected areas burned were Caatinga (8.5%) and Pampa (9.5%). Cerrado and Pantanal

climates are the worst scenarios in terms of impact, and human factors prevail in Amazon. Roughly 55% of burned areas in the Amazon are connected as a tool for increasing deforestation. There is evidence that creating more pasture lands or cleaning the pastures is indirectly associated with the density of the heads of cattle. The gross deforestation rates in Cerrado and Pantanal are lower than in the Amazon.

The neighboring countries also increasing wildfires are Bolivia, Peru, and Colombia. Brazil concentrated along the central road networks, which directed the more accessible delivery of goods and minerals [3].

Peru impacted the central region most by clearing a new Mennonite colony. Colombia heavily impacts protected areas and indigenous territories. With a legalization proposal, the conditions for mines are now illegal, with criminal developments of mines and agricultures opened primarily for foreigners exploiting indigenous people with low salaries and non-health insurance, raising many of the guys against the proposal. They would get rights for the exploitation, and the owners would not want to share their profits [4]. It was an unprecedented activity in Central Brazil and the Amazon, pointing out the restricted mines in those areas [5-7].

Agriculture or pastures in the Amazon are not the main reason for the deforestation near the roads in dense forests, as is the case in the Amazon region. Technically, companies and individuals (not all Brazilians) have mostly been mining in the indigenous lands in the Amazon from 2011 to 2020. Those companies: Anglo American Nickel, Guanhães Mining, Amazon Small Scale Miners (COOGAM), Rio Verde Mining and Exploration of the Amazon, Alta-Floresta Small scale Gold and Gem Mining Cooperative, Jaime de Moraes, Small Scale Miner Para-Rondonia, Amazon Mineral Extraction Cooperative, Claumil Filgueiras Vasconcelos. In the period 2019-2020, some other companies joined those as Sami Hassan AKL Smd Natural Resources, Marupa Mining workers, Daniel Pereira, Samuel Gerivelli, SMS Holding Nereopolis

Station, Tate Gold Miners Union, Denys Carlos Aragao. It is important to emphasize that Brazilian names are sometimes meaningless and are only used to cover up and manage international operations [8-12].

All those pseudo-owners take the charges for environmental trespass, instead of the ‘real landlords’.

However, mineral owners as Sami Hassan and Anglo-Americans are facing lawsuits related to environmental violations in Brazil. At this point, note workers’ skills in such regions are low. therefore the company owners will not offer any kind of security or safety for those working in mines including severe injuries, poisoning due to deal with radioactivity, extra-hours, or any other damage occurring during labor.

A list of minerals with high potential to develop new safe energies are aluminum, copper, chromium, gold, graphite, and lithium, known sites beginning to be exploited. However, our essential reserves are Uranium and Niobium; this last one has all the productivity exported, and nothing stays in Brazil. Due to the heavy exportation for several locations, there is no way to be sure that the prices are reasonable or if it went through any visualization when leaving the country. It is also impossible to know with some kind of supervision if the minerals leaving the region are what they are saying they are. There is no regulation or inspection, and the charts show that Brazil has considerable potential to become a leader in the exportation of minerals. However, most of the mine owners are foreigners, and they engage in the ever-increasing exploitation of minerals without any restrictions on protecting the population from the pollution created by toxic minerals, waste from factories, and the increasing contamination of aquifers. Typically, Brazil has allowed such indiscriminate exploitation without any intention of applying the profits made by these companies to projects for the betterment of the people in the vicinity of the mines. The wealthy owners from those companies are involved local politicians, it is a normal practice in Brazil.

Any serious researcher who tries to find traces or even references to such companies runs the severe risk

of having his or her writings rejected by national or foreign journals. The death of the poorest populations, or the congenital deformities of babies, is completely ignored, showing that Brazilian governments are more concerned with filling their lives with entertainment and money than with the development of their population with good culture and learning. The level of education, even in centers of excellence such as Rio de Janeiro and São Paulo, has declined exponentially, and Brazilians have been on the vertiginous path of contempt for learning since they were teens. Mass entertainment, using different tools to complete the work required by some of the most demanding teachers, has transformed the new generation into people who do not even respect their education. There is a growing dismantling of culture and knowledge as being too racist or with inappropriate language for teenagers. We assume there is also an increasing appreciation for self-improvement and entertainment techniques. In the following sections, we are going to prove that many of the proclaimed climate changes in our country have been a narrative to hide the real problem in any country and uneducated people who are more likely to just destroy the environment with the speech that in 100 years none of us will be alive. The following paragraph is about the wildfire enhancement in the country.

2. Deforestation and Wildfire Comparisons in Brazil

The authors in Ref. [13] notice¹ that deforestation is the central menace threatening the primary forest across the Amazon; critical land use designations are the hope for the long-term conservation of critical remaining forests.

The most important are the protected areas and indigenous territories. The study considered nine countries of the Amazon biome, including Brazil, which has a vast area of 883,7 million hectares (Fig. 1). The primary forest loss over the past 5 years, (2017-2021) was reviewed. Then, it was distinguished, fire and non-fire, forest losses. For non-fires, we consider natural events such as landslides or wind storms the

best proxy for non-human-caused deforestation the region is divided into three main areas:

1) Protected Areas: cover 197 million hectares (23.6% of Amazon);

2) Indigenous Territories: cover 163.8 million hectares (19.6% of Amazon);

3) All remaining areas outside (1) and (2) cover: cover 473 million hectares (56.7% of Amazon).

Resuming deforestation was the primary driver of forest loss, with fire being a smaller subset. On average, the period considered protected areas, and indigenous territories reduced the primary forest loss rate compared with the areas outside of these designations, which were 3 times less if compared with others.

The figure shows the critical results across the Amazon in greater detail, including a breakdown of the Amazon (Bolivia, Colombia, Ecuador, and Peru) and Brazilian Amazon. The authors documented the loss of 11 million hectares of primary forest in nine South American countries of the Amazon biome occurred in the period 2017-2021. The conclusion was that 70% of the cases were non-fired, including deforestation and natural, and the rest were fires. The deforestation out of the protected land or indigenous territories was 78%.

Fig. 2 shows, over the five years, the protected areas in colors, (green) forest loss (0.12%), followed by indigenous territories (0.14%). The forest loss (red) out of both zones was higher out of protected zones, and the fires in 2017 were almost double those in other years.

Maccarthy and Parson [14] linked the 2015 El Niño surge in the Amazon (Brazil) with a significant spike in fires and droughts in the area. Evidence has shown that this correlation was erroneous. We investigated that there was a scenario of intense drought in Northeast Brazil in 2012-2013 that did not cause fires in the region, affected hundreds of cities in the area, and none El Niño occurred in that time interval. The contradiction presented was that the intense drought of the mentioned period affected hundreds of cities in that area. However, there was no presence of El Niño in that period.

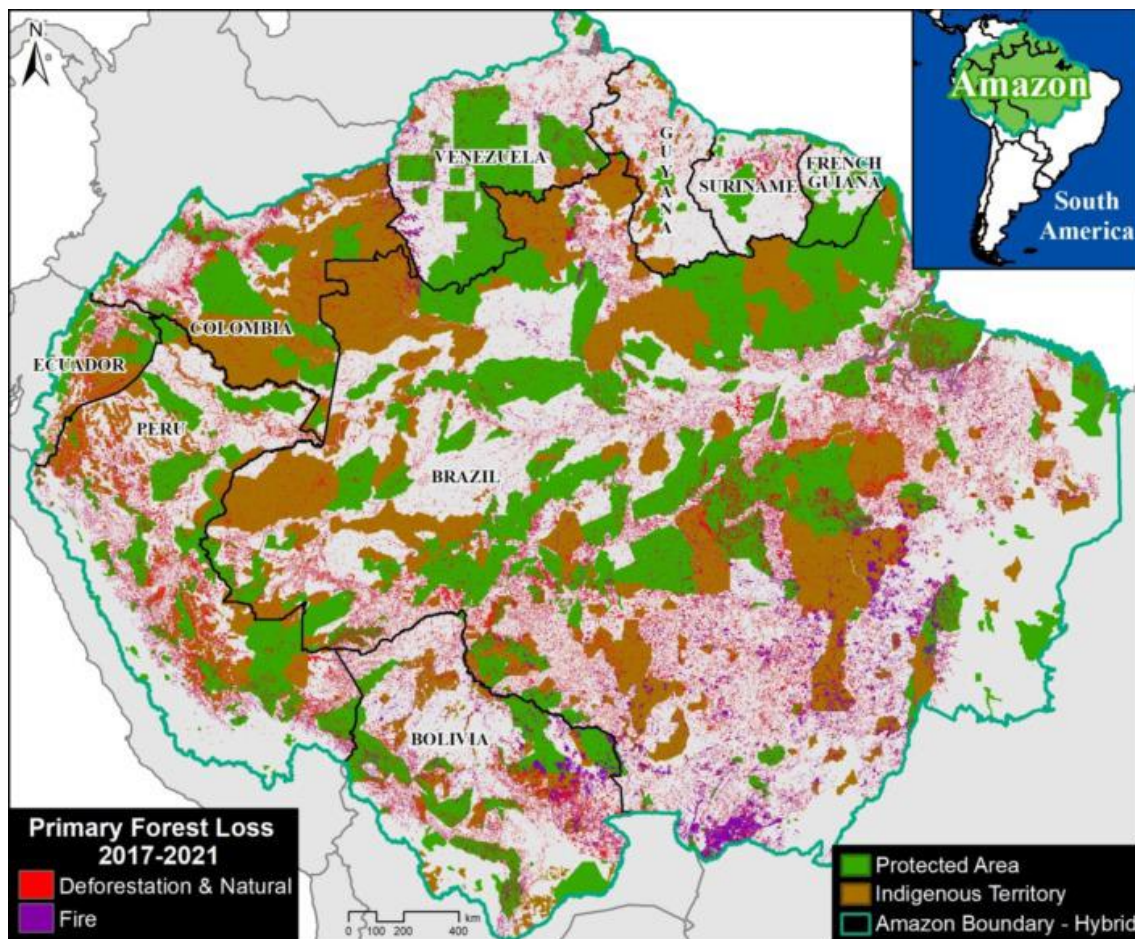


Fig. 1 The primary forest loss and the protected areas, indigenous areas, and outside of these denominations.

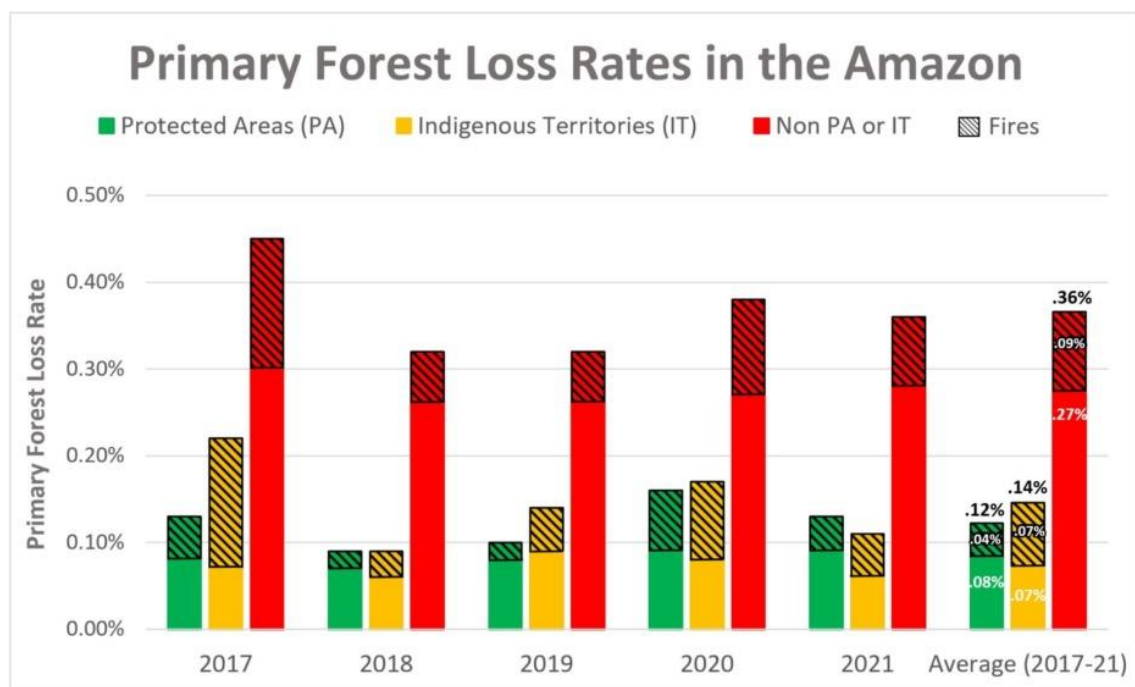


Fig. 2 Primary forest loss rates across the Amazon, 2017-2021 divided by areas, protected, indigenous, non-PA or IT, fires.



Fig. 3 The fires in the Amazon region and states such as Acre, Amazon, Para, and Rondônia, even in Bolivia. See the connection with the roads nearby.

Therefore, connecting El Nino with the drought or wildfires on Amazon was meaningless. Perhaps a small amount of this phenomena is associated with severe droughts but would never be responsible for direct correlation with each other.

The worst scenario in the event was the tree cover loss due to fires in the Amazon, 2001-2023, with a maximum in 2015.

From Fig.3, we discovered the fires are all connected; the hotspots are along the major roads delineated in the map as 163;220;319 and 364. All the roads appear interconnected and allow an easy flow of materials or the arrival of machinery within the forest. It is possible that the satellite cannot discern the positioning of points for mining due to the high density of trees in these regions recently being cleared for later planting or mining. Therefore, there is a possibility of building

constructions for posterior enhancement of workers' closeness. The enhancement of people around the mines is evident in the continued work in the exploration. They are low jobs when people do not have skills or health care around the places. Workers can quickly bring food, medicine, and goods near the roads.

In Pantanal, the situation is chaotic since the vegetation is quite different from the Amazon. The 2020 drought was the worst since 1970. There was no natural reason for the drop in the river level, and wetlands dried. In 2019, fire spread in wetlands; in 2020, the same areas were classified as grasslands. A percentual of 60% of grassland in the area was burned in 2020, followed by natural forest formation had 15% area burned the savanna location were 14% burned. In a historical average, 2000-2019 and 2020, the difference in the burned area increased by 677%.

In Neto and Evangelista [7] pointed out that human actions in the area (accidental or criminal) started in 2020, and most of the fires were in Pantanal. There is a clear connection with the Amazon fires near the roads and rivers where human accessibility is more straightforward.

The same happened in the Amazon Forest, where 90% of fires were systematically enhanced with 10 km from existing roads and waterways. The drought and deforestation accompanying fires relate to human interference. Now, despite the Environment Minister and donations to protect Amazon and other biomas in Brazil, there is a lack of budgets or workers to expand the probable preservation of fires. Environmental factors such as rain or lack of rain, temperature, fuel loads, wind, and topography determine fire risk and dynamics. These factors can be ignited by land use and land practices, enhancing the risk of fires and their dynamics. Cerrado and Pantanal have climate conditions tied up with human factors that will determine the impact of the fire. In Amazon, anthropogenic interference is a significant factor in the increase of wildfires. We conclude that fires not only in the Amazon but also through the Pantanal, Cerrado, and wetlands were more human actions in the land for pasture and agriculture, or the only point we will study here is the exploitation of the mines.

3. The new “Green Energy” Technologies

Green energy technologies are a complicated issue.

Table 1 shows the minerals necessary to perform a perfect “green” energy.

Solar energy demands 15 elements for the energy transition. Wind energy has 10 elements, and electric cars, vehicles, and energy storage demand 12. However,

green energy needs mines, contaminating the environment as much as traditional energy. The worst would be getting solar wind nowadays, despite enormous benefits, spending a massive amount of minerals exploiting Titanium and Uranium minerals that can harm humans if not man seated well. The increasing problem in Brazil is the low number of qualified people who can work in geological sites or handle nuclear material, even though there are no colleges for people prepared for academic research or the formation of highly qualified students in those fields. The workers in the mining exploitation are unqualified for higher jobs and are employed in lower positions with smaller salaries. Later, we will see that the owners of those companies are all foreigners and minerals, as Niobium has the entire production exported. In Africa, there is an alarming similarity between the enormous mines of diamonds and gold production to send the manufacturer abroad. In history, the most giant diamond found in Africa went to England. Illiterate politicians are transforming Brazil into an ample storage of minerals, agricultural goods, and cattle for foreigners but also for Brazilians. The low education skills acquired in public schools are a huge issue; fewer people want to follow science and mathematics or attend medical schools. There is a high demand for doctors and the difficulty of starting all kind of schools, the need to be well prepared is being blocked by political rules that allow many illiterate people to access the classes, creating turmoil in the learning sciences in Brazil. Some materials in Table 1, such as lithium or cobalt, will deplete in 2060; therefore, new technologies and metal substitution pathways are needed to address potential supply deficits. Some reports point out that

Table 1 Source data from the World Bank (2017) and the American Exploration and Mining Association (2013).

Green energy technology	Minerals required
Solar	Bauxite / Aluminum; chromium; cobalt; copper; iron; lead; manganese; molybdenum; rare earths, zinc
Wind	Bauxite / Aluminum; chromium; cobalt; copper; iron; lead; manganese; molybdenum; rare earths, zinc
Electric vehicles	Bauxite /Aluminum, cobalt copper; graphite; iron; lead; lithium; manganese; nickel; rare earth's; silicon;titanium
Energy storage	same as the electric vehicles

Large-Scale Mines (LSM) can be a significant source of foreign investments, jobs (low skill jobs most) and human development in new areas almost impossible in regions known as inhospitable and far from developed centers due to the difficulty reaching the locations in the middle of forests.

All the supposed advantages of opening new mining posts in the Amazon forests or in other threatened biomes supposedly would bring advantages to the local people and the development of new perspectives such as schools, advanced medical posts, improvements in the quality of life of the population. However, the reality of those claims is far from 'ideal' and the decimation of humans with new diseases, the menace of extermination of wild animals, the clear cut of trees what is bringing changes to the climate in the locations, as observed in the wetlands in Pantanal, which became a green pasture.

The new investments in the infrastructure will not be invested in human safety or people's well-being at the beginning. If the profits on the locations are not what was expected, the owners of those companies will leave a track's devastation behind. Large-scale mines will never occur despite the proposed benefits as foreign investments for the people, jobs, and infrastructure. All the extracted minerals are removed from the found sites and sent to undergo reprocessing to be used in other countries with better economic power and those interested in using those materials. It is missing where the mineral is extracted, precisely the will to expand the companies interested in sending products abroad.

In many situations, the extracted material will return to the country, from once being extracted as raw material, in a sophisticated form, such as a smartphone, computer, or electric car, and the price charged will be at least many times from material extracted in the ground. Strong laws and policies to extract minerals in further locations will only make foreigners comfortable with eventually breaking the rules and paying a small amount of money to satisfy the country. It is worthy enough since what they will earn will be ten times what

they pay to shut up the local people. Due to the geological formation, those structures with essential minerals are located in the most stable continental formations, and it happens most in the Southern Hemisphere, as Brazil, Colombia, Venezuela, and some locations in Africa.

For comparison, let us mention the most sought-after mineral today, Niobium. Brazil has 98% of the world's reserves within its vast territory. Nowadays, all Niobium is removed from Brazil to provide countries that can use the mineral and do not leave any of this material on national territory with the excuse that no companies here can process the mineral correctly. Other countries suffer the same process of becoming mere providers of strategic minerals and becoming dependent and poorer, buying from wealthy owners, the minerals transformed into other instruments used in industries beyond these countries' borders, such as Morocco, Guinea, and Brazil.

So-called green energy technologies have actually been colored red by the blood of workers and miners in remote and hostile regions of the planet. All the products extracted from the earth do not benefit the people who extracted them but rather those who own the companies and industries that use these materials. Unfortunately, the countries that welcome and accept these exploitative companies without demanding any kind of compensation, such as better education for future generations or better health and living conditions for the workers, are, in fact, allowing their own citizens to be decimated by the greed of other nations. Countries with the most mines and soil exploration are in increased violence, corruption, and weak governance, as pointed out in the following places: Central Africa, Middle East North Africa, South Eastern Asia, Central America, and some parts of South America, depending the degree of interest from the company's owners to act in a location. All those spots contradict the fallacy that the mines will bring benefits or development for the region with the deposits. It is possible to draw an equation expressing what occurs between the exploited and the benefited country.

Wealth = minerals extracted and manufactured

There cannot be development in the exploited areas or excellence in the work presented to the citizens. In fact, the more the area is exploited, the more environmental problems will arise, such as pollution of freshwater sources poisoning the soil and animals, whether domestic or wild. The occurrence of newborn deformations will increase.

The occurrence of new diseases without routine treatment will also increase. People in these places will have respiratory and cardiac problems, and other possible diseases will occur due to the unhealthiness of these places. Another cause for concern is that many toxic elements are needed to extract certain materials from the soil, such as rare earth mining, which requires thousands of gallons of acid. Unfortunately, the people recruited to extract these materials do not have any advanced training and often ignore instructions from those in charge of using the instruments. The degradation and poisoning of these places, such as in China, in a place called Dalahai village, has caused such high incidences of lung cancer, brain cancer, and respiratory and cardiovascular diseases among local residents that it is known as the “village of death” [15].

In the following sections, we will discuss the Brazilian problem with Niobium, which we have 98%, and Uranium, which has many locations and is forbidden to be shown publicly.

4. Niobium, Rare Earths in Brazil

Brazil has 98% niobium worldwide. The companies focused in Canada are moving to Brazil and trying to expand the country's economy as a critical mineral explorer and developer. The company declares additionally, “Brazil is a relatively geopolitical neutral jurisdiction access to global off, take unrestricted access to global off-take and funding options, giving their projects the best chance of success with the macro environment” (Grover director) [16].

It implies that the company will focus on taking as much of the minerals as it wants without any further

commitment from the government or the society that will not be informed. It also concerns the lack of concern about the indigenous people's education, health, or any benefit the peasants should have to compensate for the massive loss to the environment those mines will create. The primary sources of Niobium are deposits of pyrochlore and tantalite-columbite. The industry applications include ferro niobium, car bodies, shipbuilding, bridge building, overpasses, and pipelines. Niobium oxides are used in telescopes and camera lenses, electric car batteries, catalytic converters, vacuum-grade alloys in rocket and jet engines, gas turbines, and power generation. Finally, metallic Niobium is used in magnetic resonance imaging equipment, computerized tomography scanners, and particle accelerators. Some unique companies, such as Samarco, celebrate by signing some documents allowing vendors some ownership of their projects. The Summit company also commemorates the reports about the niobium extraction and partial rare earth oxide.

The Hercules north and south projects are located near artisanal mines producing beryl, aquamarine, and spodumene ($\text{LiAl}(\text{SiO}_3)_2$) in economic quantities. It is a prosperous deal for foreigners since Brazil only keeps a small percentage of the production.

5. Radioactive Material in Brazil

Natural radioactivity is a characteristic present in several materials worldwide. The material, including minerals such as uranite, containing Uranium and other radioactive elements, is widely distributed. The occurrence of radioactive material is one of the highest in Brazil worldwide. This mineral contains small amounts of radium, thorium polonium lead, and helium, a natural radioactivity material formed in the soil by volcanic rocks or hydrothermal medium and high-temperature vents. Observing the geological formations in Brazil, such as Poços de Caldas and others mostly around Minas Gerais, it is clear that there is a vast natural occurrence of radioactive material in elevated

amounts in those areas. Despite numerous trials to dismantle the Angra I and Angra II nuclear power plants, Brazil could improve the center of energy production with Germany's cooperation.[17]

Fig. 4 provides the location of mines on Brazilian soil. The biggest problem with those radioactive materials is the waste created. Currently, the waste in Brazil comes mainly from two nuclear facilities, Angra I and Angra II, located on the coast of Rio de Janeiro, which are stored in warehouses near the plants. Brazil is trying to create a definitive repository for nuclear waste, with the perspective that it will be operating for the next 60 years and monitored for 300 years; what is nothing when we are informed that the average life for radioactive materials is approximately 4,5 billion years. There are numerous ways to use nuclear technology in medicine, fruit conservation, food production, industry, poisoning detection, spatial exploration, electric energy, water desalinization, pest

control, and finally, radioactive tracers make possible the monitoring of plants' metabolism. Fig. 4 shows nuclear facilities and waste repositories in Brazil. Early in the 60's, some scientists' influence on the Brazilian nuclear program was criticized and boycotted by "friend countries" where other scientists thought the atomic energy would only make bombs. They even raise questions about the capacity of Brazilian scientists to create a safe environment for nuclear power in Brazil. Fig. 4 shows where Uranium is being extracted; however, there are unknown locations for the public since exploring these minerals is very important to the world.

Many reports claim that other places pursue Uranium or Thorium but fail to show the supposed locations worldwide. [18]

The geologists can point out there are not many worldwide locations that can have the potential required to have uranium.

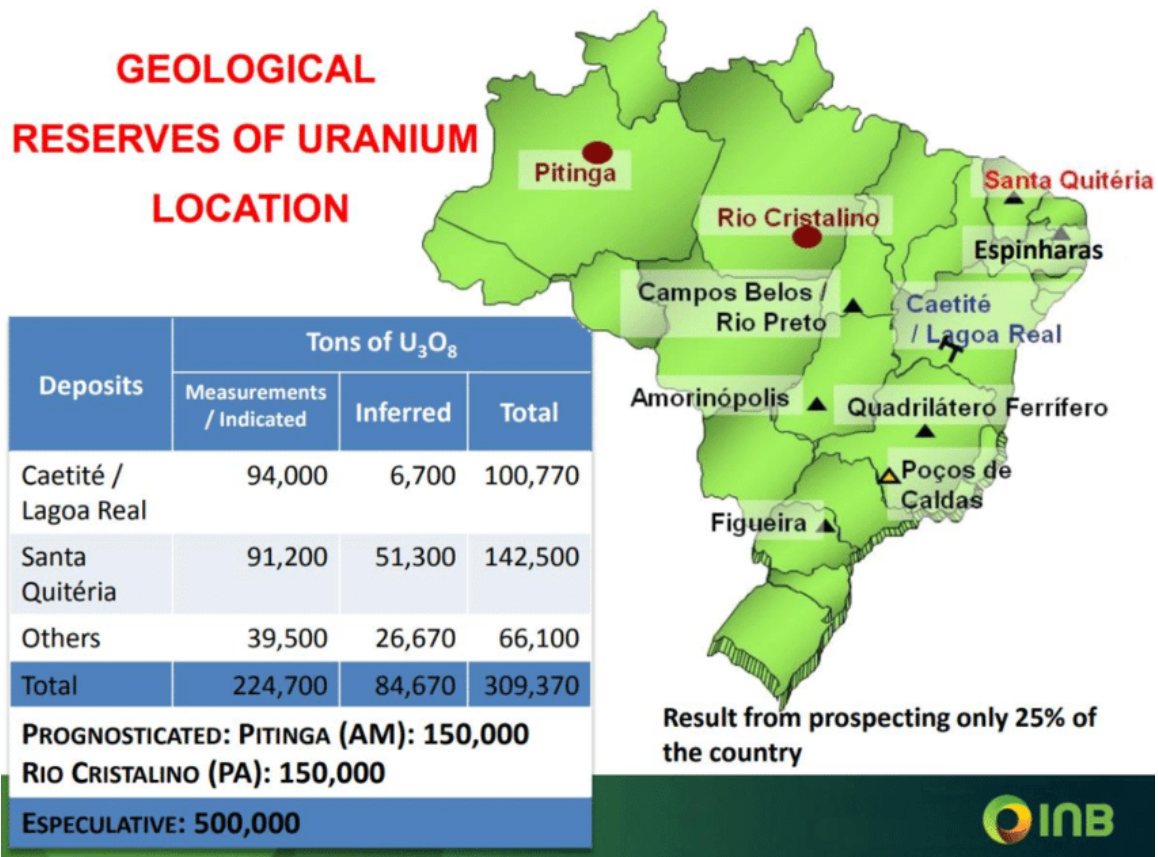


Fig. 4 The locations of Uranium and its measurements.

In 1945, the first agreement was signed with the United States, which provided for a supply of 5,000 tons of monazite annually, which could be extended up to ten times. The National Security Council denounced the deal three years later because there was no clear U.S. benefit return in exchange for the monazite. Exports were interrupted, demonstrating the government first act of concern: safeguarding raw nuclear materials in Brazil. Scientists that time earlier, as in the 60s, pointed out Brazil was sending strategic minerals for free, without any payment or compensation, trading plastic tools for monazite sand in Guarapari (E.S.); Brazil is the second country reserves of thorium apparently only below India. However, the list published cannot be trusted since it displays the USA as the 5th place in strategic reserves in a place famous for nuclear testing in the middle of the country [19].

Niobium has mineral occurrence in Brazil around 98%, and all its production is sent out of the country. Not many Brazilian companies operate mineral reserves, and we send the production abroad. Remember that in Brazil, only the government can exploit the subsoil, as a law was made in the 50s; since then, anyone has been forbidden to exploit mines in Brazil, and all the permissions and mines belong in principle to Brazil.

Remember, it is just one of the strategic minerals mapping; however, we have a considerable amount of other minerals, however, this paper is mainly show this richness is not benefiting the people in Brazil; instead, there is an enhancement of old politics to keep people unaware and away from the knowledge about it. There is a substantial political interest in the topic, and many politicians are getting benefits from foreign companies to keep the people quiet.

6. Exploitation of Minerals in Brazil, Anthropogenic and Environmental Consequences

Mining is a crucial part of Brazilian economy and has been likened to “new slave labor” for the local populations. Recently, Brazil has become a global

leader in agriculture and livestock farming. The country mild seasonal transitions facilitate this growth, except for harsher winters in the south. Modern farming practices’ have enabled significant advancements in both sectors.

Among other minerals, it is the largest producer of iron, ore, and manganese, a major exporter of gold and copper and many other materials, pursuing 40% of Tantalus reserves; Brazil produces 80 different mineral commodities: iron ore, gold, manganese, copper, nickel, tantalum as Niobium and Uranium and thorium strategical minerals. Mining in Brazil brings little profit to the country.

There are no private investors because, in Brazil, all mineral exploration has to be done by the government. The strategy was to sell Vale to international investors, and thirty or more companies are exploring the country in various regions according to the geological data of each explored location. However, the workers available for mining are people with no technical training and are not qualified to use the tools safely. Companies withdraw mining licenses but will face unqualified people with poor health and performance qualities beyond the most basic ones that allow a human being to live.

Therefore, many do not even know that they are signing contracts that grant them nothing more than an unhealthy place to live, overtime work in unhealthy places, with no hygiene and no health care. Children born in these places already have some kind of physical or mental defect and are raised without any concern for developing any type of education. The objective is actually to have more people work in these mines. Despite all the supposed protection, there is an exploitation of the poor people who, under foreign owners, suffer all kinds of abuses. It most happens in remote areas of Amazon and central Brazil. Studies estimate that 370,000 people are working in awful conditions, including minors. They call it artisanal mining, but the results have been physical violence, bondage, and all kinds of exploitation since the 1960s.

The isolation of mining sites allowed many neighboring countries to come into the slave work in the harsh conditions imagined. Although modern literature points out those bad conditions, it does not have any real solution for the problem of people living far from cities. The answer for people far from roads, shops, or medical assistance is to go beyond reality; workers are exposed to various health risks, some living in overcrowded and unsanitary shacks without clean water, toilets, electricity, or ventilation. Food, medicine, education, communication, personal protective equipment, or self-contained self-rescue equipment is lacking. It is not clear if those guys are connected somehow to the owners or if they have contracts or any kind of insurance if they are badly wounded. Although the report for 2023 is optimistic about the last measures, as with many other issues in Brazil, there is no solution for the problem. Below are the prominent companies with low commitment to human safety, and we remind you that not only the people working in the mines suffer from the issues but also their families.

- Anglo American;
- Belo Sun–Canada;
- Arcelor Mittal -Luxembourg;
- Vale -Brazilian conglomerate with 30 countries and 45% of stocks);
- Hydro -Norway. This company made a report pointing some solutions, but they said the costs would be so high that they would not be competitive with other companies that will not follow the necessary procedures;
- Samarco -Australia BHP Billington & Vale;
- Tombador , Iron – Australia.

Together, those companies account for 90% of the sources of pollution, fires, and devastation in Brazil. The owners typically get an easy license from Brazilian authorities to operate, violating Brazilian laws and security rules. No political party is engaged in doing a break or stopping those foreign companies. It is supposed to be part of the development of Brazil, but,

in fact, it is a significant destruction of the environment that surpasses the rules or worries about human lives [20].

The consequences of mineral exploration will affect local residents and the environment to a greater extent, altering local biomes, destroying natural flora, polluting water sources, and causing diseases resulting from the methods used to prepare minerals extracted from the ground for safe export. The financial return will not be used by local populations but by politicians and civilians who demand a more expensive life than their salaries would allow.

People will not have access to quality education because education will lead to knowledge of how these explorations alter the environment and create a sick population, which is expensive for the current health system. Low school performance, as well as policies to engage people with defective mental quotients, will only harm future generations in these places.

It is urgent to evaluate higher focus on the physical and mental human development of these populations.

7. Conclusions

The unprecedented wildfires in Brazil are not naturally caused but stem from human actions. Environmental damage is nearly irreversible in areas like the Cerrado and Pantanal, where livestock farming and agriculture have transformed the landscape. Agriculturists and miners exploit the rich soil and minerals, causing widespread harm. Government corruption and poor policies contribute to the collapse of villages and the decimation of populations near mining sites. The mine owners neglect the well-being of locals and fail to provide necessary safety measures for workers handling radioactive minerals. Gold mining has polluted once-clean rivers and water sources with mercury, poisoning fish over large regions. They contaminate the soil and the humans who work in slavery conditions. Nobody has security in their jobs; they do not have the right tools to mine in such areas. There is no health care stipulation for how many hours

they work, clean housing, or food. The care for young women and children don't exist; there are no doctors or primary education for anyone.

The aim is: "Get as much as possible and give nothing in return; we are already providing a job for those no skilled guys"

Any protest by humble workers is severely punished, with punishments, imprisonment, and even death for those who try to denounce this system of slavery. Children born into this system who may grow up despite all the health impediments will immediately be engaged as a "element to workforce" since they will not have any primary education. Many will be born and die without knowing how to read or write. This merciless system is not denounced because the owners of these centers of slavery pay handsomely to the corrupt politicians who inhabit the places of interest and wealth. The incalculable riches of Brazil do not return any benefit to Brazilians in poverty. On the contrary, they are being decimated so that someone, somewhere, can benefit from the new green technologies that are actually bathed in the blood of so many humble Brazilians.

References

- [1] Wikipedia. 2024. "Brazil Wildfires." [//en.wikipedia.org/wiki/2024_Brazil_wildfires](https://en.wikipedia.org/wiki/2024_Brazil_wildfires).
- [2] [//agenciabrasil.ebc.com.br/en/geral/noticia/2024-09/brazil-accounts-76-South-americaswildfires](https://agenciabrasil.ebc.com.br/en/geral/noticia/2024-09/brazil-accounts-76-South-americaswildfires).
- [3] [//www.maproject.org/amazon-hotspots2021/Maap#153:AmazonDeforestationHotspots2021-MAAP](https://www.maproject.org/amazon-hotspots2021/Maap#153:AmazonDeforestationHotspots2021-MAAP).
- [4] Mataveli, G., Chaves, M., Guerrero, J., Escobar-Silva, E. V., Conceição, K., and de Oliveira, G. 2022. "Mining Is a Growing Threat within Indigenous Land of the Brazilian Amazon." *Remote Sens.* 14: 4092. [//doi.org/10.3390/rs14164092](https://doi.org/10.3390/rs14164092).
- [5] Agência Publica, A. A. B., et al. 2020. "The Mining Map: Who's Eyeing the Gold in Brazil Indigenous Land?" [//news.mongabay.com/2020/](https://news.mongabay.com/2020/11/2020-11-20-the-mining-map-who-s-eyeing-the-gold-in-brazil-indigenous-land/)
- [6] [//www.profor.info/content/does-mining-need-forest-smart-approach-you-bet-it-does](https://www.profor.info/content/does-mining-need-forest-smart-approach-you-bet-it-does).
- [7] Oliveira, U., Soares-Filho, B., Bustamante, M., Gomes, L., Ometto, J. P., and Rajão, R. 2022. "Determinants of Fire Impact in the Brazilian Biomes." *Front. For. Glob. Change* 5: 735017. doi: 10.3389/ffgc-2022.735017.
- [8] www.noaa.gov.br/NOAA-wildfire/wildfire-climate-connection,2024.
- [9] [//rainforestfoundation.org/communities-in-the-amazon-impacted-drought-and-fires](https://rainforestfoundation.org/communities-in-the-amazon-impacted-drought-and-fires),2024.
- [10] [//www.gov.br/mme/pt-br](https://www.gov.br/mme/pt-br).
- [11] [//www.meteoblue.com/pt-br/blog/article/show/40282_drought-in-Brazil-and-its-effects-on-the-Amazonian-region](https://www.meteoblue.com/pt-br/blog/article/show/40282_drought-in-Brazil-and-its-effects-on-the-Amazonian-region).
- [12] [//www.maaproject.org/amazon-hotspots2021](https://www.maaproject.org/amazon-hotspots2021).
- [13] Maccarthy, J., and Parsons, S. 2024. "6 Graphics Explain South America Forest Fires."
- [14] Neto, N. M., and Evangelista, H. 2023. "Human Activity behind the Unprecedented 2020 Wildfire in Brazilian Wetlands (Pantanal)." *Front. Environ. Sci.* 10: 888578.
- [15] Huang, X., Zhang, G. C., Pan, A., Chen, F. Y., Zheng, C. L. 2016. "Protecting the Environmental and Public Health from Rare Earth Mining." *Earth's Future* 4: 532-5. [//doi.org/10.1002/2016EF000424](https://doi.org/10.1002/2016EF000424).
- [16] [//mining.com.au/summit-breaks-into-BrazilianNiobium-rare-earth](https://mining.com.au/summit-breaks-into-Brazilian-Niobium-rare-earth).
- [17] Maiorino, J. R. 2019. "Thorium in Brazil-Universidade Federal do ABC-Santo Andre, SP, Brazil." In *Proceedings of the 19th International Conference on Emerging Nuclear Energy*.
- [18] The niobium controversy. [\revista pesquisa.fapesp.br/en/the-niobium-controversy-2/](https://revista.pesquisa.fapesp.br/en/the-niobium-controversy-2/),2024.
- [19] <https://epocanegocios.globo.com/Brasil/noticia/2021/09/mineradoras-estrangeiras-sao-campeas-de-denuncias-e-conflitos-no-brasil>, 2021.
- [20] Bansal, V., Wallach, J., Brandão, J. L., Lord, S., Taha, N., Akoglu, T., Kiss, L., and Zimmerman, C. 2023. "An Intervention-Focused Review of Modern Slave Labor in Brazil." *World Development* 171: 106362.