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Green Extractivism's New Frontiers

RAPHAEL DEBERDT

During the first three months of 2024, at least 17 people died in the Tulizembe artisanal cobalt mine in the southeast of the Democratic Republic of the Congo (DRC). This mine is one of hundreds dotting the landscape of the region—and among the thousands of sites around the world where critical minerals are being extracted for the low-carbon energy transition. The trend of green extractivism is said to be justified by the climate crisis and the goal of mitigating carbon emissions through this resource-hungry transition.

As it drives investments to continue mining and to open new sites across (mostly) Indigenous and agrarian lands, the transition is also entering new realms and frontiers otherwise relegated to science fiction—the ocean floors and outer space. Overall, these initiatives aim to reproduce the consumption patterns that have defined global warming and the ecological crisis. This time, however, the green narrative promises a sustainable and responsible process in which the impacts of open pits and underground extraction are legitimized and outsourced to remote locations.

The consumption of low-carbon products thus entails a necropolitics in which both humans and ecosystems are sacrificed for the greater good. These sacrifice zones are not new; they did not arise with green extractivism, but recycle past abuses that have defined the mining and oil and gas industries for centuries. The acceleration of extractivism targeting so-called critical minerals—those ores that are necessary for low-carbon technologies and whose supply is constrained by geopolitical, market, and geological realities—is fueling new inequalities and abuses that are hidden behind the veil of planetary salvation.

THE COSTS OF CRITICAL MINERALS

In 2024, the International Energy Agency estimated that by 2040, demand for lithium, graphite, and nickel will increase by 700 percent, 389 percent, and 151 percent respectively under a net-zero emissions scenario. Although researchers have pointed to the high variability of such estimates, the low-carbon transition as currently imagined will certainly require immense amounts of raw commodities, from minerals to rubber. The pursuit of these resources is often described as climate extractivism or green extractivism, since it facilitates the manufacturing of products deemed to be essential for protecting the environment and addressing the climate crisis. The result is a rush to secure minerals from existing land-based deposits and the slow but continuous opening of new frontiers, from the deep sea to space.

The first abuses of climate extractivism are already visible. In Indonesia, where the nickel boom has led to the building of 27 smelters in ten years, up from 3 originally and with 22 more planned, deforestation is rampant. On average, 63 square kilometers are deforested for each plant. The effects are devastating for ecosystems and communities.

Not too far to Indonesia's north, Myanmar's border with China is now dotted with hundreds of holes from which miners extract precious rare earth elements with no social or environmental regulation. Unlike in Indonesia, which established stringent regulations for value addition within its borders, all the ore extracted in Myanmar's Kachin State is sent to its powerful neighbor for refining and incorporation in low-carbon technologies.

In the West, conflicts surrounding lithium mining in Serbia and the United States follow different

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trajectories but the same overarching theme. The Jadar project in western Serbia has provoked a string of public demonstrations due to fears of water pollution, but its operator, British-Australian mining conglomerate Rio Tinto, is pushing forward with the blessing of powerful European countries whose economies rely heavily on the automobile industry. In Nevada, the federal government granted a $2.26 billion loan for a lithium mine on the site of a massacre of Paiute men, women, and children around Thacker Pass. In Chile and Peru, meanwhile, there is growing pressure to mine copper, compounding environmental impacts that legislation has failed to address.

The expansion of the resource frontier is sustained by climate extractivism's techno-utopianism. In pursuit of solutions for climate change, it increasingly mobilizes new technologies to identify and mine ore deposits, accelerating both exploration and exploitation. Artificial intelligence (AI) is being mobilized by small exploration companies in Africa and the Arctic to more efficiently target critical minerals needed for low-carbon transitions. KoBold Metals, for example, has made significant discoveries in Zambia, Greenland, and northern Canada, often flying teams into remote areas to drill where their AI tool identifies deposits with the highest potential.

The frontiers of extraction are being pushed to new limits.

Such unexplored areas often have fragile ecosystems and are under the stewardship of Indigenous or agrarian communities. The dynamics of green extractivism thus reproduce colonial patterns of resource extraction. This time, however, they are justified by purportedly unbiased technological developments and the cause of saving the planet.

An electric vehicle (EV) requires around 173 kilograms of critical minerals to function, compared with 34 kg in a traditional gas-powered automobile. When we also account for the minerals needed for windmills, energy storage systems, and solar panels, the quantities exponentially increase. The problems associated with this massive demand for minerals should not raise any doubts about the need for a low-carbon transition. But they should raise questions about the ways in which this transition is envisioned, marked by a continuation of existing consumption patterns in a green guise.

THE SCRAMBLE FOR CONGO'S COBALT

The southern DRC has become the world's largest supplier of cobalt by far, providing nearly three-quarters of global needs, while also ranking as the second-largest copper producer. The copper and cobalt industries are tied together, since the latter is a byproduct of the former. Cobalt is extracted in immense industrial open-pit and underground mines, controlled by Swiss, Luxembourgian, Emirati, Indian, and Chinese interests. With 17 industrial operations, China is by far the largest beneficiary of cobalt mining in the DRC, sending most of the minerals to transformation units located around Shanghai and Shenzhen for further refining. Other miners, including Swiss-based commodities trader Glencore, extract cobalt from mines that often have been acquired in murky deals and whose operators reportedly have failed to implement environmental best practices.

Some of these companies, including China's CMOC, have recently received CopperMark certification, a standard that aims to improve socio-environmental performance. On the ground, however, little has changed. Pollution is still rampant, conflict with artisanal miners continues, and poverty levels are skyrocketing in a region often described as a "geological scandal" because of the immense wealth of its mineral deposits.

The workers at Tulizembe, on the outskirts of Kolwezi in the southern tip of the DRC, are part of the booming contingent of artisanal miners in the region. For 12 to 14 hours a day, they extract cobalt. Once it is refined and integrated into battery chemistries, the mineral allows EVs made by the likes of Tesla, Nissan, and Audi to avoid catching fire. But the pits in which these miners work are mostly unorganized and prone to collapse, while the uraninite formed alongside cobalt produces radioactive radon gas, further exposing miners to health risks. The sector has also been consistently cited for the use of child labor, a recurring issue that is often misconstrued in racist terms. Siddharth Kara, author of the 2023 book *Cobalt Red*, described entering a Congolese artisanal mine as "dialing back our clock centuries."

Artisanal miners produce 15 to 30 percent of the DRC's cobalt output, or as much as 22 percent of the world's total production. They are often organized under the umbrella of a cooperative controlled by political elites. Although they are

crucial to the extraction of a commodity that is worth billions of dollars and sustains the livelihoods of hundreds of thousands of people, little revenue returns to the miners.

In a mine I recently visited on the outskirts of Likasi, miners estimated that 50 percent of output was taken by the cooperative. Of the 2,000 bags holding 35 pounds each that the miners extract every day to fill up one truck, they receive a minimal amount. At another site, the mineral is washed by women in a lake formed by the waste from a nearby industrial mine. They stand in this toxic soup for hours on end to earn what they estimated to be around $2 a day.

The Congolese Copperbelt is marked by high commodification of land—nearly all of it is now under concessions controlled by foreign interests or domestic political and economic elites. This leaves little space for artisanal miners to try to access deposits that are both geologically and economically viable. Researchers have pointed to conflictual relationships between artisanal miners and their industrial counterparts as the latter encroach on land and even cities. Recently the historic Gécamines neighborhood in the eastern part of Kolwezi was partly razed to make way for copper and cobalt industrial mines. On the western side of the city, artisanal mines have transformed the subsoil of Kasulo into Swiss cheese, prone to regular collapse.

The Congolese government seems helpless, either on purpose or due to structural deficiencies—likely a bit of both. But it is the low-carbon transition and the Western and Chinese thirst for cobalt and copper that have fueled this extractivism. Cobalt production in the country has almost tripled since 2010 as the DRC finds itself at the center of geopolitical competition. In this context, artisanal production is often deprecated as dirty and unethical, resulting in the othering and exclusion of millions of subsistence workers, while foreign-owned industrial mines reap the benefits of the shift to low-carbon consumption patterns.

Space and sea ambitions

Far from the African Copperbelt, the frontiers of extraction are being pushed to new limits. Yet this development is not entirely separate from artisanal cobalt mining: the risks associated with the informal mining sector are often incorporated into narratives justifying new means of extraction. As governments and corporate actors feed the boom in demand for critical minerals, a new set of companies, fueled by a techno-utopian ethos, aim to engage in both space mining and deep sea mining.

In the 2021 blockbuster movie *Don't Look Up*, an avaricious billionaire's desire to mine asteroids leads to the demise of the planet. In fact, given its potentially unbounded amount of resources, space has attracted the attention of techno-futurist entrepreneurs for decades. The rise of a new set of robber barons in the twenty-first century has intensified this trend with their tendency for escapism and eagerness to extract riches beyond the planet—potentially also beyond the survival of earthbound populations.

In theory, capturing one asteroid could supply the Earth with immense quantities of critical minerals, including those needed for a low-carbon transition. Huge numbers are thrown around—the near-Earth asteroid Anteros could harbor $5 trillion worth of platinum, according to some estimates. But technology has yet to provide the necessary means to mine these giants.

These projects raise other concerns. A booming space industry would require launching numerous spacecraft, generating significant pollution, including greenhouse gas emissions, ozone-damaging chemicals, and soot particles released at high altitudes. And at a time of geopolitical competition among rival powers, the development of a conflict-free space mining industry is a questionable prospect.

Russia and China are pushing into space exploration, while the United States and 46 other countries to date have signed the 2020 Artemis Accords, whose terms equate to a blueprint for space colonialism. Given these preliminaries, the scramble for mineral exploitation in space is likely to reproduce violent dynamics already seen on Earth. Visions for the redistribution of mining proceeds from the galactic commons remain blurry, and a successful asteroid-mining industry would jeopardize the incomes of communities that depend on earthbound extractivism.

A more likely development in the medium term is deep sea mining (DSM). Polymetallic nodules on the seafloor are rich in cobalt, manganese, copper, and nickel, and they could provide enough of these metals for up to 4.8 billion EVs. Current estimates hold that these nodules could provide 3 to 4 times the land-based reserves of cobalt, double those of nickel, and increase those of copper by 25 percent. Companies in Belgium and Canada, as well as public authorities in France, Germany, and

China, are already exploring the possibilities of mining these resources in the Clarion Clipperton Zone of the Pacific Ocean. But regulations are lacking.

The ocean floor is designated as "the common heritage of mankind" by the United Nations Convention on the Law of the Sea. It is under the jurisdiction of an obscure, underfunded organization, the International Seabed Authority (ISA). The ISA has been tasked with developing a mining code, but it has so far failed to complete the process. The current concession model for private economic actors relies on member states of the ISA to sponsor mining companies. So far, the emerging industry has focused on securing sponsorship from smaller insular and poverty-ridden countries such as Tonga and Nauru.

DSM has drawn a wave of opposition from governments, companies, and nongovernmental organizations. Many have signed a call for a moratorium, and companies using these minerals have committed to refrain from sourcing them from the deep oceans until more research is conducted and potential impacts are better understood. Scientific knowledge remains limited regarding the possible ramifications of extracting minerals at a depth of 4 to 6 kilometers. Environmentalists warn that risking the destruction of a wide swath of underwater lands would be a short-sighted approach, with possible consequences for both the carbon absorption rate of the oceans and the production of oxygen from the seafloor. Others point to the absence of verification capabilities for checking corporate practices in international waters in the middle of the ocean, an environment that has been described for decades as a lawless area.

One asteroid could supply the Earth with immense amounts of critical minerals.

Although DSM companies promote narratives of the supposed environmental benefits and social improvements that will come with mining the deep seabed, the reality might differ drastically. As with space mining, mechanisms for effective wealth redistribution are lacking. And at a time of high market volatility in critical minerals trading, with boom-and-bust swings most evident in the cobalt and nickel sectors, a new supply of immense quantities of these resources is likely to have a devastating impact on mining-dependent communities.

Low-carbon transitions are extending the boundaries of extractive frontiers. Hailed as solutions to the climate crisis, these techno-utopian visions of boundless sources of minerals are largely disconnected from socio-environmental realities, reproducing colonial thinking. This time, colonization is reaching beyond land, transforming the ocean depths and outer space into sacrificial areas.

BROWNFIELDS AND GRAY EXTRACTIVISM

Back on Earth, amid booming competition to secure critical minerals, the United States and the EU are increasingly promoting extractivism at home. Both are wary of the domination that China exerts over the resources needed to transition away from fossil fuels. The return of Donald Trump to the White House will not fundamentally change these dynamics; green technologies are now understood to be an economic necessity, regardless of political leanings.

The new mineral extraction projects in Western countries rely on the traditional opening of new mine (greenfield) sites as well as the use of degraded (brownfield) sites that were previously mined but still hold rich ore deposits. This push for a new source of critical minerals can be called "gray extractivism," given the fact that it relies on preexisting and pollution-intensive supply chains and mining operations.

In the United States, cobalt deposits are being reopened on the sites of former mines. These projects use both reprocessing and remining to extract critical minerals from feedstock. Reprocessing often focuses on tailings, wastes that were generated by previous operations using technologies that often failed to recover some of the resources they sought. Remining involves the reuse of a former mine, targeting newly identified deposits.

Both approaches make use of brownfield sites, which offer evident benefits compared with greenfield projects. This trend extends to the processing stage, as mining companies establish plants on former industrial sites. The strategy responds to two main concerns: first, the permitting process is often streamlined due to the previous existence of industrial activity; and second, societal acceptance of such activity is often more easily secured in areas marked by a legacy of extractivism.

In 2024, my research brought me to Missouri's southeastern lead belt, a region that is marked by more than 300 years of extractivism and highly polluted by the refining of lead ore. It is also home to an impoverished community with diminished economic prospects since the end of those operations in the 1960s. The history of mining boom and bust in the region—accompanied by the regular opening and closing of operations—appears to be a lesser concern than the culture of mining that many invoke to explain their own way of life and their hopes for the industry's renewal. Similar dynamics are at work in Idaho's Cobalt Belt, whereas the development of nickel processing in North Dakota is presented by economic and political leaders as a win for the state's coal country and the small town of Beulah.

With the US government mobilizing hundreds of billions of dollars in the form of tax credits and other corporate subsidies and loans to increase domestic production, extractivism will see a boom in the country. But 97 percent of nickel, 89 percent of copper, 79 percent of lithium, and 68 percent of cobalt resources in the country are within 35 miles of Native American reservations. These communities and ecosystems may be sacrificed to a new colonial mission.

In Europe, the dynamics appear different. In France, the reopening of the Salau tungsten mine and the transformation of the Beauvoir kaolinite mine into a lithium producer are raising significant opposition. Nevertheless, as the European Union pushes to develop domestic supplies after the passage of the Critical Raw Materials Act in April 2024, pressure on member states to develop deposits of resources needed for the low-carbon transition will be compounded.

Meanwhile, the EU Batteries Regulation, adopted in 2023, introduced a "battery passport," a mandatory digital record of the social and environmental conditions in which the minerals for each battery were extracted. This measure is intended to respond to some of the abuses occurring in global supply chains. However, its focus on transparency disclosures without requiring much verification of the information provided by producers suggests that it will inadequately address human rights, environmental, and economic injustices in the production of minerals for low-carbon transitions.

RETHINKING THE LOW-CARBON TRANSITION

Mineral demands to fuel the production of low-carbon technologies are wreaking havoc on communities around the world. Although it is undeniable that mining will remain necessary, and could even be conceived as a wealth-producing industry with redistribution potential, its current structure fails both communities and ecosystems. From the push to mine the oceans with little basis in scientific knowledge to the imposition of modern slavery conditions in Congolese artisanal mines, serious abuses are tainting the low-carbon transition.

Such violence and inequities are deeply embedded in the production of critical minerals. The necropolitics—decisions to live and let die—of transitions away from fossil fuels have only strengthened. With geographer Philippe Le Billon, I have described the creation of a new class system based on carbon emissions, favoring the reproduction of abuses that have defined global capitalism. The relations among these new classes—from the ultra-carbonized (billionaires and holders of green technology capital) to the decarbonized (high earners and adopters of green technologies), the still-carbonized (the lower middle class unable to afford green technologies), and the uncarbonized (the diverse populations whose territories provide the raw commodities for energy transitions and whose lives are treated as disposable)—are aligned with priorities of extraction, particularly of critical minerals.

To avoid these pitfalls, governments across the globe need to rethink low-carbon transitions. The move to a more sustainable world cannot be achieved under the capitalistic fallacy of eternal growth in a finite world. The imperative of balancing society's needs, economic priorities, and nature's survival calls for consideration of degrowth—reducing the use of resources and energy—as an option to drive low-carbon transitions. In transportation alone, moving beyond individual car ownership to heavy investment in public transportation systems could partly address the abuses of raw materials production. But a simple transfer from oil-based to electric technologies will not address the root of the issue: overconsumption, for which the continuous exploitation and sacrifice of entire populations and ecosystems is the necessary precondition. ■