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The Ethics of Artisanal Cobalt Mining for Green Technologies

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Every domain of human living has become dependent on technologies. Phones, computers, as well as other technologies such as wind turbines, automobiles, lighting, solar panels, and electric vehicles all depend on a "mineral foundation" of raw materials (Bazilian, 2018). As demands for environmental conservation increase and societies are pressured to move away from fossil-fuels, the demands for these raw materials to power our carbon-combating technologies also increase. Electric vehicles (EV) are slowly replacing the gasoline vehicle market and will likely become the new norm in personal travel. EV sales are expected to grow 10-fold by the end of the decade, and 90% of total Lithium ion battery demand will come from the EV sector (Lee & Manthiram, 2022). Cobalt (Co), an element incorporated in nearly every new lithium-ion battery for its charge-balancing and thermal stabilizing properties, is being mined at unprecedented rates (Botelho Junior et al., 2021). Congolese cobalt in particular has become an instrumental part of supply chains for emerging low-carbon innovations critical to energy or climate sustainability (Sovacool, 2019, 2021). Although exacerbated in the Democratic Republic of the Congo (DRC), unethical mining practices around the globe have involved the exploitation of land and labor. This humanitarian crisis has led to the supply chain shortages that challenge the stability of the EV market and thus jeopardize efforts in combating climate change. Artisanal cobalt mining is an ethical dilemma; it has served to propagate cheap clean energy but has also led to humanitarian and (ironically) environmental injustices. Using the DRC as a case study, in this essay I will explore the anthropocentric ethical violations of artisanal cobalt mining and show how implementing sustainable development practices will resolve these violations.

Anthropocentrism is a branch of utilitarian theory that was developed amidst controversy over Darwinian theory to represent the idea that humans are the center of the universe (Campbell, 1983). Though the origins of anthropocentric thinking can be traced back to Aristotle's teleological theory of nature, posing that nature is viewed as having ends, purposes, or goals (Bradie & Miller, 1984). In this case, the anthropocentric view of nature is one in which nature's purpose is to serve the human being; other life forms or non-living things are important only to the extent that they affect humans or can be useful to humans. While this worldview is often considered as being self-centered and ignoring the needs and rights of other species and ecosystems, criticisms overlook the positive contributions that anthropocentrism can make towards promoting human well-being and environmental conservation. Firstly, anthropocentrism recognizes the importance of human needs and interests in shaping our relationship with the environment: humans are the primary beneficiaries of the environment, and we have a legitimate interest in ensuring that our needs are met. By prioritizing human needs and interests, anthropocentrism promotes the development of policies and practices that balance human needs with the preservation of the environment. Secondly, anthropocentrism recognizes that humans are not separate from nature, but are an integral part of it: humans depend on natural resources and ecosystems for survival; therefore, our well-being is closely tied to the health of the environment. By recognizing this interdependence, anthropocentrism promotes the idea that protecting the environment is an ethical imperative. For example, polluting the ocean with plastics would be an anthropocentric ethics violation because harvested seafood would contain plastic particles that a human would digest. Hence, anthropocentric ethic defines an ecological problem as one that poses difficulties for humans; it conforms the natural world to its ultimate instrumentalist position, that is, the concern for nature is at end for the benefit of human beings.

Since how nature is treated affects humans, anthropocentric ethics, though nature has no intrinsic value, is also a pro-environmental attitude. However, when it comes to artisanal cobalt mining, an anthropocentric view has been hijacked to prioritize short-term economic benefits which consequently overlook the negative impacts it has on the environment and the human rights violations it fosters. Criticisms of such a narrow view of anthropocentrism are not unfounded, this forward looking and limited perspective of anthropocentrism has neglected the need for responsible mining practices that consider the well-being of both humans and the environment. Because of this, contemporary practices in artisanal cobalt mining are a violation of anthropocentric ethic. From an anthropocentric perspective, human beings have an ethical responsibility to ensure that their actions do not harm others, including future generations. Therefore, it is essential to consider not just the ethical implications of climate change, but also the efforts used to mitigate it, such as artisanal mining practices. In the context of adopting extraction methods to align with climate action under anthropocentric view, critical materials such as cobalt can be mined to support the transition to a green economy without exploiting labor and land.

The idea of strategic or critical raw materials was developed by the U.S. in response to national security concerns through the Strategic Materials Act of 1939, which enabled the U.S. to establish critical material stockpiles (Rachidi et al., 2021). These materials are gaining popularity in the sphere of government policy as international trade is becoming subject to increasingly fragile geopolitical situations. Critical materials are a non-substitutable material in which consumer countries are dependent on imports and whose supply is dominated by one or few producers (Overland, 2019). All critical materials are pivotal in the contribution to develop a circular green economy (Mathieux et al., 2017). Energy-transition metals, such as cobalt used in

lithium-ion batteries to support electric vehicle development, are under pressure to fulfil this pivotal contribution. The U.S. classifies cobalt as a critical material because of the risk of interruption of supply in the short and medium term, importance for energy generation by clean technologies, availability in natural resources, and production regarding national and economic security (Chu, 2011). Implementing green energy policies for economic growth and sustainable development necessarily depends on recognizing the importance of environmental and social factors within the mineral industry and adopting rigorous governance to align with climate change action (Lèbre et al., 2020). However, the increasing demand for green technology has led to the unregulated clandestine extraction of cobalt and other critical materials to meet market considerations and socio-economic pressure from consumer nations. Consequently, artisanal cobalt mining, which is often characterized by informal activities with little or no governmental oversight, has become a means of fulfilling these demands.

Approximately 60% of worldwide cobalt is located in copper-cobalt ores in the DRC, where geopolitical instability and unethical working conditions have led to the halting of cobalt exports in the past (Schulz et al., 2017; Tsurukawa et al., 2011). In 1978, civil conflict in the DRC generated a drastic price spike known as the Cobalt Crisis when the price of cobalt increased nearly 9-fold over (Gourley et al., 2020). Because of this, the ever-increasing demand for clean energy and continued global reliance on cobalt may in turn feed into economic instabilities domestically as supply chain shortages come from increased prices.

Cobalt is an essential element in human health, such as for the formation of vitamin B_{12}. However when overexposed, the metal is poisonous to the heart muscle and extensive industrial exposure leads to serious clinical effects such as respiratory lesions, skin sensitizations, and may be carcinogenic (Kurt J. Lesker Company, 2017). The mean urine concentration of Co in the

U.S. population is approximately 0.1μg of Co/L, with the 95th percentile floating around 8.3μg/L (Barceloux & Barceloux, 1999). In contrast, Banza et. al. found that urinary concentrations of cobalt were 43-fold higher (mean of 17.1μg/L) in subjects from the DRC mining area than in control subjects (Banza et al., 2009). Despite industrial machinery, an estimated 15-20% of the total cobalt product in the DRC comes from artisanal mining (Al Barazi et al., 2017). Artisanal mining employs between 110,000 and 225,000 people depending on season, 40,000 of which, on average, are children (Van den Brink et al., 2020). Cobalt mining in the DRC is exemplary of an emergent trend in resource extraction industry; In the race to secure viable long-term cobalt sources, corporate opportunists such as Tesla, VW, Volvo, and Mercedes-Benz make haste in securing economic returns from a climate crisis. They have taken advantage of a lack of sustainable development cooperatives in the DRC to work wageless artisanal miners who are paid by production output without a base salary or other social protection mechanisms (Calvão et al., 2021). Since poor worker safety and social standards are characteristic of labor operations in developing countries, these corporate-sponsored wageless labor pools circumvent and outsource all forms of social protection that would rightly secure the capacity of workers for decent living conditions. However, cobalt mining is not just a humanitarian crisis, it is also an environmental crisis. Mining practices disturb the environment; heavy environmental burdens are imposed such as a disruption in biodiversity, soil degradation, and a sequestering of agricultural land.

Despite these conditions, for the Congolese people, seizing artisanal work is their only option away from privation. The people need to satisfy their immediate concerns (hunger, financial stability); they do not have the luxury to concern themselves with the long-term health consequences of their labor. Cobalt mining is a contemporary example of how the necessity to feed stomachs necessarily neglects environmental concerns. People will sacrifice their long-term

health for short-term satisfaction, and this is characteristic of these humanitarian crises in all third world countries. For example, reduction in tree density in the Sundarban Mangrove Forest in Bangladesh is due to overharvesting by forest-dependent communities as a result of limited resource options and socio-economic pressure (Cobbinah et al., 2015). This is because a challenge these developing countries face when attempting to implement sustainable development is the absence of reliable infrastructure and standard development policies (Ayman El Rifai, 2021). These barriers restrict the improvement of a community's quality of life and creates a vicious cycle of poor economic development. Communities can't afford, literally, to care about the environment.

We are facing an environmental paradox – efforts to serve climate prospects result in immediate environmental degradation. While rapid extraction of natural resources has served climate action and green economies in the short-term, it has consequently degraded ecosystem services vital for long-term human prospects, primarily affecting the economically disadvantaged. Anthropocentric doctrine, if implemented correctly, can re-equilibrate human balance with the natural world and serve the interests of exploited groups. However, artisanal cobalt mining (and extensions of green energy efforts) does not stem from an anthropocentric attitude per se, but from one too narrowly conceived. Cobalt mining is done with the interest of serving the consumers of lithium-ion batteries (or other cobalt-infused items); climate justice is an afterthought; It gives no due regard for the process by which resources are mined. Since both humans and their land are being exploited and destroyed for this resource, an anthropocentric resolve must be realized. Since the ethical principle depends primarily on the essence of human life, followed by the instrumental value of non-human life, we must address the condition of the artisanal miners as they are at the crux of the anthropocentric violation.

Sustainable development was first defined in 1987 by the Bruntland Commission as "a system of development that meets the basic needs of all people without compromising the ability of future generations to meet their own life-sustaining needs" (Brundtland, 1987). This definition marked a departure from the view that economic growth and environmental values were incompatible (Laurence, 2011). However, there remains considerable hesitancy among governments and transnational corporations to adopt sustainability in their industrial operations. This is because sustainable development practices aren't universally applied across nations and impose short-term economic strain on mining management enterprises. Thus, when you're a transnational battery producer and the world's supply of a necessary resource for your increasingly sought after product happens to be in a nation where low standards of living are coupled with a government that offers little regulatory intervention in labor practices, you will do what you can to maximize profits, even if it means exploiting people. I posit that the anthropocentric ethic violation can be resolved by the implementation of rigorous international regulation regarding sustainable development practices. It is evident to me that this would resolve the humanitarian crisis, alleviate the economic burden and working conditions of the artisanal miners, serve direct environmental concerns, and stabilize the cobalt market. I first want to show how economic prosperity and the health of a nation (the ultimate anthropocentric result of implementing sustainable development policy) reinforces and generates a culture of environmentalism and further propagates developments to act on climate justice.

In the present era, humanity has become increasingly aware of the interdependence among all the components of nature as well as our accelerating imposition over nature. However, it is precisely because of our technological innovations and economic prosperity that we have developed the luxury of environmental awareness. A growing number of consumers in the US

and western Europe are becoming more environmentally responsible in terms of their personal habits and life styles (Stone et al., 1995). This is because advances in technology and our relationship to it has made space for networks in which various constituencies (otherwise disconnected) concerned with diverse environmental resource issues could coalesce and identify themselves as "environmentalists" (E.g., farmers, consumers, hunters, birdwatchers). In other words, cultural environmentalism is brought about by industrialization of societies to develop technologies that foster connection networks. For example, the advent of the internet came with emergent networks that unlocked human potential to engage in environmental issues in an unprecedented manner (Frischmann, 2007). This shows that economic and technological wealth ties together interests from the public domain otherwise coveted from sects of society engaged in struggles with no sense of a larger context. This means, however, that environmental activism as a product of wealth, is a luxury. Citizens must be comfortable enough to sacrifice their "creature comforts" for the sake of environmental protection. Why raise economic standards? When the Congolese (and other marginalized groups) choose to work in unsafe conditions, sacrificing their health, their children's health, and their environment, it is not because they want to but because they have to. Cobalt mining, despite its conditions, is their barrier against privation and starvation. To quote Pierre-Joseph Proudhon, an empty stomach knows no virtue.

If we are to provide just governance to the environment, policy must be developed on part of consumer nations such that international mining interests are held accountable. Trade regulation must be implemented such that transnational mining companies have no choice but to invest in fair wages and safe working conditions (both on the humanitarian and environmental front). The imposition of sustainable development trade regulation on cobalt mining would: 1) resolve the humanitarian crisis by providing safe and stabilized working conditions:

Providing stable working conditions and fair wages would raise the standard of living for the Congolese at the lowest common denominator, removing them from states of privation and existential insecurity.

2) resolve the direct environmental degradation by regarding local inhabitants as stakeholders in the enterprise: By recognizing artisanal miners as stakeholders in the practice, social capital can be developed as the share of wealth generated finds its way back into the community for the development of socially useful infrastructure and institutions. This result would give the people the luxury to adopt efforts to improve their communities. Additionally, educational opportunities, as a product of economic prosperity, hones the minds of a population to develop creative solutions to environmental injustices, thus further maintaining the ideals of anthropocentric ethic.

3) promote the development of EV and carbon-neutral technologies due to the stabilization of the cobalt market: The functionality of community interaction will ultimately allow management to focus its efforts on the most effective operation of their mine. The cessation of dysfunctionality within the mining practice will then promote a stabilized cobalt market while addressing environmental concerns. The EV and green technology market is then more apt to combat climate injustices.

What we find here, for the sake of extended anthropocentrism, is that in general, raising the standards of living for the impoverished is a mechanism of propagating environmental activism. In brief, mitigating potential supply-chain disruptions for sustainable cobalt supply requires responsible humanitarian and environmental governance. By implementing and abiding by sustainable development practices, the anthropocentric ethic violation in regard to artisanal cobalt mining has been resolved. However, EV companies have made efforts to substitute cobalt with other resources that offer better safety, higher capacity, high-rate capability, and which are

more abundant and affordable to meet the needs of consumer electronics (Liu et al., 2022). For example, a new class of metal cathode material such as $LiNi_xFe_yAl_zO_2$ (NFA), has been researched as a suitable candidate (Elmaataouy et al., 2023). This is an important argument to consider as the world's supply of cobalt is being mined at unprecedented rates and resource depletion will warrant eventually finding energy alternatives. However, substituting other metals for cobalt does little to resolve the ethical issue of human and land exploitation; switching metals may provide temporary market stability, but ultimately labor and land will be exploited for critical materials when it means profits can be made.

The rapid development of renewable energy power has improved global energy and environmental problems. However, with the high volatility of renewable energy resources, it is an environmental challenge to guarantee the consumption of renewable energy. Resource volatility increases in the scope of geopolitical constraints, especially when those constraints are isolated in a resource bottleneck of a global supply chain such as the DRC. To mitigate these constraints, the humanitarian crisis must be resolved in order to provide resource stability. Artisanal cobalt mining is a violation of anthropocentric ethic as both the exploitation of human beings and the environment we rely on is being exercised. This exploitation also destabilizes the EV and technology markets, which makes the practice both a direct and indirect threat to climate justice. The means to resolve this ethical issue is by enforcing international trade policy such that mining companies can invest in safe working practices and provide living wages for artisanal miners. This would 1) stabilize and reinforce the lives of artisanal miners; 2) reduce direct ecosystem destruction through sustainable harvesting developments; 3) leverage the Cobalt market volatility which in turn will stabilize the EV and other carbon-neutral technology sector, thus promoting a transnational effort towards climate justice.

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