There Are No Ethical Lithium Ion Batteries:

The Decarbonization Divide & Ethical Practices of the Lithium Ion Battery Supply Chain Analyzed Through a Deontological Framework

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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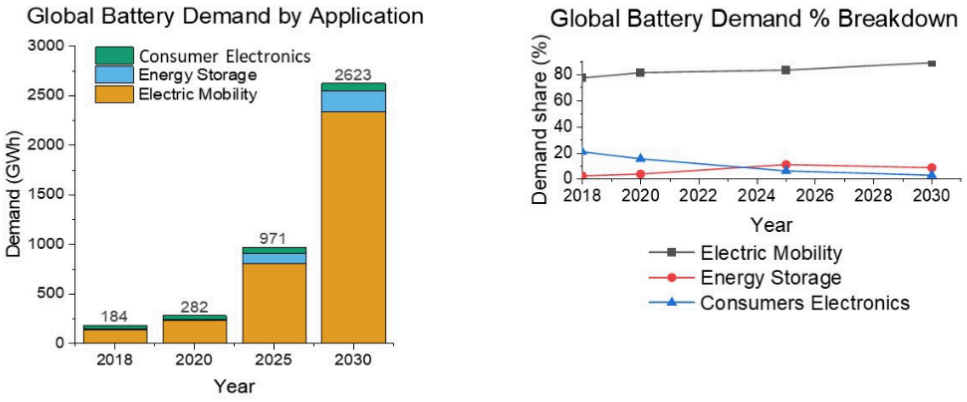
Introduction

Many of the convenient technologies we use today run on lithium ion batteries (LIBs) such as our laptops, phones, cameras, watches, and portable chargers (Vermont Department of Environmental Conservation, 2020, p. 1). These batteries will also be crucial as we continue to decarbonize society as well, as lithium ion batteries are not only used on commercial scales to store renewable energy but are the main battery type used in the majority of all electric vehicles (EVs) that are coming out currently (Zhao et al., 2021, p. 167). There has been a surge in demand for lithium-ion batteries over the past decade because of its advantages over other storage technologies (lead-acid, nickel-metal hydride, and nickel cadmium) due to its high energy density, high life cycle, and low self-discharge (Hayder et al., 2022, p. 1; Zhang et al., 2023, pp. 2-3). Demand has grown from 0.5 GWh in 2010, to approximately 526 GWh in 2020 with an expected demand of 9,300 GWh by 2030 (Hayder Ali et al., 2022, p. 1). By 2030, electric vehicle batteries will make up over 85% of the entire LIB market, followed by energy storage with 10% (Zhao et al., 2021, p. 189). As seen below in Figure 1, the growth in demand for electric mobility in terms of global battery demand (shown in GWh in the left and mirroring as a percentage of global demand on the right) has a staggering increase from 2020 to 2030 and consistently overshadows all other types of battery demand into 2030 (Figure 1). With this projected increase in demand, there have been questions about whether or not the entire globe will be able to decarbonize with the amount of critical raw materials needed - and whether or not the sourcing of these materials can be done sustainably *and* ethically.

Figure 1

Global Battery Demand by Application [Left] and by Application Demand Percentage [Right] from 2018 to 2030



Note. Zhao, et al. (2021). A Review on Battery Market Trends, Second-Life Reuse, and Recycling [Image]. *Sustainable Chemistry*, 2(1), 167. https://doi.org/10.3390/suschem2010011

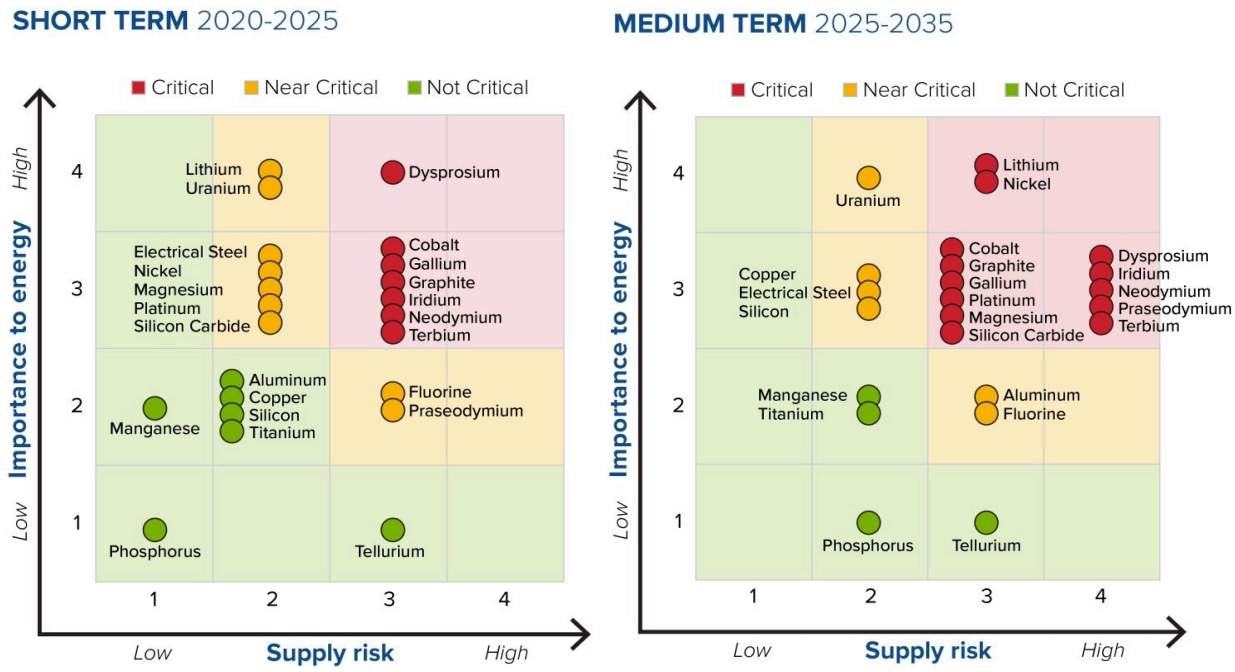
To establish why this is relevant to the U.S., the majority of us will be buying and driving EV's in the near future. In 2021, an executive order was passed that set targets for 50% of U.S. passenger car and light truck sales to be zero-emission vehicles by 2030 (National Renewable Energy Laboratory [NREL], 2023, p. v). This was then followed by the passage of the U.S. Bipartisan Infrastructure Law and Inflation Reduction Act which established tax credits and investment grants to help provide financial incentives for the Executive Order and further fund societal electrification (NREL, 2023, p. v). It's projected that by 2030, plug-in EVs could account for 48-61% of the U.S. light-duty vehicle market which is an unprecedented transition in the history of the automotive industry that will require adequate supply chains to support (NREL, 2023, p. v).

According to Backhaus and Duffner, forecasts indicate that lithium-ion batteries will be the standard solution for electric cars over the next decade and there is currently no projected challenger in the field of battery technology that offers the amount of overwhelming notable advantages necessary to justify the billion dollar investments to switch to new machinery as these investments are currently going into scaling production of LIBs (Backhaus, 2023, p. 8; Duffner, et al., 2021, p. 123, 132).

This is where the crux of the issue begins. The main materials to make lithium-ion batteries are graphite, cobalt, lithium, manganese, and nickel (Backhaus, 2021, p. 8). Cobalt, lithium, nickel, and natural graphite have all been identified as critical raw materials due to their high risk of supply chain disruption and their essential function within one or more energy technologies (U.S. Department of Energy, n.d., paras. 1-2, 6-9). The material that will be most discussed in this paper will be cobalt. The Democratic Republic of Congo (DRC) currently supplies the majority of the world's cobalt (more than 70%) and has been repeatedly cited in the literature as having unethical mining practices due to the widespread presence of child labor, exploitative mining practices, and human rights abuses (Williams et al., 2021, p. e327; Sovacool et al., 2020, pp. 4, 8-15; Calvão et al., 2021, p. 2; Amnesty International, 2017, pp. 4-9). As can be seen in Figure 2, cobalt is and still will be a critical material to the United States until 2035.

Figure 2

Criticality Matrix for Critical Materials Short Term [Left] and Medium Term [Right]



Note. U.S. Department of Energy. (n.d.). *What Are Critical Materials and Critical Minerals?* [Image]. https://www.energy.gov/cmm/what-are-critical-materials-and-critical-minerals

Given that our current and future electric vehicles will use lithium ion batteries and cobalt is an essential ingredient to produce them - I will explain why our current cobalt supply chain will never allow for ethical lithium ion batteries using a deontological framework.

A Deontological Framework

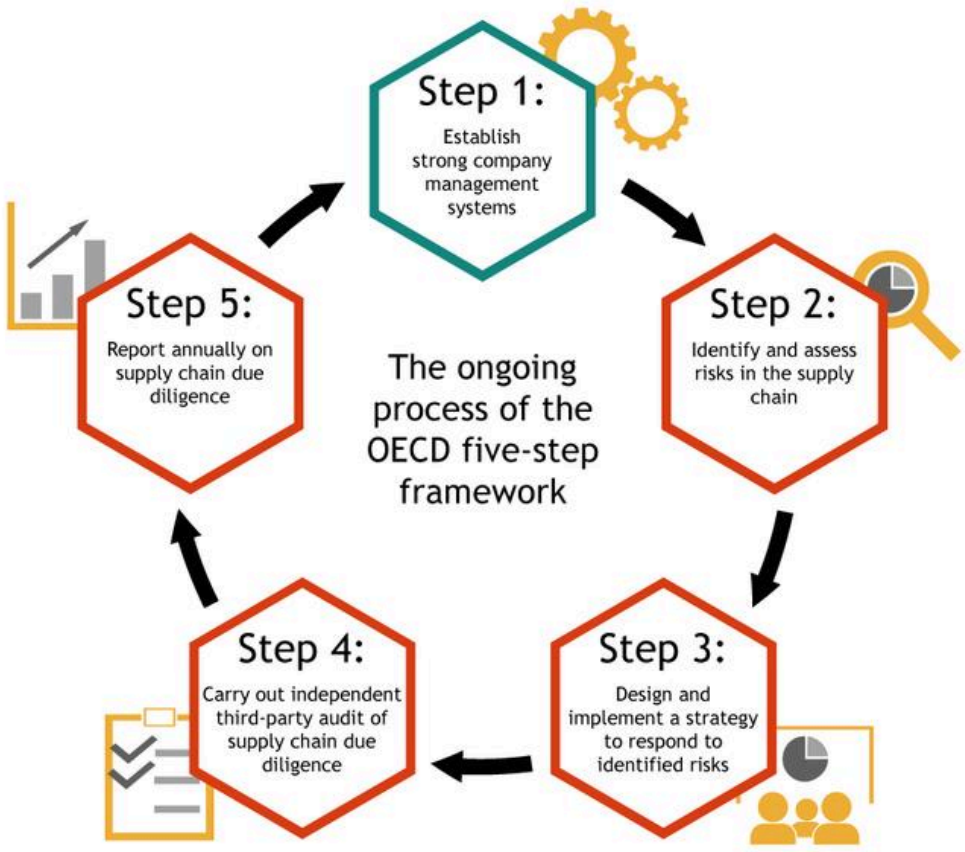
Deontology, as an ethical framework, maintains that the ethicality of an action or choice is based on the action itself and its "rightness" rather than its outcomes/effects - essentially prioritizing "The Right" over "The Good" (Stanford Encyclopedia of Philosophy, 2020, paras. 14-15). It stands as a direct foil to consequentialism, which holds that choices should be evaluated solely by the outcomes their choices bring about - prioritizing "The Good" over "The Right" (Stanford Encyclopedia of Philosophy, 2020, paras. 2-13). Deontology thus holds that even if an action would create enormous societal benefits, if the action is not deemed right then that action cannot be undertaken no matter The Good it might produce (Stanford Encyclopedia of Philosophy, 2020, paras. 14-15). Deontology is thus *action* focused rather than *outcome* focused.

The Right in this case and the measures of rightness are determined by which choices are morally required, forbidden, or permitted under its conformity to a moral norm (Stanford Encyclopedia of Philosophy, 2020, paras. 14-15). The moral norms that I will be using in this paper are concepts and widely subscribed to systems (in the Global North, and the United States) and frameworks that govern the concepts of ethical mining practices and human rights. In order to determine ethical mining practices, we'll be analyzing relevant business' (who use LIBs and thus cobalt in their products that they sell to consumers) alignment with the most relevant and accepted schema which is the Organization for Economic Co-operation and Development (OECD) Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict

Affected and High-Risk Areas (the United States is a permanent and active member in the OECD). As can be seen in Figure 3, it outlines a very clear five step process meant for companies along the entire mineral supply chain to follow to ensure due diligence, with the five basic steps as follows: establish strong company management systems that includes transparency of suppliers to the public, identify and assess risks in the supply chain, design and implement a strategy to respond to identified risks, carry out independent 3rd party audits of supply chain due diligence at identified points in the supply chain, and report on their supply chain due diligence (Organization for Economic Co-operation and Development [OECD], 2016, pp. 17-19).

Figure 3

Five Step OECD Due Diligence Guidance

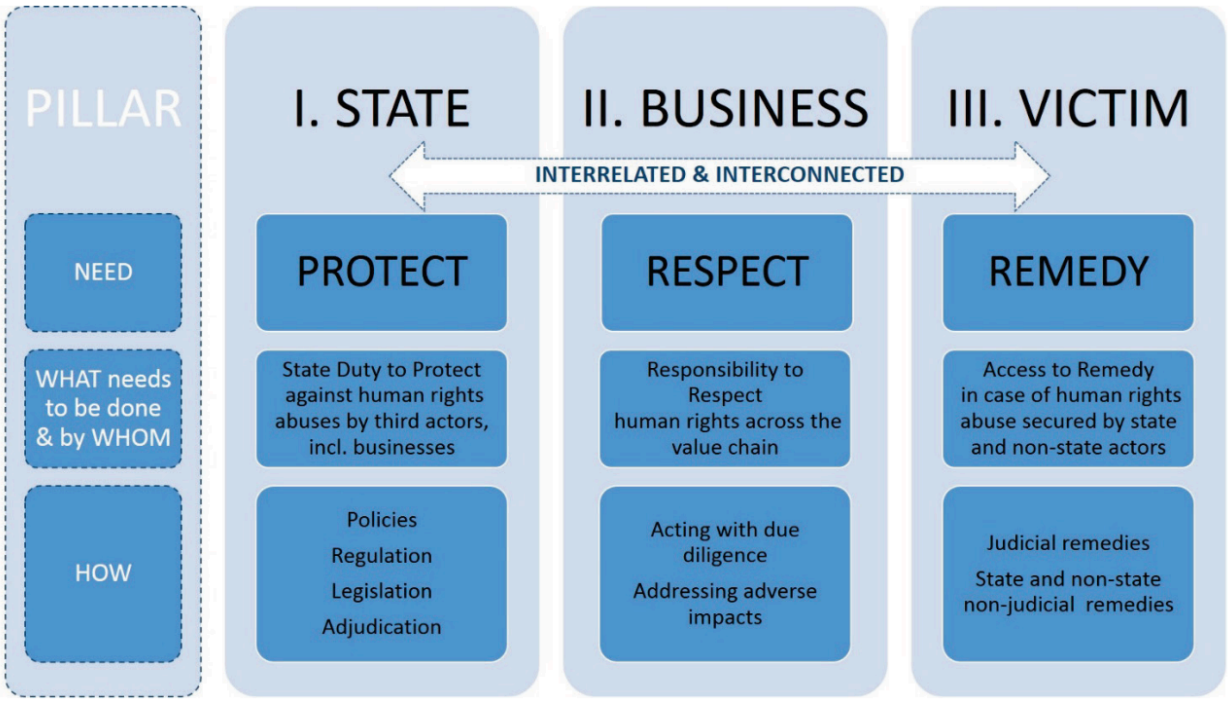


Note. European Partnership for Responsible Minerals. (n.d.). *How to implement the five-step OECD Due Diligence Guidance?* [Image]. https://europeanpartnership-responsibleminerals.eu/page/view/a39df764-597d-4571-a703-b71f38c3fd29/how-to-implement-the-five-step-oecd-due-diligence-guidance

In order to determine if human rights are being respected and upheld, we'll be analyzing business' alignment with the United Nations Guiding Principles on Business and Human Rights. As can be seen in Figure 4, it sets this responsibility for upholding human rights by establishing 3 pillars: States have an existing obligation to respect, protect, and fulfill human rights and fundamental freedoms; The role of business enterprises as mechanisms for performing specialized functions in society requires that they comply with all applicable laws and respect human rights; The need for rights and obligations to be matched to appropriate and effective remedies when breached (United Nations Human Rights Office of the Commissioner, 2011, p. 1).

Figure 4

United Nations Guiding Principles on Business and Human Rights



Note. Faracik, B. (2017, February 2). *Implementation of the UN Guiding Principles on Business and Human Rights* [Image]. https://doi.org/10.2861/527765

Within this guiding framework, it also states that businesses should have "A policy commitment to meet their responsibility to respect human rights … A human rights due diligence process to identify, prevent, mitigate and account for how they address their impacts on human rights … [and] processes to enable the remediation of any adverse human rights impacts they cause or to which they contribute" (United Nations Human Rights Office of the Commissioner, 2011, pp. 15-16). With these frameworks in mind - of what businesses and governments (States) should be doing internationally to ensure they are respecting human rights but also doing their due diligence to ensure their operations are ethical - we can now get into the current conditions workers are operating under despite these widely known international frameworks and schema.

Mining and Sourcing of Cobalt

Of the cobalt that comes from the DRC, 80% is produced by large scale industrial mining while approximately 20% is excavated by hand by artisanal miners (approximately 150,000 people and 98% of the workforce in mining) who work in highly dangerous conditions (Williams et al., 2021, p. e327; Sovacool et al., 2020, pp. 8; Calvão et al., 2021, p. 2). The artisanal mining sector also props up some of the worst cited labor conditions seen in the modern day, as the industry utilizes significant child labor (40,000 children as young as 6 years old) to mine out resources (Amnesty International, 2016, p. 28). The consequences of artisanal mining are numerous both environmentally and socially. Environmentally, toxic trace metals contaminate local waterways and soil, which leads to local habitat destruction and arable farmland pollution (Williams et al., 2021, p. e327; Sovacool et al., 2020, pp. 7-11). Artisanal miners usually work without basic personal protective equipment (PPE) (gloves, face masks/respirators) and are dangerously exposed to dust and chemicals, and potential mining tunnel collapses because of

their lack of adequate tools/resources (Williams et al., 2021, p. e327; Sovacool et al., p. 8). Due to this, miners frequently suffer from chronic illnesses as well as potentially fatal respiratory illnesses from prolonged exposure to dust containing cobalt and other heavy metals (Amnesty International, 2017, pp. 5, 22). They also have no legal protections provided by the state as many artisanal miners operate outside of authorized mining zones (Amnesty International, 2017, p. 4). Despite most artisanal mining operations being unauthorized, this cobalt still gets mixed with legitimately mined material by local exporters before all of it is shipped for refinement and processing overseas - thus entering the global supply chain (Williams et al., 2021, p. e327). This essentially means that there is no distinction or no way to verify between industrial and artisanally mined cobalt as it goes down the supply chain.

But what about businesses who have adopted and reported on their own due diligence schema? Reports done by Amnesty International in 2016 and 2017 had devastating findings. In Amnesty International's *This is What We Die For (2016)* report, they found that of the 26 major companies that had put in place human rights due diligence measures (sourcing of cobalt, conditions of how it was extracted and traded) all 26 had failed to conduct their due diligence in line with international standards. The companies in question (2017):

> … Included the upstream company Zhejiang Huayou Cobalt Co., Ltd (Huayou Cobalt), whose wholly owned subsidiary in the DRC, Congo Dongfang International Mining SARL (CDM), is a major buyer from traders of artisanal cobalt in the former province of Katanga in the DRC, and 25 downstream companies that researchers found were potentially buying from Huayou Cobalt, either directly or indirectly … Alarmingly, the majority were unable to answer basic questions about where the cobalt in their products

came from and whether there were any risks of the kind observed by researchers. (Amnesty International, 2017, p. 4)

Given this and current artisanal mining sector conditions, it highlights that businesses who source their cobalt from the DRC have failed steps 2 and 3 in the OECD guidelines as they have not adequately identified and assessed risks throughout their entire supply chain (ethical risks being the intermixing of artisanal mining cobalt and the child labor involved in the chain), and haven't adequately designed and implemented a strategy to respond to identified risks (meaning that they do know about the problem, but their solutions have not adequately addressed them). Businesses also fail under UN guidelines, as businesses have failed to respect human rights across the value chain and have failed to adequately adopt a human rights due diligence process to identify, prevent, mitigate and account for how they address their impacts on human rights as well as processes to enable the remediation of adverse human rights impacts they cause or to which they contribute as there is still child labor contributing to the artisanal mining pool and artisanally mined cobalt would not exist without the high demand for cobalt to be exported from the country.

Due to uproar and pressure from the public over the cruelty of the cobalt supply chain that is necessary for our electronics, some companies have taken it upon themselves to begin ethical mining initiatives in addition to their due diligence initiatives for their supply chains in order to uphold their ethical obligations. There have now been case studies on these ethical mining operations (called artisanal mining formalization or ASM Formalization) as well as critiques that point out some of their glaring problems.

According to a study done by Baumann-Pauly (2023, pp. 3-12), the most promising ASM formalization project in the DRC was a pilot launched in Mutoshi from 2018-2020. This project

not only successfully integrated women into mining operations (women are believed to bring bad luck on work sites, and they were able to put this issue to rest through co-op training), but also was able to put to rest child labor at the mine by allowing women into the workforce (increasing children's abilities to attend school), allowed miners to negotiate their prices for the cobalt they mined (giving them bargaining power, and more autonomy over their work), and did not suffer any worker deaths due to their utilization of semi-automated extraction methods which drastically increased worker safety (so they did not die in tunnel collapses). The project shut down because of the COVID-19 pandemic, the company behind it - Chemaf - pulled out and after that the mining operation quickly devolved back into regular ASM mining operations (no PPE equipment, there are now 15,000 people working the site instead of the capped 5,000, there are children working there now, they are not able to negotiate prices with the Chinese mining company "drop-box" machines that evaluate their cobalt and give them a set price to sell for, etc.).

The number one recommendation Baumann-Pauly asserted was "Global cobalt buyers should acknowledge that ASM is an integral component of cobalt mining in the DRC. It is not credible for any company to assert that it is limiting its purchases to cobalt produced in large industrial mine sites because the production gets combined with ASM cobalt during processing. Formal recognition of ASM mining also supports jobs for hundreds of thousands of people in an economically depressed region and advances broader development objectives in the DRC" (2023, p. 12). This asserts that businesses have a duty to reform or formalize the artisanal mining sector, as it is integral to their supply chains, and thus must be formally implemented into their due diligence schema - not cut out of it.

Not all ASM formalization projects are created equal, but if every formalization project was able to achieve what Mutoshi did - would that not make a portion of the artisanal mining sector ethical as business' would be upholding all steps within OECD guidance and actively working on aligning with UN guidance into the future?

Calvao et al's (2021, pp. 2, 5-9) study into this issue specifically looks at 3 examples of multinational mining companies in Mutoshi, Kasulo, and Kamilombe that were trying to formalize the artisanal sector and they had multiple critiques. The first is that recruiting artisanal workers, who are wageless, by mining companies is an ongoing trend of corporation's outsourcing responsibility that is detrimental to workers. In effect, since workers are wageless and paid by cobalt output with no base salary or social protections (decent living conditions as they live in the mining tunnels sometimes, guaranteeing healthcare or health protections, protections against job loss, or protections from price fluctuations), all extraction risks are put onto miners and not the corporations themselves. To give a more readily available comparison, they are similar to contracted workers with no protections or benefits regarding the work they do. Instead of being paid a wage for hours worked - depending on the cobalt they procure and the market conditions that day - what they are paid can be close to nothing after materials and supplies used for ethical mining are taken out of their pay (PPE lent, mining equipment if borrowed, etc.). The second is the criticism of current "model mines" (including the 3 studied) as they only try to reform a *portion* of the industry. These companies are not actively attempting to scale up these pilot type models, or markedly improve them. They also point out that formalization, with the additional conditions and access to open markets, may actually produce "new forms of dispossession and insecure labor" as it creates a narrative of *legal* and *illegal* extraction (a problem, because cobalt for artisanal miners is quite literally dug up from

backyards and general areas of open land that are being mined by others - artisanal miners do not have “property rights” over the land they’re extracting from) (p. 9). This allows corporations to reinforce themselves with private security forces, and allow more external industrial companies into the country. It also allows for the complete exclusion of vulnerable miners, such as those who cannot get access to government issued IDs (refugees) as these programs are exclusively for those with DRC citizenship the majority of the time).

From this, it seems the current paths of formalization still do not uphold OECD Guidelines for step 3 - adequately designing and implementing a strategy to respond to identified ethical risks as these projects are not being employed at mass scale despite how long the problem has been ongoing and identified. They also fail in upholding UN Guidelines as businesses that are formalizing are still not adequately addressing adverse impacts of their operations upon their workers.

Deontology & Historical Context as it Informs Duty/Responsibility

In order to approach the world’s Decarbonization through LIBs ethically, we must approach it under a Deontological framework as it is the best framework to understand why our current decarbonization schemes are unethical. In regards to this topic, the United Nations repeatedly and specifically calls for a “just transition” when it comes to our decarbonization - entailing that:

> No one is left behind or pushed behind in the transition to low-carbon and environmentally sustainable economies and societies … Countries need to develop, through inclusive dialogue, approaches to a just transition that reflect the needs, priorities and realities of their societies and their historical responsibilities for climate change and

environmental degradation. (United Nations Committee for Development Policy, 2023, p. 1).

The emphasis here is on *historical responsibilities*. Many countries in the Global South who have contributed the least in total amount of carbon emissions will end up facing the worst effects of climate change, while the biggest contributors in the Global North will not (Islam & Winkel, 2017, pp. 22-24). One of the biggest advantages of the deontological approach is the requirement of context, specifically historical and place-based context as these greatly inform alignment with the moral norms chosen to be evaluated. I chose this approach specifically to cover the current unethical practices plaguing the DRC under widely used/regarded due diligence and human rights schema. I wanted to establish that businesses have not only failed in their own due diligence schema, but that even their proposed solutions (formalization) and current attempts at solutions also still fail when evaluated under globally agreed upon guidelines (given that they are informal and not enforceable, but they are still regarded as the default guidelines to follow nonetheless).

I also wanted to draw the connection between power structures that have dominated the DRC in the past and how they've reformed in the present. But for the sake of brevity, there had to be more focus on the present rather than the past but that does not mean the history of the DRC should not be taken into consideration when evaluating the ethical practices of businesses in the artisanal mining sector. I believe it's important to note that because of the need for LIBs, the DRC is not only being currently exploited by multinational mining companies (meaning that the majority of the profits from these resources has not and never will go towards helping the country and its people despite its importance to the world for its vast supply of resources), but it is also still facing the aftereffects of being previously colonized by Belgium's King Leopold II.

After the DRC gained its independence in 1960, it has had coups backed by Belgium and the U.S. occur during the Cold War, the country eventually split in two, the Rwandan genocide occurred and thousands of migrants moved into the DRC, and now there are various militant groups that exist due to the multitude of political conflicts that have taken place since the "end" of its colonization 64 years ago - with some fighting over occupation of these resource mines for profit (Lawal, 2024, paras. 6-12; U.S. Committee for Refugees and Immigrants, 2020, pp. 4-6).

In effect, the DRC (a part of the Global South) was previously exploited by Belgium (a power in the Global North) for its resources for multiple decades, and then gained independence but was still exploited for its resources through *companies* from the Global North instead (U.S. Committee for Refugees and Immigrants, 2020, pp. 3-6; Exenberger & Hartmann, pp. 5-11, 13, 15-16). As can be seen in Figure 5, China and Switzerland are two major countries involved in cobalt mining in the DRC, but they are not the only ones to blame as when it is sent to manufacturers to develop lithium ion batteries - it implicates all major companies using those batteries in their products - including the major tech companies from the Global North.

Figure 5

Countries Involved in Mining

Note. The DRC's mineral resources are a factor in the ongoing crisis, as various armed groups battle for control of the mines to use the earnings to fuel wars (Lawal, 2024). Lawal, S. (2024, February 20). *A guide to the decades-long conflict in DR Congo* [Image]. https://www.aljazeera.com/news/2024/2/21/a-guide-to-the-decades-long-conflict-in-dr-congo

The conflicts between rebel groups and the government within the DRC due to these histories and various economic, governmental, and societal factors are now escalating once more, causing other countries to pay attention as access to cobalt (and further decarbonization) relies upon supply chains not being disrupted by these conflicts (Lawal, 2024, paras. 1-6).

Results

I, like many others, am aware that we need to decarbonize rapidly. This is especially so as more and more people every year are exposed to natural disasters that strike the coasts of the U.S. whether they be the violent hurricanes that hit southern Florida or vicious wildfires that spread across the Californian hills (Smith, 2024, paras. 1-2). This last year, 2023, was the highest on record with 28 weather/climate disasters that cost the U.S. around 1 billion dollars in lost/damaged infrastructure (Smith, 2024, paras. 1-2). This topic was important for me to cover because I am an avid environmentalist and chose my area of study specifically because I wanted

to have the technical knowledge necessary to build the sustainable infrastructure we'll need in the future to fight the climate crisis and the side effects that will follow. As we continue to roll out these decarbonization technologies, many people are becoming increasingly aware of the carbon footprint of EVs as they are seen as a necessary step to decarbonize our car centered infrastructure here in America. At the very same time, critics of EVs have started to shed a harsh reality that the precious metals used to make what powers our everyday technologies comes at a higher cost than just dollars and cents (Carson, 2023, paras. 1-8).

As an environmentalist, and general citizen of the world, I've learned the importance of intersectionality when it comes to environmental issues and the way it affects people across the globe. I've witnessed multiple paradigm shifts in American culture in the way we think about societal issues in the short span of time I've been alive, but one that I have yet seen to be discussed and spread to the masses is the reality of the ever growing Decarbonization Divide. We focus, with good reason, a lot of energy on how and why we have to decarbonize and we debate on how quickly and what policies we'll be able to implement to make it all possible. But we never really talk about the human cost, the toll that will be paid for the Global North to decarbonize in the way *they* want to - irrespective of others' opinions or thoughts. When I've discussed this issue with others, and explained why it is such a tough issue to solve - similar to many people's views on sweatshop labor they seem to view this human suffering as ultimately necessary for the greater good. That it is ultimately a necessary evil. For the development of the country, for the workers' themselves to lift themselves out of poverty, for the entire world to decarbonize. The greater *good* in this case ultimately leads to propping up and allowing these companies to keep extracting from these countries the same way they have for decades. This support for the greater good - even if that greater good is actually a thin veiled belief that the

hegemonic power of capitalism, and the perpetual wheel of a growing GDP that this labor allows for the Global North and its consumers, will somehow keep us all afloat.

Whenever I hear such arguments, it is a perpetual reminder that we do not teach others the horrors and actualities of the effects that hundreds of years of colonization and exploitation have caused - as we in the Global North were the ultimate winners and we've fought tooth and nail with every strategy in our arsenal to make sure that remains true - that the power imbalance between the Global North and South holds (Hickel et al., 2022, p. 1). It has been proven that not only has there been a massive resource drain from the Global South, but that the Global South's loss in resources to the Global North outstrips their aid from the Global North by a factor of 30 (Hickel et al., 2022, p. 1). This inequity has also been directly tied to being a major driver of underdevelopment and global inequality as well (Hickel et al., 2022, p. 1). Michael Parenti (1986) said it best in his famous "Yellow Lecture":

> But [the fact] that expropriation of the Third World—has been going on for 400 years — brings us to another revelation—namely, that the Third World is not poor. You don't go to *poor* countries to make money. There are very few poor countries in this world. Most countries are *rich*! The Philippines are *rich*! Brazil is *rich*! Mexico is *rich*! Chile is *rich*—only the *people* are poor. But there's *billions* to be made there, to be carved out, and to be taken—there's been *billions* for 400 years! The Capitalist European and North American powers have carved out and taken the *timber*, the *flax*, the *hemp*, the *cocoa*, the *rum*, the *tin*, the *copper*, the *iron*, the *rubber*, the *bauxite*, the *slaves*, and the cheap labour. They have taken out of these countries—these countries are not underdeveloped—they're overexploited! (Transcript, para. 7)

There is a lack of acknowledgement in the majority of the American mind that this is not the only way forward, that our capitalistic economy is not the only way forward for the Globe. There is little acknowledgement or thinking that there are other power structures, other ways of organizing our institutions - especially our businesses and corporations - that could actually solve this problem that is not the current way we formulate our societies. There is a lack of understanding of the power of unions, or worker owned cooperatives, or the understanding that the reason these resource rich countries have such poor people is because the very structure and operation of multinational corporations means none of the profits being generated in that country will go to the countries in which they are operating. The very countries allowing our collective growth, get none of the benefits despite the fact that their very existence allows for the resources necessary for these companies' profit margins. How unjust is it that multinational corporations get to continue to exploit these countries because we have intentionally designed our systems to allow it? That we have saddled these countries with so much debt, decades ago, in order to build up their infrastructure that they will continue to pay the Global North ad infinitum because of the interest? (Debt Justice, 2023, pp. 7-15). It does not have to be this way - it never needed to be this way. The simple fact is that it was designed this way, by corporations and countries who had the most to gain, and now we are faced with the mess.

Conclusion

Due to the current reliance and future projected reliance on the DRC's cobalt resources to meet expected demand for the globe's decarbonization goals, it is expected that current exploitative practices in the DRC will continue unless significant and deep interventions are made. Given the political instability due to the DRC's history of being colonized and all events that followed that have now led to an unreliable government, it is unlikely that governmental

regulation on these corporations - if made - will be successfully enforced in the coming years within the artisanal mining sector. Global regulation is also not looking like a viable alternative given that there are no enforcement mechanisms on the side of the United Nations (as all actions are voluntary, and not enforceable) but there are universal guidelines for ethical mining and widely accepted due diligence schema that can be easily followed for greater enforcement.

Even so, we've seen how corporations who have stated that they follow these regulations don't actually seem to follow them under closer inspection - ensuring that corporation's self-regulation will also not be the path forward. From these current facts, and the current conditions DRC's artisanal mining workers already face and have continued to face for decades - it is not an understatement to say that the DRC will most likely continue to have deeply unethical mining practices on a massive scale into the future unless they are able to properly and justly formalize the industry by shifting control over these mines into the hands of trained mining workers themselves who are also being regulated by trained community members (using the case of the most successful artisanal mining operation at Mutoshi as an example to be improved upon).

This is why the deontological framework is important, as it helps to simplify this complex issue down to a measurable framework on the *ethicality of global business decisions*. We have determined that conditions are unlikely to change on the scales necessary to be deemed significant with current formalization. There is even an argument to be made that with the upscaling of these technologies and the subsequent increase in demand that it may lead to ever increasing suffering in the coming decades. Thus the conclusion can be made, that just as there is no ethical consumption under capitalism (Carrington et al., 2016) - society will not be able to decarbonize ethically under lithium ion batteries. Due to the current and projected future failures

of the global cobalt supply chain to uphold OECD and UN guidelines on human rights, and historical exploitation of the DRC and historical mistreatment of its people by corporations for decades, there is virtually no such thing as an ethically made lithium ion battery.

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