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Analytical Paper

MES Application

The 2022 IPCC report confirms that "net anthropogenic GHG emissions have increased since 2010 across all major sectors globally". To reduce greenhouse gas emissions and slow the rise of global temperatures above 2 degrees Celsius, immediate action is needed. However, where does this action start? Within the United States, the EPA has pointed out that the transportation sector generates 28% of total greenhouse gas emissions, accounting for the largest share of emissions (EPA 2023). The Biden Administration has taken a significant step toward reducing these emissions through implementing mitigation strategies targeting electric vehicle (EV) production and infrastructure. The President's most recent policy and budget developments encourage this transition away from fossil fuels to a source of renewable energy. However, not all renewable energy is sustainable, and this push towards electric vehicle production overlooks the complex and multifaceted implications of EV production, specifically the dependency on lithium, a critical finite metal. Lithium is essential for EV batteries as it is "the only element common for all current battery chemistries" (Riofrancos et. al 2023). This paper addresses the concerns of lithium extraction on indigenous rights, the environment, and human health, and provides recommendations to reduce the demand for lithium in the United States.

The history of electric vehicle production in the US has experienced a transformative evolution. It first met enthusiasm and popularity in the 1890s until the recognition and affordability of the gas-powered Ford Model T in 1908. Affordability emerged as a crucial factor in the success of gas-powered vehicles and echoed contemporary challenges to shift public dependency from fossil fuels to renewables. The popularity of electric vehicles has recently resurged due to global concerns of climate change and the implications of fossil fuels on the planet. The electrification of the individual car fleet could reduce greenhouse gas emissions by 66 percent in the United States (Freemark 2022). As detailed in the Long-

Term Strategy of the United States, current President Biden has set a goal to replace 50% of vehicle sales with electric vehicles by 2030. However, affordability is still a limiting factor for much of the population and many reports have concluded that the current supply of lithium cannot meet the scale of expansion. Historically, mining for lithium has been concentrated in Australia, Chile, China, and Argentina. However, according to the Climate and Community Project (CCP), a "200% increase in lithium mines is needed by 2035 to meet EV demands" (Riofrancos et al. 2023). To propel the electric vehicle industry in the US, President Biden has focused efforts, policies, and resources to domestic lithium mines without considering the implications on indigenous rights, human health, the environment.

In the final days of the Trump Administration, the US Department of the Interior's Bureau of Land Management approved Lithium Americas to mine on close to 6,000 acres of leased federal land near the Oregon border in Nevada (Riofrancos et al. 2023). This area is known as Thacker Pass, but to the Paiute and Shoshone people, Peehee Mu'huh, a native burial ground of indigenous peoples, including those killed during an 1856 massacre. Two lawsuits have been filed claiming the Bureau of Land Management did not inform the Nevada State Historic Preservation Office of the historical site. One lawsuit is pending court decision while the other already ruled in favor of the mining project. President Biden has overlooked the controversy and deemed the site as necessary for the country's efforts in reduced greenhouse gas emissions. This argument is not new to the mining world and is "emblematic of a fundamental tension surfacing around the world" (Penn and Lipton 2021). It has been reported that close to 85% of known lithium deposits sit on or near indigenous land (Sainato 2023). Many countries have approved mining sites without Free, Prior, and Informed Consent (FPIC) with indigenous tribes, raising concerns for indigenous rights, as well as potential risks to human health and the environment.

Water usage and soil contamination have been key concerns fueling opposition to lithium mining in South America and China. Half of the current global lithium is found in what is known as the lithium triangle in South America, covering part of Argentina, Bolivia, and Chile (Katwala 2018). The popular

extraction method in the triangle is brine extraction, which uses approximately 500,000 gallons of water per ton of lithium (Katwala 2018). In some areas, this water-intensive process is limiting water availability to local farmers. It has also been stressed that brine extraction has “significant deleterious impacts on freshwater stores and ecosystems” (CCP 27). In China, three separate incidents near the eastern edge of the Tibetan plateau have “wrecked havoc with the local ecosystem” due to water contamination (Katwala 2018). The most recent incident was a mass fish fatality event in 2016 when toxic chemicals leaked into the Liqi River. Water contamination has led scientists in the United States to research risks at proposed mining sites across the naation. Although the more common mining practice within the US is hard rock / clay mining, water usage and contamination “emerged as a top environmental concern” at all 72 proposed lithium sites (Guerra 2022). Additionally, all 72 proposed mining sites were full of important biodiversity, including “248 rare and/or special status species” (Parker et al. 2024). The impact on biodiversity is another consequence to lithium mining around the world. A report by the UN wrote how “mining activities have been responsible for ecosystem degradation and landscape damage” (2020). In Argentina, mining has destroyed habitats and threatened many species, including the endangered Andean Mountain cat and short-tailed chinchilla (Riofrancos et al. 2023). Unfortunately, many governments continue to overlook these environmental impacts due to the urgent demand for lithium for electric vehicle production.

The Biden Administration is in full support of electric vehicle production despite recognizing the consequences to human health and the environment. The administration recently approved a 700-million-dollar-loan to Rhyolite Ridge to develop a second mine in Nevada, which has impacts to the already endangered wildflower, Tiehm’s buckwheat. Other sites have also been explored for extraction, such as the Salton Sea in California. President Biden has promised that EVs will not only be the green alternative but will also match the distance coverage of their traditional gas-powered counterparts. He shared at the Detroit Auto Show, “Today, if you want an electric vehicle with a long range, you can buy

one made in America" (Walker 2023). His one-to-one swap of a gas-powered vehicle to an electric vehicle is quite literal, as GMC produced a 2022 Electric Hummer pickup. According to the CCP, the Hummer EV pickup "weighs over 9,000 pounds with a massive battery pack weighing almost 3,000 pounds, which is around three times the size of an average EV battery pack" (2023). Although these heavy- duty electric vehicles prove that a one-to-one swap is possible, it doesn't prove to be feasible as it requires far more lithium per vehicle. Currently, there isn't enough lithium to go around and if the US continues this trend, it will need 300% more lithium in 2050 than the total amount that is produced today worldwide (Riofrancos et al. 2023). The CCP also reported on possible scenarios to reduce the lithium demand within the United States. The most effective actions from these scenarios include… the most effective actions to reduce lithium demand within the US. These include a reduction in electric battery size, a fundamental transition away from car dependency and a refocus on US public transportation, and the establishment of lithium recycling.

The concern to transition from fossil fuels to the cleaner alternative provided by the electric vehicle is outweighing the consequences posed through lithium extraction. However, suggestions have been given to reduce the demand for lithium within the United States. Many reports have encouraged the transition away from a car-dependent nation and stressed the importance of public transportation. President Biden has included resources in newer policies, such as 3 billion in funding in the Inflation Reduction Act for increased infrastructure for public transportation. However, the scale at which public transportation is needed will not be met by this alone. A complete behavioral shift amongst Americans is necessary to limit personal vehicle use and expand the benefits of not only public transportation but alternate modes of travel. The CCP states vehicle demand could decrease by 15 percent through a reduction in car dependency (2023). The report also encourages the establishment of recycling facilities for lithium spent batteries. According to the UN, "spent LIBs could contain between 5 to 10 percent of lithium as well as other metals such as copper, aluminum and iron" (2020). Unfortunately, no recycling

exists today and the current “end of life recycling rate is estimated at less than 1 percent” (2020). The establishment of recycling facilities would not only decrease the demand for new lithium extraction, but it would also provide job opportunities and an economy for recycled metals.

The Biden administration has been implementing sustainable policies to address the nation’s contributions to climate change. Although the shift to electric vehicles is at the forefront of decarbonizing transportation, it needs to be met with justice in mind for indigenous rights, human health, and the environment. One topic that could be a gamechanger in electric vehicle production is the use of alternative battery technologies, such as sodium-ion batteries. These technologies are currently being researched for potential use in the future. Next, environmental impact reports could guide developers to prioritize lithium extraction sites with fewer impacts (Parker 2023). Another topic that wasn’t discussed in this paper, but needs great consideration, is the impact of electric vehicle dependency on environmental justice. Electric vehicle ownership is skewed towards individuals with higher income and there is minimal public transportation within under-represented communities. All in all, the transition to the zero-emission transportation sector needs to be equitable with indigenous rights, the environment, human health, and social classes in mind.

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