

TULANE LAW REVIEW ONLINE

VOL. 96

JUNE 2022

Out of Sight, Out of Mind: Addressing the Unseen but Potentially Detrimental Issues of the Lithium-Ion Battery Supply Chain

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I. INTRODUCTION

In May of 2016, Tibetan villagers awoke to a gruesome scene: masses of dead fish floating down the Liqi River and hundreds of cow and yak carcasses blighting their once lush and grassy sacred fields, dead from drinking the river water contaminated by nearby mines.¹ A sixty-seven-year-old yak herder described the deep torment this pollution caused the villagers by explaining, “[o]ld people, we see the mines and we cry.”² This was the third incident in seven years caused by the increased lithium mining activity under the Tibetan plateau.³ Officials had even closed the mines temporarily in 2013 in response to similar incidents of toxic chemicals that leaked into the Liqi River killing livestock and poisoning fish.⁴ As demand for lithium increased exponentially, China’s thirst for mineral resources forced the mine to reopen in April of 2016, and herders whose ancestors had lived on the land for thousands of years found their livelihoods devastated by pollution once again.⁵

The raw materials extracted from these mines are ultimately used in lithium-ion batteries that power portable electronics, medical equipment, and electric vehicles (EVs).⁶ Most mines for the essential raw materials used in lithium-ion batteries are geographically concentrated in a few countries, where local communities are forced to endure the ramifications of such activities.⁷ Toxic chemical leaks are among the many harmful environmental concerns commonly caused by mining activities regardless of which country controls the

1. *The Environmental Impact of Lithium Batteries*, INST. ENERGY RSCH. (Nov. 12, 2020), <https://www.instituteforenergyresearch.org/renewable/the-environmental-impact-of-lithium-batteries/> [hereinafter IER]; see also Simon Denyer, *Tibetans in Anguish as Chinese Mines Pollute Their Sacred Grasslands*, WASH. POST (Dec. 26, 2016), https://www.washingtonpost.com/world/asia_pacific/tibetans-in-anguish-as-chinese-mines-pollute-their-sacred-grasslands/2016/12/25/bb6aad06-63bc-11e6-b4d8-33e931b5a26d_story.html (stating that the “thirst for mineral resources” propels exploitation of the Tibetan plateau); Amit Katwala, *The Spiralling Environmental Cost of Our Lithium Battery Addiction*, WIRED (Aug. 5, 2018), <https://www.wired.co.uk/article/lithium-batteries-environment-impact> (describing the plight of Tibetan residents protesting toxic chemical leaks related to lithium mining activity).

2. Denyer, *supra* note 1.

3. See sources cited *supra* note 1.

4. *Id.*

5. *Id.*

6. *The Common Uses of Lithium-Ion Batteries*, EARTH AWARDS (Jan. 7, 2019), <https://www.theearthawards.org/the-common-uses-of-lithium-ion-batteries/>.

7. ETHAN N. ELKIND ET AL., CTR. L. ENERGY & ENV’T, NAT. RES. GOVERNANCE INST., SUSTAINABLE DRIVE SUSTAINABLE SUPPLY: PRIORITIES TO IMPROVE THE ELECTRIC VEHICLE BATTERY SUPPLY CHAIN 3 (2020).

operations.⁸ Moreover, this geographical concentration of the supply chain makes the supply vulnerable to geopolitical conflicts that could delay lithium-ion battery production in the United States.⁹

Lithium-ion battery supply chain vulnerabilities, unfortunately, do not stop after the mining phase. Once raw materials are extracted from mines like those beneath the Tibetan plateau, they are refined into usable form and transferred to cathode and cell-manufacturing facilities.¹⁰ These stages of the lithium-ion battery supply chain are largely controlled by Asian, especially Chinese, actors, whose dominance is so significant that they could dismantle the lithium-ion battery industry in the United States and leave American companies unable to meet the growing demand for the batteries.¹¹ After being composed into cells, “hundreds or thousands of individual cells” are combined into battery packs that vehicle manufacturers like Tesla, Inc. (Tesla) and General Motors Company (GM) use to power the EVs that are increasingly filling American roads.¹² As such, the supply of lithium-ion batteries in the United States is unstable because it relies on the cooperation of a limited number of countries, and unsustainable because the mining for essential raw materials is causing detrimental environmental impacts on local communities.

Meanwhile, American automobile companies pursue aggressive EV production goals under the popular pretext of reaching a zero-emissions future,¹³ and American politicians boast about plans to eliminate greenhouse gas emissions by investing in EV infrastructure, scarcely mentioning the supply chains needed to support such a huge increase in demand for the essential materials used in the batteries.¹⁴ Likewise, demand for smartphones and EVs is steadily rising,¹⁵ yet

8. See IER, *supra* note 1.

9. ELKIND ET AL., *supra* note 7, at 8.

10. See *id.*

11. See *id.*

12. *Id.*

13. See, e.g., *Our Path to an All-Electric Future*, GEN. MOTORS, <https://www.gm.com/electric-vehicles.html> [<https://perma.cc/56DX-25M8>] (last visited June 22, 2022) (explaining GM’s environmentally savvy goals).

14. See, e.g., Enrique Dans, *The Biden Administration Makes the Move to Electric Vehicles*, FORBES (Jan. 29, 2021), <https://www.forbes.com/sites/enriquedans/2021/01/29/the-biden-administration-makes-the-move-to-electricvehicles/?sh=4148b7ca7fe5> (explaining the Biden administration’s policies for electronic vehicles); Michael Cantu, *Biden to Pitch \$174 Billion EV Plan Before F-150 Lightning Reveal*, INSIDE EVS (May 11, 2021), <https://insideevs.com/news/506758/biden-ev-plan-f150-lightning/> [<https://perma.cc/KGX9-6D8F>] (describing the Biden Administration’s proposals to boost EVs).

15. ELKIND ET AL., *supra* note 7, at 1.

American consumers remain blissfully unaware of the helpless villagers whose sacred lands are being destroyed in their wake.¹⁶

Although these supply issues take place down the value chain, hidden from the American consumer's direct perception, the United States must address them immediately in order to ensure a successful energy transition to a lower-carbon, electric future, which is largely powered by lithium-ion batteries.¹⁷ If the supply chain is left as unreliable as it is now, the United States' lithium-ion battery industry risks not being able to meet the massive anticipated demand increase and subsequently causing delays in EV production.¹⁸ The present dependence on a limited number of foreign nations also leaves the price of lithium-ion batteries vulnerable to international manipulation.¹⁹ Unexpected and unwelcomed price increases and interruptions in production caused by geopolitical conflicts could weaken and delay public acceptance of EVs.²⁰

Leaving the supply chain unreformed will also further entrench the environmental abuses in mineral-rich nations. These countries will be forced to scramble to meet higher demands as quickly and as cheaply as possible, likely bypassing safer and environmentally conscious sourcing practices.²¹ Not only is addressing these environmental abuses the morally right thing to do, but "sustainability" is gaining popularity in the corporate world as more and more companies, big and small, name sustainability as a key priority moving forward.²² Sustainability has been defined as "meeting the needs of the present without compromising the ability of future generations to meet

16. See *Developing Countries Pay Environmental Cost of Electric Car Batteries*, U.N. CONF. TRADE & DEV (July 22, 2020), <https://unctad.org/news/developing-countries-pay-environmental-cost-electric-car-batteries> [<https://perma.cc/L8VG-4UGN>] [hereinafter *UNCTAD*].

17. See Florencia Heredia et al., *The Importance of Lithium for Achieving a Low-Carbon Future: Overview of the Lithium Extraction in the 'Lithium Triangle'*, 38 J. ENERGY & NAT. RES. L. 213, 213 (2020).

18. See Ethan Elkind, *Why the US Must Support the Electric Vehicle Supply Chain*, THE HILL (Feb. 9, 2021), <https://thehill.com/opinion/energy-environment/537870-why-the-us-must-support-the-electric-vehicle-supply-chain>.

19. *Id.*

20. *Id.*

21. Dylan Hays, *My Brother's Keeper: A Framework for a Legal Obligation to Respect Human Rights in Global Supply Chains*, 88 GEO. WASH. L. REV. 454, 459 (2020).

22. Andrew Beattie, *The 3 Pillars of Corporate Sustainability*, INVESTOPEDIA (June 29, 2021), <https://www.investopedia.com/articles/investing/100515/three-pillars-corporate-sustainability.asp#:~:text=Key%20Takeaways&text=ESG%20investment%20represents%20the%203,to%20a%20company's%20bottom%20line> [<https://perma.cc/LWJ8-6XGN>].

theirs.”²³ Thus, sustainability calls for business practices that generate profit (economic sustainability), have a beneficial impact on the planet (environmental sustainability), and have support from its employees, stakeholders, and the community it operates in (social sustainability).²⁴ The growing popularity of corporate sustainability is largely driven by the ever-increasing number of investors seeking not only economic profit but also social and environmental good.²⁵ Walmart, Inc. and McDonald’s Corporation are just two of the many corporate giants that have followed this sustainability trend.²⁶

As the world undergoes an energy transition toward a low-carbon economy and the demand for lithium-ion batteries continues to grow, the United States must endorse policy that both ensures supply security and promotes environmental and social sustainability²⁷ throughout the supply chain. This Comment sheds light on widely overlooked supply security and environmental sustainability concerns that currently threaten the lithium-ion battery industry.²⁸ It also proposes policy initiatives that, after implementation by both the United States and other countries around the world, achieve the supply security and sustainability necessary for an electric future.

Part II of this Comment analyzes in detail the supply chain security and environmental sustainability concerns, focusing first on factors that contribute to the unstable supply and then detailing the

23. *Id.*

24. *Id.*

25. *Id.*

26. *Id.*

27. In addition to the adverse environmental and health impacts that mining has on surrounding communities, human rights abuses that involve forced and child labor are prevalent in early phases of the lithium-ion battery value chain. *See, e.g., Amnesty Challenges Industry Leaders to Clean Up Their Batteries*, AMNESTY INT’L (Mar. 21, 2019), <https://www.amnesty.org/en/latest/news/2019/03/amnesty-challenges-industry-leaders-to-clean-up-their-batteries/> [<https://perma.cc/W752-BFPA>] (explaining Amnesty International’s efforts to forge an ethical battery industry). While this is also a major sustainability concern that demands attention from the American government and auto-industry, it is outside the scope of this Comment.

28. The scope of this Comment is limited to the environmental abuses that occur when mining for essential raw materials used in lithium-ion batteries. It is important to note, however, that there are other significant environmental concerns that the industry is faced with when lithium-ion batteries reach their end-of-life and must be disposed of or, preferably, recycled/reused. *See* Lauren Neuhaus, *The Electrifying Problem of Used Lithium Ion Batteries: Recommendations for Recycling and Disposal*, 42 ENVIRONS: ENV’T. L. & POL’Y J. 67, 71-72 (2018) (analyzing the health and environmental impacts of lithium-ion batteries once they reach end of life). Although this Comment focuses on the mining environmental abuses, policymakers must address these pressing problems simultaneously in order to reach sustainability goals.

harmful environmental impacts of mining in mineral rich countries. Part III explores existing United States policy, the regulatory state, and non-governmental initiatives and their shortcomings. Part IV suggests a range of steps that, taken together, can create a comprehensive policy that would help secure supply and minimize environmental abuses. It also calls for international collaboration in promoting lithium-ion battery supply security and sustainability policy objectives and analyzes how the European Union has already made such goals a top priority. Part V concludes on a positive note by highlighting the promising and electric future that the lithium-ion battery industry will bring the world.

II. LITHIUM-ION BATTERY OVERVIEW: LACK OF SUPPLY CHAIN SECURITY AND SUSTAINABILITY

Electric investment is the way of the future.²⁹ As the world is going through an energy transition to a low-carbon future, the United States has seen a huge increase in the deployment of energy storage, especially through the use of lithium-ion batteries, which are used to power EVs and smartphones.³⁰ Batteries for EVs in particular are a main driver for the demand for lithium-ion batteries.³¹ Today, some estimates suggest that EVs emit significantly fewer greenhouse gases per kilometer traveled than internal combustion engines.³² Not only do EVs currently have substantial emission benefits over traditional gasoline vehicles, but greenhouse gas benefits are estimated to grow as companies develop new production technologies and the “overall electrical grid becomes less carbon-intensive.”³³

29. Notably, Elon Musk, Tesla and SpaceX entrepreneur, recently surpassed Amazon.com founder, Jeff Bezos, as the world’s richest person due to Tesla’s increasing stock price, which has risen almost 700% this past year. Al Root, *Tesla Stock’s Spectacular Rise Means Elon Musk is the Richest Man in the World*, BARRON’S (Jan. 7, 2021, 1:03PM), <https://www.barrons.com/articles/tesla-stocks-rise-means-elon-musk-is-the-richest-man-in-the-world-51610042581>. This demonstrates that investors see electric vehicles as the future for personal transportation. *Id.*

30. *Lithium-Ion Battery Market Worth \$129 Billion by 2027—Breakdown by Component, End-Use Industry and Region—ResearchAndMarkets.com*, BUS. WIRE (July 20, 2020 7:10 AM), <https://www.businesswire.com/news/home/20200720005363/en/Lithium-ion-Battery-Market-Worth-129-Billion-by-2027---Breakdown-by-Component-End-use-Industry-and-Region---ResearchAndMarkets.com> [<https://perma.cc/VPR4-C96A>].

31. ELSA DOMINISH ET AL., INST. SUSTAINABLE FUTURES, RESPONSIBLE MINERALS SOURCING FOR RENEWABLE ENERGY iv (2019) [hereinafter RESPONSIBLE MINERALS].

32. ELKIND ET AL., *supra* note 7.

33. *Id.*

Because of the increasingly popular desire to rely on cleaner energy and the promising environmental benefits of EVs, passenger EV sales jumped from 450,000 in 2015 to 2.1 million in 2019.³⁴ Furthermore, these numbers are projected to “continu[e] to rise as battery prices fall, energy density improves, more charging infrastructure is built, and sales spread to new markets.”³⁵ By 2030, global sales of EVs are anticipated to reach tens of millions per year.³⁶ Consequently, the demand for graphite, lithium, and cobalt, three essential materials used in lithium-ion batteries, is estimated to grow close to 500% by 2050 in order to meet global EV targets.³⁷

As lithium-ion battery demand continues to rise at an exponential rate both nationally and globally, the United States must prepare for all difficulties that may arise instead of blindly investing in this sector. Two key issues currently loom over the lithium-ion battery industry and have the potential to devastate the industry’s growth. First, there is an unstable supply of essential materials used in lithium-ion batteries that could at any moment prevent American companies from producing enough EVs to meet the rising U.S. demand.³⁸ Second, the rising demand implicates significant environmental consequences that harmfully impact, and in many cases completely uproot, the lives of local communities in mineral-producing countries.³⁹ These issues are widely overlooked by consumers, who tend to focus only on the immediate benefits of EVs over traditional gasoline vehicles instead of the abuses that occur earlier on in the manufacturing of the batteries, in foreign countries and hidden from American consumers.⁴⁰

34. *Electric Vehicle Outlook 2020*, BLOOMBERGNEF, <https://about.bnef.com/electric-vehicle-outlook/> (last visited June 22, 2022) [hereinafter *Electric Vehicle Outlook*].

35. *Id.*

36. ELKIND ET AL., *supra* note 7, at 1.

37. *Mineral Production to Soar as Demand for Clean Energy Increases*, THE WORLD BANK GRP. (May 11, 2020), <https://www.worldbank.org/en/news/press-release/2020/05/11/mineral-production-to-soar-as-demand-for-clean-energy-increases> [<https://perma.cc/2PHV-9UUR>].

38. Courtney Bublé, *White House Outlines ‘Made in America’ Executive Order Implementation*, GOV’T EXEC. (June 14, 2021), <https://www.govexec.com/management/2021/06/white-house-outlines-made-america-executive-order-implementation/174712/> [<https://perma.cc/T3AC-A3AA>].

39. See IER, *supra* note 1 (explaining the detrimental effects of a toxic chemical leak from a lithium mine on Tibetan indigenous communities).

40. See UNCTAD, *supra* note 16 (describing how the United Nations Conference on Trade and Development Director of International Trade explained that consumers are unaware of the “dirty” aspects of the lithium-ion battery production process).

A. *Unstable Supply and Price*

One of the reasons consumers are unaware of the lithium-ion battery supply chain's vulnerabilities is that it, as is common in other global markets, is fragmented into different stages spread out around the globe, currently performed in separate, specialized facilities.⁴¹ The process begins with the mining of raw materials needed in lithium-ion batteries, including lithium, nickel, cobalt, manganese, and graphite.⁴² Then, these materials are processed for purity or specific composition.⁴³ Next, these processed materials are used to manufacture cathodes, which are key components of battery cells.⁴⁴ The cathode and cell manufacturing phases are typically carried out in the same facility.⁴⁵ Finally, cells and other components are assembled into a complete battery pack, which vehicle manufacturers use in EVs that are sold to consumers.⁴⁶

Increased demand could cause serious problems for the United States. Two key characteristics of the lithium-ion battery supply chain make it unstable and vulnerable to disruption. First, the essential raw materials are concentrated in a few specific countries, many of which are still developing.⁴⁷ As a result, access to supply is susceptible to the impacts of geopolitical conflicts that are often present in developing nations.⁴⁸ Second, the refining, cathode manufacturing, and cell manufacturing stages of the supply chain are dominated by companies that are largely concentrated in east Asia—most significantly in China⁴⁹—which gives these few countries substantial control over supply availability for the United States.⁵⁰ Looking at these issues in detail reveals that they have already caused some disruption in supply

41. See Donald Chung et al., *Automotive Lithium-Ion Battery (LIB) Supply Chain and U.S. Competitiveness Considerations* 8 (June 2015); RESPONSIBLE MINERALS, *supra* note 31, at v.

42. ELKIND ET AL., *supra* note 7; Chung, *supra* note 41, at 8.

43. Chung, *supra* note 41, at 9.

44. *See id.*

45. *Id.*

46. *Id.*

47. Tae-Yoon Kim & Milosz Karpinski, *Clean Energy Progress After the Covid-19 Crisis Will Need Reliable Supplies of Critical Minerals*, IEA (May 6, 2020), <https://www.iea.org/articles/clean-energy-progress-after-the-covid-19-crisis-will-need-reliable-supplies-of-critical-minerals> [<https://perma.cc/8TX8-C6R4>]; ELKIND ET AL., *supra* note 7, at 7-8.

48. See Kim & Karpinski, *supra* note 47; ELKIND ET AL., *supra* note 7, at 7-8.

49. ELKIND ET AL., *supra* note 7, at 8.

50. *Id.*

availability, but they have the potential to create a much larger impact on the EV industry in the United States.⁵¹

The geographic concentration of the raw materials used in lithium-ion batteries in a small number of countries makes the entire supply chain vulnerable to geopolitical conflicts.⁵² The Democratic Republic of the Congo (DRC) is estimated to be the location of up to sixty percent of global cobalt production and more than half of global cobalt reserves.⁵³ While Australia, Canada, China, Cuba, Madagascar, the Philippines, Russia, and Zambia also produce cobalt, the production and reserves in these countries are substantially smaller than those of the DRC.⁵⁴ Lithium production, another key component of lithium-ion batteries, is also concentrated in a limited number of countries.⁵⁵ Mineral-rich brines, one of the two primary forms of lithium reserves, are primarily located in South America's "lithium triangle," which includes Argentina, Chile, and Bolivia.⁵⁶ The other form of lithium reserves, hard rock mines, exist primarily in Australia and China.⁵⁷ Overall, ninety percent of current global lithium production takes place in Australia, China, Argentina, and Chile.⁵⁸ Likewise, roughly eighty percent of graphite reserves are located in Brazil, China, and Turkey.⁵⁹ The extraction of other essential mineral inputs of lithium-ion batteries are concentrated in a small group of countries as well.⁶⁰

Reliance on a few foreign nations for essential minerals leaves the supply chain vulnerable to geopolitical issues caused by unstable governments, regulatory and trade restriction changes, and internal conflicts.⁶¹ Such geopolitical conflicts could cause significant delays in battery production that would lead to American companies failing to

51. *Id.*

52. TSISILILE IGOGO ET AL., SUPPLY CHAIN OF RAW MATERIALS USED IN THE MANUFACTURING OF LIGHT-DUTY VEHICLE LITHIUM-ION BATTERIES vi (2019); ELKIND ET AL., *supra* note 7, at 3, 6.

53. ELKIND ET AL., *supra* note 7.

54. *Id.*

55. *Id.* at 6.

56. *Id.*; Heredia, *supra* note 17, at 214. Although Bolivia is considered part of the lithium triangle, it is not yet producing commercial quantities. ELKIND ET AL., *supra* note 7, at 6.

57. ELKIND ET AL., *supra* note 7, at 6.

58. *Id.*

59. UNCTAD, *supra* note 16.

60. ELKIND ET AL., *supra* note 7, at 6; Kim & Karpinski, *supra* note 47.

61. ELKIND ET AL., *supra* note 7; Kim & Karpinski, *supra* note 47.

meet the raising demand for the batteries.⁶² As an example, protests that took place in Chile in 2019 illustrate how internal conflicts can impact the entire lithium-ion battery supply chain when the essential raw materials are concentrated in a few countries.⁶³ There, indigenous communities blocked access to lithium operations at Chile's Atacama salt flats, which are among the world's richest lithium reserves.⁶⁴ These protests were largely focused on social inequality in the country, but environmental concerns of the lithium mining in the area were also cited as a motivation for the rallies.⁶⁵ These protests caused more than \$1.4 billion of losses to businesses in just one week.⁶⁶ Events like this are always a concern that could affect supply when the essential components are concentrated in so few countries, especially in those that are still developing. Political instability and conflict have long affected the DRC, for example.⁶⁷ This puts the cobalt supply at risk of disruption and threatens the overall lithium-ion battery production chain.⁶⁸ Access to supply and prices of materials are also susceptible to unstable governments' changing regulatory schemes and trade restrictions in the countries that contain essential raw materials.⁶⁹ In 2018, for example, the DRC classified cobalt as a "strategic substance," causing the royalty rate on cobalt to nearly triple.⁷⁰

The strain put on the country's supply of minerals from increasing demand can also cause price fluctuation of end-products sold to consumers.⁷¹ For example, between 2016 and 2018, the price of cobalt increased five times its 2016 price in response to the amplified demand.⁷² Although an adequate amount of cobalt was produced to meet the demand at that time, there is no guarantee the supply will be able to meet the projected demand increases of the coming years, even with significant price increases.⁷³ Price volatility, evidently, is another risk associated with the lithium-ion supply chain.

62. ELKIND ET AL., *supra* note 7.

63. See Dave Sherwood, *Chile Protesters Block Access to Lithium Operations: Local Leader*, REUTERS (Oct. 25, 2019), <https://www.reuters.com/article/us-chile-protests-lithium/chile-protesters-block-access-to-lithium-operations-local-leader-idUSKBN1X42B9>.

64. *Id.*

65. *Id.*

66. *Id.*

67. See ELKIND ET AL., *supra* note 7, at 5.

68. *See id.*

69. Kim & Karpinski, *supra* note 47.

70. *Id.*

71. *Id.*

72. *Id.*

73. *See id.*

Not only is the mining of raw materials dominated by a limited number of countries, but the refining, cathode manufacturing, and cell manufacturing phases of the supply chain are as well.⁷⁴ Most noteworthy, China has been dominating these phases and is projected to continue to do so unless the United States makes significant advances in its manufacturing technologies and capacity.⁷⁵ Benchmark Mineral Intelligence, a market analysis firm, estimated that in 2019, Chinese actors controlled twenty-three percent of upstream mining (of lithium, cobalt, graphite, and manganese), eighty percent of chemical refining, sixty-six percent of cathode and anode production, and seventy-three percent of lithium-ion battery cell manufacturing.⁷⁶ To help conceptualize China's dominance over the industry: in 2018, Chinese lithium reserves totaled one million metric tons—nearly thirty times that of the United States.⁷⁷

This dependence on foreign manufacturers represents a key challenge to the industry's anticipated and desired growth. China's dominance in particular could threaten global access to mineral supplies,⁷⁸ and any decision made by China regarding its refining and processing operations would have significant impacts on the stability and governance of the overall supply chain.⁷⁹ For example, if the Chinese government decided to change its policy to require that their resources be directed toward exclusively domestic producers, U.S. companies would lose access to key battery components.⁸⁰ China's control over supply to the United States was illustrated in 2010 when it attempted to limit rare earth exports.⁸¹ Although the policy change was never implemented, this demonstrates how quickly a change in China's policy could affect the United States' access to essential lithium-ion battery components.⁸²

74. ELKIND ET AL., *supra* note 7, at 8.

75. Robert Rapier, *Why China Is Dominating Lithium-Ion Battery Production*, FORBES (Aug. 4, 2019), <https://www.forbes.com/sites/rpapier/2019/08/04/why-china-is-dominating-lithium-ion-battery-production/?sh=371e30253786>.

76. *China Controls Sway of Electric Vehicle Power through Battery Chemicals, Cathode and Anode Production*, BENCHMARK MIN. INTEL. (May 6, 2020), <https://www.benchmarkminerals.com/membership/china-controls-sway-of-electric-vehicle-power-through-battery-chemicals-cathode-and-anode-production/> [<https://perma.cc/3Y8B-LMMZ>].

77. Rapier, *supra* note 75.

78. ELKIND ET AL., *supra* note 7, at 8.

79. *Id.*

80. *Id.* at 6.

81. Kim & Karpinski, *supra* note 47.

82. *Id.*

The concentration of producers and reserves in a limited number of countries creates significant supply risks for the United States as it sets out to achieve a low-carbon future. Without lithium-ion battery supply and price security, U.S. auto companies will not be able to reliably meet the Biden Administration’s projected demand increase for electric vehicles. China’s dominance in lithium-ion battery production is not going anywhere, and the world’s supply of essential minerals also remains confined to just a few countries. Thus, although it may be impossible to guarantee price and supply security, the United States should take steps to reduce the risks posed by the current supply chain.

B. *Environmental Impacts*

In addition to paving the way for supply instability, the globalization of the lithium-ion battery supply chain has spurred a rise in sustainability issues in the earlier phases of the supply chain. This unsustainability is due to a “race to the bottom” by multinational corporations to find the cheapest investments in these mineral rich nations⁸³ and a lack of transparency and accountability of mining practices in foreign countries.⁸⁴ The “race to the bottom” by multinational corporations has encouraged mineral rich countries to cut corners in order to produce the most minerals in the quickest and cheapest ways possible, often ignoring social or environmental concerns that would slow and increase the price of extraction.⁸⁵ Additionally, because of the geographic concentration of producers and reserves, the markets for the essential raw materials used in lithium-ion batteries tend to be less transparent than those for conventional materials like aluminum and copper.⁸⁶ Therefore, these mineral rich nations are less incentivized to practice environmentally conscious extraction techniques because they won’t be held accountable for practicing environmentally adverse operations.⁸⁷ Countries will instead be more inclined to choose the cheapest paths towards extraction, which often bypass environmental protections in order to win the investments of multinational corporations seeking the materials.

The lithium extraction process specifically poses significant risks due to the immense amount of water required, which can create water

83. Hays, *supra* note 21.

84. IGOGO, *supra* note 52, at vi.

85. See Hays, *supra* note 21.

86. IGOGO, *supra* note 52, at vi.

87. See *id.*

contamination and shortage risks. As explained earlier, more than half of the world's supply of lithium is found in South America's "lithium triangle," which covers parts of Argentina, Bolivia, and Chile.⁸⁸ This area, home to indigenous quinoa farmers and llama herders who have lived there for centuries, is one of the world's driest regions.⁸⁹ Because lithium mining requires massive amounts of ground water to pump out brines from drilled wells,⁹⁰ indigenous farmers and herders are left with minimal access to water.⁹¹ This problem is so severe that it has spurred protests and lawsuits.⁹² As an illustration of these mines' effects on local communities, one indigenous protestor's sign read, "[w]e don't eat batteries They take the water, life is gone."⁹³ Chile's Salar de Atacama has been hit especially hard by these projects.⁹⁴ There, the lithium mining activities consumed sixty-five percent of the region's water, causing the groundwater to be depleted, the soil to be contaminated, and the area to be overwhelmed with environmental degradation.⁹⁵ Consequently, local communities were forced to abandon ancestral settlements.⁹⁶ Unsurprisingly, the United Nations Conference on Trade and Development (UNCTAD) reported that as demand for lithium rises and producers seek the raw material from deeper rock mines and brines, environmental risks will continue to increase.⁹⁷

While much attention has been given to human rights abuses occurring in the DRC cobalt mines,⁹⁸ serious environmental abuses related to the extraction of cobalt also deserve attention.⁹⁹ Specifically,

88. IER, *supra* note 1.

89. UNCTAD, *supra* note 16.

90. "Some estimates show that almost 2 million litres of water are needed to produce one ton of lithium." *Id.*

91. *Id.*

92. Todd C. Frankel & Peter Whoriskey, *Tossed Aside in the 'White Gold' Rush*, WASH. POST (Dec. 19, 2016), https://www.washingtonpost.com/graphics/business/batteries/tossed-aside-in-the-lithium-rush/?wpisrc=al_alert-COMBO-economy%252Bnation.

93. *Id.*

94. UNCTAD, *supra* note 16.

95. *Id.*; see IER, *supra* note 1.

96. UNCTAD, *supra* note 16.

97. *Id.*

98. See, e.g., Paul Tregunna, *The Cost of Cobalt*, BUZZ (Feb. 16, 2021), <https://buzz.bournemouth.ac.uk/2021/02/the-cost-of-cobalt/> (explaining the industry surrounding cobalt production); Ewelina U. Ochab, *Are These Tech Companies Complicit in Human Rights Abuses of Child Cobalt Miners in Congo?*, FORBES (Jan. 13, 2020), <https://www.forbes.com/sites/ewelinaochab/2020/01/13/are-these-tech-companies-complicit-in-human-rights-abuses-of-child-cobalt-miners-in-congo/?sh=37fddfdb3b17>.

99. RESPONSIBLE MINERALS, *supra* note 31, at v, 39.

the sulfur minerals that may be found in cobalt mines can generate sulfuric acid when exposed to air and water, a process known as “acid mine drainage.”¹⁰⁰ This process can “devastate rivers, streams and aquatic life for hundreds of years.”¹⁰¹ Smelting, the process used to obtain cobalt, also emits sulfur dioxide into the atmosphere.¹⁰² Because of these extraction practices, cobalt miners and the communities surrounding the mines have experienced severe health impacts caused by metal contamination of the air, water, and soil.¹⁰³ Furthermore, the cobalt mining area in the DRC has been listed as one of the top ten most polluted places in the world due to the mining activities in the region.¹⁰⁴

Mining for lithium and cobalt are not the only environmental dangers. Graphite mining, for example, uses explosives that blow dust and fine particles into the atmosphere, which contaminates soils and creates health risks for communities near the mining sites.¹⁰⁵ These environmental abuses cause detrimental impacts on the livelihoods of local communities but are often overlooked because they occur so far down the supply chain.¹⁰⁶ As UNCTAD’s director of international trade explained, “[m]ost consumers are only aware of the ‘clean’ aspects of electric vehicles The dirty aspects of the production process are out of sight.”¹⁰⁷

Consumers cannot continue to live in such blissful ignorance while innocent lives are being uprooted and the supply for these batteries can falter at any moment. Many American politicians, industry actors, and third-party players have acknowledged the need to address lithium-ion battery supply chain issues, but little action has been carried out to make any substantial progress in making the supply more reliable and sustainable.¹⁰⁸

100. UNCTAD, *supra* note 16.

101. *Id.*

102. Neuhaus, *supra* note 28, at 71.

103. RESPONSIBLE MINERALS, *supra* note 31, at v, 39.

104. *Id.*

105. UNCTAD, *supra* note 16.

106. *Id.*

107. *Id.*

108. BIDEN ADMINISTRATION ANNOUNCES STEPS TO STRENGTHEN CRITICAL SUPPLY CHAINS, WILMERHALE (June 9, 2021), <https://www.wilmerhale.com/en/insights/client-alerts/20210609-biden-administration-announces-steps-to-strengthen-critical-supply-chains> [<https://perma.cc/AS7U-EQ54>] [hereinafter WILMERHALE].

III. LIMITATIONS OF EXISTING U.S. POLICY AND INITIATIVES

The United States should promptly address the impending lithium-ion battery supply chain security risks and sustainability concerns for a number of reasons. First, as the United States, along with the rest of the world, strives for a low-carbon future, the supply of essential lithium-ion battery components must be able to respond to the projected rise in demand.¹⁰⁹ If the supply chain remains unchanged—that is, largely dependent on a few countries for extraction, refining, and manufacturing—then the supply will remain unreliable and the price volatile.¹¹⁰ Such an unstable market could significantly delay public acceptance of EVs.¹¹¹ Furthermore, ensuring that environmental and social goals are met in foreign mineral-rich nations will reduce the risk of internal conflicts that could halt production, like the protests that took place in Chile that blocked lithium mining operations.¹¹² Without security of supply, the energy transition could be delayed if supply cannot meet demand; without security of price, the energy transition could be delayed if consumers lose their positive perception of the industry.

The United States also has economic incentives to address the security of supply issues. Increasing domestic manufacturing capabilities has the potential to create many new jobs for Americans.¹¹³ Finally, the United States declared sustainability a national policy in 1969 when it passed the National Environmental Policy Act.¹¹⁴ The Act set out the objective “to create and maintain conditions under which [humans] and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations.”¹¹⁵ In line with this goal, the United States cannot continue to ignore the wellbeing of communities that are being plagued by

109. See RESPONSIBLE MINERALS, *supra* note 31, at 46.

110. *Id.*

111. See Neuhaus, *supra* note 28, at 71.

112. See Sherwood, *supra* note 63.

113. Ronald Brownstein, *Here's What Biden Must Do to Get More Electric Cars on the Road*, CNN (Feb. 2, 2021), <https://www.cnn.com/2021/02/02/politics/biden-climate-change-electric-cars/index.html>.

114. National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321-47. The United States has also expressed its desire to achieve sustainability by implementing the Sustainable Development Goals both domestically and abroad. Kristen Cordell & Christine Li, *It's Time for the United States to Reengage with the SDGs, Starting with SDG 16*, CSIS (Apr. 12, 2021), <https://www.csis.org/analysis/its-time-united-states-reengage-sdgs-starting-sdg-16> [https://perma.cc/9UW9-JHXS].

115. National Environmental Policy Act of 1969, 42 U.S.C. § 4331.

unsafe and hazardous mining practices while American companies and consumers ignorantly reap the benefits.¹¹⁶ Furthermore, the public's interest in sustainability has risen in recent years and more companies are naming sustainability as a top priority.¹¹⁷ Americans are becoming more concerned with the future of the planet, and the United States government must respond to that concern not only because its citizens call for it, but also because it is the morally right thing to do. Thus far, however, the government and the industry as a whole has fallen short.

A. Current Regulatory State and Federally Funded Initiatives

United States policy concerning lithium-ion batteries is currently underdeveloped. In 1976, the Electric and Hybrid Vehicle Research, Development, and Demonstration Act was passed with the goal to reduce the United States' dependence on foreign oil.¹¹⁸ The Act lists the advancement of EV research as one of its objectives.¹¹⁹ Similar to other legislation related to lithium-ion batteries and electric vehicles, this Act did not discuss the batteries' manufacturing process or the batteries' end of life stage.¹²⁰ The lithium-ion battery industry is also regulated by the U.S. Department of Transportation, which manages safety hazards of lithium-ion batteries in their packaging, marking, labeling and transportation through the Hazardous Materials Regulations.¹²¹ Additionally, the U.S. Resource Conservation and Recovery Act, passed in 1976 and regulated by the Environmental Protection Agency, imposes requirements for waste management and requires recordkeeping, labeling, and storage methods that keep material out of the environment.¹²² Glaringly absent from the current regulatory framework is any mention of the manufacturing process and supply chain of lithium-ion batteries.

The Green New Deal, a congressional resolution that calls for a reduction of fossil fuel emissions in the United States, is not the solution unless supplemental policy addressing supply security and

116. See Hays, *supra* note 21.

117. Beattie, *supra* note 22; *Learn About Sustainability*, U.S. ENV'T PROT. AGENCY (Dec. 2, 2021), <https://www.epa.gov/sustainability/learn-about-sustainability> [<https://perma.cc/ET8E-9S7C>].

118. 15 U.S.C. § 2501.

119. *Id.*

120. *See id.*

121. *See* 49 C.F.R. §§ 171-80 (2017).

122. 42 U.S.C. § 6901.

sustainability concerns is implemented.¹²³ Although it calls for drastic cuts to carbon emissions across the economy by investing in electric, “zero-emission,” vehicle infrastructure and manufacturing, it fails to mention the supply chains needed to support this industrial effort.¹²⁴ To meet the goals set out by the Green New Deal without making any changes to the value chain, supply may not be able to meet demand and the environmental issues that we are seeing down the supply chain today will only become more severe and detrimental to local communities. What is more, critics have suggested that “[i]f the U.S. does not get its industrial policy in order, our potential American Green New Deal could well become China’s Green New Deal,” claiming that it would only bring new jobs and economic growth to China and not to America.¹²⁵

The Biden Administration’s energy policy appears to put American policy on the right track but still requires future action in order to implement the stated objectives. Most media attention has been focused on President Biden’s aggressive push for EV deployment and investments in EV charging technologies so that roads and highways can support the transition to EVs, but such objectives must be supplemented by policy that secures supply and promotes sustainability, which the Biden Administration has already made significant steps towards doing.¹²⁶

Most notably, on February 24, 2021, President Biden signed Executive Order 14017, “America’s Supply Chains,” which calls for a one hundred day interagency review that identifies risks in the supply chains of four critical U.S. products, including the batteries used to power EVs, and specifies the path towards strengthening U.S. supply

123. Lisa Friedman, *What is the Green New Deal? A Climate Proposal, Explained*, N.Y. TIMES (Feb. 21, 2019), <https://www.nytimes.com/2019/02/21/climate/green-new-deal-questions-answers.html>.

124. John Adams, *Mining ‘The Green New Deal’*, REALCLEAR ENERGY (Nov. 5, 2019), https://www.realclearenergy.org/articles/2019/11/05/mining_the_green_new_deal_110487.html [<https://perma.cc/J948-6UZK>].

125. *Id.*

126. See, e.g., Michael Wayland, *Biden Plans to Replace Government Fleet with Electric Vehicles*, CNBC (Jan. 25, 2021), <https://www.cnbc.com/2021/01/25/biden-plans-to-replace-government-fleet-with-electric-vehicles.html> (focusing on Biden’s plan to replace the government’s vehicle fleet with EVs); Sean Szymkowski, *Biden Administration Promises an EV Era, New World for the Auto Industry*, CNET (Jan. 20, 2021), <https://www.cnet.com/roadshow/news/joe-biden-administration-ev-autos-transportation-infrastructure/> [<https://perma.cc/MHG3-CJNQ>] (explaining Biden’s plan to improve infrastructure by focusing on Biden’s push to improve roads and highways so that they can support the transition to EVs).

chain resilience.¹²⁷ On June 8, 2021, such reports were released.¹²⁸ The reports identified five main sources of vulnerabilities in supply chains including insufficient U.S. manufacturing capacity, geographic concentration in global sourcing, and “[m]isaligned incentives and short-termism in private markets, as U.S. companies are increasingly focused on maximizing short-term capital returns while neglecting investments that would improve quality, sustainability, or long-term productivity.”¹²⁹

The reports make numerous recommendations to address these vulnerabilities, which the Biden Administration has responded to by taking a number of immediate actions which, among other things, aim to address lithium-ion battery supply chain security and sustainability.¹³⁰ Specifically, the actions seek to “[s]ecure an end-to-end domestic supply chain for advanced batteries” through releasing a National Blueprint for Lithium Batteries, which will codify the reports in a ten-year plan to develop a lithium-ion battery domestic supply chain, leveraging around seventeen billion dollars in loan authority to support the domestic battery supply chain, and launching a new effort through the Department of Energy’s (DOE) Federal Energy Management Program that will support federal agencies deploying energy storage projects.¹³¹ Additionally, the Biden Administration seeks to “[i]nvest in sustainable domestic and international production and processing of critical minerals” through, among other things, establishing a working group to identify United States locations that could produce critical minerals while meeting sustainability standards and creating an interagency team to identify gaps in current statutes and regulations that must be updated to adequately support sustainability goals.¹³² Although the Administration states that improving international sustainability in production and processing is an objective, the planned actions focus on ensuring sustainable domestic

127. Exec. Order No. 14017, 86 Fed. Reg. 11849 (2021).

128. THE WHITE HOUSE, BUILDING RESILIENT SUPPLY CHAINS, REVITALIZING AMERICAN MANUFACTURING, AND FOSTERING BROAD-BASED GROWTH (2021).

129. WILMERHALE, *supra* note 108.

130. *See id.*; *Fact Sheet: Biden-Harris Administration Announces Supply Chain Disruptions Task Force to Address Short-Term Supply Chain Discontinuities*, WHITE HOUSE (June 8, 2021), <https://www.whitehouse.gov/briefing-room/statements-releases/2021/06/08/fact-sheet-biden-harris-administration-announces-supply-chain-disruptions-task-force-to-address-short-term-supply-chain-discontinuities/> [<https://perma.cc/E8CK-DEBJ>] [*hereinafter Fact Sheet*].

131. *Fact Sheet*, *supra* note 130.

132. *Id.*

practices while, for the most part, ignoring international practices.¹³³ Regarding the actions to improve domestic sustainability practices and increase domestic manufacturing capabilities, the Biden Administration is making promising plans, but future action is necessary in order to implement the plans and reach their grand objectives.

The Biden Administration has also made other express commitments to advancing domestic manufacturing in order to create more jobs for American citizens.¹³⁴ President Biden's Plan to Ensure the Future is Made in All of America by America's Workers, for example, calls for the federal government to use a wide array of its tools—including its purchasing power, research and development, tax, trade, and investment policies—to “position America to be the global leader in the manufacture of electric vehicles and their input materials and parts.”¹³⁵ On his website, Biden specifically notes that he plans to “vigorously enforce” trade rules in response to, among other things, Chinese government abuses in the EV industry.¹³⁶ Following these policy objectives, President Biden signed a “Made in America” Executive Order in January 2021 that is intended to grow domestic manufacturing in all industries in order to boost the American economy.¹³⁷ There is no specific mention to lithium-ion batteries, however.

Additionally, Biden's “Build Back Better” plan calls for large investments in federal research and development in sectors including in the auto industry.¹³⁸ Five billion dollars over five years in this proposed investment is meant for battery and energy storage “that can boost the range and slash the price of electric cars.”¹³⁹ The Biden Administration, evidently, has taken a step in the right direction by acknowledging the need to address supply chain security issues and promoting policy to boost domestic manufacturing in all industries, including the auto industry.

133. *See id.*

134. *The Biden Plan to Build a Modern, Sustainable Infrastructure and an Equitable Clean Energy Future*, BIDEN HARRIS, <https://joebiden.com/clean-energy> [<https://perma.cc/D3UN-YCWH>] (last visited June 22, 2022).

135. *Id.*

136. *Id.*

137. Exec. Order No. 14005, 86 Fed. Reg. 7475 (Jan. 25, 2021).

138. Szymkowski, *supra* note 126.

139. *Id.*

The Biden Administration and Democrats in Congress have also looked to tax reform as a potential tool to incentivize auto companies to invest in EVs. For example, a ten percent advanceable tax credit has been proposed for companies making investments that will create American jobs, and President Biden has specifically pointed to companies changing their existing factories to focus on producing EVs.¹⁴⁰ Early in February of 2021, Democrats in the House of Representatives reintroduced the Growing Renewable Energy and Efficiency Now Act of 2021 (GREEN Act), which would expand the EV tax credit so that companies like Tesla and GM, who currently are excluded from future EV tax credits because they are selling so many EVs already, would become eligible for tax credits.¹⁴¹ The criteria to be eligible for these proposed tax credits, however, is centered on companies' EV energy storage capacity.¹⁴² In other words, the tax credits give American companies incentives to sell more EVs, but it does not promote any incentives to improve domestic manufacturing capabilities. Therefore, these tax reforms could have the adverse effect of further entrenching the American EV industry in an unstable supply chain that relies on foreign manufacturing and mineral imports.

The administrative state has also made efforts to support and research lithium-ion battery recycling and reuse. Having sufficient recycling capabilities is an important step towards supply security of lithium-ion batteries. If the United States can develop successful technologies that recover materials from domestic recycling efforts for reuse, it could lessen the demand on foreign mineral producing nations.¹⁴³ This not only could help secure supply since the demand on foreign imports would be less strenuous, but it could also lessen the environmental abuses as mineral-producing nations would have less aggressive targets to reach. Most notably, the Energy Storage Grand Challenge, announced by the DOE in January of 2020, calls to develop a secure domestic manufacturing supply chain, independent of foreign

140. *Outlook for What's Ahead for Energy Tax Incentives*, KPMG (Feb. 26, 2021), <https://home.kpmg/us/en/home/insights/2021/02/tnf-kpmg-report-outlook-for-whats-ahead-for-energy-tax-incentives-green-act.html> [<https://perma.cc/8J7W-V6EM>] [hereinafter KPMG].

141. Sean Szymkowski, *EV Tax Credit Renewal and Expansion Gets First Big Push Under Biden Administration*, CNET (Feb. 11, 2021), <https://www.cnet.com/roadshow/news/ev-tax-credit-tesla-renewal-expansion-biden-administration/> [<https://perma.cc/D2JC-CEBL>].

142. KPMG, *supra* note 140.

143. RESPONSIBLE MINERALS, *supra* note 31, at ii.

sources currently controlling critical materials, by 2030.¹⁴⁴ The DOE has also created a lithium-ion battery “recycling prize” that offers \$5.5 million in awards to improvements of the current recycling technologies.¹⁴⁵

Overall, the United States has created policy that could lessen demand on foreign suppliers and manufacturers by promoting domestic manufacturing, improving domestic sustainability practices, and encouraging recycling and reuse research. These objectives, however, cannot be pushed to the side and forgotten as the popular goal of filling American roads with EVs is more aggressively pursued. Such a scenario in which the United States continues to deploy more EVs but fails to lessen demand of foreign suppliers and manufacturers would worsen the current supply chain security issues. Creating more demand but not reducing reliance on foreign nations for manufacturing and mineral supply could create such a strain on the supply chain that it would fail to meet the rising demand.

While the U.S. government has pushed to reduce reliance on foreign mineral imports and increase domestic manufacturing of lithium-ion batteries, there is significantly less policy that directly addresses or acknowledges the sustainability concerns. The United States is involved in a number of international efforts aimed at increasing supply chain transparency and risk management throughout the battery production stages.¹⁴⁶ Most notably, the Organization for Economic Co-Operation and Development Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas is focused on assessing, mitigating, and reporting supply-chain risks.¹⁴⁷ Other international initiatives include the Responsible Minerals Initiative and the Extractive Industries Transparency Initiative.¹⁴⁸ Overall, however, these initiatives suffer from lack of coordination, limited adherence, and inadequate international oversight.¹⁴⁹

144. *Energy Storage Grand Challenge*, U.S. DEP'T ENERGY, <https://www.energy.gov/energy-storage-grand-challenge/energy-storage-grand-challenge> [<https://perma.cc/YQF8-8WFN>] (last visited June 22, 2022) [hereinafter *Grand Challenge*].

145. *Department of Energy Lithium-Ion Battery Recycling Prize*, AMER. MADE CHALLENGES, <https://americanmadechallenges.org/batteryrecycling/> [<https://perma.cc/DP2M-9XLZ>] (last visited June 22, 2022).

146. See ELKIND ET AL., *supra* note 7, at 10.

147. *Id.*

148. *Id.* at 11, 14.

149. *Id.* at 11.

As noted earlier, the National Environmental Policy Act of 1969 made sustainability a national policy.¹⁵⁰ No national policy, however, has addressed the specific international sustainability issues associated with the lithium-ion battery supply chain. Subsequently, under the current legal landscape, most U.S. corporations face few, if any, real obligations to ensure their supply chains practice sustainable operations.¹⁵¹

B. Nongovernmental Initiatives

In addition to the needed governmental response, nongovernmental initiatives created by industry actors and third parties will undoubtedly play a role in addressing the looming risks of the current supply chain. The Responsible Battery Coalition, formed in 2017, was created by a coalition of companies, academics, and organizations “to advance the responsible production, transport, sale, use, reuse, recycling and resource recovery of batteries and other energy storage devices.”¹⁵² Academics have made efforts to raise awareness of the supply chain issues and suggest solutions as well. For example, University of California, Berkeley School of Law’s Center for Law, Energy & the Environment (CLEE) and the Natural Resource Governance Institute (NRGI) developed a research initiative that focuses on pinpointing key barriers to sustainability in the EV battery supply chain and recommending reforms to overcome those barriers.¹⁵³ Most of the solutions promoted by their report focus on the role industry players themselves can play in fixing sustainability issues.¹⁵⁴

American auto companies are also working to expand domestic manufacturing through developing new technologies that reduce reliance on mineral imports. General Motors Co., for example, has entered into a joint venture with South Korean battery-manufacturing company LG Chem to build a manufacturing factory in Ohio.¹⁵⁵ Tesla has also stated that it intends to expand its battery-making capabilities by making some materials in-house in order to cut costs and shorten its

150. National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321-4347.

151. Hays, *supra* note 21, at 3.

152. RESPONSIBLE BATTERY COALITION, <https://www.responsiblebatterycoalition.org/> [https://perma.cc/4M5U-2XNF] (last visited June 22, 2022).

153. ELKIND ET AL., *supra* note 7, at 1-2.

154. *See id.*

155. Ben Foldy & Rebecca Elliott, *Shift to Electric Vehicles Spurs Bid to Make More Batteries in U.S.*, WALL ST. J. (Jan. 26, 2021), <https://www.wsj.com/articles/u-s-mounts-a-charge-to-take-on-china-the-king-of-electric-vehicle-batteries-11611658235>.

supply chain.¹⁵⁶ Significantly, Tesla is working to phase out cobalt use in its batteries,¹⁵⁷ and it has already announced that its Model 3 electric vehicles (made in China) will be powered by cobalt-free batteries.¹⁵⁸ More cobalt-free electric vehicles could play a significant role in reducing cobalt demand from the DRC and push the supply chain closer to sustainability.

Although there are a number of nongovernmental efforts to address production security and sustainability already in play, a more comprehensive and targeted federal policy and regulatory state would incentivize EV industry players and third parties to revamp their efforts towards reaching supply security and sustainability.

IV. SECURING SUPPLY AND REACHING SUSTAINABILITY

The federal government is better suited to address lithium-ion battery concerns than state and local governments because under the Commerce Clause of the United States Constitution, Congress has the authority to regulate interstate and international trade.¹⁵⁹ This power is needed when addressing such a globalized supply chain. Furthermore, the federal government has the ability to partake in and encourage global collective action, which is necessary to adequately transform the current value chain.

The government should carry out the following suggested federal policy changes simultaneously in order to create a comprehensive national policy and regulatory framework that will promote a secure and sustainable lithium-ion battery supply chain. The first objective aims at securing supply, which will in turn have positive effects on sustainability. Similarly, the second objective aims at promoting sustainable sourcing practices, which will also contribute to a more secure supply chain. Creating such a comprehensive policy would set an example for other countries that participate in the lithium-ion battery market and pave the way towards a prospering EV industry.

156. *Id.*

157. Haley Zaremba, *Tesla's Ambitious Plan to Ditch Cobalt*, OILPRICE.COM (July 5, 2020), <https://oilprice-com.cdn.ampproject.org/c/s/oilprice.com/Energy/General/Teslas-Ambitious-Plan-To-Ditch-Cobalt.amp.html> [<https://perma.cc/CM2J-3BJT>].

158. Kristen Lee, *Tesla is Nixing One of the Most Controversial Metals from Some Model 3 Battery Production, Report Says*, BUS. INSIDER (Sept. 30, 2020), <https://www.businessinsider.com/tesla-use-cobalt-free-batteries-in-model-3-production-china-2020-9>.

159. U.S. CONST. art. I, § 8, cl. 3.

A. *Reduce Dependence on Chinese Manufacturers and Foreign Mineral Imports*

The United States must reduce its reliance on foreign mineral imports and Chinese manufacturers in order to secure supply and reach sustainability goals. To do this, U.S. policy must improve domestic manufacturing capabilities, speed up the mining permit application process, and support battery reuse and recycling. This will make lithium-ion battery supply in the United States more secure by creating a self-sustaining market that does not depend on the cooperation of a few geographically concentrated foreign nations. In other words, a geopolitical conflict in one of the countries that currently dominates a portion of the supply chain (e.g., China or Chile) will not disrupt the American lithium-ion battery industry if the market is self-sustaining. In such circumstances, instead of failing to meet the growing demand as would happen if the supply chain is left unchanged,¹⁶⁰ the United States would be able to make up for lost supply domestically until any geopolitical conflicts are resolved.

The Biden Administration has begun to promote domestic manufacturing,¹⁶¹ but most policy specifically addressing lithium-ion batteries is focused on increasing EV deployment on American streets.¹⁶² Moreover, President Biden has articulated some policy objectives regarding improving lithium-ion battery supply security, but these words have not yet been followed up with actions. Federal initiatives like the Energy Storage Grand Challenge similarly calls for a self-sufficient domestic battery supply chain but has not made much progress.¹⁶³ A more focused and aggressive federal policy on increasing domestic manufacturing of lithium-ion batteries is key to creating a secure supply chain that can reliably respond to the projected rise in demand. Boosting domestic manufacturing of lithium-ion batteries in particular is a top priority and cannot take a backseat to policies that focus solely on deploying more EVs in America.

Further, the current mining permit delay problem must be addressed in order to reduce reliance on mineral imports.¹⁶⁴ A 2015

160. See RESPONSIBLE MINERALS, *supra* note 31, at 46.

161. *Fact Sheet*, *supra* note 130; Exec. Order No. 14005, 86 Fed. Reg. 7475 (Jan. 25, 2021).

162. See, e.g., Green New Deal, H.R. Res. 109, 116th Cong. (2019).

163. See *Grand Challenge*, *supra* note 144.

164. *New Study Finds U.S. Mine Permitting Delays Hinder U.S. Economy*, MINERALS MAKE LIFE (July 9, 2015), <https://mineralsmakelife.org/blog/new-study-finds-u-s-mine-permitting-delays-hinder-u-s-economy/#:~:text=New%20research%20from%20SNL%20>

study commissioned by the National Mining Association found that it takes on average seven to ten years to secure necessary mining permits in the United States.¹⁶⁵ By comparison, it only takes on average two years to obtain necessary mining permits in Canada or Australia, two countries with similar environmental regulations to the United States.¹⁶⁶ The study found that the cumbersome, unpredictable, and duplicative permitting process used in the United States that causes such delays is deterring the United States' ability to meet rising demands for minerals.¹⁶⁷ Environmentalists criticized the Trump Administration's recent efforts to speed up the mining permit process for being an "unnecessary handout" to an industry that has historically contaminated American waters.¹⁶⁸ If, however, the government also follows the policy recommendations laid out below that are aimed at reaching sustainability (transparency and due diligence requirements), the concerns of the environmentalists will no longer be necessary.

The federal government must also support circular economy research as part of its effort to create a self-sustaining lithium-ion battery market. A circular economy's objective is "to promote a sustainable economic system by minimizing material and energy used to provide economic goods and services."¹⁶⁹ This, in turn, typically calls for a hierarchy on end-of-life management options.¹⁷⁰ Battery reuse so that it may be used for a "second life" is the most preferable path of action once a battery reaches its end of life.¹⁷¹ Recycling material inputs is the second-best option, and disposal is the least desirable course.¹⁷² The current state of American recycling and reuse capabilities, however, is largely underdeveloped and costly.¹⁷³ If adequate reuse and recycling technologies can be employed, our

Metals,mining%20projects%20and%20ultimately%20weakening [https://perma.cc/W2TU-FNM8].

165. SNL METALS & MINING, PERMITTING, ECONOMIC VALUE AND MINING IN THE UNITED STATES 7 (2015).

166. *Id.*

167. *Id.* at 7, 25, 32.

168. Dylan Brown, *Mining Industry Hopes NEPA Rules Net Faster Permits*, E&E NEWS (Jan. 10, 2020), <https://www.eenews.net/stories/1062045159> [https://perma.cc/KG3A-Y9Z5].

169. ENERGY STORAGE ASS'N, END-OF-LIFE MANAGEMENT OF LITHIUM-ION ENERGY STORAGE SYSTEMS 4 (2020).

170. *Id.* at 4-5, 10.

171. *Id.* at 4-5.

172. *Id.*

173. Neuhaus, *supra* note 28, at 72-73; *Energy Storage Association*, *supra* note 169, at 11-13.

reliance on foreign nations for mineral imports could be significantly reduced.¹⁷⁴ Some experts suggest that recycling is the most important strategy the United States needs to focus on to reduce demand.¹⁷⁵ Therefore, United States federal policy should make supporting a lithium-ion battery circular economy a top priority. This can be done through awarding more federal grants for research and through legislation that imposes extended producer responsibility of end-of-life management,¹⁷⁶ requirements on companies to collect spent batteries sold to consumers, and targets for recycling efficiencies and amounts of recovered materials.

Although this Comment recommends creating a self-sustaining lithium-ion battery market, these policies should not completely abolish mineral imports from foreign nations. It is important to keep in mind that, apart from the environmental and social abuses, these minerals bring significant economic benefits to these countries.¹⁷⁷ For example, the cobalt mining industry in the DRC made up thirty-two percent of its GDP and ninety-five percent of export revenue in 2018.¹⁷⁸ Therefore, American federal policies should seek to reduce demand on foreign mineral rich countries, not completely eliminate it. These mineral rich nations should continue to reap the economic benefits of this industry but not have to endure environmental abuses. A less stringent demand will both make American supply less dependent on a select number of countries and will put less pressure on foreign miners to cut corners by ignoring environmental and social protections in order to meet massive supply. Reducing demand through improving domestic manufacturing, mining, and recycling capabilities coupled with the sustainability policies set forth below will create a more secure and sustainable global lithium-ion battery industry.

174. Neuhaus, *supra* note 28, at 69.

175. RESPONSIBLE MINERALS, *supra* note 31, at ii.

176. *Product Stewardship and Extended Producer Responsibility (EPR)*, CALRECYCLE (Sept. 14, 2020), <https://www.calrecycle.ca.gov/epr> [<https://perma.cc/XG2L-YM9C>] (explaining what extended producer responsibility is and how it places end-of-life management responsibility primarily on producers, not the public).

177. *See, e.g.*, Helen Reid & Hereward Holland, *Congo Mine Closures Would Cause Economic and Social Crisis, Minister Says*, REUTERS (Apr. 18, 2020), <https://www.reuters.com/article/us-health-coronavirus-congo-mining/congo-mine-closures-would-cause-economic-and-social-crisis-minister-says-idUSKBN21Z1Z4> (explaining the effects of the cobalt industry on the Democratic Republic of Congo).

178. *Id.*

B. *Incentivize Companies to Maintain Sustainable Sourcing Practices*

In general, investors are putting more pressure on corporations to conduct sustainable practices.¹⁷⁹ In the lithium-ion battery industry specifically, however, sustainability appears to have been pushed aside as corporations largely ignore the environmental and social issues occurring down the supply chain.¹⁸⁰ The federal government must step in and create policy that will incentivize American companies to maintain responsible sourcing practices. This can be done through legislation that improves transparency and imposes legally binding duties on companies to maintain responsible sources practices.

Legislation that increases transparency in the lithium-ion battery industry will incentivize American companies to ensure all supply chain players conduct sustainable practices. Specifically, legislation should require companies to disclose to consumers information regarding the sustainability of their supply chains. This will educate the public so that they can make informed investments in and purchases of products from companies with responsible sourcing practices.¹⁸¹ Consequently, this will incentivize companies to improve their sustainability agenda because they will want to demonstrate to consumers and investors that they are addressing sustainability concerns.¹⁸² It is important, however, not to impose too harsh of a transparency initiative that “name[s] and shame[s]” individual companies for unsustainable behavior (e.g., through sustainability score-cards).¹⁸³ This risks igniting a perverse reaction by companies to divest from areas that need the most environmental and social improvements.¹⁸⁴ Therefore, a simple transparency initiative that requires public disclosure of sustainable agendas is ideal. In 2010, the California legislature led the way in improving supply chain transparency when it signed into law the California Transparency in Supply Chains Act.¹⁸⁵ This requires large retailers and manufacturers to provide consumers with information regarding their efforts to eradicate

179. See Beattie, *supra* note 22.

180. See UNCTAD, *supra* note 16.

181. T.A. Gardner et al., *Transparency and Sustainability in Global Commodity Supply Chains*, 121 *World Dev.* 163, 168 (2019).

182. *Id.*

183. *Id.*

184. *Id.*

185. CAL. CIV. CODE § 1714.43 (2019).

slavery and human trafficking from their supply chains.¹⁸⁶ Although this act is focused on social sustainability, it is a step in the right direction, and Congress should pass a similar federal law that covers both social and environmental information.

Improving transparency alone will not create a sustainable supply chain.¹⁸⁷ It is a means to an end¹⁸⁸ (sustainable lithium-ion battery value chain) that must be accompanied by additional legislation that requires some form of affirmative action by the same companies. Therefore, Congress should also impose an affirmative duty on companies to maintain sustainable sourcing practices by creating a legally binding due diligence and corrective action obligation on companies that participate in globalized supply chains. Such mandatory corporate due diligence is becoming increasingly popular around the world,¹⁸⁹ but any such proposals to Congress have gained minimal traction.¹⁹⁰ The California Transparency in Supply Chains Act, mentioned above, does provide a legal remedy for violations of the Act (through actions brought by the California Attorney General for an injunction),¹⁹¹ but legal action has been infrequent.¹⁹² Despite Congress's reluctance thus far to pass any mandatory due diligence requirements, hopefully future bills will gain more traction in response to an increased awareness of the significant supply chain sustainability issues and the global trend towards passing such legislation.

C. *International Contributions*

Implementing the aforementioned national policy recommendations will take the United States one step closer to securing supply and reaching sustainability, but collective action from nations around the globe that contribute to the lithium-ion battery industry is essential

186. *Id.*

187. Gardner, *supra* note 181, at 168.

188. *Id.*

189. *See, e.g.*, CODE DE COMMERCE [C. COM.] [Commercial Code] art. L. 225-102-4 (requiring parent companies to file vigilance plans that details measures to identify and prevent risks of human rights and environmental abuses resulting directly or indirectly from a company's activities).

190. *Part Two—Mandatory Corporate Human Rights Due Diligence: What Now and What Next? An International Perspective*, GIBSON DUNN (Mar. 11, 2021), <https://www.gibsondunn.com/wp-content/uploads/2021/03/part-two-mandatory-corporate-human-rights-due-diligence-what-now-and-what-next-an-international-perspective.pdf> [<https://perma.cc/XE6K-SVP8>].

191. CAL. CIV. CODE § 1714.43 (2019).

192. GIBSON DUNN, *supra* note 190.

to reaching these goals. Because lithium-ion battery demand is projected to increase globally, other countries should have the same incentives as the United States to create a more sustainable and secure supply chain. If more countries that participate in the downstream portions of the lithium-ion battery supply chain also improve their domestic manufacturing capabilities and promote sustainable sourcing practices, China's dominance over manufacturing will diminish and foreign nations will feel more pressure to address environmental abuses.

The European Union has already begun pushing forward legislation that promotes many of these goals. In 2017, the European Union launched the European Battery Alliance, which aims to make Europe a global leader in sustainable battery production and use.¹⁹³ In line with these objectives, the European Commission released a Strategic Action Plan for batteries in 2018 that lays out a cross-border European framework of regulatory and non-regulatory measures that is intended to address all aspects of the value chain.¹⁹⁴ The plan articulates six key objectives, which include securing access to raw materials, supporting European battery cells manufacturing, and supporting the sustainability of EU battery cell manufacturing industry.¹⁹⁵

Since releasing the Strategic Action Plan, the European Union has made progress in addressing supply security concerns by advancing initiatives aimed at securing access to raw materials and improving domestic manufacturing capabilities in order to reduce dependence on China. Specifically, the European Raw Materials Alliance was created in 2020 and “aims to build resilience and strategic autonomy” for Europe's rare earth value chain.¹⁹⁶ Additionally, the European Union has launched a number of initiatives that support and fund European manufacturing research and technology in order to increase domestic manufacturing capabilities.¹⁹⁷ Since launching the European Battery

193. *European Battery Alliance*, EUR. COMM'N, https://ec.europa.eu/growth/industry/policy/european-battery-alliance_en [<https://perma.cc/G558-WXDD>] (last visited June 22, 2022).

194. EUR. COMM'N, *Annex 2—Strategic Action Plan on Batteries, in Europe on the Move: Sustainable Mobility for Europe: Safe, Connected and Clean 1* (2018).

195. *Id.*

196. *European Raw Materials Alliance*, EUR. COMM'N, https://ec.europa.eu/growth/industry/policy/european-raw-materials-alliance_en [<https://perma.cc/P2H4-PWGS>] (last visited June 22, 2022).

197. *See, e.g., Batteries Europe*, EUR. COMM'N, https://ec.europa.eu/energy/topics/technology-and-innovation/batteries-europe_en (last visited June 22, 2022) (displaying the European Commission's e-platform); *State Aid: Commission Approves €3.2 Billion Public*

Alliance, the European Union has seen record-high levels of investment and the emergence of around seventy industrial battery projects.¹⁹⁸

The European Union has also made significant advances towards supporting lithium-ion battery supply chain sustainability. In December 2020, the European Commission proposed a modernized Batteries Regulation that it is hoping to adopt by 2022.¹⁹⁹ This proposed regulation suggests mandatory requirements that aim to, among other things, reduce environmental and social impacts throughout the supply chain and promote a circular economy.²⁰⁰ Specifically, the proposal calls for increased transparency through mandatory labelling that will provide consumers with relevant information and the creation of a common electronic exchange system, or battery dataspace, that will provide the public with information about every battery model placed in the EU market.²⁰¹ The proposal also calls for mandatory corporate due diligence that would require third party verification via notified bodies.²⁰²

These initiatives are merely a few of the many efforts that the European Union has made to secure lithium-ion battery supply chain security and sustainability. The European Union, evidently, is already a step ahead of the United States by taking these concerns seriously. The United States must follow in the European Union's footsteps and strive to adopt the policies recommended above in order ensure security of supply and sustainability. As the European Union and the United States lead the way, other countries will likely follow. Cooperation among these many nations will successfully transform the lithium-ion battery supply chain so that it is both secure and sustainable.

Support by Seven Member States for a Pan-European Research and Innovation Project in All Segments of the Battery Value Chain, EUR. COMM'N (Dec. 9, 2019), https://ec.europa.eu/commission/presscorner/detail/en/ip_19_6705 [<https://perma.cc/TB7D-SXSJ>] (explaining public support by seven European Commission member states).

198. *Daily News 12/03/2021*, EUR. COMM'N (Mar. 12, 2021), https://ec.europa.eu/commission/presscorner/detail/en/mex_21_1143 [<https://perma.cc/D3S2-TPX4>].

199. *Id.*

200. *Proposal for a Regulation of the European Parliament and of the Council Concerning Batteries and Waste Batteries, Repealing Directive 2006/66/ED and Amending Regulation (EU) No 2019/1020*, 2020, at 2, COM (Sept. 23, 2021).

201. *Id.* at 12.

202. *Id.* at 68.

V. CONCLUSION

The future is electric—both literally and figuratively. EV sales will continue to grow and take the place of traditional combustion engine vehicles.²⁰³ This will profoundly reduce the amount of greenhouse gas emissions into the atmosphere, creating a cleaner and more sustainable world for us and future generations to live in.²⁰⁴ However, there are currently significant supply security and sourcing sustainability concerns that surreptitiously plague the lithium-ion battery industry.

Still, the path forward is attainable. A comprehensive federal regulatory scheme that brings supply security and supply chain sustainability to the forefront of American policy objectives combined with similar efforts by national governments around the world can transform the lithium-ion battery industry into a reliable, sustainable, and electrifying enterprise.

203. *Electric Vehicle Outlook*, *supra* note 34.

204. ELKIND ET AL., *supra* note 7.