

**EVALUATING THE EFFECT CHINA'S BELT AND ROAD INITIATIVE HAS ON THE
UNITED STATES' CLEAN ENERGY TRANSITION**

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Abstract

This research study looks at how China's Belt and Road Initiative (BRI) is negatively impacting the United States' (US) clean energy transition. Whether intentionally or unintentionally, China's BRI is eliminating US access to minerals critical to the clean energy transition and is essentially monopolizing the overall supply chain. This research study analyzes Chinese engagements in specific countries determined to be among the top three producers of one of the seven minerals identified by the International Energy Agency as critical for a clean energy transition, highlighting the BRI's investment and political tactics and corresponding effects on US clean energy markets, investments, and initiatives. The elimination of critical mineral and alternate processing providers outside of Chinese control runs the risk of not only limiting US clean energy goals and transition timelines but projecting China as a leader and top partner in the rapidly growing global clean energy push. While research has been done on the relationship between the BRI and critical minerals, the BRI and clean energy, and critical minerals and clean energy, there is a lack of research on the intersection of all three. This research study looks to bridge that gap and provide insight into how the BRI is hindering US clean energy efforts in an attempt to not only better inform the US strategy going forward, but to understand China's intentions.

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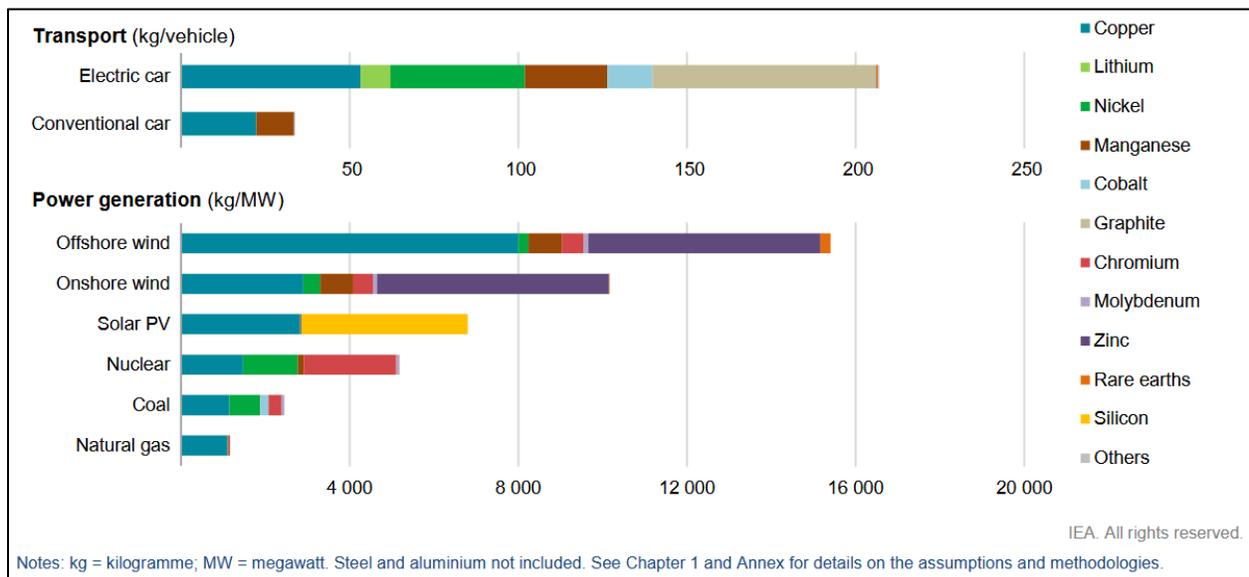
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Introduction

Clean energy has quickly become a major geopolitical touchpoint, with international tensions and worries increasing over how to limit and reduce greenhouse gas emissions. With this increasing interest in limiting greenhouse gas emissions, for fear of irreversible damage to the climate, has also come a need for clean energy technologies. Clean energy technologies/sources typically include nuclear, solar, hydro, and wind. As seen in Chart 1, these clean energy technologies require a significantly larger amount of minerals than their fossil-fuel counterparts. Because of this increased need for specific minerals, the geopolitical importance of the countries that control the mining and processing of them will likely increase as well.

Chart 1: Minerals Used in Selected Clean Energy Technologies¹



Given the importance of these critical minerals to clean energy transitions and thus importance of the countries with the largest reserves, the threat from China’s Belt and Road

¹ “The Role of Critical Minerals in Clean Energy Transitions.” *International Energy Agency*, 2021, 6. <https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/reliable-supply-of-minerals>.

Initiative (BRI) is steadily growing as it potentially limits United States (US) access to these minerals and supply chains, hindering the US clean energy transition. This issue stems from the fact that China is already a top supplier for 18 of the 35 minerals designated as critical by the US in any given year, with the US being import reliant for 31 of those 35, and the BRI able to expand this dependence.²³ China has likely realized the geopolitical significance of leading the global clean energy transition and is strategically gaining access to/taking control of the global supply of critical minerals and related supply chains in an effort to advance related political and economic objectives. What is less known is how, where, and to what extent, these efforts are affecting US clean energy objectives. It may also be important to consider if Chinese efforts have been specifically targeted to create leverage over the US or to prevent the US from influencing or succeeding in the clean energy transition.

This research study will begin by reviewing some of the existing literature/research in areas covering the BRI, clean energy, and critical minerals, with most tying in at least one of the other aforementioned topics. Next, this research will analyze agreements made under the purview of the BRI in countries identified as the top extractors and processors for minerals vital to clean energy, cross-referencing those against major global or US climate and mineral announcements, summits, agreements, etc. Taking this information into account, this research will end by studying the broader market of the identified minerals of concern and how BRI investments have altered the US Government's and US companies' clean energy strategy, production, resource allocation, and effectiveness. Overall, this analysis and research will help reveal the true extent of how China's BRI has impacted the US' clean energy transition and raise

² "Mineral Commodity Summaries 2021." *United States Geological Survey*, February 1, 2021. <https://www.usgs.gov/centers/nmic/mineral-commodity-summaries>.

³ US Department of the Interior. "Final List of Critical Minerals 2018." *Federal Register*, May 18, 2018. <https://www.govinfo.gov/content/pkg/FR-2018-05-18/pdf/2018-10667.pdf>.

awareness of the tactics, techniques, and procedures the BRI is using to gain a strategic advantage in the global clean energy push and related supply chains.

Literature Review

Building upon the primary areas of the BRI, clean energy transitions, and critical minerals, this paper will review and expand on these concepts and related research from the academic community. While there is abundant research on all of these topics separately, there are a select few articles that help provide the necessary background and insight into the interconnectedness of the multiple areas. Each section will look to bridge this divide, bringing together the available research and synthesizing their findings.

Belt and Road Initiative

China's BRI has quickly become an unprecedented example of combining economic development, international trade, national security, and foreign investment. Understanding the evolution of the BRI will provide the necessary background to further advance our knowledge of how the BRI may be affecting the US clean energy transition. Four research articles specifically help us form the basis of this understanding. In the first article, Si Cheng and Shaozhou Qi discuss the BRI's foreign direct investment (FDI) shift towards non-carbon intensive industries.⁴ The second article is by three researchers studying the growing "green bonds" and incentives under the BRI.⁵ The third article is by Ruben Gonzalez-Vicente discussing the relationship

⁴ Cheng, Si, and Shaozhou Qi. "The Potential for China's Outward Foreign Direct Investment and Its Determinants: A Comparative Study of Carbon-Intensive and Non-Carbon-Intensive Sectors along the Belt and Road." *Journal of Environmental Management* 282 (March 15, 2021): N.PAG. doi:10.1016/j.jenvman.2021.111960.

⁵ Jian, Jianhui, Xiaojie Fan, and Shiyong Zhao. "The Green Incentives and Green Bonds Financing under the Belt and Road Initiative." *Emerging Markets Finance & Trade* (February 27, 2021): 1–11. doi:10.1080/1540496x.2021.1887726.

between the Chinese FDI in extractive sectors and possible resource curse theories.⁶ Lastly, the fourth article by Willie Ganda looks at specific BRI strategies in Africa.⁷

China's global engagement through the BRI has historically targeted a wide-array of countries for various purposes, having differing effects on each. Ganda discusses some of China's intentions with the BRI and highlights how China seems to have a "self-interested position of establishing and maintaining an assured and reliable source of raw materials for its economic interests" in countries with a "need for international support in the global geopolitical domain".⁸ This is then expanded on, with Ganda showing how the BRI benefits from the "shared international adversaries along the initial Cold War rivalries that have transformed into modern day global economic dominance wars".⁹ Building off this research, Gonzalez-Vincent shows how the effects from the BRI seem to depend on geographic location. For example, in Africa, where "resource-endowed countries often present authoritarian regimes or weak democracies, China's impact on the internal curses of extraction ranges from neutral to negative".¹⁰ This is in stark contrast to South America, where the BRI typically has a positive or neutral effect due to stronger democracies, more efficient state intervention, and civil societies as seen in Peru, Chile, and Paraguay.¹¹

Demonstrating the evolution of the BRI, Cheng and Qi highlight how BRI investment has recently shifted from focusing on carbon-intensive industries to non-carbon-intensive industries

⁶ Gonzalez-Vicente, Ruben. "China's engagement in South America and Africa's extractive sectors: new perspectives for resource curse theories." *The Pacific Review* 24, no. 1 (March 2011): 65-87. doi:10.1080/09512748.2010.546874.

⁷ Ganda, Willie D. "The China Model in Zimbabwe: The Belt and Road Initiative and Beyond." *Politics & Policy* 48, no. 5 (October 2020): 932-59. doi:10.1111/polp.12373.

⁸ Ganda, "The China Model," 953.

⁹ Ganda, "The China Model," 954.

¹⁰ Gonzalez-Vicente, "China's engagement," 83.

¹¹ Ibid.

given the growing global trend in the later sectors. Due to this growing trend, European countries have increasingly started implementing emission trading systems and carbon taxes, a newer market China has been quick to build on and influence through the BRI.¹² China ultimately used this momentum to launch the green bond market, “advocating sustainable economic development and emphasizing green financial innovation”.¹³ They have also been able to use it to deflect some criticism of their own clean energy failures while also promoting the “Green BRI”.¹⁴ Having both the BRI and related “Green BRI”, China has created an avenue for BRI influence and investment regardless of sector or economic/policy goals.

Frequently highlighted throughout the research articles, and an important final aspect to consider, are the methods the BRI uses to achieve the goals stated above. Cheng and Qi emphasize how “China has been encouraged to develop markets through FDI” in an attempt to access those regions “high-yield area[s] for energy minerals and abundant reserves”.¹⁵ Reinforcing this analysis, the green bonds article assesses that the adoption of green bonds and broader green financing market could be a newer or unique attempt to access BRI countries’ “abundant mineral resources, cultivated land resources, solar energy resources, and petroleum resources”.¹⁶ Gonzalez-Vicente also shows that Chinese extraction firms typically use soft loans (i.e. loans with below-market interest rates) by Chinese state-run banks with weak oversight or form joint ventures with state-owned companies.¹⁷ In all, China has been able to use a variety of means and methods under the BRI for investments, enabling access to mineral resources in

¹² Cheng, “The Potential for,” 7.

¹³ Jian, “The Green Incentives,” 1.

¹⁴ Ibid.

¹⁵ Cheng, “The Potential for,” 7.

¹⁶ Jian, “The Green Incentives,” 1-2.

¹⁷ Gonzalez-Vicente, “China’s engagement,” 72-78.

different regions and political climates across the globe and ultimately enhancing China's posture and engagement in clean energy.

Clean Energy Transition

In order to understand how the BRI may affect the US' clean energy transition, we must first understand China's own climate ambition. Three academic articles provide the necessary background and insight into China's growing clean energy transition and ambition. One article is from Colby College analyzing China's First Nationally Determined Contribution (NDC), a document required under the 2015 Paris Agreement outlining the actions a country will take in achieving its emissions target, and assessing the implications on the broader Paris Agreement and possible ways forward.¹⁸ The second is from four Chinese researchers analyzing China's strategy for incorporating critical minerals into their NDC and clean energy transition.¹⁹ Lastly, the third is from Wei Shen and Marcus Power, providing a strategic assessment on China's clean energy ambition in Africa with implications for their broader global strategy.²⁰

According to the research, China is responsible for 26% of global greenhouse gas emissions, making them the largest emitter in the world. Although China is supposedly set to meet its First NDC objectives, their current trajectory shows they still won't be compatible with the 2°C warming limit by 2030.²¹ Building off this research and highlighting the "unprecedented scale-up of renewable infrastructure" required by global targets for climate change, the four

¹⁸ Carlson, D'Arcy, et al. "China's Climate Ambition: Revisiting Its First Nationally Determined Contribution and Centering a Just Transition to Clean Energy." *Energy Policy* 155 (August 2021): N.PAG. doi:10.1016/j.enpol.2021.112350.

¹⁹ Wang, Peng, et al. "Incorporating Critical Material Cycles into Metal-Energy Nexus of China's 2050 Renewable Transition." *Applied Energy* 253 (November 2019): N.PAG. doi:10.1016/j.apenergy.2019.113612.

²⁰ Shen, Wei, and Marcus Power. "Africa and the Export of China's Clean Energy Revolution." *Third World Quarterly* 38, no. 3 (March 2017): 678–97. doi:10.1080/01436597.2016.1199262.

²¹ Carlson, "China's Climate," 3.

Chinese researchers projected the mineral supply needed (for wind and solar technologies) under a Stated Policies Scenario (SPS) and a Below 2°C Scenario (B2S).²² The SPS is based off the NDC strategy described above, drastically reducing China’s emissions but failing to support or fall under the Paris Agreement 2°C target; while the B2S is based on the technology needs of complying with the Paris Agreement 2°C target. Looking at the research and tables, one can see the significant difference in the amount of minerals needed for the two scenarios.

Table 1: Demand for Minerals Under SPS and B2S²³

Cumulative demand of studied materials under B2S (Below 2°C Scenario) and SPS (Stated Policies Scenario).									
Material	Scenarios	Nd	Dy	Cd	Te	In	Ga	Se	Ge
Previous total demand in 2011–2015 (unit: tons)	B2S	843	67	173	272	37	28	190	178
	SPS	843	67	173	272	37	28	190	178
Total future demand (2016–2050, unit: tons)	B2S	258,986	20,935	13,751	21,609	1219	938	6284	24,366
	SPS	193,867	15,676	8403	13,205	720	554	3713	15,538
Total future demand (2016–2030, unit: tons)	B2S	67,242	5422	5592	8788	610	469	3146	5915
	SPS	44,203	3565	2455	3858	263	203	1360	2546
Material in-use stock in 2050 (unit: tons)	B2S	173,905	14,066	11,399	17,912	1053	810	5426	22,097
	SPS	133,994	10,838	7212	11,333	642	494	3310	14,438
Total future EoL material in 2016–2050 (unit: tons)	B2S	86,053	6947	2528	3972	203	157	1049	2443
	SPS	60,845	4915	1367	2148	115	89	593	1274

Table 2: Mineral Shortage Assessment²⁴

Mineral shortage assessment of six critical metals based on demand, production and reserve estimations.									
Material		Nd	Dy	Cd	Te	Ga	Se	In	Ge
Reserve in China (unit: kt)		6784	792	92	6.6	16.3 [79]	26	1.3	10.9 [80]
Global reserve [36] (unit: kt)		12,800	1100	500	31	560 [79]	98	12	36 [80]
Annual Production in China-2015 (unit: tons)		15,215	1142	8090	280	550	920	350	115
Global annual Production-2015 (unit: tons)		17,937[81]	1328[81]	24,200	410	730	3270	759	160
Share of renewables in all end-users		1% [77]	1% [77]	6% [45]	40%[52]	8% [79]	10% [52]	8% [44]	15% [52]
Fraction of direct demand in China’s reserve	B2S	3%	2%	13%	2.8	5%	22%	85%	2.1
	SPS	1%	1%	2%	39%	0.1%	3%	5%	42%
Fraction of primary demand in China’s reserve	B2S	16%	11%	28%	64	2.3	4.8	1.9	123
	SPS	12%	8%	17%	40	1.4	2.9	1.2	80
Co-/by-production host metals		Fe, other rare earth		Zn, Cu	Cu	Al, Zn	Cu	Zn	Zn, coal fly ash
Shortage		Low	Low	Low	High	Medium	High	Medium	Very High

Going along with China’s ambitions as described in the NDC, a major focus is on expanding their influence in other countries as a means to access the above minerals, increase

²² Wang, “Incorporating Critical,” 5.

²³ Ibid, 8.

²⁴ Ibid, 9.

clean energy production and infrastructure, and enhance their image as a global climate leader. This focus has been especially targeted towards Africa given the growing demand for renewable energy in the region due to the “increasing international recognition of the nexus between energy access, climate change and environmental sustainability more broadly”.²⁵ Shen and Power show that Chinese investments in Africa cover a “full range of commercial activities along the production chain, including the export of wind turbines and solar panels, the development of new equipment manufacturing facilities, and the financing and construction of new renewable energy generation facilities”.²⁶ More broadly, in 2020 alone, China “invested in 36 renewable energy projects, the majority of which centered on solar and in the Belt and Road countries”, showcasing China’s increasing clout in the clean energy sector.²⁷

With Paris Agreement Parties increasing pressure on China to do more, China has “double[d]-down on the importance of the original interpretation of the CBDR + RC principle [(common but differentiated responsibilities and respective capabilities principle)], arguing that developed countries such as the United States and those in the European Union should lead and be the first to cut their emissions”.²⁸ At the same time, China is increasing its global push to project itself as a major contributor to climate change and broader clean energy transition, “reaffirm[ing] its position as a lead nation...and fostering their economic growth and development in the process”.²⁹ Ultimately, China has been able to use this growing clean energy footprint, along with the US’ uneven stance on clean energy, to amplify themselves as a reliable

²⁵ Shen, “Africa and,” 679.

²⁶ Ibid.

²⁷ Carlson, “China’s Climate,” 5.

²⁸ Ibid, 1.

²⁹ Shen, “Africa and,” 680.

clean energy partner while building out a reliable supply chain that would be difficult for other countries to emulate.

Critical Minerals

Taking the research on both the BRI and clean energy into account, critical minerals seemingly act as the link connecting the two. Learning more about the nature of critical minerals and their role in resource competitions will help us better understand this link. Four research articles make up the research in this area. The first article is from Dhana Raju, discussing the nature, occurrence, and uses of critical minerals.³⁰ The second is from five researchers at China's Hebei GEO University discussing mineral resource competition in terms of "dominator" and non-dominator" countries.³¹ The third article is from three researchers analyzing China and the US' competition for critical minerals.³² And the final article is looking at China's domestic and foreign influence in certain critical mineral supply chains.³³

Critical minerals, defined by Raju as "metals and non-metals that are considered vital for the economic well-being of the world's major and emerging e-economies", are essential in the production of technologies in clean energy, defense, transportation, space exploration, health, and more.³⁴ These minerals are also more likely to have supply chain disruption risks from "geopolitical scarcity, geopolitics, trade policy, vulnerability and other factors".³⁵ Underscoring

³⁰ Raju, R. Dhana. "Critical Minerals: Their Nature, Occurrence, Recovery and Uses." *Current Science* (00113891) 119, no. 6 (September 25, 2020): 919–25. doi:10.18520/cs/v119/i6/919-925.

³¹ Zhu, Zhiyun, et al. "Strategic Mineral Resource Competition: Strategies of the Dominator and Nondominator." *Resources Policy* 69 (December 2020): N.PAG. doi:10.1016/j.resourpol.2020.101835.

³² Gulley, Andrew L., Nedat T. Nassar, and Sean Xun. "China, the United States, and Competition for Resources That Enable Emerging Technologies." *Proceedings of the National Academy of Sciences of the United States of America* 115, no. 16 (April 17, 2018): 4111–15. doi:10.1073/pnas.1717152115.

³³ Gulley, Andrew L., Erin A. McCullough, and Kim B. Shedd. "China's Domestic and Foreign Influence in the Global Cobalt Supply Chain." *Resources Policy* 62 (August 2019): 317–23. doi:10.1016/j.resourpol.2019.03.015.

³⁴ Raju, "Critical Minerals," 919.

³⁵ Ibid.

this issue is the “fact that many of the elements required for advanced technologies are obtained from mineral commodities that are produced online in a few countries, recovered only or mainly as byproducts, and generally not recycled in significant quantities after use”.³⁶

This supply chain risk and increasing uses of critical minerals in advanced technologies has driven “dominant” countries (i.e. countries with stronger international status such as the US and China) to “compete for resources in other nondominant countries or regions”.³⁷ This has inevitably led to non-dominant countries finding themselves stuck between the power-struggle/competition of dominant countries for their resources.³⁸ An example of this competition was China’s “Going Out Strategy” (an earlier iteration of the BRI), which encouraged “Chinese companies to expand overseas foreign direct investment—especially for mineral resources and infrastructure in developing countries in Africa and Asia”.³⁹ This then gave way to China’s “minerals for infrastructure” strategy, with a primary example being China “providing favorable loans to the DRC [(Democratic Republic of the Congo)] government for infrastructure, purportedly in exchange for access to copper and cobalt mineral development rights”.⁴⁰

Tying into, and building off, the above research, the article examining the US and China’s competition for critical minerals uses the Herfindahl-Hirschman Index to analyze the concentration of global production for US designated critical minerals and the corresponding import reliance for both the US and China. The Herfindahl-Hirschman Index is a common measure of market concentration, with an index greater than 2,500 signifying a highly concentrated market. The research shows that while the US is not only import reliant for

³⁶ Gulley, “China, the United States,” 4111.

³⁷ Zhu, “Strategic Mineral,” 15.

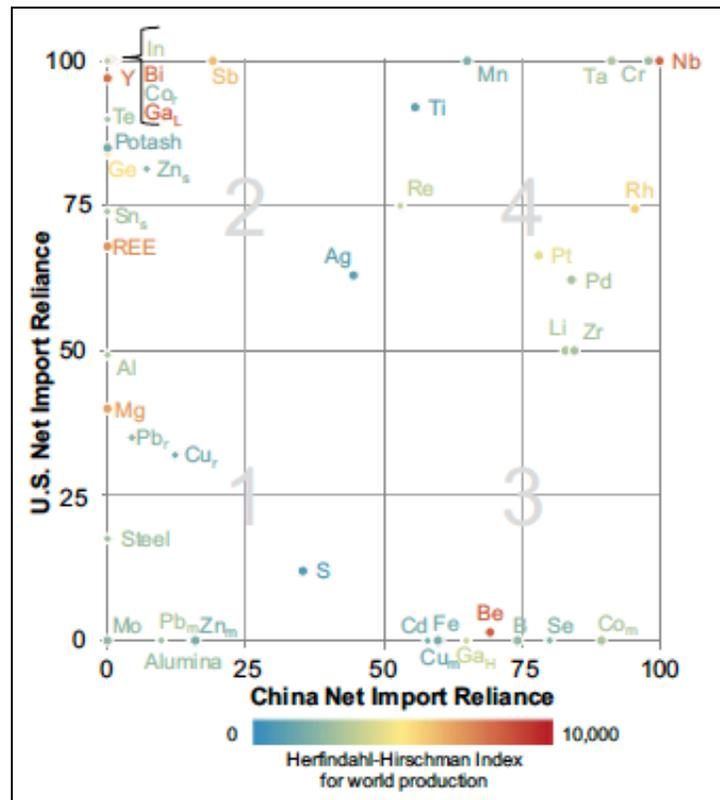
³⁸ Ibid.

³⁹ Gulley, “China’s Domestic,” 318.

⁴⁰ Ibid.

significantly more critical minerals than China, those minerals are more concentrated globally than China's import reliant minerals.⁴¹ It is this dilemma, reliance, and fear of monopolization that has created the targeting of non-dominant countries to access these minerals. This has inevitably left these non-dominant countries to weigh the economic and security benefits of working closer with China versus the US, with significant geo-political, security, and economic implications tied to the outcome.⁴²

Chart 2: US and China Critical Mineral Net Import Reliance and Concentration⁴³



With the US having 35 minerals designated as critical, all with major technological and energy implications, and only three ways to acquire them (domestic extraction, recycling, and

⁴¹ Gulley, "China, the United States," 4112.

⁴² Zhu, "Strategic Mineral," 15.

⁴³ Gulley, "China, the United States," 4112.

imports/international extraction), the importance of/competition for these minerals will continue to escalate.⁴⁴ China's increasing geopolitical and economic clout has already created a major obstacle for US superiority globally, with China's active strategy of acquiring critical mineral mines abroad and exclusive trading rights for critical minerals challenging US strategic goals across many sectors.⁴⁵⁴⁶ As the above literature shows, China likely recognizes the importance of this competition and is strategically growing its mineral accesses to improve its economic security and clean energy position, leaving the US with limited options going forward.

⁴⁴ Raju, "Critical Minerals," 919.

⁴⁵ Zhu, "Strategic Mineral," 15.

⁴⁶ Gulley, "China, the United States," 4113-4114.

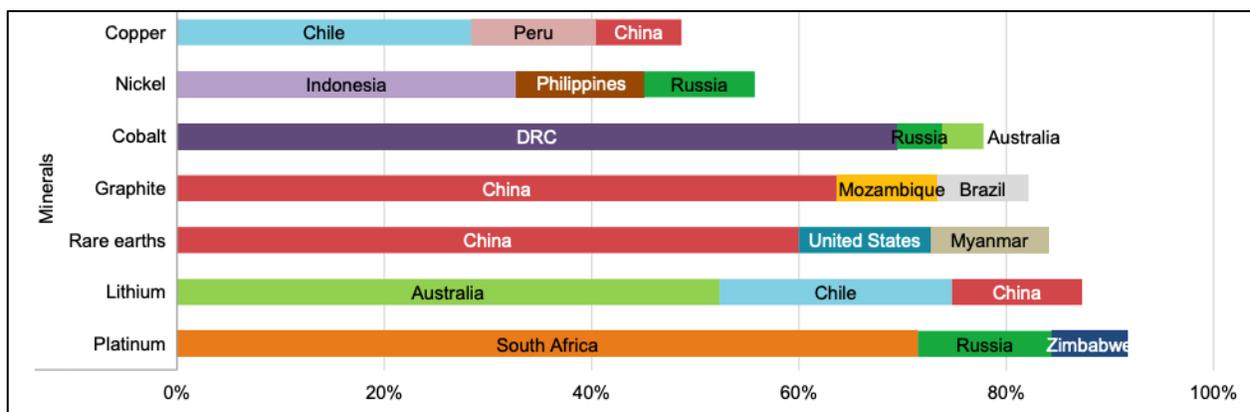
Hypothesis & Methodology

Overview

Taking the existing research into account, one can see that while there is sufficient insight into the relationship between the BRI and clean energy, the BRI and critical minerals, or critical minerals and clean energy, there is a gap in our understanding of the interconnectedness between all three. Determining the relationship between the BRI, clean energy transitions, and critical minerals would shed light on drivers and repressors of the US transition, helping the US better understand the geopolitical environment and formulate a cohesive strategy to counter efforts aimed at or inadvertently limiting US clean energy and technology advancements.

This research aims to bridge the divide outlined above by analyzing Chinese engagements in specific countries determined to be a top three producer of one of the seven minerals (five of which are designated as critical by the US) identified by the International Energy Agency as critical for the clean energy transition. The countries, which can be seen with their corresponding minerals in Chart 3, will be discussed in alphabetical order.

Chart 3: 2019 Share of Top Three Producing Countries for Select Clean Energy Minerals⁴⁷



⁴⁷ “The Role of Critical Minerals”, 30.

Due to the BRI not officially starting until 2013, engagements from 2013 and on will be the primary focus. It is important to note that three of the top producing countries (Australia, Brazil, and Russia) have not formally joined the BRI. These three countries will not be included in this research due to the specific focus of how the BRI is affecting clean energy. While Brazil and Russia are both a part of BRICS (i.e. an economic association consisting of Brazil, Russia, India, China, and South Africa) with China, and have discussed the possibility of joining the BRI, the assessment of different strategies targeting BRI members and non-BRI members is a topic for another study.⁴⁸⁴⁹

This study hypothesizes that the BRI is eliminating US access to minerals vital to the clean energy transition, creating bottleneck supply chains for clean energy minerals and technologies, and hindering US leadership in the global clean energy push. The null hypothesis would show no effect on the US clean energy transition and/or decreasing or stagnant Chinese investment or influence in the mining or energy sectors of one of the top three producing countries currently apart of the BRI. Additionally, this research will look for any correlation between the timing of Chinese investments in the countries, specifically focusing on major investments around seven specific timeframes: (1) November 2016 enactment of the Paris Agreement, (2) December 2017 Executive Order (EO) 13817 on securing a critical minerals supply, (3) May 2018 designation by US Department of the Interior of critical minerals, (4) June 2019 report by US Department of Commerce on how to achieve the goals of EO 13817, (5) September 2020 EO on addressing reliance on critical minerals from adversaries, (6) January

⁴⁸ Studart, Rogério, and Margaret Myers. "Reimagining China-Brazil relations Under the BRI: The Climate Imperative." *Council on Foreign Relations*, January 19, 2021. https://cdn.cfr.org/sites/default/files/pdf/studart-myers-cfr-cebri-paper_0.pdf.

⁴⁹ Shah, Ankur. "Russia Loosens Its Belt." *Foreign Policy*, July 16, 2020. <https://foreignpolicy.com/2020/07/16/russia-china-belt-and-road-initiative/>.

2021 EO on tackling climate change, and (7) April 2021 US climate summit. If the research shows large investments in the target countries' energy and mineral sectors around these dates, it would at least suggest that China is purposely using the BRI to hamper US clean energy ambitions.

Caveats and Limitations

While this study is focused on the effect the BRI has on the US clean energy transition, we must also consider the effect the US' own policies have. Given the US' fluctuating and uneven support to domestic and international energy initiatives, and shifting view on the importance of international engagements, it is likely this has had a significant impact on the US clean energy transition in itself. Although the BRI would likely have some sort of an effect on the US clean energy transition regardless of US policies and engagement, the extent of the BRI's effect likely varies greatly based on the different degrees of US Government involvement and decisions.

Unrelated to the above, China also has a history of attempting to "cover up" or "hide" certain BRI agreements it knows may cause increased backlash for the host country or itself. One example is China and a state government in Australia initially attempting to conceal a memorandum of understanding (MoU) on the BRI in October 2018, likely in an attempt to prevent US retaliation. While the agreement was eventually canceled in April 2021, it shows that not all agreements may be publicly available/announced.⁵⁰ Although a lack of fully transparent agreements slightly hinders this research, it is unlikely that any major agreements with the

⁵⁰ Westcott, Ben. "Australian Government Tears up Victoria's Belt and Road Agreement with China, Angering Beijing." *CNN*, April 22, 2021. <https://www.cnn.com/2021/04/22/business/australia-china-belt-and-road-initiative-intl-hnk/index.html>.

potential to alter the overall ownership or rights to significant mining or processing ventures would be able to go unreported.

Data

Chile

Chile joined the BRI in early November 2018. China and Chile have historically been major trading partners and joining the BRI was apparently Chile's way of becoming a "landing point for investments in Latin America".⁵¹ According to reporting on the agreement, China and Chile were using the BRI to streamline customs procedures and secure key investments in certain industries. One of the major initiatives that Chile was pursuing from the BRI was securing investments in its lithium and copper industries, two minerals Chile is a leading producer of and are vital to clean energy.⁵² Chile joining the BRI also came at a time that many consider to be the beginning of their clean energy transition, with electricity from renewable energy sources more than tripling from 2014 to 2018.⁵³

In October 2018, a few months after the US designated lithium as a critical mineral and right before Chile officially joined the BRI, China's largest lithium company, Tianqi Lithium Corporation, agreed to a deal to purchase 24 percent of Chile's largest lithium producer, Sociedad Química y Mineral (SQM), for \$4.1 billion.⁵⁴ Less than a year later, in September 2019, Chile began marketing its lithium reserves to China in exchange for technology investments, in what came to be called a "lithium-for-investment tender." According to government documents obtained by Reuters, Chile's goal was to offer discounted lithium in exchange for "a commitment to build battery parts plants in Chile as the government looks to

⁵¹ Sherwood, Dave. "Chile to Join China's Belt and Road Initiative." *Reuters*, November 1, 2018.

<https://www.reuters.com/article/us-chile-china/chile-to-join-chinas-belt-and-road-initiative-idUSKCN1N65YD>.

⁵² "Chile Joins China's Belt and Road Initiative." *Economist Intelligence*, November 22, 2018.

http://country.eiu.com/article.aspx?articleid=917372275&Country=Chile&topic=Politics&subtopic=For_5.

⁵³ Proano, Maximiliano. "Is an energy revolution underway in Chile?" *Energy Transition*, July 9, 2018.

<https://energytransition.org/2018/07/is-an-energy-revolution-underway-in-chile/>.

⁵⁴ Maidenberg, Micah. "Court Ruling Paves Way for Chinese Investment in Chilean Lithium Producer." *Wall Street Journal*, October 4, 2018. <https://www.wsj.com/articles/court-ruling-paves-way-for-chinese-investment-in-chilean-lithium-producer-1538696815>.

move up the value chain”.⁵⁵ China’s interest in this deal is especially important given “Of the 136 lithium ion battery plants in the pipeline to 2029, 101 are based in China”.⁵⁶ Therefore, this opportunity gave China the ability to essentially catapult vastly ahead in the lithium ion battery production worldwide and further limit supplies outside of Chinese control.

As for copper, Chile is the top producer and China is the largest buyer. This buying power has historically given China the ability to affect prices through their demand signals, ultimately able to control the market.⁵⁷ China has also pursued the same strategy for copper mines in Chile as it has for lithium, attempting to gain a controlling interest or exclusive trading rights (i.e. a contractual agreement guaranteeing a supplier provides a set amount of a good at a specific price before supplying other parties). A recent example of this was in July 2021, with Chilean mining company Antofagasta PLC signing an agreement to supply select Chinese copper smelters, one of which is the biggest copper user in the world, for the next year. Although it does not give China direct control over any copper mines, it has instead secured “supply deals well before the annual fourth-quarter ‘mating season’ for three years running, as buyers seek feedstock in a tight market”.⁵⁸ This deal came just a few months after US President Biden held a summit on the climate crisis and announced the US’ intention of rejoining the Paris Agreement.⁵⁹

⁵⁵ Sherwood, Dave, and Natalia Ramos Miranda. “Chile taps China, Japan in Lithium-for-Tech Push; Faces Tough Sell.” *Reuters*, September 17, 2019. <https://www.reuters.com/article/chile-lithium/chile-taps-china-japan-in-lithium-for-tech-push-faces-tough-sell-idUSL2N26414X>.

⁵⁶ “China Controls Sway of Electric Vehicle Power Through Battery Chemicals, Cathode and Anode Production.” *Benchmark Mineral Intelligence*, May 6, 2020. <https://www.benchmarkminerals.com/membership/china-controls-sway-of-electric-vehicle-power-through-battery-chemicals-cathode-and-anode-production/>.

⁵⁷ Attwood, James. “World’s Top Copper Supplier Trims Price Forecast as China Slows.” *Bloomberg*, September 14, 2021. <https://www.bloomberg.com/news/articles/2021-09-14/copper-prices-seen-falling-next-year-as-surplus-looms-cochilco>.

⁵⁸ Daly, Tom. “Chile’s Antofagasta inks copper ore supply deals with China smelters, sources say.” *Reuters*, July 2, 2021. <https://www.reuters.com/article/us-china-copper-antofagasta/chiles-antofagasta-inks-copper-ore-supply-deals-with-china-smelters-sources-say-idUSKCN2E814N>.

⁵⁹ Psaki, Jen. “FACT SHEET: President Biden’s Leaders Summit on Climate.” *The White House*, April 23, 2021. <https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/23/fact-sheet-president-bidens-leaders-summit-on-climate/>.

Outside of just mineral investments, China has used a variety of other means to further deepen ties to Chile. In April 2019, China and Chile signed a Joint Action Plan for 2019-2022 and a MoU on Trade Defense. The Joint Action Plan promotes cooperation between the two countries in 14 areas, including geology and mining, energy, transportation and telecommunications, and technology to name a few.⁶⁰ Also in 2019, Chinese company Huawei announced an investment of over \$100 million to be spread out over three years to build cloud services and 5G capabilities in Chile, building data centers in Chile in both 2019 and 2020.^{61,62}

Democratic Republic of the Congo

The Democratic Republic of the Congo (DRC), the largest producer of cobalt in the world, recently agreed to join the BRI in January 2021.⁶³ In what was likely an attempt to garner goodwill with the DRC and enhance future collaboration, China canceled nearly \$30 million in debts that matured in 2020 for the DRC, while also issuing almost \$20 million in support. During the trip in which the DRC signed on to join the BRI, Chinese Foreign Minister Wang Yi “promised that Beijing would fund infrastructure projects, mostly in DRC’s energy and mining industry, where Chinese companies have already invested more than US\$10 billion in the past decade”.⁶⁴

⁶⁰ “Chile and China Sign Agreements to Strengthen Their Bilateral Relationship.” *Ministerio de Relaciones Exteriores*, April 24, 2019. <https://minrel.gob.cl/minrel/noticias-antteriores/chile-and-china-sign-agreements-to-strengthen-their-bilateral-relationship>.

⁶¹ Critchley, Adam. “Huawei Announces Major Investment in Chile.” *Nearshore Americas*, April 29, 2019. <https://nearshoreamericas.com/huawei-announces-major-investment-in-chile/>.

⁶² Ellis, Evan. “Chinese advances in Chile.” *Global Americans*, March 2, 2021. <https://theglobalamericans.org/2021/03/chinese-advances-in-chile/>.

⁶³ Nyabiage, Jevans. “China sends Africa a signal that Belt and Road Initiative is still open for business.” *South China Morning Post*, January 10, 2021. <https://www.scmp.com/news/china/diplomacy/article/3117129/china-sends-africa-signal-belt-and-road-initiative-still-open>.

⁶⁴ *Ibid.*

DRC cobalt mining currently produces around two-thirds of the world's cobalt through 14 mines and companies, eight of them being Chinese-owned.⁶⁵ A notable deal that is important to mention, but happened well before China even started the BRI, is the 2007 deal for China to acquire 68 percent ownership of Sicominex cobalt and copper mine (one of Africa's largest) in exchange for China Railway Group Limited and Sinohydro Corporation building \$3 billion worth of infrastructure including hospitals and roads.⁶⁶ This is a great example of one of the original "minerals for infrastructure" deals China has leveraged since then to access certain mineral reserves. In 2016, China and the DRC formed an agreement to have Chinese company Sinohydro build a dam and hydroelectric power plant to power the entire Sicominex mine, further creating reliance on China and making it significantly harder to use the dam and mine without Chinese cooperation.⁶⁷ Then, shortly after the Paris Agreement was signed, China's China Molybdenum Co. acquired 56 percent of the Tenke Fungurume mine (later increased to 80 percent), one of the largest cobalt and copper mines in the DRC, from U.S. Freeport-McMoRan.⁶⁸

More recently, in December 2020, China Molybdenum Co. acquired a 95 percent ownership stake in DRC's Kisanfu copper and cobalt mine.⁶⁹ This deal came just two months after former US President Trump issued an EO on "Addressing the Threat to the Domestic

⁶⁵ Farchy, Jack, and Hayley Warren. "China Has a Secret Weapon in the Race to Dominate Electric Cars." *Bloomberg*, December 2, 2018. <https://www.bloomberg.com/graphics/2018-china-cobalt/>.

⁶⁶ Ross, Aaron. "China's 'infrastructure for minerals' deal gets reality-check in Congo." *Reuters*, July 9, 2015. <https://www.reuters.com/article/us-congodemocratic-mining-china-insight/chinas-infrastructure-for-minerals-deal-gets-reality-check-in-congo-idUSKCN0PI1UB20150709>.

⁶⁷ "Busanga hydropower plant project timeline and what you need to know." *Construction Review Online*, September 25, 2021. <https://constructionreviewonline.com/project-timelines/busanga-hydropower-plant-project-timeline-and-what-you-need-to-know/>.

⁶⁸ Daly, Tom. "China Moly buys 95% of DRC copper-cobalt mine from Freeport for \$550 million." *Reuters*, December 13, 2020. <https://www.reuters.com/article/cmoc-congo-m-a/china-moly-buys-95-of-drc-copper-cobalt-mine-from-freeport-for-550-million-idINKBN28N0D9>.

⁶⁹ *Ibid.*

Supply Chain from Reliance on Critical Minerals from Foreign Adversaries”.⁷⁰ Additionally, in September 2021, Chinese company Zhejiang Huayou Cobalt and its subsidiary Congo Dongfang International Mining SARM were in negotiations with DRC-backed Entreprise Generale du Cobalt over the rights to the Kasulo mine in the DRC, with the Chinese companies stating they have “a contract giving it the right to stay until the deposit is exhausted”.⁷¹ This, once again, comes just months after the US summit on climate change and the Paris Agreement.

Indonesia

Indonesia is a country originally determined by China to be vital to the BRI, largely due to its strategic location for shipping routes. While there never seemed to be an official declaration of Indonesia joining the BRI, most experts agree that Indonesia technically joined in 2015 when it awarded China the Jakarta-Bandung High Speed Rail project.⁷² What often goes unnoticed with Indonesia though is how it is the world’s leading supplier of nickel. Indonesia currently produces over 30 percent of the global nickel supply, with current plans that could possibly bring its share close to 60 percent by 2030. These plans have one small caveat though, they are all “linked to Chinese companies keen to cement their grip on stainless steel production and to meet fast growing demand for batteries which require a range of new-energy metals”.⁷³

⁷⁰ Trump, Donald. “Executive Order on Addressing the Threat to the Domestic Supply Chain from Reliance on Critical Minerals from Foreign Adversaries.” *The White House*, September 30, 2020. <https://trumpwhitehouse.archives.gov/presidential-actions/executive-order-addressing-threat-domestic-supply-chain-reliance-critical-minerals-foreign-adversaries/>.

⁷¹ Reid, Helen. “Congo in talks with China’s Huayou to end dispute over cobalt mine.” *Reuters*, September 27, 2021. <https://www.reuters.com/world/africa/exclusive-congo-talks-with-chinas-huayou-end-dispute-over-cobalt-mine-2021-09-27/>.

⁷² Lai, Hongyi. “Indonesia: The Belt and Road Initiative and relations with China.” *University of Nottingham: Asia Research Institute*, October 4, 2019. <https://theasiadialogue.com/2019/10/04/belt-and-road-initiative-in-indonesia-and-relations-with-china/>.

⁷³ Treadgold, Tim. “Indonesia on Track to Dominate the Supply of Nickel to Make Batteries.” *Forbes*, June 2, 2021. <https://www.forbes.com/sites/timtreadgold/2021/06/02/indonesia-on-track-to-dominate-the-supply-of-nickel-to-make-batteries/?sh=360f36fd7488>.

China's increasing interest in Indonesia's nickel can be traced back to shortly after Indonesia joined the BRI. In 2016, China funded/supported three separate nickel projects, establishing nickel smelting facilities across the country.⁷⁴ One year later, in June 2017, French company Eramet and one of the Chinese companies involved with the 2016 deal (Tsingshan) agreed to develop the Weda Bay nickel deposit in Indonesia. It was around this same time that Tsingshan announced they were looking to expand their nickel refining capabilities, providing China with complete supply chain control over nickel.⁷⁵ Although the 2016 nickel projects happened before the Paris Agreement, the 2017 deals came shortly after it; and just months before EO 13817.⁷⁶

Further showcasing China's clean energy ambitions, in May 2019, two Chinese companies planned to partner with mining company PT Aneka Tambang Tbk (Antam) for two nickel projects in Indonesia. One project was partnering with China's Zhejiang Huayou Cobalt Company Ltd to produce lithium-ion batteries while the other partnered with Sinomach to develop a ferronickel plant.⁷⁷ Building off these successes, China actively pursued a significant increase in mining deals in Indonesia in 2021. In January 2021, Chinese electric vehicle battery manufacturer GEM Co Ltd stated they would increase their share in a nickel project in Indonesia from 36 percent to 72 percent to "strengthen 'strategic control' of the resources amid a nickel

⁷⁴ Wang, Ellie. "2016 REVIEW: China-backed Indonesian nickel projects step up production to satisfy growing Chinese NPI demand." *Fastmarkets Metal Bulletin*, December 30, 2016. <https://www.metalbulletin.com/Article/3649788/2016-REVIEW-China-backed-Indonesian-nickel-projects-step-up-production-to-satisfy-growing-Chinese-NPI.html>.

⁷⁵ Zuberi, Suhaib. "Eramet, China's Tsingshan to jointly develop Indonesia nickel deposit." *S&P Global*, June 8, 2017. <https://www.spglobal.com/marketintelligence/en/news-insights/trending/d2yfkjafhz7rsn9ufe0crq2>.

⁷⁶ Trump, Donald. "Executive Order 13817: A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals." *The White House*, December 26, 2017. <https://www.federalregister.gov/documents/2017/12/26/2017-27899/a-federal-strategy-to-ensure-secure-and-reliable-supplies-of-critical-minerals>.

⁷⁷ Sulaiman, Stefano. "Antam, Chinese companies to build plants." *The Jakarta Post*, May 22, 2019. <https://www.thejakartapost.com/news/2019/05/22/antam-chinese-companies-build-plants.html>.

shortage”.⁷⁸ In May 2021, Zhejiang Huayou Cobalt Company Ltd (mentioned above) announced a partnership with EVE Energy in an Indonesian nickel and cobalt project.⁷⁹ EVE Energy is an electric vehicle battery manufacturer, with this deal showcasing an increasing trend in control over electric vehicle battery markets. Lastly, in June 2021, the China Baowu Group signed an agreement with PT Vale Indonesia and Shandong Xinhai Technology to jointly run a nickel processing facility in Morowali. Both this deal and the EVE Energy deal happened just a month or two after the US summit on climate change.

Mozambique

Mozambique is said to have joined the BRI in 2016 when the two countries agreed to raise their relationship to the level of a “comprehensive strategic partnership”.⁸⁰ While Mozambique has historically accounted for approximately 10 percent of the global graphite production, it has recently been pushing to capitalize on its vast untapped reserves. Specifically, Mozambique is attempting to take advantage of the world’s largest graphite reserve, the Balama mine.⁸¹ On the other hand, China accounts for approximately 60 to 70 percent of graphite production in any given year, but has begun increasing its imports in recent years in an attempt to meet the rising demands of clean energy technology. Although reporting on China’s mining, processing, and other energy deals in Mozambique is limited, the available reporting still clearly shows Chinese targeting of Mozambique mines and processing companies.

⁷⁸ “China’s GEM seeks to double stake, take control of Indonesia nickel project.” *Reuters*, January 3, 2021. <https://www.reuters.com/article/gem-indonesia-nickel-cobalt/chinas-gem-seeks-to-double-stake-take-control-of-indonesia-nickel-project-idUKL4N2JF0UG>.

⁷⁹ Daly, Tom. “China’s Huayou invests in \$2.1 bln Indonesia nickel project.” *Reuters*, May 24, 2021. <https://www.reuters.com/business/energy/chinas-huayou-invests-21-bln-indonesia-nickel-project-2021-05-24/>.

⁸⁰ Xiu, Lin. “Mozambican President: BRI is a way of modernizing multilateralism.” *CGTN*, April 28, 2019. <https://news.cgtn.com/news/3d3d414f77417a4d34457a6333566d54/index.html>.

⁸¹ Saigal, Kanika. “Mozambique’s glittering graphite mining boom.” *The Africa Report*, March 7, 2019. <https://www.theafricareport.com/412/mining-mozambique-glittering-graphite/>.

A relevant deal in Mozambique with available reporting is Triton Minerals, an Australian mining company, agreeing in May 2018 to provide close to 25 percent of Mozambique's Ancuabe mine graphite to Chinese company Qingdao Chenyang Graphite for the next five years. Just one month prior, Triton Minerals and Chinese company Qingdao Tianshengda Graphite Company agreed to a similar deal, ultimately giving China the rights to 50 percent of mined graphite from the mine.⁸² In September 2018, Australian company Triton Minerals signed a contract with Chinese company MCC International to build additional infrastructure supporting the exploration of the Ancuabe mine. Then, in October 2019, Chinese mining company Jinan Hi-Tech purchased a 34 percent ownership stake in Triton Minerals, bolstering "China's presence in Mozambique's graphite extraction and processing".⁸³ Outside of the October 2019 deal, the others seem strategically timed. The April and May 2018 deals were months after EO 13817 was signed and the September 2018 deal came months after the US Department of the Interior released its list of designated critical minerals.

As mentioned above, China has been relatively unable to expand control over Mozambique graphite resources compared to its attempts in other countries. A major reason for this failure seems to be Australia and other countries push to control Mozambique's graphite resources. Australia's Syrah Resources currently controls the massive Balama mine and Triton Minerals holds around eight exploration licenses in Mozambique, with each pursuing more Western involvement.⁸⁴ In July 2021, Syrah opened a graphite processing facility in Louisiana to

⁸² "Mozambique Graphite: Triton secures second China offtake deal." *Further Africa*, May 10, 2018. <https://furtherafrica.com/2018/05/10/mozambique-graphite-triton-secures-second-china-offtake-deal/>.

⁸³ "Chinese company boosts stake in the exploration of graphite deposits in Mozambique." *China-Lusophone Brief*, October 15, 2019. <https://www.clbrief.com/chinese-company-boosts-stake-in-the-exploration-of-graphite-deposits-in-mozambique/>.

⁸⁴ Padhy, Siv. "Graphite in Africa: Madagascar, Mozambique, Namibia and Tanzania." *Investing News Network*, September 7, 2017. <https://investingnews.com/daily/resource-investing/battery-metals-investing/graphite-investing/graphite-africa-madagascar-mozambique-namibia-tanzania-energizer/>.

create battery anode materials, looking to “establish a non-China supply chain for active anode material... [with] US and Australia governments strongly aligned on the longer-term importance of critical minerals in the battery supply chain”.⁸⁵ In addition to this, in August 2021, UK graphite company Tirupati acquired Australian company Battery Minerals’ Mozambique graphite portfolio, further isolating China.⁸⁶

Myanmar (Burma)

Myanmar officially joined the BRI in May 2017 during the Belt and Road Forum for International Cooperation. This cooperation and agreement came at a time when Myanmar was under intense geopolitical pressure due to treatment of the Rohingya population, ultimately extending Myanmar a so-called “lifeline” of political, diplomatic, and economic support.⁸⁷ Myanmar is the third-largest producer of Rare Earth Elements (REEs), most notably dysprosium and terbium; which the U.S. Department of Energy declared as two of the five “most critical in the short term for clean energy technologies”.⁸⁸ Dysprosium was declared the single-most critical element, so much so that the Department of Energy drastically increased research on alternate minerals for use in wind turbines in case they were ever cut off.⁸⁹

⁸⁵ Thompson, Brad. “Syrah walks line between China sales, US supply chain.” *Australian Financial Review*, May 22, 2020. <https://www.afr.com/companies/mining/syrah-walks-line-between-china-sales-us-supply-chain-20200522-p54vhp>.

⁸⁶ “Tirupati to acquire Battery Minerals’ Mozambique graphite projects.” *Mining Technology*, August 18, 2021. <https://www.mining-technology.com/news/tirupati-battery-minerals-mozambique-graphite/>.

⁸⁷ Yhome, K. “The BRI and Myanmar’s China debate.” *Observer Research Foundation*, July 18, 2018. <https://www.orfonline.org/expert-speak/bri-myanmar-china-debate/>.

⁸⁸ Gambogi, Joseph. “Rare Earths: Mineral Commodity Summaries.” *United States Geological Survey*, January 2021. <https://pubs.usgs.gov/periodicals/mcs2021/mcs2021-rare-earths.pdf>.

⁸⁹ “Critical Materials Strategy.” *U.S. Department of Energy*, December 2011. https://www.energy.gov/sites/default/files/DOE_CMS2011_FINAL_Full.pdf.

As for China’s involvement in Myanmar, they have long viewed a China-Myanmar Economic Corridor as key to the BRI, proposing 38 separate projects from 2017-2020.⁹⁰ The importance of Myanmar as a key country for establishing the BRI should not take away from the parallel efforts China is using to control Myanmar minerals in the name of the BRI. Myanmar is a major BRI focus for China not simply because of its geographic location, but because Myanmar supplies about half of China’s heavy REE concentrates.⁹¹ The deals China uses in Myanmar are murky at best, but China seems to be supporting more infrastructure in the country while gaining favorable trade terms for REEs.

For the investments China does make in Myanmar’s mining industry, outside of simple purchase agreements, they tend to be fairly opaque and underreported. For example, in 2015, Amnesty International released a statement saying Chinese mining company Wanbao worked with the economic arm of the Myanmar military, the Union of Myanmar Economic Holdings, to evict people from 2011 to 2015 in order to expand and run the Letpadaung mine under military protection.⁹² In June 2020, PanAust, an Australian-based subsidiary owned by a Chinese state-owned entity, was granted a mineral “exploration license for an area nearly the size of Singapore” in Myanmar. This apparently brought the total number of exploration licenses for PanAust in Myanmar to seven, with other licenses being granted in 2016 and 2018.⁹³ These deals

⁹⁰ Ajansi, Anadolu. “Myanmar Getting ‘Very Concerned’ By Chinese Belt & Road Initiative (BRI).” *The Eurasian Times*, August 23, 2020. <https://eurasianimes.com/myanmar-getting-very-concerned-by-chinese-belt-road-initiative-bri/>.

⁹¹ Daly, Tom, and Mai Nguyen. “Explainer: Possible impact of Myanmar coup on China’s metal and rare earth supply.” *Reuters*, February 10, 2021. <https://www.reuters.com/article/us-myanmar-politics-china-metals-explain/explainer-possible-impact-of-myanmar-coup-on-chinas-metal-and-rare-earth-supply-idUSKBN2AA12U>.

⁹² “Myanmar: Foreign mining companies colluding in serious abuses and illegality.” *Amnesty International*, February 10, 2021. <https://www.amnesty.org/en/latest/news/2015/02/myanmar-foreign-mining-companies-colluding-serious-abuses-and-illegality/>.

⁹³ Lwin, Nan. “Chinese-Backed Firm Granted Massive Copper and Gold Exploration Permit in Myanmar.” *The Irrawaddy*, June 3, 2020. <https://www.irrawaddy.com/news/burma/chinese-backed-firm-granted-massive-copper-gold-exploration-permit-myanmar.html>.

obviously fell within the time frame between the Paris Agreement, EO 13817, and the designation of critical minerals. It is also important to acknowledge a statement in a Myanmar news website, Irrawaddy, claiming “China buys up all the metal from Wa State, a self-administered region in Shan State, as well as all the rare earth metals from Panwar in Kachin State”, showcasing the possibly illicit nature of Chinese deals in the country.⁹⁴

Peru

In late April 2019 Peru joined the BRI, weeks after Secretary of State Mike Pompeo visited South America and warned of China’s ill-intentions with the BRI.⁹⁵ Peru, being the second largest producer of copper behind Chile, has seen significant Chinese interest in its copper holdings, especially since joining the BRI. To put it into perspective, China is the leading export destination for Peru (approximately \$12 billion), with over 70 percent of Peru’s exports to China being either copper ore or refined copper. As for China’s increasing ownership and control over Peruvian mines, there are currently over 170 Chinese companies in the country, with a majority of them within the mining sector.⁹⁶

According to Peru’s Ministry of Energy and Mines, China invested over \$15 billion in Peru’s mining sector between 2009 and 2020. The largest portion of this investment came between 2012 and 2015 (coinciding with the launch of the BRI) into the Las Bambas copper mine, one of the largest in the world.⁹⁷ Chinese company MMG Limited originally acquired the

⁹⁴ “Myanmar Junta to Sell Metal Worth US\$51 Million.” *The Irrawaddy*, June 28, 2021.

<https://www.irrawaddy.com/news/burma/myanmar-junta-to-sell-metal-worth-us51-million.html>.

⁹⁵ Galindo, Jimena. “Peru to join China’s Belt and Road Initiative.” *Global Americans*, May 1, 2019.

<https://theglobalamericans.org/2019/05/just-the-facts-peru-to-join-chinas-belt-and-road-initiative/>.

⁹⁶ *Ibid.*

⁹⁷ “Chinese mining investments in Peru reach nearly US\$15 billion in last 11 years.” *Andina*, September 9, 2020.

<https://andina.pe/Ingles/noticia-chinese-mining-investments-reach-nearly-15-billion-in-last-11-years-813142.aspx>.

mine in 2014 for nearly \$6 billion.⁹⁸ In 2016, China and Peru signed a MoU for the “Mechanism for Development and Collaboration of the Energy Sector” while at the same time a large Chinese mining company, China Three Gorges Corporation, signed an “Agreement on Further Cooperation on Renewable Energy” with Peru’s Ministry of Energy and Mines.⁹⁹ Since then, China has subtly expanded influence and control over Peru’s mining and energy sectors through a variety of factors. One of the other largest copper mines in Peru, the Toromocho copper mine, is also owned by a Chinese company and in 2018 (one month after the US Department of the Interior’s designation of critical minerals) invested over \$1 billion to expand copper production by one-third.¹⁰⁰ Although this all happened before Peru joined the BRI, China has used this strategic leverage in the country to further its objectives in clean energy from 2019 and on.

Outside of minerals, and shortly after Peru joined the BRI, China purchased a Peruvian hydroelectric facility for \$1.4 billion. Later that year, in September 2019, a Chinese power company bought almost \$4 billion worth of electric utility assets from a Pure-based power company, giving China control over almost 35 percent of Peru’s power grid.¹⁰¹ Lastly, in 2021, after Peru’s presidential elections put a new president in charge, the government was quick to

⁹⁸ “MMG to acquire Las Bambas.” *PR Newswire*, April 13, 2014. <https://www.prnewswire.com/news-releases/mmg-to-acquire-las-bambas-255100771.html>.

⁹⁹ Ingram, Elizabeth. “China Yangtze Power completes acquisition of Peru’s Luz Del Sur.” *Renewable Energy World*, April 27, 2020. <https://www.renewableenergyworld.com/baseload/china-yangtze-power-completes-acquisition-of-perus-luz-del-sur/#gref>.

¹⁰⁰ “Peru President highlights US\$1.355 billion investment in Toromocho’s expansion.” *Andina*, June 1, 2018. <https://andina.pe/ingles/noticia-peru-president-highlights-1355-billion-investment-in-toromochos-expansion-711954.aspx>.

¹⁰¹ Ellis, Evan. “Peru’s Multidimensional Challenge – Part 3: Engagement with China.” *Global Americans*, November 20, 2020. <https://theglobalamericans.org/2020/11/perus-multidimensional-challenge-part-3-engagement-with-china/>.

conduct outreach to Chinese mining companies to discuss policies and strengthen trade agreements, further increasing China's power in copper and thus clean energy.¹⁰²

Philippines

The Philippines officially signed a MoU to join the BRI in November 2018, while formalizing \$24 billion worth of deals with China.¹⁰³ The Philippines are the second largest producer of nickel, after Indonesia, accounting for around 16 percent of global production. Since joining the BRI, the Philippines has expanded policies designed to increase Chinese investments into the energy sector and also take advantage of China's growing demand for minerals vital to clean energy.¹⁰⁴ In addition, the country has long been a proponent of clean energy, recently kicking off their third clean energy selection process in January 2021 where they decided to move forward on 17 hydropower projects and five geothermal projects.¹⁰⁵

In 2012, the Philippines surprisingly put a ban on new mineral mining agreements, creating a potential roadblock for increased Chinese influence over energy and minerals in the country. From 2012 up until April 2021 (when Philippine President Duterte lifted the ban), China increased investments into other aspects of the energy sector while also engaging in “improper”/backdoor investments in the mining sector.¹⁰⁶ For overt investments outside of minerals, China poured large amounts of money into Philippine energy. For example, in 2014,

¹⁰² Aquino, Marco. “Peru’s new leftist president prioritizes China ties during early days in office.” *Reuters*, August 5, 2021. <https://www.reuters.com/world/americas/perus-new-leftist-president-prioritizes-china-ties-during-early-days-office-2021-08-05/>.

¹⁰³ Fernando, Jonina. “China’s Belt and Road Initiative in the Philippines.” *East-West Center*, December 16, 2020. <https://www.eastwestcenter.org/publications/china%E2%80%99s-belt-and-road-initiative-in-the-philippines>.

¹⁰⁴ “Philippines Nickel Mining Market Report 2019-2023 – ResearchAndMarkets.com.” *Businesswire*, December 5, 2019. <https://www.businesswire.com/news/home/20191205005554/en>.

¹⁰⁵ “Philippines DOE launches third renewable energy call, with 17 hydro projects.” *Renewable Energy World*, January 7, 2021. <https://www.renewableenergyworld.com/baseload/philippines-doe-launches-third-renewable-energy-call-with-17-hydro-projects/#gref>.

¹⁰⁶ Cruz, Enrico Dela. “Philippines lifts nine-year ban on new mines to boost revenue.” *Reuters*, April 15, 2021. <https://www.reuters.com/business/energy/philippines-lifts-nine-year-old-ban-new-mines-boost-revenues-2021-04-15/>.

China only invested in the Philippines power sector.¹⁰⁷ In 2016, after Duterte announced the Philippines and US had a “falling out”, China pledged over \$20 billion in investments to Philippine infrastructure and energy. Showcasing this increased Chinese interest, from 2016 to 2017, Chinese FDI in the Philippines more than quadrupled.¹⁰⁸ Fast forward a few years to when the Philippines joins the BRI, Chinese investments in the Philippines surpass the US’ with almost \$90 billion, illustrating the Philippines pivot towards China.¹⁰⁹

As for the “improper” investments mentioned above, during the ban on new mining agreements period, “industry sources claim that most Chinese mining companies misrepresent[ed] their operations to reduce tax payments, engage in operations that tend to be rejected by government authorities or objected to by anti-mining advocacy groups, and to bypass Philippine mining laws”.¹¹⁰ Chinese mining companies reportedly bribed politicians often, gathered secret processing permits, and operated under the licenses of Filipino mining subsidiaries. During the ban, the only mining investments and processing permits allowed were those where Filipinos owned at least 60 percent of the company. Taking this into account, during that timeframe, Chinese mining companies invested in 25 different Philippine mining companies or projects for close to 40 percent.¹¹¹ Shortly after the investment ban was lifted, the Philippine government attended the China Investment Fair for Investment and Trade 2021, highlighting

¹⁰⁷ Stern, Tom. “Chinese Investments in the Philippines.” *Journal of Political Risk* 4, no. 6 (June 2016). <https://www.jpolorisk.com/chinese-investments-in-the-philippines/>.

¹⁰⁸ Lema, Karen, and Martin Petty. “Two years after Philippines’ pivot, Duterte still waiting on China dividend.” *Reuters*, November 18, 2018. <https://www.reuters.com/article/us-philippines-china-analysis/two-years-after-philippines-pivot-duterte-still-waiting-on-china-dividend-idUSKCN1NN0UO>.

¹⁰⁹ Rivas, Ralf, and Sofia Tomacruz. “In Charts: How Duterte’s love affair with China shaped the PH economy.” *Rappler*, July 21, 2021. <https://www.rappler.com/business/charts-how-duterte-love-affair-china-shaped-philippine-economy>.

¹¹⁰ Stern, “Chinese Investments in the Philippines.”

¹¹¹ *Ibid.*

investment opportunities for China in Philippines' renewable energy sector.¹¹² With no policies holding back Chinese companies anymore, and the Philippine government encouraging investment in the energy sector, it is likely China will continue to use the Philippines to its advantage in the clean energy race.

South Africa

South Africa, the leading producer of platinum and many other critical minerals not directly tied to clean energy production, joined the BRI in 2015, signing a MoU along with 25 other agreements with China worth approximately \$7 billion. Of these agreements, major focus was put on Chinese investments in the energy and mining sectors. One of the biggest agreements signed was between the China Construction Bank Corporation and the Industrial Corporation of South Africa Limited, funding projects with a focus on “industrial infrastructure (which encompasses energy renewable and conventional) agro-processing; [and] manufacturing and mining beneficiation”.¹¹³ With South Africa also being a top three economy in Africa, as well as a Paris Agreement signatory, the implications of Chinese influence in the country on clean energy are significant.¹¹⁴

As for Chinese involvement in South Africa outside of minerals, it seems to be very heavily focused on photovoltaic and wind power energy. China's strategy involves both equity investments and general contracting, but after joining the BRI saw Chinese companies aiming to control the entire supply chain, from investment and construction all the way down to operations.

¹¹² “Philippines invites investments from China during CIFT 2021.” *Republic of Philippines – Department of Trade and Industry*, September 10, 2021. <https://www.dti.gov.ph/overseas/philippines-invites-investments-from-china-during-cifit-2021/>.

¹¹³ “South Africa: Government signs twenty-six agreements worth R94 billion with China.” *Bilaterals*, December 2, 2015. <https://www.bilaterals.org/?south-africa-government-signs>.

¹¹⁴ Xu, Hongfeng, and Jing Wang. “The resources and potential of renewable energy in South Africa.” *Green Belt and Road Initiative Center*, July 22, 2019. <https://green-bri.org/bri-cooperation-and-financing-on-renewable-energy-taking-china-and-south-africa-as-an-example/>.

An example of this is the De Aar Project, which saw numerous Chinese companies fund, build, install, and operate 163 wind turbines throughout South Africa, establishing China as a leading supplier in this domain. China has also utilized its influence in BRICS to support a South Africa push. Chinese influence was a leading factor in the BRICS New Development Bank establishing a regional center in South Africa and approving \$1.5 billion for energy projects.¹¹⁵ Much of China's focus and involvement in this sector seemingly comes from China's targeting of South Africa's Renewable Energy Independent Power Producer Procurement Program, the primary channel for renewable energy investment in the country.¹¹⁶ None of these investments by China or Chinese companies seemed to correlate with any major US or energy initiative/announcement, but is obviously very heavily oriented towards clean energy.

Regarding minerals, China has been more active around the key dates mentioned above. China's investment in this area first came around the rollout of the BRI in 2013, with China providing \$650 million to Wesizwe Platinum's Bakubung mine which would produce platinum group metals and was not even slated to start production until 2018. An interesting aspect of this deal was the unusually low interest rate of 3.8 percent compared to typical BRI interest rates of 8 percent, showcasing the value of the mine.¹¹⁷ Then, in July 2018 (just two months after the critical mineral designations by the US Department of the Interior) and around the time the mine became operational, Chinese investors provided over \$10 billion to build a metallurgical

¹¹⁵ Ibid.

¹¹⁶ Fisher-Murray, Suzanne. "Understanding China's involvement in South Africa's Renewable Energy Sector." *University of Sussex*, February 26, 2016. <https://blogs.sussex.ac.uk/sussexenergygroup/2016/02/26/understanding-chinas-involvement-in-south-africans-renewable-energy-sector/>.

¹¹⁷ Stoddard, Ed. "AFRICA INVESTMENT-China's Africa resource scramble goes platinum." *Reuters*, February 1, 2013. <https://www.reuters.com/article/africa-investment/africa-investment-chinas-africa-resource-scramble-goes-platinum-idUSL5N0B02V820130201>.

complex, further cementing China's role in the supply chain.¹¹⁸ The most recent example of Chinese investment in South Africa's platinum sector happened in May 2021, one month after the US climate summit, when it launched the Garatau Platinum Mine Project between Chinese gold company Zijin Mining Group and South Africa's platinum developer Nkwe Platinum Limited. This individual investment is set to play a significant role in the future of the platinum market as the mine is slated to be among the top 10 largest platinum producers in the world.¹¹⁹

Zimbabwe

The last country to highlight, Zimbabwe, is a leading producer of platinum but rich in countless other critical minerals and resources such as tin and cesium. Zimbabwe joined the BRI in mid-2018, coming to no surprise after their "Look East" policy mentioned above. Around that same time, and not-surprisingly around the same time as EO 13817 and the US Department of the Interior designation, China was "emerging as the top investor in Zimbabwe's energy sector".¹²⁰ For years before joining the BRI China had been a major investor and geopolitical ally to Zimbabwe, building off that relationship once they officially joined. Given Zimbabwe's relatively weak global political stance and conflicts with the West, China was able to pursue more lopsided energy and mineral deals likely having a major impact on critical mineral and energy supply chains.

¹¹⁸ Winning, Alexander. "Chinese investors plan \$10 billion metallurgical complex in South Africa." *Reuters*, July 27, 2018. <https://www.reuters.com/article/us-safrica-brics-china/chinese-investors-plan-10-billion-metallurgical-complex-in-south-africa-idUSKBN1KH1E8>.

¹¹⁹ Jika, Thanduxolo, and Alex Patrick. "Platinum mine launched despite controversy over ownership and land." *Times Live*, May 14, 2021. <https://www.timeslive.co.za/news/south-africa/2021-05-14-platinum-mine-launched-despite-controversy-over-ownership-and-land/>.

¹²⁰ Yuliang, Zhang, and Gretinah Machingura. "Zimbabwe embraces ample cooperation opportunities following Mnangagwa's trip to China." *Africa and the World*, May 7, 2018. <https://lawrencefreemanafricaandtheworld.com/2018/05/07/zimbabwe-joins-chinas-silk-road/>.

For overall energy within the country, China has been instrumental in a majority of Zimbabwe's power plants. China not only funded and constructed Zimbabwe's largest power plant, the Hwange Thermal Power project, but is a major contributor to almost all major energy sources in the country.¹²¹ Since Zimbabwe joined the BRI, China has announced plans to build a major industrial park, steel plants, power plants, and more. To encourage increased Chinese investment in the country, given how much Zimbabwe's GDP and economy relies on China, Zimbabwe agreed to lower electricity tariffs for some Chinese miners.¹²² Focusing more on clean energy, and possibly showcasing China's use of Zimbabwe as a test for future energy ambitions, China's Industrial and Commercial Bank of China canceled its funding of a \$3 billion coal power plant in the country in June 2021 in a preliminary show of support to China's green development initiative.¹²³ Possibly unrelated, this "show of support" once again came just two months after the US climate summit.

As for Zimbabwe minerals and Chinese interest, there has been a steady flow of acquisitions in mines and companies over the years. In a strange change of events in the relationship with mining and China, in May 2020 Zimbabwe actually revoked a mining license for Chinese companies to mine Zimbabwe's Hwange national park, claiming they were not transparent in their operations.¹²⁴ Besides this issue, Zimbabwe has still agreed to (or seen) Chinese influence grow in the country's mining sector. Much of China's interest has come fairly

¹²¹ Ibid.

¹²² Whitehouse, David. "Zimbabwe well-placed to benefit from China's thirst for chromium." *The Africa Report*, July 8, 2019. <https://www.theafricareport.com/15054/zimbabwe-well-placed-to-benefit-from-chinas-thirst-for-chromium/>.

¹²³ Ndlovu, Ray, and Antony Sguazzin. "Biggest China Bank Abandons \$3 Billion Zimbabwe Coal Plan." *Reuters*, June 30, 2021. <https://www.bloomberg.com/news/articles/2021-06-30/biggest-china-bank-walks-away-from-3-billion-zimbabwe-coal-plan>.

¹²⁴ Nyabiage, Jevans. "China lectures Zimbabwe on environmental duty and transparency after permits to mine park canceled." *South China Morning Post*, September 20, 2020. <https://www.scmp.com/news/china/diplomacy/article/3102208/china-lectures-zimbabwe-environmental-duty-and-transparency>.

easily due to Zimbabwe announcing in 2019 the goal of tripling the country's revenue from mining over four years. In Zimbabwe's strategy, titled "Strategic Road to the Achievement", it explicitly states Zimbabwe's intention of increasing FDI into their platinum mines.¹²⁵ Shortly after this announcement, China and Zimbabwe signed a currency swap deal, making Chinese investment significantly easier to attract and support in the mining sector (while also enabling Chinese companies to remit profits easier, doubling China's benefits).¹²⁶ Once again, this deal between China and Zimbabwe came just a few months after President Trump's EO on critical mineral vulnerabilities.

¹²⁵ Todd, Felix. "Zimbabwe aims to triple its mining industry revenue to \$12bn by 2023." *NS Energy*, October 15, 2019. <https://www.nsenegybusiness.com/news/zimbabwe-mining-industry-2023/>.

¹²⁶ Matiashe, Farai. "A currency swap deal with China could backfire on Zimbabwe's hope to build forex reserves." *Quartz*, January 16, 2020. <https://qz.com/africa/1786207/chinas-currency-swap-deal-with-zimbabwe-could-backfire/>.

Discussion

Taking the above information into account, it is important to understand how the control over strategic minerals and investments into clean energy supply chains are being leveraged to actually affect the US clean energy transition. For starters, it is obvious that China has a significant influence/control over a major portion of the supply of minerals critical to clean energy technologies. Looking at this supply of different minerals and corresponding demand, shortages, and recent US policies, we can begin to see the hurdles the BRI and Chinese influence over minerals are having on the US clean energy transition.

Copper, which Chile and Peru are leading producers of, is “the most widely used mineral in clean energy technologies,” primarily due to its “unmatched thermal and electrical conductivity.”¹²⁷ The research above shows that China has used the BRI to establish itself as the leading investment and trading partner in both countries, especially in the energy and copper mining sectors. China has obtained exclusive supply deals and taken control of some of the largest copper mines in the world in Chile and Peru, usually shortly after one of the major US energy/mineral announcements. Additionally, the world is currently experiencing a significant shortage of copper. According to the global commodity trading company Trafigura’s CEO, to meet the growing renewable energy push the supply of copper will need to increase by at least 10 million metric tons by 2030, but “so far, only 5 million mt extra capacity is expected to come on stream, indicating a significant deficit”.¹²⁸ Therefore, China’s deals through the BRI has set

¹²⁷ “The Role of Critical Minerals”, 135.

¹²⁸ Kinch, Diana. “Copper miners eye complex jurisdictions as energy transition buoys prices: Kainantu.” *S&P Global*, August 13, 2021. <https://www.spglobal.com/platts/en/market-insights/latest-news/metals/081321-copper-miners-eye-complex-jurisdictions-as-energy-transition-buoys-prices-kainantu>.

China up to flourish in the copper shortage, essentially dictating the global market and making US clean energy ambitions dependent on China.

Building off China's BRI deals in Chile, we must also look at Chile's role in lithium supply (primarily used in lithium-ion batteries). As mentioned above, China has used the BRI to take control over not only some of the largest lithium mines, but of nearly 75 percent of the lithium-ion battery plants in the world. Like copper, lithium demand is set to more than double within the next few years, with supply problems already affecting the US.¹²⁹ The current output will be unable to meet the US' demand for lithium-ion battery production, already limiting capabilities at Ford, GM, Tesla, and more. Showcasing the impact of the BRI, Chinese electric vehicle sales have tripled within the last year with no problems in production, while Tesla has had to scale back the production of certain vehicles; and GM is spending millions of dollars to secure a reliable supply of lithium outside of Chinese control.¹³⁰¹³¹¹³²

In terms of REEs, their primary use in clean energy is in the creation of permanent magnets for motors and catalytic converters. China is already producing 60 percent of the world's REEs (and securing Myanmar's supply would bring closer to 70) and is actively looking to limit US access. In January 2021, China's Ministry of Industry and Information Technology

¹²⁹ Xie, John. "How China Dominates Global Battery Supply Chain." *Voice of America*, September 1, 2020. https://www.voanews.com/a/silicon-valley-technology_how-china-dominates-global-battery-supply-chain/6195257.html.

¹³⁰ Horner, Will. "Booming Electric-Vehicle Demand Supercharges Lithium Prices." *Wall Street Journal*, March 10, 2021. <https://www.wsj.com/articles/booming-electric-vehicle-demand-supercharges-lithium-prices-11615391390>.

¹³¹ Wayland, Michael. "GM moves to secure critical U.S.-sourced lithium for electric vehicle batteries." *CNBC*, July 2, 2021. <https://www.cnn.com/2021/07/02/gm-moves-to-secure-critical-us-sourced-lithium-for-electric-vehicles.html>.

¹³² "Tesla hit by battery shortage amid rallying lithium, cobalt, nickel prices." *Mining.com*, January 29, 2021. <https://www.mining.com/tesla-hit-by-battery-shortage-amid-rallying-lithium-cobalt-nickel-prices/>.

announced the tightening of regulations on the export of REEs, primarily targeted at the US.¹³³ This comes at a time when the US was looking to build a domestic supply chain capacity, hoping to end reliance on China.¹³⁴ Where this ties into the BRI is how China can use this increased market share to drive out competitors and successfully keep the US from developing a cost-effective REE supply chain, thereby limiting US investment into and production of clean energy technologies. China has already done this in the past, with a 2018 Department of Defense report stating “China has strategically flooded the global market with rare earths at subsidized prices, driven out competitors, and deterred new market entrants”.¹³⁵

Like lithium, cobalt and nickel are both currently essential in electric vehicles, lithium-ion batteries, wind turbines, and solar panels, facing similar supply and demand constraints. For cobalt, the DRC is responsible for nearly 70 percent of the cobalt supply, so it is unsurprising that the largest “minerals for infrastructure” deals China has pursued has been with the DRC. As for nickel, China has been extremely successful in obtaining mine ownership, mining rights, and exclusive mineral trade agreements with Indonesia and the Philippines, cementing control over approximately 50 percent of the nickel market. The US has apparently realized the threat this poses to its clean energy transition, with the US Department of Energy announcing a goal to “reduce U.S. lithium-battery manufacturing dependence on scarce materials, especially cobalt

¹³³ Tabeta, Shunsuke. “China tightens rare-earth regulations, policing entire supply chain.” *Nikkei Asia*, January 16, 2021. <https://asia.nikkei.com/Business/Markets/Commodities/China-tightens-rare-earth-regulations-policing-entire-supply-chain>.

¹³⁴ Subin, Samantha. “The new U.S. plan to rival China and end cornering of market in rare earth metals.” *CNBC*, April 17, 2021. <https://www.cnbc.com/2021/04/17/the-new-us-plan-to-rival-chinas-dominance-in-rare-earth-metals.html>.

¹³⁵ Secretary of Defense. “Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States.” *Department of Defense*, September 2018. <https://media.defense.gov/2018/Oct/05/2002048904/-1/-1/1/ASSESSING-AND-STRENGTHENING-THE-MANUFACTURING-AND%20DEFENSE-INDUSTRIAL-BASE-AND-SUPPLY-CHAIN-RESILIENCY.PDF>.

and nickel, in order to develop a stronger, more secure and resilient supply chain” by 2030.¹³⁶

This strategy is important to note as it completely bypasses trying to acquire or develop mines for a reliable supply.

Graphite, necessary in nearly all renewable energy storage technologies, is mined almost entirely in China already. Given graphite demand is expected to multiply nine-fold by 2028 (from 2017 levels) due to clean energy production, China has attempted to use the BRI to expand their reach into Mozambique.¹³⁷ China’s already dominant position in the market and aggressive tactics in acquiring new deposits seemed to be a determining factor in the US adding graphite to the US National Defense Stockpile Acquisitions List in October 2021.¹³⁸ This has all led to numerous energy, technology, and mining companies in the US and abroad to scramble to acquire the limited supply of graphite or attempt to use less reliable and tested materials in its place.¹³⁹

Lastly, platinum, which is often used in fuel cells and catalytic converters and primarily found in South Africa and to a lesser extent Zimbabwe, has also seen some supply and demand disruptions. While currently not as drastic as the other minerals described above, the supply crunch for platinum is expected to become dire as the hydrogen and auto industry look to increasingly use platinum in place of palladium and other minerals.¹⁴⁰ Although China’s control

¹³⁶ “Executive Summary: National Blueprint for Lithium Batteries 2021-2030.” *National Consortium for Advanced Batteries*, June 2021. https://www.energy.gov/sites/default/files/2021-06/FCAB%20National%20Blueprint%20Lithium%20Batteries%200621_0.pdf.

¹³⁷ Jorgensen, Barbara. “Automotive Industry Likely to Face Materials Shortage.” *Ceylon Graphite*, March 11, 2021. <https://www.ceylongraphite.com/news/automotive-industry-likely-to-face-materials-shortage/>.

¹³⁸ Huston, Anthony. “Graphite One Reports Graphite Added to the U.S. National Defense Stockpile List.” *Graphite One*, October 7, 2021. https://www.graphiteoneinc.com/news/news-display/index.php?content_id=333.

¹³⁹ Metz, Cade. “Your Batteries Are Due for Disruption.” *New York Times*, September 8, 2021. <https://www.nytimes.com/2021/09/08/technology/batteries-new-technology.html>.

¹⁴⁰ Hobson, Peter. “Platinum set for third year of deficit as industry demand surges, WPIC says.” *Reuters*, May 16, 2021. <https://www.reuters.com/business/environment/platinum-set-third-year-deficit-industry-demand-surges-wpic-says-2021-05-17/>.

over South Africa and Zimbabwe's platinum supply chains likely does not affect the US clean energy transition currently, it definitely has the possibility to in the future.

Conclusion

This paper offers a foundation for better understanding the relationship between both the BRI and clean energy transitions, as well as the BRI and access to critical minerals. As this research shows, China has used the BRI to become “the world’s largest producer of solar panels, wind turbines, batteries and electric vehicles,... the top investor in clean energy for nine out of the last ten years”, and control a majority of the world’s minerals most vital to clean energy technologies.¹⁴¹ This increasing monopolization of clean energy has slowed US adoption of clean energy by limiting US energy companies access to these minerals, causing unfavorable trade deals, and forcing companies to limit production but increase research into alternate technologies.

A US inability to access the identified minerals above not only limits the US purchasing power, manufacturing, and installation of clean energy technologies, but limits the overall influence the US can have in clean energy globally. With calls for the US to be a leader in the clean energy push, but unable to produce or acquire the necessary clean energy technologies required to conform to agreements such as the Paris Agreement without Chinese cooperation, the US will likely stumble geopolitically. If so, with China’s increasing ability and clout in the clean energy sphere due to the BRI, China will be relied upon more by the international community, catapulting them both economically and politically.

Although this paper shows how the US clean energy transition is being impacted by the BRI, it does not mean China is purposely using the BRI to limit US clean energy goals. China may be pursuing the discussed minerals and using the BRI to advance their own economy and

¹⁴¹ Campbell, Charlie. “China Is Bankrolling Green Energy Projects Around the World.” *TIME*, November 1, 2019. <https://time.com/5714267/china-green-energy/>.

defense industry, or even to possibly protect against Western countries increasing focus of limiting Chinese controlled/involved supply chains. Regardless, whether the US were to get serious about clean energy this instant and actively pursue carbon emission goals under the Paris Agreement, or wait a few years for the climate crisis to worsen, the US will find itself with limited options either way.

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- "China Controls Sway of Electric Vehicle Power Through Battery Chemicals, Cathode and Anode Production." *Benchmark Mineral Intelligence*, May 6, 2020. <https://www.benchmarkminerals.com/membership/china-controls-sway-of-electric-vehicle-power-through-battery-chemicals-cathode-and-anode-production/>
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Curriculum Vita

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