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The Lobito Atlantic Railway:
Is it enough and can the West make up for lost time?

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Lobito Corridor Memo

While important in addressing barriers to critical mineral investments, infrastructure projects – such as the United States-led Lobito Atlantic Railway project covering Angola, the Democratic Republic of Congo (DRC), and Zambia – may result in positive spillovers for competitors in a way that does not align with investors’ original intent. Specifically, Chinese state-owned enterprises and private companies dominate many critical mineral supply chains (CMSCs) needed for the manufacture of EV components like batteries and electric motors, including in copper/cobalt abundant DRC and Zambia. This memo assesses the U.S. strategy of developing infrastructure projects in developing nations where the predominant user of said logistical infrastructure may very well be the Chinese companies it seeks to compete against. It asks the question, “Will the Lobito Atlantic Railway project increase access to African critical minerals for the United States and its allies?” Though there is no conclusive answer, we seek to draw attention to potential gaps in the U.S.’s strategy and implications for its strategic approach to diversifying CMSCs.

Background and Motivating Factors

On October 26, 2023, a Memorandum of Understanding (MOU) was signed between seven parties—the United States, the European Union, Angola, the DRC, Zambia, the African Development Bank, and the Africa Finance Corporation—to begin work on a massive infrastructure project in southern Africa.¹ Generally referred to as the “Lobito Corridor,” the infrastructure project is actually two rail projects totaling 1,300 km; (1) the development of a 120-year-old Benguela rail project² linking copper mines in the south of the DRC to the Lobito port in Angola and (2) a “greenfield” rail project to connect mines in northern Zambia via the DRC railway.³

¹ U.S. Department of State, Signing of the Memorandum of Understanding on the Development of the Lobito Corridor and the Zambia-Lobito Rail Line, October 26, 2023. As of April 2, 2024: <https://www.state.gov/signing-of-the-memorandum-of-understanding-on-the-development-of-the-lobito-corridor-and-the-zambia-lobito-rail-line/>.

² Originally begun in 1889 by the Portuguese, the Benguela Railway operated into the 1970s and was the quickest route to ship minerals in the Congolese Copperbelt to the Atlantic coast and Europe. See Preuss, Helmo, Congolese copper mine Kamoia-Kakula are launch partners for Lobito railway, IOL, February 8, 2024. As of April 2, 2024: <https://www.iol.co.za/business-report/economy/congolese-copper-mine-kamoia-kakula-are-launch-partners-for-lobito-railway-ef25686a-00a0-40e0-8d7e-6e4b42efb27c>.

³ Chabala, E. D. Wala, Lobito Corridor – A Reality Check, Africa Policy Research Institute, February 2, 2024. As of April 2, 2024: <https://afripoli.org/lobito-corridor-a-reality-check/>; Stonor, Alex, The Lobito Corridor: Washington’s Answer to Belt and Road in Africa, Geopolitical Monitor, January 4, 2024. As of March 29, 2024: <https://www.geopoliticalmonitor.com/the-lobito-corridor-washingtons-answer-to-belt-and-road-in-africa/>

Historically, U.S. ties to the African continent have received less attention compared to the European, Middle East, or Indo-Pacific theaters. In the past, Washington has incorporated trade agreements as part of its strategic engagement with the region, such as through the 2000 African Growth and Opportunity Act (AGOA), which granted participating countries preferential access to U.S. markets.⁴ U.S. ties with AGOA countries have plateaued since 2008, contrasting with these countries' growth in economic ties with China via its "Going Out" strategy and the Belt and Road Initiative (BRI). Between 2007 and 2020, for example, Chinese development banks provided \$23bn for African infrastructure, while all other development banks provided less than half that amount.⁵

With the growing recognition of the importance of access to critical minerals for use in the clean energy transition, and the economic equities of countries with relevant industries (e.g., the auto sector), the United States and other Western countries are seeking to grow relations with African countries. In 2022, the U.S. released a strategy on its approach to the region which includes CMSCs in its scope.⁶ Per the strategy, "[t]he United States will assist African countries to more transparently leverage their natural resources, including energy resources and critical minerals, for sustainable development while helping to strengthen supply chains that are diverse, open, and predictable," all while "upholding human rights and complying with international environmental and social safeguards."

The strategy at play seems to be one of presenting an alternative to China's approach to economic development abroad, and more specifically, resource development. Instead of signing MOUs and agreements trading infrastructure for access to mineral deposits, as Chinese state-owned enterprises and private companies have done in the past,⁷ Western countries are betting that large scale infrastructure projects carried out by a more responsible party will open up opportunities for Western investment in new mining projects and buy good will among host countries and communities. Some of the challenges to exporting metals and minerals include a lack of capacity to process exports, corruption, poor roads, and security risks from hijacking of

⁴ Sub-Saharan African countries must meet specific criteria to participate in AGOA. The U.S. president has the discretion to disqualify countries based on human rights violations and protectionist policies and U.S. presidents have done so in the past. The act also mandates increased U.S. development assistance to sub-Saharan African countries in agriculture and HIV/AIDS prevention. Ibid.

⁵ "How Chinese firms have dominated African infrastructure," *The Economist*, February 19, 2022. As of April 15, 2024: <https://www.economist.com/middle-east-and-africa/how-chinese-firms-have-dominated-african-infrastructure/21807721>

⁶ The White House, U.S. Strategy Toward Sub-Saharan Africa, August 2022. As of April 15, 2024: <https://www.whitehouse.gov/wp-content/uploads/2022/08/U.S.-Strategy-Toward-Sub-Saharan-Africa-FINAL.pdf>.

⁷ Strohecker, K., Do Rosario, J., "Exclusive: Congo sees deal on \$6 bln China mining contract overhaul this year - FinMin", *Reuters*, January 18, 2023. As of April 8, 2024: [https://www.reuters.com/markets/commodities/congo-sees-deal-6-blm-china-mining-contract-overhaul-this-year-finmin-2023-01-18/#:~:text=LONDON%2C%20Jan%2018%20\(Reuters\),told%20Reuters%20in%20an%20interview.](https://www.reuters.com/markets/commodities/congo-sees-deal-6-blm-china-mining-contract-overhaul-this-year-finmin-2023-01-18/#:~:text=LONDON%2C%20Jan%2018%20(Reuters),told%20Reuters%20in%20an%20interview.)

trucks carrying copper cathodes or cobalt hydroxide.⁸ Western countries, journalists, and non-government organizations have alleged that these challenges are exacerbated by Chinese entities' operations and behavior in the region. These include: predatory pricing; low transparency; the use of imported labor; poor consideration for local communities; and bribery of local and high level officials.⁹

Overall, Western countries, and especially the United States and the European Union, are more engaged with resource development than in the past. With strategies outlined and projects in development, they are poised to compete with China at various levels of the value chain and supply chain. But the question remains, are these efforts enough and can the West make up for lost time?

Potential Gaps, Concerns, and Unintended Consequences

China's Influence Over Copperbelt Mining Production

While the Lobito Atlantic Railway project presents a unique opportunity for the United States to exercise soft power in Africa, the extent to which the project will meaningfully alter access to critical minerals remains unclear. For instance, many of the copper and cobalt mines along the corridor's route – which, presumably, would utilize the rail system – are owned by Chinese companies. To illustrate, Figure 1 uses 2016 data to report the extent of Chinese control over the DRC's cobalt mining sector. The distribution between Chinese and non-Chinese production is even more stark when accounting for Glencore's substantial reduction in production starting in 2019.¹⁰ In Zambia, Chinese mining giant China Non-Ferrous Metals Mining Company (CNMC) has been a major player in copper mining since the 1990s and has, in recent years, aggressively expanded its operations in country.¹¹ Should the Lobito Atlantic

⁸ Hill, M., "The Metals for Your EV Are Stuck in a 30-Mile Traffic Jam", Bloomberg, November 3, 2022. As of April 8, 2024: <https://www.bloomberg.com/features/2022-africa-copper-supply-chain-snarls/>.

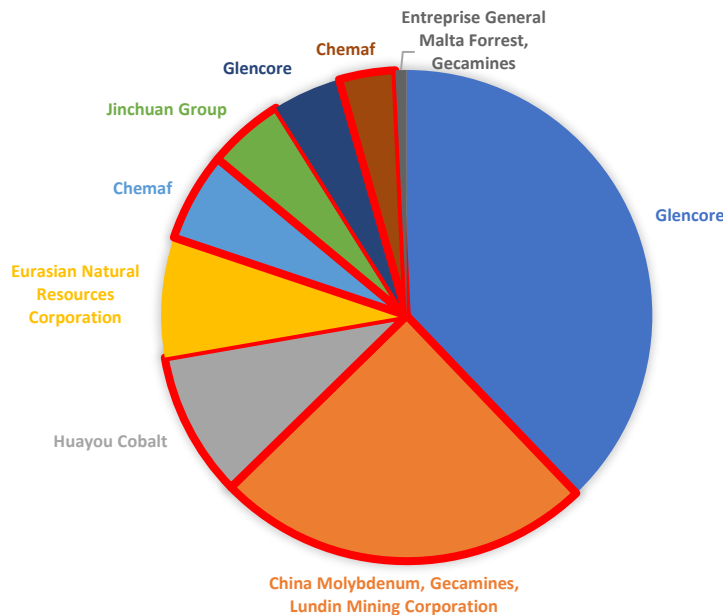
⁹ Authors' interviews with local and industry Subject Matter Experts; see also Clowes, W., Kavanagh, M.J., "Biggest African Bank Leak Shows Kabila Allies Looted Congo Funds", Bloomberg, November 19, 2021. As of April 8, 2024: <https://www.bloomberg.com/news/articles/2021-11-19/biggest-african-bank-leak-shows-ex-congo-president-s-allies-looted-state>.

¹⁰ Desai, P. and Denina, C., "Glencore's Mutanda mine to produce less cobalt on ore depletion – sources," Reuters, November 27, 2023. As of April 15, 2024: <https://www.reuters.com/markets/commodities/glencores-mutanda-mine-produce-less-cobalt-ore-depletion-sources-2023-11-27/>; "Glencore closes Mutanda mine, 20% of global cobalt supply comes offline," Benchmark Intelligence, November 28, 2019. As of April 15, 2024: <https://www.benchmarkminerals.com/blog-archive/glencore-closes-mutanda-mine-20-of-global-cobalt-supply-comes-offline/>; Van den Brink, S., Kleijn, R., Sprecher, B. and Tukker, A., "Identifying supply risks by mapping the cobalt supply chain," Resources, Conservation and Recycling, Vol. 156, May 2020. As of April 15, 2024: <https://www.sciencedirect.com/science/article/pii/S0921344920300653>.

¹¹ Li, P., "The Myth and Reality of Chinese Investors: A Case Study of Chinese Investment in Zambia's Copper Industry," South African Institute of International Affairs, China in Africa Project, Paper No. 62, May 2010. As of April 15, 2024: https://africaportal.org/wp-content/uploads/2023/05/SAIIA_Occasional_Paper_62.pdf; "Chinese

Railway project materialize, Chinese companies may benefit from investments made by the U.S. and other Western countries; a possibility made more likely by the fact that the consortium set to operate the new railway has pledged to prevent any one company from monopolizing its use.¹² Compared to trucking minerals to the port of Durban in South Africa, it will be cheaper to transport mineral products by rail to the Lobito port and ship them around the horn of Africa to Asian markets. Chinese companies may opt to do just that.¹³

Figure 1. Ownership Status of DRC’s Industrial Cobalt Mines by Production Proportion



SOURCE: Authors’ analysis based on Van den Brink et al (2020) and company websites.
 NOTE: Red outlining indicates primary ownership by a Chinese company.

To date, two companies have signed long-term commitments with the Lobito Railway Authority to transport minerals via the planned railway. The first is Trafigura, a Singapore-headquartered commodities trader that has a deal to market future production from the Mutushi copper/cobalt mine in the DRC. Notably, the company owns a 30% stake in one of China’s largest copper refineries, run by the state-owned Jinchuan Group. The second is Kamoakakula, a joint venture between Canada’s Ivanhoe Mines and China’s Zijin Mining. In short, there are

firm launches \$832 million Zambia copper mine,” Reuters, August 22, 2018. As of April 15, 2024: <https://www.reuters.com/article/idUSKCN1L71P6/>.

¹² Chabala, W., “Lobito Corridor – A Reality Check,” Africa Policy Research Institute, February 2, 2024. As of April 2, 2024: <https://afripoli.org/lobito-corridor-a-reality-check>; Gerding, J., “Lobito corridor: Hoping to break China’s grip on African ore,” Deutsche Welle, February 8, 2024. As of April 15, 2024: <https://www.dw.com/en/lobito-corridor-hoping-to-break-chinas-grip-on-african-ore/a-68201444>.

¹³ Gerding, J., 2024.

already clear indications that the Lobito Corridor will not exclusively supply ex-China produced minerals or supply ex-China off-takers.

China's Dominance of Copper/Cobalt Processing

A fundamental issue with the Lobito Atlantic Railway project is that it focuses on a second order barrier to U.S. access to African critical minerals. The dearth of U.S. investment in African infrastructure relative to Chinese investment in the past two decades is a symptom, rather than the cause of, China's stronghold over Africa's minerals. Chinese mining companies have not stood up operations in countries like Zambia and the DRC because of enabling infrastructure supported by BRI, but because there is significant demand in China for mineral feedstocks to support an array of processing and manufacturing industries. Starting in the early 1990s, and well before the inauguration of BRI in 2013, Chinese consumption of minerals began to accelerate, outpacing the capacity of domestic resources to meet demand.¹⁴ At that point, Chinese exploration and mining companies started looking towards Africa, and elsewhere, to fill the gap in demand.¹⁵ As shown in Figure 2 and Figure 3 below, the majority of cobalt, and over a third of the copper produced in the DRC and Zambia, is exported to China. Unsurprisingly, China accounted for 76% of global refined cobalt output and 45% of global refined copper output in 2023, respectively.¹⁶ Chinese manufacturers also dominate the market for the components and end-products for which refined or processed copper and cobalt products are material inputs, like EV batteries, solar panels, and electric motors.¹⁷ In short, supportive infrastructure has helped to facilitate Chinese investment in Africa's critical minerals sector, but it does not drive it.

¹⁴ Ericsson, M., Löf, O. and Löf, A., "Chinese control over African and global mining—past, present and future," *Miner Econ*, Vol. 33, July 2020. As of April 15, 2024: <https://doi.org/10.1007/s13563-020-00233-4>; Menzie, W. D., testimony before the U.S.-China Economic and Security Review Commission on "China's Global Quest For Resources And Implications For The United States," January 26, 2012. As of April 15, 2024: https://www.doi.gov/oc/heardings/112/ChinaMinerals_012612

¹⁵ Ericsson et al, 2020.

¹⁶ "China tightens grip on copper, key to world's energy transition," *The Japan Times*, November 14, 2023. As of April 15, 2024: <https://www.japantimes.co.jp/business/2023/11/14/tech/china-copper-world-energy-transition/>; Tang, L., "Global oversupply of cobalt to potentially spill over to 2024: Antaie," *S&P Global Commodity Insights*, October 27, 2023. As of April 15, 2024: <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/metals/102723-global-oversupply-of-cobalt-to-potentially-spill-over-to-2024-antaie>

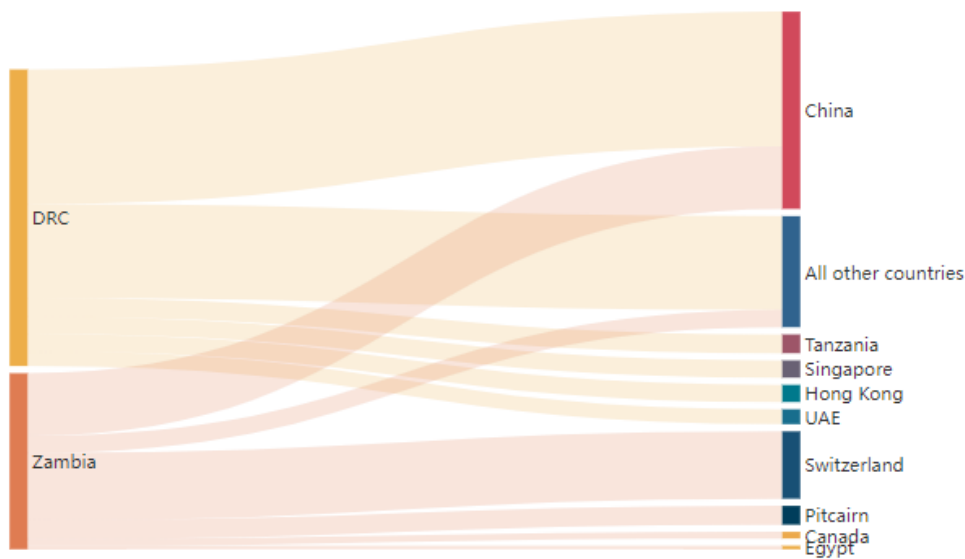
¹⁷ Okamoto, Y., "Chinese manufacturers dominate wind power, taking 60% of global market," *Nikkei Asia*, August 19, 2023. As of April 15, 2024: <https://asia.nikkei.com/Business/Energy/Chinese-manufacturers-dominate-wind-power-taking-60-of-global-market>; Lin, C., "3 Drivers of China's Booming Electric Vehicle Market," *Harvard Business Review*, January 3, 2024. As of April 15, 2024: <https://hbr.org/2024/01/3-drivers-of-chinas-booming-electric-vehicle-market#:~:text=According%20to%20a%20report%20by,than%20Tesla%20in%20Q4%202023.>

Figure 2. Export Destinations for Congolese and Zambian Cobalt, by Value (2022)



SOURCE: Authors' analysis based on Chatham House trade data.

Figure 3. Export Destinations for Congolese and Zambian Copper, by Value (2022)



SOURCE: Authors' analysis based on Chatham House trade data.

NOTE: Commodity traders in Zambia are known to purchase output from local mines and store it in warehouses until a purchaser is identified. In those cases, the export country is listed as the trader's country of origin. This explains why Switzerland appears to be a key destination for Zambian copper even though the country does not actually import copper from Zambia. A similar situation is likely at play for Zambian exports to Pitcairn. See Dobler and Kesselring (2019) for more information.

Stakeholders with knowledge of Chinese mining operations in developing countries have emphasized that China dominates this market because it “shows up.”¹⁸ In contrast, until the recent escalation of economic competition with China and disruptions from the COVID-19

¹⁸ Authors' interview with Subject Matter Expert.

pandemic, the United States and its allies were satisfied to source cheap, intermediate products and components from China, leaving to someone else the precarious, complex business of sourcing raw materials from developing countries and the energy, water, and chemical intensive process of transforming raw materials into manufacturing-grade intermediate products and commodity chemicals. Indeed, while Western companies often point to the fact that their Chinese counterparts are not subject to the same anti-corruption laws and ESG standards as reasons for why they have trouble competing in Africa, a more fundamental reason is the lack of customers for mined materials in Western markets.¹⁹ In recent years, there are numerous examples of Chinese companies buying out “Western-owned” mines in Africa. Freeport-McMoran (United States) and Lundin Mining (Canada) owned one of the DRC’s largest industrial cobalt mines until 2016-2017, when the two companies sold their shares to Chinese interests for \$3.8 billion.²⁰ The United States government was alerted of the sale but did nothing at the time. Other examples of Chinese companies buying Western-owned mining projects in Africa abound.²¹

While China expands investments in mining, the United States’ mining sector has been in decline for decades. The number of university mining and mineral engineering programs in the United States, for example, has declined significantly in the last 40 years, from 25 such programs in the early 1980s to just 15 in 2023.²² In the last decade, graduates from these programs have staggered in number as well, ranging from about 300 to 500.²³ In contrast, China has 38 mineral processing schools and 44 mining engineering programs. The largest of these programs alone – Central South University’s Mineral Processing and Bioengineering program – hosts 1,000 undergraduate and 500 graduate students.²⁴ A 2022 McKinsey survey of Western mining leaders and executives found that 86% of respondents were finding it harder to recruit and retain needed

¹⁹ [The Economist, 2022](#); Gerding, J., “DR Congo wants to move up the battery supply chain,” Deutsche Welle, September 29, 2023. As of April 15, 2024: <https://www.dw.com/en/dr-congo-wants-to-move-up-the-battery-supply-chain/a-66957922>

²⁰ Jamasmie, C., “Chinese tighten grip on Tenke mine as Lundin agrees to sell stake for \$1.14bn,” Mining.com, November 15, 2016. As of April 15, 2024: <https://www.mining.com/chinese-tighten-grip-on-tenke-mine-as-lundin-agrees-to-sale-stake-for-1-14bn/>; Brophy, K., “DRC’s largest mine was just sold and DRC got nothing,” Oxfam, August 3, 2016. As of April 15, 2024: <https://politicsofpoverty.oxfamamerica.org/drcs-largest-mine-was-just-sold-and-drc-got-nothing/>

²¹ In Ericsson et al, 2020.

²² Hale, T., “The United States Needs More than Mining Engineers to Solve Its Critical Mineral Challenges,” Center for Strategic & International Studies, May 8, 2023. As of April 15, 2024: <https://www.csis.org/analysis/united-states-needs-more-mining-engineers-solve-its-critical-mineral-challenges>

²³ Data USA, Mining and Mineral Engineering, Institutions dataset, last updated 2021. As of April 15, 2024: <https://datausa.io/profile/cip/mining-mineral-engineering>

²⁴ Hale, 2023.

talent than in the past, while 71% of survey respondents were experiencing operational setbacks stemming from talent shortages.²⁵

Focusing solely on access to raw materials will not solve the more fundamental bottleneck in critical mineral supply chains: the concentration of processing capacity in China. Understanding this reality, the United States has begun to promote local value addition as a means of addressing this gap. In December 2022, the United States signed a Memorandum of Agreement with both Zambia and the DRC, where it pledged to support the two countries' goal of building a "productive supply chain" for EV batteries, "from the mine to the assembly line."²⁶ Among the vague "intentions" delineated in the memo are promises to "take appropriate steps" to promote awareness of EV battery priorities among U.S. companies and "explore" technical assistance opportunities.²⁷ However, given its dominance in EV material and component manufacturing, China may be in a stronger position to support Zambia and the DRC's transition up the critical minerals value chain.²⁸ Chinese companies have the technical know-how, experience, and capacity to help these countries develop processing projects. They also have more direct incentives to transfer processing operations to local countries: doing so would cut logistics costs and help address growing concerns about the health and environmental impacts of refining and chemical processing at home. A similar dynamic of Chinese foreign direct investment has unfolded in Indonesia's nickel market, albeit primarily in response to Indonesia's ban on raw nickel exports.

Barriers to Developing Zambia and the DRC's Processing Capacity

There are other, more fundamental challenges associated with building out Zambia and the DRC's processing capacity. Besides logistical barriers – the target of the Lobito project – other challenges include the unreliable supply of electricity, a limited technical workforce, and low access to chemical inputs required for processing. Compared to mining, processing can be a more technically complex process, requiring a diverse range of skills and expertise and ready

²⁵ Abenov, T., Grabbert, T., Franklin-Hensler, M., and Larrat, T., "Has mining lost its luster? Why talent is moving elsewhere and how to bring them back," McKinsey & Company, February 14, 2023. As of April 15, 2024: <https://www.mckinsey.com/industries/metals-and-mining/our-insights/has-mining-lost-its-luster-why-talent-is-moving-elsewhere-and-how-to-bring-them-back#/>

²⁶ U.S. Department of State, "The United States Releases Signed Memorandum of Understanding with the Democratic Republic of Congo and Zambia to Strengthen Electric Vehicle Battery Value Chain," press release, January 18, 2023. As of April 15, 2024: <https://www.state.gov/the-united-states-releases-signed-memorandum-of-understanding-with-the-democratic-republic-of-congo-and-zambia-to-strengthen-electric-vehicle-battery-value-chain/>

²⁷ Memorandum of Understanding Among the United State of America, the Democratic Republic of the Congo, and the Republic of Zambia Concerning Support for the Development of a Value Chain in the Electric Vehicle Battery Sector, December 13, 2022. As of April 15, 2024: <https://www.state.gov/wp-content/uploads/2023/01/2023.01.13-E-4-Release-MOU-USA-DRC-ZAMBIA-Tripartite-Agreement-Tab-1-MOU-for-U.S.-Assistance-to-Support-DRC-Zambia-EV-Value-Chain-Cooperation-Instrument.pdf>

²⁸ Gerding, 2024.

access to an array of chemical inputs. Processing also tends to be much more energy intensive relative to mining. For example, GHG emissions associated with producing cobalt sulfide are seven times higher than emissions from mining cobalt-containing ores.²⁹ This poses a significant challenge for companies operating in countries like the DRC, where only about 15-20% of population has access to electricity.³⁰ While China's BRI and the United States' more recent efforts around infrastructure have helped, and will continue to help, fill this gap, these investments fall short of the total development aid needed: the African Development Bank estimates that an additional \$100 billion is needed for infrastructure development each year.³¹

Open Questions About the United States' Value Proposition

There is also the added challenge for the United States that what it sees as its main value proposition for African partners – greater respect for environmental and social considerations and transparency – may not be such a clear-cut competitive advantage. While there are countless reports and examples of Chinese actors failing to adhere to international standards, the empirical evidence regarding the impact of Chinese companies in comparison to other international companies is mixed. For example, a 2019 study published by Johns Hopkins' School of Advanced International Studies quantitatively analyzed violence against mine workers in the DRC, South Africa, and Zambia in the context of mine ownership and found that Chinese companies did not appear in public reports of violence against workers much more often than Western or domestically-owned firms.³² Another 2019 report looked at the local employment effects associated with mining operations by ownership status and found that while people living close to Chinese mining operations were at higher risk of being unemployed compared to those living in the vicinity of other international or domestic mines, mining operations in general did not positively contribute to local employment opportunities.³³

²⁹ "Average GHG emissions intensity for production of selected commodities," International Energy Agency, last updated May 5, 2021. As of April 15, 2024: <https://www.iea.org/data-and-statistics/charts/average-ghg-emissions-intensity-for-production-of-selected-commodities>

³⁰ Naveed, A. and Vazeir C., "Value Amidst Transition: Evaluating Strategic Opportunities for Value Addition in the Democratic Republic of Congo," Harvard Kennedy School, M-RCBG Associate Working Paper Series, No. 204, Jun2 2023. As of April 15, 2024: https://www.hks.harvard.edu/sites/default/files/centers/mrcbg/working_papers/204_AWP_final.pdf

³¹ "The push to close Africa's infrastructure funding gap," Devex Partnerships, February 14, 2024. As of April 15, 2024: <https://www.devex.com/news/sponsored/the-push-to-close-africa-s-infrastructure-funding-gap-107030#:~:text=The%20African%20Development%20Bank%20estimates,gap%20of%20around%20%24100%20billion.>

³² Freymeyer, C., "Disasters While Digging: Rates of Violence Against Mine Workers in Democratic Republic of Congo, South Africa, and Zambia," Johns Hopkins University, School of Advanced International Studies (SAIS), China Africa Research Initiative (CARI), Policy Brief No. 37, 2019. As of April 15, 2024: <http://hdl.handle.net/10419/248216>

³³ Wegenast, T., Krauser, M., Strüver, G. and Giesen, J., "At Africa's expense? Disaggregating the employment effects of Chinese mining operations in sub-Saharan Africa," World Development, Vol. 118, 2019. As of April 15, 2024: <https://www.sciencedirect.com/science/article/pii/S0305750X19300324>

There are also indications that Chinese companies have begun to adapt their operations to meet local and international expectations related to ESG compliance. Some commentators have observed that China's involvement in the DRC has entered a "second phase" characterized by a desire to "keep the people in a peaceful mind-set" through increased training and investment in schools, for example.³⁴ Similarly, through its China Local/Global Project, the Carnegie Endowment for International Peace has explored ways in which Chinese actors have adapted their engagement strategies across a range of developing country contexts in order to "work within local realities" and meet the demands of local actors and institutions.³⁵ In Central Asia, for example, Chinese firms have met local demands for industrial capacity building by investing in value-added projects, increasing the proportion of local hires, and training Central Asian workers both onsite and in China to address skill gaps.³⁶ It is crucial for the United States to recognize and address these realities as it seeks to engage with African partners in the critical minerals sector.

Implications for U.S. Strategic Approach

The United States should adopt a more pragmatic approach regarding China's role in Africa. The reality is that the United States faces significant challenges in regaining control of the processing segment of mineral supply chains, both in the short and medium to long term. Given China's established capacity and expertise in critical mineral processing, expecting a swift reversal of their dominance would be overly optimistic. Instead, the U.S. should explore avenues for collaboration, including potential partnerships with Chinese firms to facilitate knowledge transfer and technological exchange in countries like the DRC and Zambia. The Centre of Excellence for Advanced Battery Research, which was launched on April 2022 in Lubumbashi, DRC with support from the United Nations Economic Commission for Africa, could be one avenue for greater collaboration.³⁷

The United States should conduct actions that demonstrate a genuine desire to prioritize developing nations' interests. There is strong interest among African nations to move up the value chain; prioritizing these efforts would indicate the West's understanding of developing nations' wants and needs. Identifying the critical minerals where value addition is most feasible, while promoting commercial partnerships and utilizing foreign aid and investment agencies in

³⁴ Niarchos, Nicolas, "The Dark Side of Congo's Cobalt Rush," *The New Yorker*, May 24, 2021. As of April 15, 2024: <https://www.newyorker.com/magazine/2021/05/31/the-dark-side-of-congos-cobalt-rush>

³⁵ "China local/global," Carnegie Endowment for International Peace, website, undated. As of April 15, 2024: <https://carnegieendowment.org/specialprojects/chinalocalglobal/>.

³⁶ Van Der Klay, D. and Yau, N., "How Central Asians Pushed Chinese Firms to Localize," Carnegie Endowment for International Peace, October 15, 2021. As of April 15, 2024: <https://carnegieendowment.org/2021/10/15/how-central-asians-pushed-chinese-firms-to-localize-pub-85561>

³⁷ *Ibid.*

the region, would bolster this line of effort. Western countries must recognize that strengthening infrastructure alone will not immediately secure access to minerals from this region.

References

- Abenov, T., Grabbert, T., Franklin-Hensler, M., and Larrat, T., “Has mining lost its luster? Why talent is moving elsewhere and how to bring them back,” McKinsey & Company, February 14, 2023. As of April 15, 2024: <https://www.mckinsey.com/industries/metals-and-mining/our-insights/has-mining-lost-its-luster-why-talent-is-moving-elsewhere-and-how-to-bring-them-back#/>
- Barr, S., “Bureau of Mines Feeling Shafted,” The Washington Post, December 4, 1995. As of April 15, 2024: <https://www.washingtonpost.com/archive/politics/1995/12/04/bureau-of-mines-feeling-shafted/549828a0-1886-48aa-95b2-536cb054b862/>
- Benchmark Intelligence, “Glencore closes Mutanda mine, 20% of global cobalt supply comes offline,” November 28, 2019. As of April 15, 2024: <https://www.benchmarkminerals.com/blog-archive/glencore-closes-mutanda-mine-20-of-global-cobalt-supply-comes-offline/>
- Brophy, K., “DRC’s largest mine was just sold and DRC got nothing,” Oxfam, August 3, 2016. As of April 15, 2024: <https://politicsofpoverty.oxfamamerica.org/drcs-largest-mine-was-just-sold-and-drc-got-nothing/>
- Carnegie Endowment for International Peace, “China local/global,” website, undated. As of April 15, 2024: <https://carnegieendowment.org/specialprojects/chinalocalglobal/>
- Chabala, W., “Lobito Corridor – A Reality Check,” Africa Policy Research Institute, February 2, 2024. As of April 2, 2024: <https://afripoli.org/lobito-corridor-a-reality-check>; Gerding, J., “Lobito corridor: Hoping to break China's grip on African ore,” Deutsche Welle, February 8, 2024. As of April 15, 2024: <https://www.dw.com/en/lobito-corridor-hoping-to-break-chinas-grip-on-african-ore/a-68201444>.
- Data USA, Mining and Mineral Engineering, Institutions dataset, last updated 2021. As of April 15, 2024: <https://datausa.io/profile/cip/mining-mineral-engineering>
- Desai, P. and Denina, C., “Glencore’s Mutanda mine to produce less cobalt on ore depletion – sources,” Reuters, November 27, 2023. As of April 15, 2024: <https://www.reuters.com/markets/commodities/glencores-mutanda-mine-produce-less-cobalt-ore-depletion-sources-2023-11-27/>

Devex Partnerships, “The push to close Africa’s infrastructure funding gap,” February 14, 2024. As of April 15, 2024: <https://www.devex.com/news/sponsored/the-push-to-close-africa-s-infrastructure-funding-gap-107030#:~:text=The%20African%20Development%20Bank%20estimates,gap%20of%20around%20%24100%20billion.>

Dobler, G. and Kesselring, R., "Swiss extractivism: Switzerland's role in Zambia's copper sector," *The Journal of Modern African Studies*, Vol. 57, No. 2, 2019.

The Economist, “How Chinese firms have dominated African infrastructure,” February 19, 2022. As of April 15, 2024: <https://www.economist.com/middle-east-and-africa/how-chinese-firms-have-dominated-african-infrastructure/21807721>

Ericsson, M., Löf, O. and Löf, A., “Chinese control over African and global mining—past, present and future,” *Miner Econ*, Vol. 33, July 2020. As of April 15, 2024: <https://doi.org/10.1007/s13563-020-00233-4>; Menzie, W. D., testimony before the U.S.-China Economic and Security Review Commission on "China's Global Quest For Resources And Implications For The United States," January 26, 2012. As of April 15, 2024: https://www.doi.gov/ocl/hearings/112/ChinaMinerals_012612

Frey Meyer, C., “Disasters While Digging: Rates of Violence Against Mine Workers in Democratic Republic of Congo, South Africa, and Zambia,” Johns Hopkins University, School of Advanced International Studies (SAIS), China Africa Research Initiative (CARI), Policy Brief No. 37, 2019. As of April 15, 2024: <http://hdl.handle.net/10419/248216>

Gerding, J., “DR Congo wants to move up the battery supply chain,” *Deutsche Welle*, September 29, 2023. As of April 15, 2024: <https://www.dw.com/en/dr-congo-wants-to-move-up-the-battery-supply-chain/a-66957922>

Hale, T., “The United States Needs More than Mining Engineers to Solve Its Critical Mineral Challenges,” Center for Strategic & International Studies, May 8, 2023. As of April 15, 2024: <https://www.csis.org/analysis/united-states-needs-more-mining-engineers-solve-its-critical-mineral-challenges>

International Energy Agency, “Average GHG emissions intensity for production of selected commodities,” last updated May 5, 2021. As of April 15, 2024: <https://www.iea.org/data-and-statistics/charts/average-ghg-emissions-intensity-for-production-of-selected-commodities>

Jamasmie, C., “Chinese tighten grip on Tenke mine as Lundin agrees to sell stake for \$1.14bn,” *Mining.com*, November 15, 2016. As of April 15, 2024: <https://www.mining.com/chinese-tighten-grip-on-tenke-mine-as-lundin-agrees-to-sale-stake-for-1-14bn/>

The Japan Times, “China tightens grip on copper, key to world’s energy transition,” November 14, 2023. As of April 15, 2024:

<https://www.japantimes.co.jp/business/2023/11/14/tech/china-copper-world-energy-transition/>

Klobucista, C., Ferragamo, M., Backgrounder – AGOA: The U.S.-Africa Trade Program, Council on Foreign Relations, December 4, 2023. As of April 15, 2024:

<https://www.cfr.org/backgrounder/agoa-us-africa-trade-program>.

Li, P., “The Myth and Reality of Chinese Investors: A Case Study of Chinese Investment in Zambia’s Copper Industry,” South African Institute of International Affairs, China in Africa Project, Paper No. 62, May 2010. As of April 15, 2024: https://africaportal.org/wp-content/uploads/2023/05/SAIIA_Occasional_Paper_62.pdf

Lin, C., “3 Drivers of China’s Booming Electric Vehicle Market,” Harvard Business Review, January 3, 2024. As of April 15, 2024: <https://hbr.org/2024/01/3-drivers-of-chinas-booming-electric-vehicle-market#:~:text=According%20to%20a%20report%20by,than%20Tesla%20in%20Q4%202023>.

Memorandum of Understanding Among the United State of America, the Democratic Republic of the Congo, and the Republic of Zambia Concerning Support for the Development of a Value Chain in the Electric Vehicle Battery Sector, December 13, 2022. As of April 15, 2024: <https://www.state.gov/wp-content/uploads/2023/01/2023.01.13-E-4-Release-MOU-USA-DRC-ZAMBIA-Tripartite-Agreement-Tab-1-MOU-for-U.S.-Assistance-to-Support-DRC-Zambia-EV-Value-Chain-Cooperation-Instrument.pdf>

Naveed, A. and Vazeir C., “Value Amidst Transition: Evaluating Strategic Opportunities for Value Addition in the Democratic Republic of Congo,” Harvard Kennedy School, M-RCBG Associate Working Paper Series, No. 204, Jun2 2023. As of April 15, 2024: https://www.hks.harvard.edu/sites/default/files/centers/mrcbg/working.papers/204_AWP_final.pdf

Niarchos, Nicolas, “The Dark Side of Congo’s Cobalt Rush,” The New Yorker, May 24, 2021. As of April 15, 2024: <https://www.newyorker.com/magazine/2021/05/31/the-dark-side-of-congos-cobalt-rush>

Okamoto, Y., “Chinese manufacturers dominate wind power, taking 60% of global market,” Nikkei Asia, August 19, 2023. As of April 15, 2024: <https://asia.nikkei.com/Business/Energy/Chinese-manufacturers-dominate-wind-power-taking-60-of-global-market>

Preuss, Helmo, Congolese copper mine Kamao-Kakula are launch partners for Lobito railway, IOL, February 8, 2024. As of April 2, 2024: <https://www.iol.co.za/business-report/economy/congolese-copper-mine-kamao-kakula-are-launch-partners-for-lobito-railway-ef25686a-00a0-40e0-8d7e-6e4b42efb27c>.

Reuters, “Chinese firm launches \$832 million Zambia copper mine,” August 22, 2018. As of April 15, 2024: <https://www.reuters.com/article/idUSKCN1L71P6/>.

Stroecker, K., Do Rosario, J., “Exclusive: Congo sees deal on \$6 bln China mining contract overhaul this year -FinMin”, *Reuters*, January 18, 2023. As of April 8, 2024: [https://www.reuters.com/markets/commodities/congo-sees-deal-6-bln-china-mining-contract-overhaul-this-year-finmin-2023-01-18/#:~:text=LONDON%2C%20Jan%2018%20\(Reuters\),told%20Reuters%20in%20an%20interview](https://www.reuters.com/markets/commodities/congo-sees-deal-6-bln-china-mining-contract-overhaul-this-year-finmin-2023-01-18/#:~:text=LONDON%2C%20Jan%2018%20(Reuters),told%20Reuters%20in%20an%20interview).

Tang, L., “Global oversupply of cobalt to potentially spill over to 2024: Antaike,” S&P Global Commodity Insights, October 27, 2023. As of April 15, 2024: <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/metals/102723-global-oversupply-of-cobalt-to-potentially-spill-over-to-2024-antaike>

Tadesse, F., A Crumbling Metro Reveals Failed Promise of China’s Billions in Africa, Bloomberg, April 11, 2024. As of April 15, 2024: <https://www.bloomberg.com/news/articles/2024-04-12/addis-ababa-ethiopia-metro-s-decline-shows-china-s-step-back-from-africa>.

Usman, Z., Csanadi, A., How Can African Countries Participate in U.S. Clean Energy Supply Chains?, Carnegie Endowment for International Peace, October 2023. As of April 15, 2024: [https://carnegieendowment.org/2023/10/02/how-can-african-countries-participate-in-u.s.-clean-energy-supply-chains-pub-90673#:~:text=It%20outlines%20three%20such%20opportunities.3\)%20data%20collection%20and%20analytics%20data%20collection%20and%20analytics](https://carnegieendowment.org/2023/10/02/how-can-african-countries-participate-in-u.s.-clean-energy-supply-chains-pub-90673#:~:text=It%20outlines%20three%20such%20opportunities.3)%20data%20collection%20and%20analytics%20data%20collection%20and%20analytics).

UN Economic Commission for Africa (ECA), Centre of Excellence for Advanced Battery Research in DRC Officially launched, Yaounde, Cameroon, April 22, 2022. As of April 15, 2024: <https://www.uneca.org/stories/centre-of-excellence-for-advanced-battery-research-in-drc-officially-launched>.

U.S. Department of Interior, "Bureau of Mines," Department of Interior 1995 Annual Report, Archived from the original on December 25, 2004, p.49.

U.S. Department of State, Signing of the Memorandum of Understanding on the Development of the Lobito Corridor and the Zambia-Lobito Rail Line, October 26, 2023. As of April 2, 2024: <https://www.state.gov/signing-of-the-memorandum-of-understanding-on-the-development-of-the-lobito-corridor-and-the-zambia-lobito-rail-line/>.

- U.S. Department of State, “The United States Releases Signed Memorandum of Understanding with the Democratic Republic of Congo and Zambia to Strengthen Electric Vehicle Battery Value Chain,” press release, January 18, 2023. As of April 15, 2024: <https://www.state.gov/the-united-states-releases-signed-memorandum-of-understanding-with-the-democratic-republic-of-congo-and-zambia-to-strengthen-electric-vehicle-battery-value-chain/>
- U.S. Government Accountability Office, “The U.S. Mining and Mineral-Processing Industry: An Analysis of Trends and Implications,” ID-80-04, October 31, 1979. As of April 15, 2024: <https://www.gao.gov/products/id-80-04>.
- Van den Brink, S., Kleijn, R., Sprecher, B. and Tukker, A., “Identifying supply risks by mapping the cobalt supply chain,” Resources, Conservation and Recycling, Vol. 156, May 2020. As of April 15, 2024: <https://www.sciencedirect.com/science/article/pii/S0921344920300653>.
- Van Der Klay, D. and Yau, N., “How Central Asians Pushed Chinese Firms to Localize,” Carnegie Endowment for International Peace, October 15, 2021. As of April 15, 2024: <https://carnegieendowment.org/2021/10/15/how-central-asians-pushed-chinese-firms-to-localize-pub-85561>
- Villalobos, Fabian, Jonathan L. Brosmer, Richard Silberglitt, Justin M. Lee, and Aimee E. Curtright, Time for Resilient Critical Material Supply Chain Policies, RAND Corporation, RR-A2102-1, 2022. As of March 22, 2024: https://www.rand.org/pubs/research_reports/RRA2102-1.html
- Yoshiara, E., Villalobos, F., Critical minerals can pave the road to more robust international development, World Economic Forum Annual Agenda, January 12, 2024. As of April 15, 2024: <https://www.weforum.org/agenda/2024/01/critical-minerals-international-development/>.
- Wegenast, T., Krauser, M., Strüver, G. and Giesen, J., "At Africa's expense? Disaggregating the employment effects of Chinese mining operations in sub-Saharan Africa," World Development, Vol. 118, 2019. As of April 15, 2024: <https://www.sciencedirect.com/science/article/pii/S0305750X19300324>
- The White House, U.S. STRATEGY TOWARD SUB-SAHARAN AFRICA, August 2022. As of April 15, 2024: <https://www.whitehouse.gov/wp-content/uploads/2022/08/U.S.-Strategy-Toward-Sub-Saharan-Africa-FINAL.pdf>.