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China's Investment in LAC Critical Minerals help its Military Modernization

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Executive Summary

The global hunt for critical minerals continues to heat up, and they are increasingly becoming key flashpoints in the strategic competition between the U.S. and the People's Republic of China (PRC). The PRC seeks to increase its critical mineral mining industry by expanding its influence in the global south, especially in South America, home to critical minerals such as lithium, copper and niobium. Our research methodology consists of collecting quantitative data from renowned databases (i.e., American Enterprise Institute, Zijin Mining, and Florida International University's Security Research Hub) and qualitative data on State Owned Enterprises (SOEs) and private Chinese mineral companies. We geolocated Chinese critical mining presence across Latin America and the Caribbean (LAC), utilizing geographic information systems (i.e., an interactive dashboard and Story Map utilizing the ArcGIS Online platform) to identify LAC nations with the highest Chinese investment. We analyze SOEs' investments that align with China's 2049 Plan, and the People Liberation Army's (PLA's) new smart and autonomous vehicles, weapons systems, and transition to renewable energy sources.

Our research indicates that China mines 20-25% more critical minerals than the United States in LAC.[i] The PRC is aiming to monopolize critical mineral extraction in the region and restrict access to the extraction and production of technology critical elements (TCEs) and minerals essential for warfare technologies.

1) China produces 99% of the world's available gallium (smelted aluminum) and has made moves to restrict the U.S. from accessing gallium production.[ii] Gallium is used to create plutonium pits, and high precision long range missiles, jets, and radar systems.[iii]

2) China processes nearly 67% of the world's lithium supply alone, and the country is purchasing stakes in LAC mining activities to achieve full monopolization. Lithium is used to create the battery supply for electric vehicles (EVs), including unmanned autonomous vehicles.[iv]

3) In 2022, China accounted for 95.5% of Peru's total iron exports.[v] Niobium and other production metals like iron, cobalt, and copper ore are used in the manufacture of tactile military weaponry, vehicles, armor, and infrastructure.

Our findings link the Belt and Road Initiative and the PRC's participation in Group 77 summits as instruments used to increase China's mineral extraction and transport by promoting the PRC's influence in the region.

In response to the PRC's efforts and aims, we propose opportunities for U.S. Southern Command and the United States government to counter China's critical mineral preponderance and elevate its image as an alternative investment partner to the PRC in LAC, the Global South, and the international community:

1) Invest or purchase stakes in existing critical mineral mines in LAC and other countries (e.g. The U.S. International Development Finance Corporation (DFC) recently made a $30 million equity investment in TechMet Ltd., funding their cobalt/nickel mine and lithium-battery development in Brazil[vi]). Other countries with adequate critical mineral reserves are Canada (niobium, iron, lithium), Indonesia (aluminum), and Australia (iron, lithium, copper).

2) The U.S., and U.S. partner and ally nations should aim to represent an alternative investment opportunity for LAC and the Global South (i.e. the G7's Lobito Corridor Project in Angola), instead of trying to supplant China as the lone source of development financing.[vii]

3) Encourage LAC countries to create their own interagency screening mechanism emulating the Committee on Foreign Investment in the United States (CFIUS) to track suspicious investments.[viii]

4) Mine for these minerals domestically. The US is estimated to have around 14 million tons of lithium reserves, with active mining in Nevada and Utah.[ix] Another possible reserve location has been discovered by researchers from Lithium Americas at the Nevada-Oregon McDermitt Caldera. Scientists say that this could become the largest reserve of lithium in the world with an estimate of roughly 20 – 40 million tons.[x]

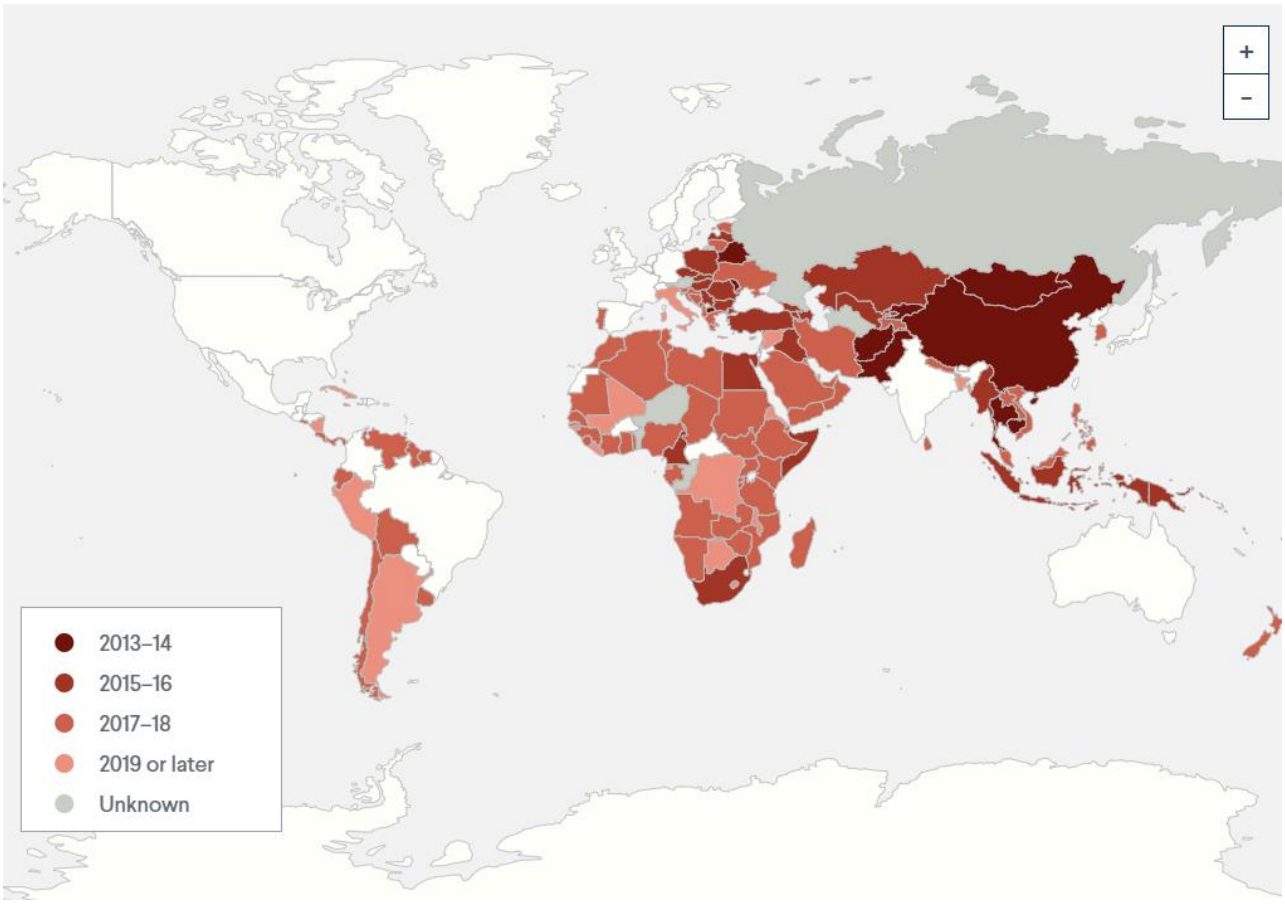
Introduction

The People's Republic of China (PRC) has increasingly become a key gatekeeper of the critical minerals the U.S. and other nations need in our everyday lives.[xi] What categorizes certain minerals 'critical' is their importance to countries' security, economic relations, and transition into renewable energy resources.[xii] China currently mines 60% of critical minerals essential for defense and energy objectives highlighted in its 2050 plan. China mines 20-25% more minerals used for energy and defense purposes than its U.S. counterpart.[xiii] Many of these minerals have advanced technological and military applications. Lithium, for instance, is used in semiconductor chips, electric vehicles (EVs), and autonomous weapon systems; Niobium for jet engines, infrastructure, superconducting magnets, and more recently, lithium batteries; Copper and Aluminum for energy and data communication transmissions. Additionally, smelted aluminum forms gallium, which is an element used for manufacturing plutonium pits, semiconductor chips, and high-precision, long-range missiles and radar systems.[xiv] [xv] In this paper, we will analyze the degree to which China aims to monopolize critical mineral extraction in Latin America and the Caribbean (LAC).

If China succeeds in monopolizing 10-15% more of critical mineral extraction in LAC, then this may limit other countries' access to these critical minerals. The PRC's significant investments and stocks in critical mineral extraction enhance its strategic competitiveness. For instance, the PRC uses bilateral and multilateral agreements to increase critical mineral extraction in LAC: the Belt and Road Initiative (BRI), and the Community of Latin American and Caribbean States (CELAC). The PRC uses the BRI as a vehicle to expand its influence on existing and potential partner nations by paving relations through China-led infrastructure projects.[xvi] Such is the case that Group 77 (G77) summits, which are intended to strengthen south-south cooperation by having global south leadership promote their collective interests, in recent years allowed the participation of China.[xvii] BRI and G77 summits enhance China's mining activities in LAC by increasing trade and leveraging partner nations' dependence on the PRC's transportation and infrastructural projects in LAC. China's mining investments advance the People Liberation Army's (PLA's) military modernization by facilitating information technology (IT) and artificial intelligence (AI) implementation.

This report provides a comprehensive analysis of how the PRC leverages various multilateral fora to extract critical minerals and technology-critical-elements (TCEs) in LAC: Copper, Aluminum, Niobium, and Lithium. What differentiates a TCE from a critical mineral is that they have technical applications that are essential for the usage and performance of emerging and

critical technologies. Part I focuses on PRC's engagement in LAC through the BRI and CELAC. Part II delves into the four critical minerals. Part III assesses U.S. and G7 responses to the PRC's advance on LAC's critical minerals.



The image displayed above shows the spread of China's BRI in the international community. BRI projects spread to the African region starting in 2015. Meanwhile, most BRI projects in LAC began in 2019, making this region a relatively new area of BRI presence.[xviii]

Part I: Geopolitical and Historical Context

The PRC uses a combination of multilateral fora to enhance its sphere of influence in the Global South and increase its critical mineral extraction and production.

We describe impacts of China's:

1) The Belt and Road Initiative

2) The Community of Latin American and Caribbean States (CELAC)

The PRC's Belt and Road Initiative

The BRI was launched in 2013 as a series of China-led infrastructure projects which would link East Asia and Europe. Since then, the BRI expanded to include Africa, Oceania, and LAC, slowly increasing Chinese sociopolitical and economic influence. Some Western analysts have raised alarms that the BRI is a trojan horse for China-led regional development and military expansion.[xix] BRI recipient countries have increased debt dependency on China for infrastructure and security initiatives. For instance, China is building a superhighway in Jamaica and is launching security initiatives throughout the Caribbean region, including financial, military, and weaponry donations. Many Caribbean countries benefit from China's transportation, energy, infrastructure, and security partnerships. In addition, three recently launched initiatives expand earlier projects to a larger scale: the Global Development Initiative, Global Security Initiative, and Global Civilization Initiative.[xx] While these initiatives are designed to reinforce China's commitment to the United Nation's 2030 Sustainable Development Goals (SDGs).[xxi] Some analysts view these Chinese investments as "asset trap diplomacy" which utilizes asset control as a mechanism for geopolitical leverage.[xxii] Through asset trap diplomacy, China obtains geopolitical leverage over critical mineral and technology-critical-element (TCE) mining. China's progress in all these efforts increase LAC dependence.

The PRC's extraction of copper, niobium, lithium, and aluminum from LAC mines achieves part of its SDGs and its transition towards renewable energy resources. China uses the BRI to expand the PRC's influence beyond existing and potential partners. As its presence expands within a nation or sector, the PRC's infrastructure and security investments are used to exert influence over partners and "allow the PRC to operate with a degree of autonomy that can challenge economic and diplomatic conventions."[xxiii] Concerning economic and diplomatic conventions,

the BRI enables China to gain and sustain LAC allegiance. Throughout China-led infrastructural projects, China forces the partner nation to comply with the One-China policy, which states that Taiwan is not a legitimate country. All the while, China demonstrates its "common cause" with the developing world by prioritizing south-south trade and technology transfer through BRI.[xxiv]

PRC-CELAC Relationship and Plans

The Community of Latin American and Caribbean States (CELAC) is an organization of 33 LAC countries formed in 2011 to unite and integrate the political, cultural, economic, and social views of the region. China has a growing relationship with CELAC, including the creation of the China-CELAC Forum in 2014 and the China-CELAC Joint Action Plan for Cooperation in Key Areas (2022-2024).[xxv]

The China-CELAC forum was first introduced by President Xi Jinping in 2014 at the China-LAC Summit in Brasilia, Brazil. The joint summit intends to enhance cooperation and communication between China and LAC, focusing on regional development and shared interests.[xxvi] The multiple subforums under the China-CELAC forum range from the China-LAC Young Political Leaders' Forum to the China-LAC Think Tanks Forum[xxvii].

The most relevant outcomes of this forum concerning this paper are China's cooperation plans. Since its start, this forum produced two plans:

1) The China-Latin American and Caribbean Countries Cooperation Plan (2015-2019).

2) The China-CELAC Joint Action Plan for Cooperation in Key Areas (2022-2024).

These plans cover cultural, political, security, and critical infrastructure cooperation.[xxviii] Ultimately, the PRC fuels additional critical mineral extraction from LAC through the BRI, limiting other countries' access to said minerals essential for energy and defense capabilities. China will accelerate its military modernization by extracting copper, aluminum, niobium, and lithium.

The Impacts of the PRC's Multilateral Fora on Critical Mining

The PRC's BRI and CELAC organization expand the PRC's influence in the Global South, and this is especially pertinent in the topic of critical mining. Our research indicates that the PRC's multilateral fora facilitate critical mineral transport, "streamlines customs procedures, and secures key investments in specific industries"[xxix] throughout the Global South.

In Tanzania, the PRC leveraged the BRI to invest $1 billion to modernize the TAZARA rail line (expanding 1000 miles connecting landlocked Zambia to coastal Tanzania). The PRC has vested interest in modernizing the rail line to provide an alternative route to the Dar es Salaam (South African port) for transporting copper from Zambia, cobalt from the Democratic Republic of Congo (DRC), and other rare earth minerals to China. The Dar es Salaam is overwhelmingly crowded and inefficient from China's trade with other countries. Tanzania's rail line presents an opportunity for Beijing to improve its African mineral supply chain and further impose its presence in Tanzania and the African interior.[xxx] This win-win exchange between Tanzania and the PRC is emulated across the Global South and increasingly in LAC.

In the Western hemisphere, the PRC and LAC countries leverage the BRI to secure deals and China's investments in critical mining and production. In Chile, the PRC secured investments in lithium and copper industries through the BRI. The PRC leverages the BRI to gain a controlling interest or exclusive trading rights in Chilean copper and lithium mines; the PRC obtains exclusive control over these mines through contractual agreements guaranteeing a supplier provides a set amount of a good at a specific price before supplying other parties. For instance, Antofagasta PLC (Chilean copper mining company) consecutively signed year-long agreements (between 2021 and 2024)[xxxi] to supply select state-owned and private Chinese copper smelters. Although Antofagasta PLC does not provide state-owned and private Chinese companies direct control over its mine, the Chilean company secures "supply deals well before the annual fourth-quarter contractual renewal for three years running." Similarly, in Peru, the Peruvian Ministry of Energy and Mines reported that China invested $15 billion into Peru's mining sector between 2009 and 2015, with the largest investment coinciding with the launch of the BRI. This investment went towards Las Bambas copper mine (one of the world's largest copper deposits), after China's MinMetals Group Limited purchased the mine for $6 billion in 2014.[xxxii]

The China-CELAC Forum also influences China's critical mineral investments and mine acquisition. The latest China-CELAC Joint Action Plan for Cooperation in Key Areas (2022-2024) has direct mentions of mineral investment and mining goals and their relation to technological advancements in four different sections: 7.2, 7.3, 7.5, and 7.7. Section 7.3 specifically highlights their goals to "explore the expansion of cooperation in emerging

industries related to clean energy and resources, technology transfer between companies, improve the mining investment environment, taking into account the respect and care of the natural environment."[xxxiii] The year following the declaration of this plan, metal investments in Argentina greatly increased, totaling $1.3B, and shortly after in 2023, the first metal investments were made in Bolivia; both countries apart of the lithium triangle.[xxxiv] This shows how cooperation through joint programs like the China-CELAC Forum has a direct impact on critical mineral investments and activities in the region.

Moreover, the PRC aligns its BRI and 2030 Sustainable Development Goals (SDGs) to disguise its internal gains. The PRC is investing in critical mining throughout LAC and rail line construction in Africa as part of its efforts to meet its Global Development Initiative and Global Civilization Initiative.[xxxv] Simultaneously, the PRC benefits from negotiations with LAC and the entirety of the Global South to improve its critical mineral supply chains,[xxxvi] indirectly control mining companies, receive prioritization through contractual agreements and informal means, and impose its presence.[xxxvii]

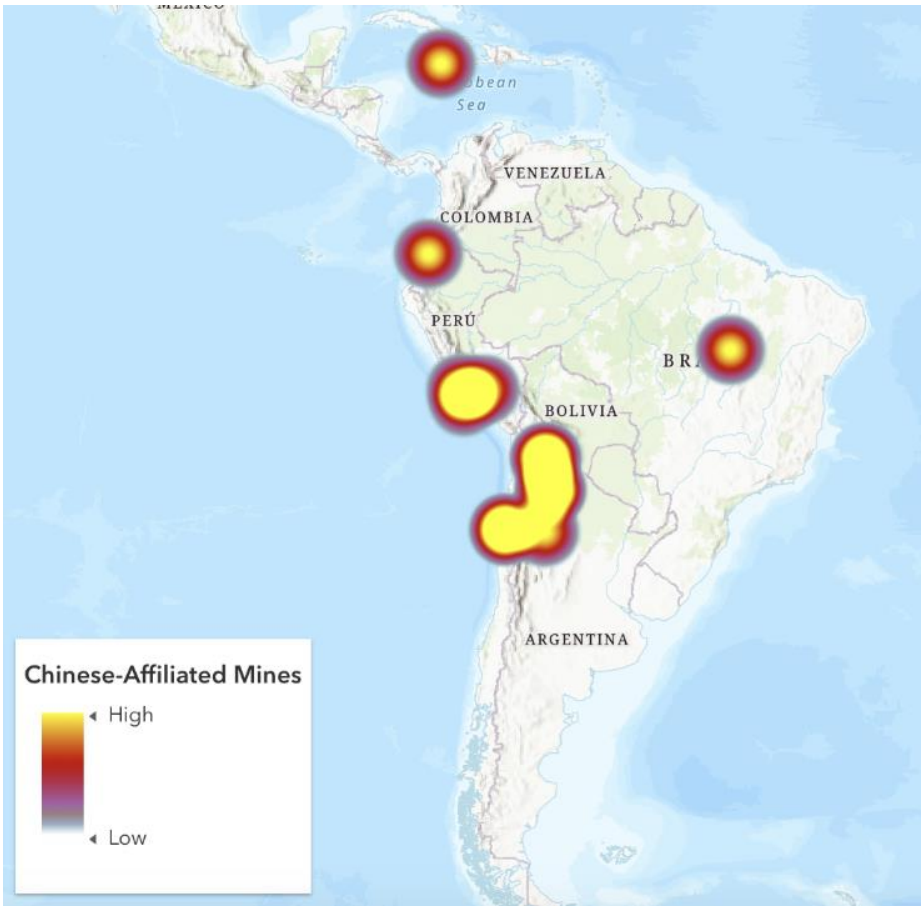
Research Methodology

Our research methodology consists of leveraging qualitative and quantitative data collection and analysis. We gathered qualitative data on PRC State-Owned Enterprises (SOEs) and private Chinese mineral companies' history of mining activities. Simultaneously, we gather quantitative data on China's critical mineral mine ownership in LAC, focusing on four critical minerals: copper, aluminum, niobium, and lithium. We then used a qualitative approach to develop a comprehensive understanding of the changes China-LAC mining engagement experienced over time. The quantitative approach identifies mining investment hotspots across LAC. Moreover, we use mixed methods of research to assess to what degree SOEs and private Chinese mineral companies' investments towards copper, aluminum, niobium, and lithium extraction throughout LAC fuel the PLA's military modernization.

Part II: China-LAC Mining Engagement

Data and Results

Map 1: China-LAC Mining Investments Heatmap



This map visualizes Chinese-affiliated copper, lithium, iron, and niobium mines located in LAC which was created using the ArcGIS online platform.[xxxviii]

The heatmap and Table 1 (below) show the locations in which Chinese mining investments were directed. The hotspots indicate that the Lithium Triangle (i.e., geographical area between Argentina, Bolivia & Chile) is a major area of investment with $16 billion (USD equivalent) invested between 2018-2020; the hotspot in Brazil indicates the location of the niobium mines, where $1.9 billion was invested in 2011, and $1.5 billion in 2016.[xxxix] The presence of major Chinese investment in Peru indicates Chinese interest in monopolizing LAC's copper deposits with $6.3 billion going to Las Bambas mine alone between 2015-2024. Following a similar trend, China invested $3.32 billion into Jamaica's Alpart aluminum refinery and is expected to invest another $1.1 billion for capacity expansion and modernization, in compliance with the Jamaican government.

Table 1: Chinese Mining Investors' Geolocation in LAC

Company Name	Name of Mine	Minerals	Location (Country)
Ganfeng Lithium	Cauchari-Olaroz Lithium Brine Project	Lithium	Argentina
Ganfeng Lithium	The Mariana Lithium-Potassium Brine Project	Lithium	Argentina
Ganfeng Lithium	Sal De La Puna	Lithium	Argentina
Ganfeng Lithium	Salar de Incahuasi	Lithium	Argentina
Tsinghan	Centenario Project	Lithium	Argentina
Tsinghan	Salar de Diablillos	Lithium	Argentina
Tibet Summit Resources	Salar Arizaro	Lithium	Argentina
Zijin Mining	Tres Quebradas Salar Mine	Lithium	Argentina
HANAQ GROUP	La Providencia	Copper	Argentina
Zangge Mining	Laguna Verde	Lithium	Argentina
Chinese Consortium CBC (CATL, Brunp and CMOC)	Salar de Coipasa	Lithium	Bolivia
Chinese Consortium CBC (CATL, Brunp and CMOC)	Salar De Uyuni	Lithium	Bolivia
China Molybdenum (CMOC)	Boa Vista	Iron	Brazil
Sul Americana de Metais (SAM)	Iron Ore Project	Iron	Brazil
China Niobium Investment Holding Ltd. (Consortium)	CBMM Mine	Iron	Brazil
Tsingshan Holding Group	Salar de Atacama	Lithium	Chile
Tianqi Lithium	Salar de Atacama	Lithium	Chile
JISCo	Alpart bauxite mine	Aluminum	Jamaica
Jiangxi Ganfeng	Sonora Lithium Clay Project	Lithium	Mexico
Chengdu Tianqi	Rio Blanco Copper-Molybdenum Mine	Copper	Peru
Chinalco	Toromocho Mine	Copper	Peru
Consortium: MMG Limited, Guoxin International Investment Co. Ltd, CTIC	Las Bambas	Copper	Peru
Shougang Group	Shougang Hierro Mine	Iron	Peru
Zhongrong Xinda	Pampa de Pongo	Iron	Peru

Table 2: Investments (in Billions) in Critical Mining across LAC from 2007-2024

Name of Mine	Investment Totals (Billions)	Minerals	Investment Timeframes
Cauchari-Olaroz Lithium Brine Project		Lithium	
The Mariana Lithium-Potassium Brine Project		Lithium	
Sal De La Puna		Lithium	
Salar de Incahuasi		Lithium	
Centenario Project	0.375	Lithium	2021
Salar de Diablillos	1.5	Lithium	2022-2023
Salar Arizaro	0.7	Lithium	2023
Tres Quebradas Salar Mine	1.15	Lithium	2021-2023
Salar de Coipasa	1.4	Lithium	2021-2023
Salar De Uyuni	1.4	Lithium	2023
Boa Vista	1.5	Iron	2016
Iron Ore Project	2.2	Iron	2022
CBMM Mine	1.95	Iron	2011
Salar de Atacama	0.233	Lithium	2023
Salar de Atacama	4.28	Lithium	2005-2023
Alpart bauxite mine	0.321	Aluminum	2022
Sonora Lithium Clay Project	0.8	Lithium	2019-2022
Rio Blanco Copper-Molybdenum Mine	2.8	Copper	2007-2023
Toromocho Mine	1.3	Copper	2018
Las Bambas	5.85	Copper	2014-2023
Shougang Hierro Mine		Iron	
Pampa de Pongo	2.36	Iron	2016-2023
La Providencia	N/A	Copper	1992-2024
Laguna Verde	Zangge invested 0.29	Lithium	2022

Table 2 shows the total investments in these critical minerals by China from 1992-2023. China has steeply increased mining investments starting in 2018 and peaking in 2023.

The heat map and tables 1 and 2 derive from the following Florida International University's Security Research Hub Critical Minerals Dashboard. This dashboard highlights mining hotspots (annual tons per annum) across LAC, investment amounts (from the time of purchase to the various project stages: exploration, feasibility, construction, and production), leading companies for specific minerals, and number of mining projects across LAC (amongst other notable features and metrics).

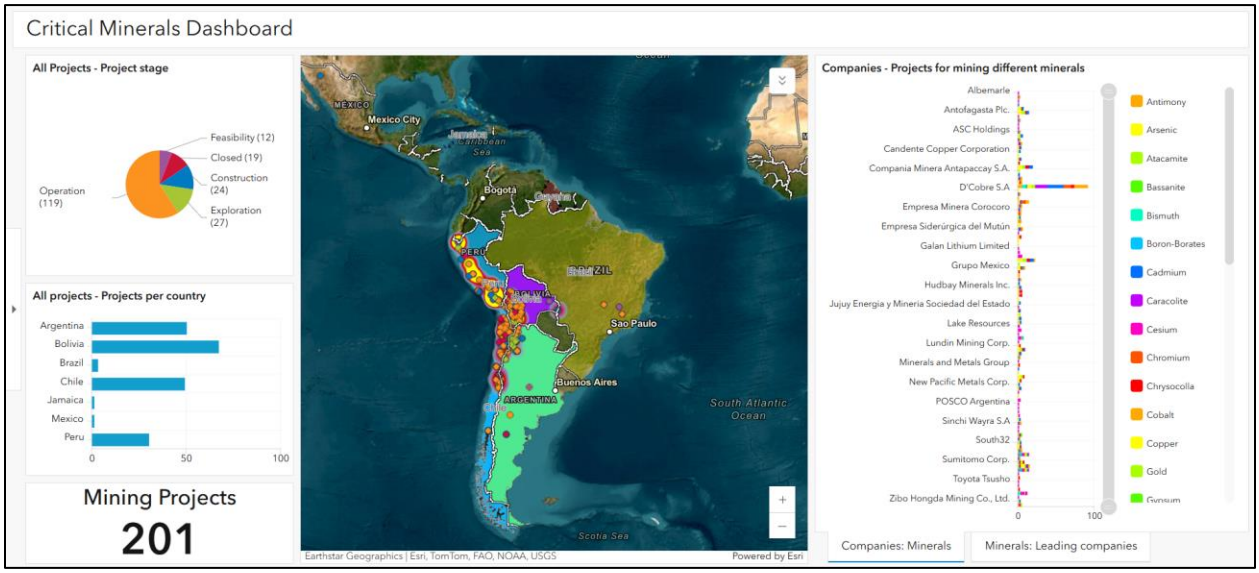
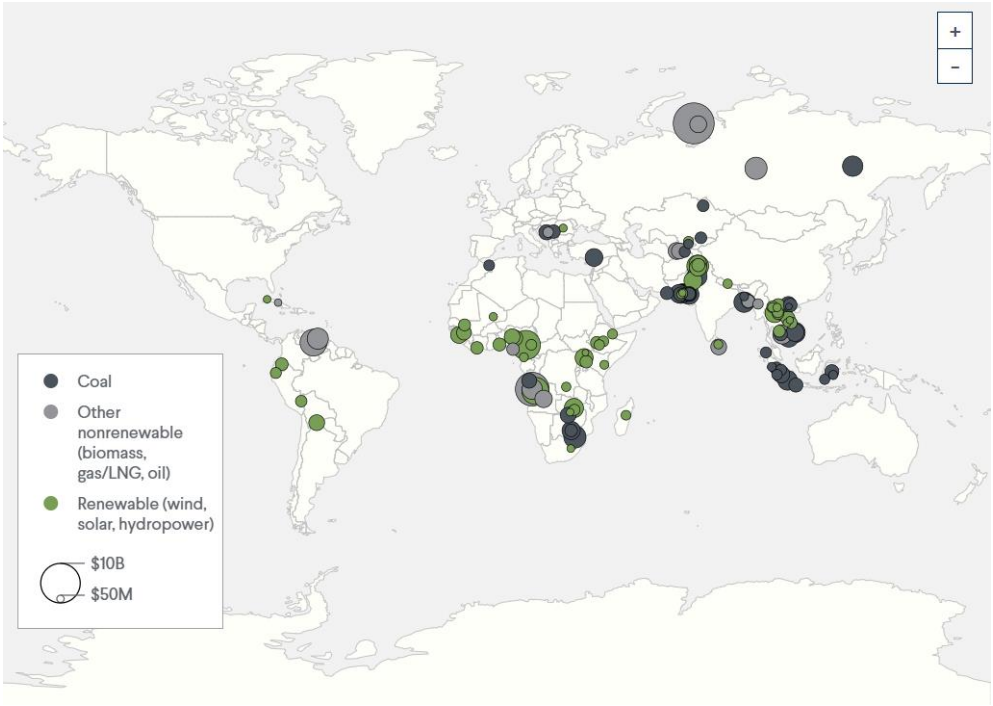


Image Credit to Florida International University's Security Research Hub.[xl]

Mining Applications

Copper

China mines copper extensively for urban development, public uses, and military applications. Copper powers low voltage lines that supply local-to-regional distribution grids and commercial industry. Copper wires are essential to the PRC's transition into renewable energy (solar, hydro, and wind power) because of the mineral's resiliency to harsh weather. This resiliency also makes it useful in the manufacturing of autonomous amphibious and non-amphibious vehicles and aircraft, tactile weapons, and ammunition.[xli] China prioritizes copper extraction and production to advance its UN Sustainable Development Goals (SDGs) because of its significance in energy transmissions and promoting green energy supplies.[xlii]



China's energy project financing in Peru and the Caribbean (BRI countries) goes towards renewables as part of China's SDGs.[xliii] Sources: Boston University, China Africa Research Initiative, Johns Hopkins University, Stimson Center, CFR research.

China's preponderance of copper is fueled by SOE and private companies' investments in mining and smelting. In 2022, China accounted for 55% of the total global copper supply and is expected to reach 60% by the end of 2024.[xliv] [xlv]

Additionally, the ongoing installation of Chinese SOE and private plants accounts for 61% of expected new plants around the world by 2027. China's copper smelting capacity will likely increase by another 45% according to Carlos Risoparton, Director of Economics at the International Copper Study Group.[xlvi] Moreover, China is investing large sums of money towards increasing their copper mining and smelting operations throughout LAC.

One of the most significant PRC investments in copper is in Las Bambas, Peru. This mine was acquired by China's MinMetals Group Limited for an equivalent $5.85 billion (USD) in 2015.[xlvii] State-owned Chinese companies (ownership %: Minmetals Group Ltd – 62.5%, Guoxin International Investment Co. Ltd – 22.5%, CITIC Metal Co., Ltd – 15%) have full ownership of

this mine, which holds one of the world's largest copper deposits.[xlviii] MinMetals Group announced that it will invest between $400-450 million USD into Las Bambas by the end of 2024.[xlix] This investment will increase China's copper extraction capacity and inventory, as well as contribute to its military modernization efforts.

Las Bambas, located in Peru, holds one of the largest copper deposits in the world. This mine releases toxic chemicals into the environment, harming public health and sparking national and international discussion.[l]

Aluminum

Aluminum is important for military and commercial purposes. Aluminum powers high voltage lines (30,000-150,000 volts of power) that supply large distribution grids and allow power trading with other countries. Aluminum is a manufacturing cornerstone for emerging jets and submarines and provides necessary wiring for electrical transmissions across military technologies.

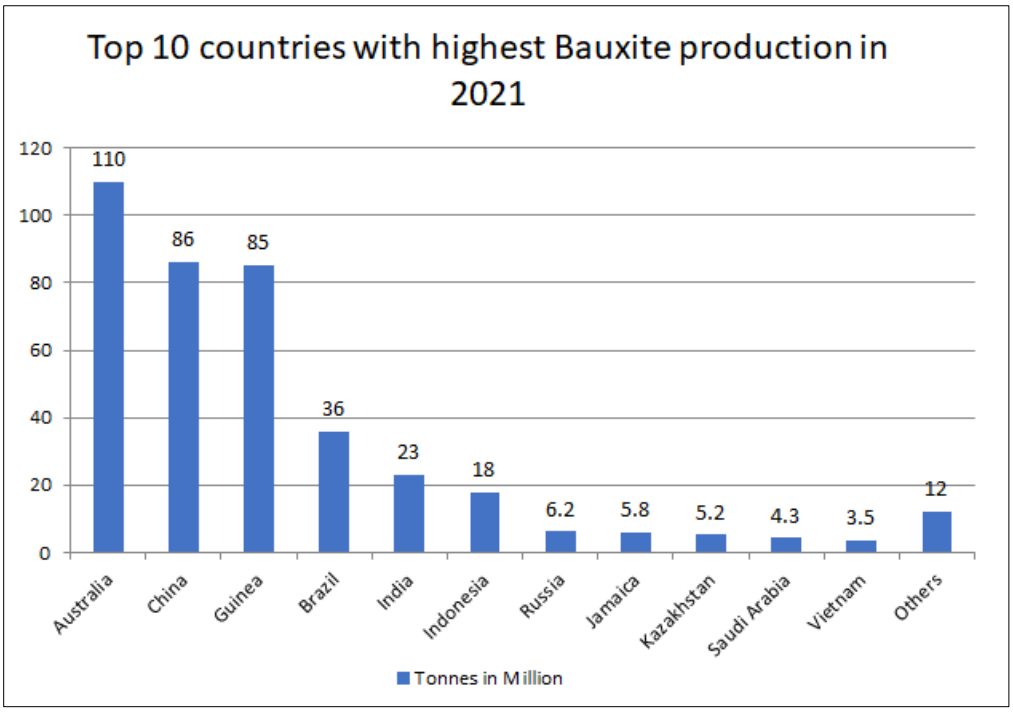
According to the Center for Strategic and International Studies (CSIS), China's control over gallium is a U.S. national security threat because it is used in the following military technologies: plutonium pits[li], semiconductor chips, and high-precision, long-range missiles and radar systems.[lii] Currently, China produces a "staggering 98% of the world's supply of raw gallium."[liii]

The above is a prototype of China's "sixth-generation fighter jet". These jets have covert possibilities and will be integrated with sensors and AI systems. The estimated release date is 2035, but some researchers say that it can be as soon as 2028.[liv]

Like copper, aluminum is important for China's UN SDGs. Aluminum is more cost effective than copper and allows utilities to run more wire with fewer supporting structures, and it is used in electrical vehicle batteries and wiring in wind turbines.

The above is a Chinese wind turbine in production. Wind turbine production provides China with a source of clean and renewable energy, one of its SDGs. China also has the greatest capacity for wind turbine production worldwide.[i]

In 2002, China imported 2.8% of global bauxite (raw aluminum form) supplies. During this time, China was considered the largest manufacturer of aluminum. However, China sought to increase its bauxite (raw aluminum form) imports following the degradation of domestic mines. As a result, China now imports 57% of the total global supply of bauxite, following a 28% increase in 2023.[lv] [lvi] SOEs and private Chinese companies are extracting bauxite from Guyana and Jamaica. Between 2017-2021, Jamaican alumina (refined bauxite) exports to China rose 3000%. Meanwhile, China is leveraging Mexican manufacturers of bauxite and alumina to obtain aluminum.[lvii]



Renewed investment in Jamaica's mines is likely to increase its bauxite production.[lviii]

The Jiuquan Iron and Steel Company (JISo), a company indirectly owned by the Gansu provincial government, purchased a significant Jamaican Alpart alumina refinery from Russia for $32 million (USD) in 2011. In addition, JISCo made a subsequent investment of $3 billion in the development of an industrial park and special economic zone in Nain, St. Elizabeth, Jamaica, where it operates its Alpart alumina refinery.[lix] In October 2019, the alumina refinery closed to undergo modernization and capacity expansion in hopes to increase their production from 1.65 million tons per annum to 2 million tons per Annum. The coronavirus delayed the modernization of the Alpart alumina refinery. Nevertheless, the government of Jamaica and JISCo resumed communication to open the refinery within an 18-month period upon JISCo's investment of $1.1 billion at the 2023/2024 Sectoral Debate in the House of Representatives.[lx] JISCo's renewed investment will expand bauxite extraction and alumina refinery in the Caribbean region and benefit the PLA's modernization plan for wiring in military technologies and gallium production.

The images above are from the 2023-24 Sectoral Debate in the House of Representatives concerning reopening the Alpart alumina refinery.[lxi]

Niobium

Niobium is a critical and strategic element due to its wide array of technical applications and uses in multiple sectors. When combined with other metals, like iron, to create alloys, its durability and strength massively increases.[lxii] Niobium and its alloys have semiconducting, heat-resistant, high-strength, and corrosion-resistant properties, which makes it a popular metal for military usage.

Other uses of niobium concern emerging technologies. Adding niobium to lithium batteries has been found to improve overall energy efficiency and is used as a semiconducting metal for quantum computing chips.[lxiii] Niobium is also integral to aerospace engineering due to its thermal properties. The PRC's hypersonic missile program has had great success, considerably passing research efforts of its US counterparts, largely due to their use of this mineral.[lxiv]

Existing applications by the U.S. and the PRC include its use as a semiconducting metal for quantum computing chips, to strengthen and decrease the weight and durability of production metals in tanks and other tactile military weaponry, to improve the efficiency of lithium-ion batteries used in autonomous vehicles and weapons systems, and in the production of the PRC's hypersonic missiles.

In 2019, Chinese SOE China Shipbuilding Industry Corporation (CSIC) revealed the "Sea Lizard", the first completely autonomous amphibious military vehicle. The Sea Lizard is equipped with sensors that allow it to complete its intelligence and reconnaissance (ISR) activities while also firing at subjects from the equipped machine guns. [lxv]

Brazil has the largest niobium reserves in the world, accounting for over 98%.[lxvi] 75% of these reserves are from Brazilian company Companhia Brasileira de Metalurgia e Mineração (CBMM).[lxvii] CBMM is one of the many South American companies that have either partnered with or received funds from Chinese private and state-owned mining companies. In 2011, a Chinese consortium consisting of Taiyuan Iron, China International Trust and Investment, and BaoWu Steel acquired a 15% stake in CBMM for $1.95 billion.[lxviii]

In 2016, China Molybdenum Co. Ltd. (CMC) bought niobium and phosphorus mines in the nearby area for $1.5 billion which accounted for 10% of global niobium production.[lxix] As long as the demand for renewable energy, smart weapons, and steel production increases, China will continue to invest and acquire more niobium mining operations in LAC.

The CBMM niobium mine located in Brazil. In 2024, CBMM partnered with companies Toshiba and Volkswagen to test and produce lithium niobium oxide batteries for EVs[lxx]. (Image courtesy of Soutar[lxxi])

Lithium

Lithium is a critical metal used for its wide technological applications. Because of its role in the production of semiconductor chips necessary for AI, autonomous vehicle and autonomous weapons, and in creating a rechargeable energy source through lithium batteries, the PLA's plans for military modernization are closer to fruition.

China's SDGs for a more powerful, renewable, and efficient energy source has created a boom in Chinese lithium production. Over 80% of the global lithium battery production takes place in China alone.[lxxii] Lithium powers China's autonomous vehicles and weapons systems, including unmanned aerial (UAV), ground (UAG), and underwater vehicles (UUV).

The Lithium Triangle is of great importance to China. South America's Lithium Triangle of Argentina, Bolivia, and Chile account for almost 60% of the world's total known lithium supply.[lxxiii] These countries contain multiple *salars*, saline desert basins containing lithium in brine. The lithium is extracted from these brines through evaporation ponds.[lxxiv] The highest concentration of lithium in brine in the world is located in Salar de Atacama, Chile.[lxxv] Between 2018-2020, China invested $16 billion in mining in the area and is expected to continue investing each year.[lxxvi]

Public and privately owned PRC-based mining companies, specifically Tianqi Lithium, Ganfeng Lithium, Tsingshan Holding Group, and more, control various lithium mining operations in this area. The largest Lithium producer, Chile's Lithium Sociedad Quimica y Minera (SQM), has a joint venture with Chinese mining company Tianqi Lithium, which bought a 24% stake in 2018.[lxxvii] SQM owns mines in Salar de Atacama, giving China access to an area with the greatest amounts and concentrations of lithium in the world (SQM). Recently, Tianqi Lithium has made efforts to stop Chilean state-run company, Coldeco, from partnering with the joint venture and sent a request for review. However, their request was denied by the court.[lxxviii]

China has purchased 10 of the 20 lithium mines available in the world since 2018[lxxix], and in 2022, China received 88% of global lithium imports.[lxxx] These numbers will likely increase, as China plans to modernize its military require substantial amounts of lithium.

The images above show the increase of lithium ponds in the Salar de Atacama from the years 1991, 2006, and 2023 (left to right). The increase in the number of ponds allows for greater production and overall output of lithium from the mine.[lxxxi]

Part III: Assessments and Outlook

China probably aims to monopolize copper, aluminum, niobium, and lithium to obtain a strategic advantage over the United States and other countries, thereby limiting their access to minerals essential in the application and development of warfare technologies.

Opportunities

The U.S. can counteract China's attempts to monopolize these critical minerals by doing the following:

1) Invest in existing critical mineral mines in the LAC area or other countries. Other countries with adequate critical mineral reserves are Canada (niobium, iron, lithium) and Australia (iron, lithium, copper).[lxxxii] The U.S. can also invest in countries that are disengaging from China. For example, the government of Indonesia enforced a bauxite ban in June 2023 to replicate the country's success in increasing nickel processing after imposing a raw nickel ban in January 2020.[lxxxiii] While the government of Indonesia is not currently exporting raw metals, Indonesia is welcoming investors to share the benefits. Although China was one of Indonesia's biggest investors pre-bauxite ban[lxxxiv], China (currently relying heavily on bauxite exports from Australia and Guinea) and Indonesia are increasingly disengaging from one another.[lxxxv] This presents an opportunity for the U.S. to engage with Indonesia as an alternative preferred investment partner, especially as Indonesia is in the talks of easing its bauxite ban due to slower-than-anticipated domestic alumina refinery development.[lxxxvi]

2) The U.S., and U.S. partner and ally nations should aim to be an alternative investment opportunity for LAC and the Global South, instead of trying to supplant China as the lone source of development financing. Projects like the Lobito Corridor (direct alternative option to the Tanzania's TAZARA rail line) impose U.S. presence in the Global South without forcing countries into a zero-sum game of alignment.[lxxxvii]

3) Encourage LAC countries to create their own interagency screening mechanism emulating the Committee on Foreign Investment in the United States (CFIUS). This interagency screening mechanism can be useful in legal disputes across various mining activities in LAC. For instance, in 2024, Jinteng Mining (a subsidiary of Chinese gold and copper company Zijin Mining Group) sought a judicial review against Canadian Minister Francois-Philippe Champagne's decision to seek a national security review after Jinteng bought a gold mine owned by a Canadian company located in Peru. Ultimately,

Section 18.1 under Canadian law allows for national security reviews within 30 days of a sale.[lxxxviii] This case shows the complexity of mining ownership and the skeptical lens through which the government of Canada and Canadian companies view China's investments in the mining sector. In a similar way, LAC countries and U.S. partner and ally investors should take precaution with Chinese investments in the mining sector.

4) Mine for these minerals domestically. While the U.S. must strike a balance between domestic mining and environmental protection, the US is home to many critical mineral reserves. The US is estimated to have around 14 million tons of lithium reserves, with active mining in Nevada and Utah.[lxxxix] Another possible reserve location has been discovered by researchers from Lithium Americas at the Nevada-Oregon McDermitt Caldera. Scientists say that this could become the largest reserve of lithium in the world with an estimate of roughly 20 – 40 million tons.[xc]

In the event of monopolization, we recommend the US relies on ally states for their necessary mineral supply.

Conclusion

China increased its presence in LAC by way of investments, partnerships, company ownership, mining projects, and more. Increased business and political relations may appear as the BRI, however, evidence included in this paper claims that China's actions have other intentions; China aims to monopolize copper, iron, niobium, and lithium for technological and military gains. Our evidence tracks the history of investments in the metal sector and showcases their increase, as well as the increase in ownership and production over the past two decades. This allows China to not only achieve its BRIs, but also to complete its SDGs and near total monopolization. Furthermore, monopolization will provide China with the materials it needs to foster its military research and projects, possibly even advancing existing modernization timelines, like in the case of the 6th generation fighter jet. Consequentially, this can cause China's military innovations and capabilities to surpass those of the US, and at a faster rate than expected. The autonomous and smart vehicles and weapons systems require copper, niobium, lithium, and iron to produce, which is fulfilled by its increased mining activities in the area. Further monitoring of Chinese and Chinese SOE companies' mining activities in LAC by the US and its allies is necessary to accurately assess how quickly and to what extent these critical minerals will be monopolized. While monopolization is likely if this trend continues, the US could take the appropriate measures to counteract this.

Limitations and Future Discourse

An inherent limitation of our study was our inaccessibility to data regarding illegalities associated with China's mineral mining. We were also limited to only open-source information so the extent of the PRC's monopolization and military advancements may be understated.

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