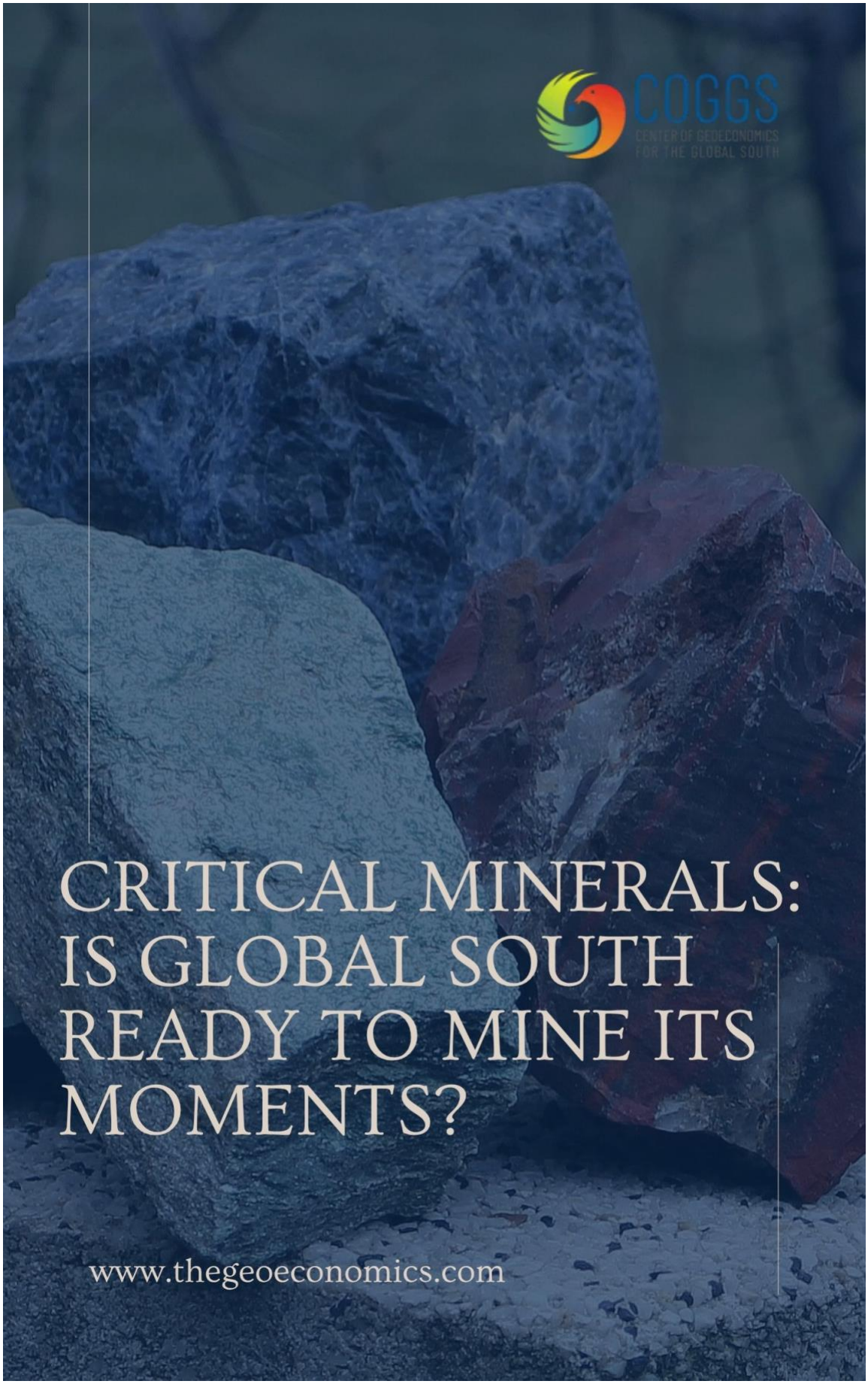
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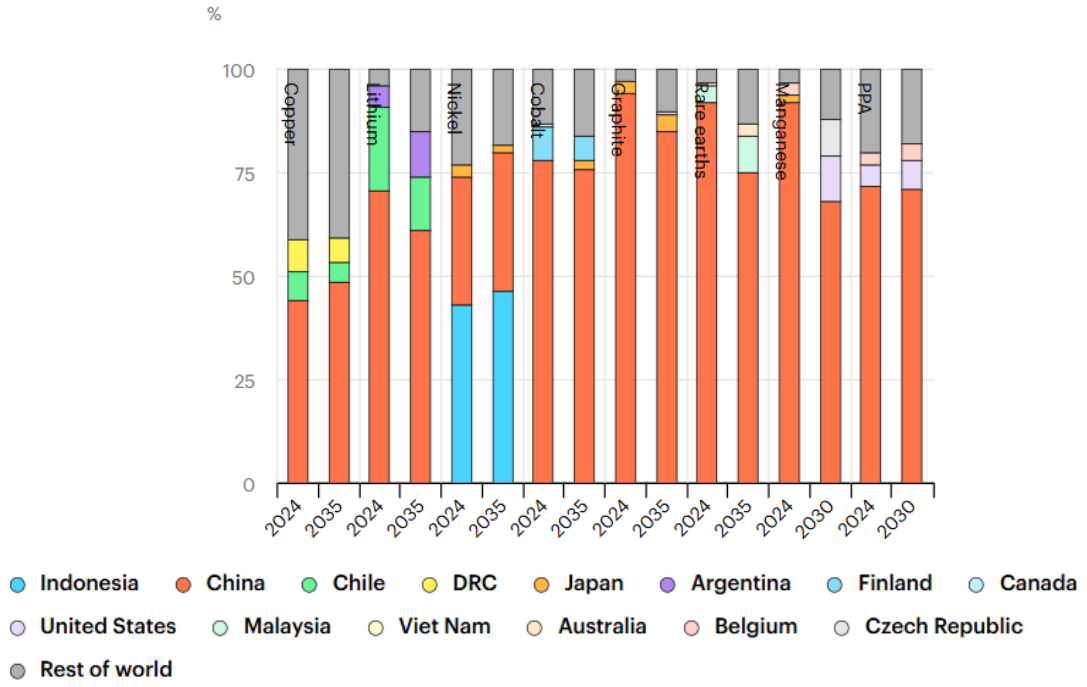
Critical Minerals: Is the Global South Ready to Mine Its Moment?

Prattyush Kala, Research Intern

What are Critical Minerals?

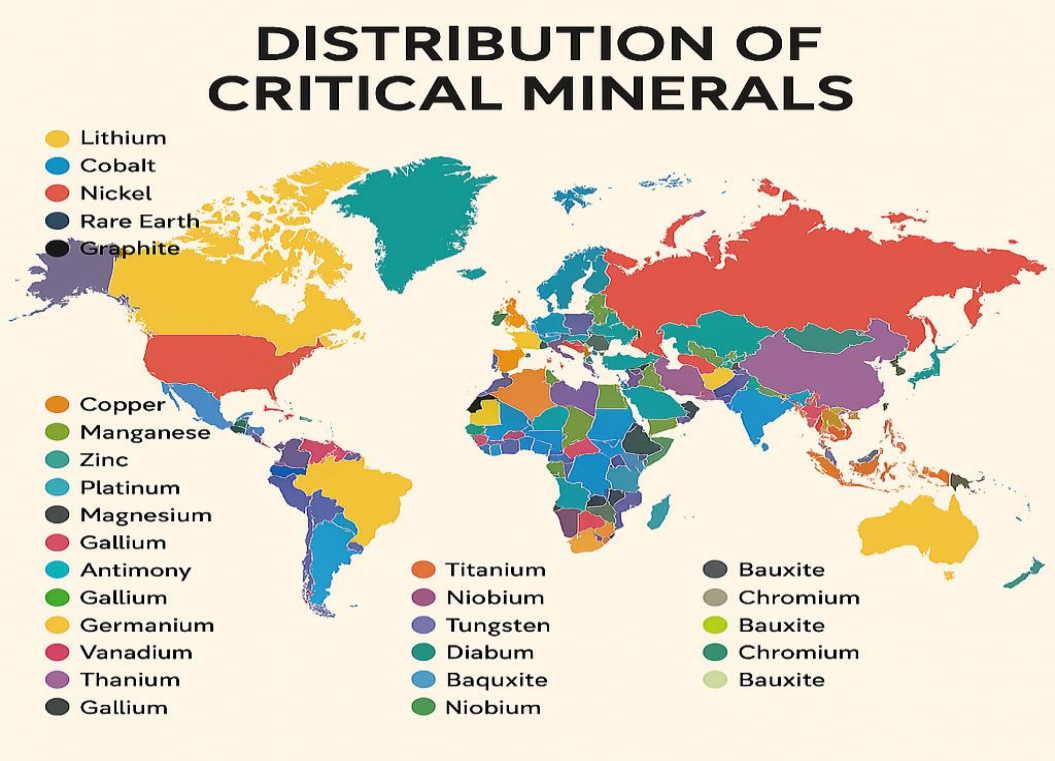
The demand for critical minerals is growing significantly, but the Global South is not in a position to respond to the demand properly. Global demand for minerals crucial to the clean-energy transition is set to surge. Critical minerals are the minerals that are significant for the growth of an economy and face the risk of disruption in supply chains due to the hegemony of a single country over them around the world. In the contemporary era, critical minerals are a must for the green transition since they are an important component in manufacturing green energy equipment and machinery.

According to the IEA's 2024 Outlook, clean-energy technologies could nearly triple demand for key minerals by 2050, from about 10 Mt today to almost 40 Mt in the NZE (Net Zero Emissions) scenario. Lithium demand is projected to grow eightfold by 2040 in a 1.5 °C pathway, driven by electric vehicles and grid storage; Copper demand may double to nearly 40 Mt by 2050, with power networks and EVs as main drivers and Cobalt, nickel, rare earths and graphite similarly see steep rises, each more than doubling by mid-century in climate-driven scenarios.



Source - International Atomic Energy, 2024

Mineral	2023 Demand	2030 (NZE)	2050 (NZE)	CAGR (2023–50)
Lithium (Mt)	0.5	1.5	4.0	~10%
Copper (Mt)	26.0	33.0	40.0	2.1%
Cobalt (kt)	140	300	550	4.5%
Rare Earths (kt)	240	450	550	2.5%



Supply Chain of Critical Minerals and Factors Affecting It

The critical minerals supply chain is a vital and vulnerable component of the green transition. Across the world, a handful of countries have emerged as major producers of critical minerals. The Democratic Republic of Congo is a major player in cobalt and lithium, Australia in Lithium and Rare Earths, South Africa in Platinum and Magnesium and Indonesia in Nickel. On the other hand, China has emerged as a major player in the remaining rare earth minerals market, thus exercising its hegemony in this regard.

Supply chains have become vulnerable in the present times due to a host of factors. The first is China's ambition of becoming a more powerful nation. In 2024, China, in response to the USA's hegemonic position, imposed a ban on the export of antimony, gallium, and germanium to the USA, which are essential minerals for telecommunications, semiconductors, and military technology. This has forced US companies to export these minerals through alternative routes, i.e., via Mexico.

Climate change has emerged as a second factor responsible for disrupting supply chains of critical minerals. Increased electricity demand in the critical minerals-rich countries, due to rising temperatures, has resulted in countries imposing caps on the amount of critical minerals that can be exported. Fulfilling local needs is being given priority in these countries, thus resulting in a shortage of critical minerals at the world level.

The green transition being undertaken on a large scale has emerged as another factor for disruptions in critical minerals supply chains. The chart given below provides information about the expected rise in demand for certain minerals by 2050 in developing Clean Energy Technologies. Countries across the world are in a race to adopt green energy as an alternative to fossil fuels, with several countries like India setting goals of achieving Carbon Neutrality. Production of green energy technology in different countries has increased the demand for critical minerals. However, the demand is not being met by supply, leading to demand-supply gaps, further stressing the already stressed supply chains.

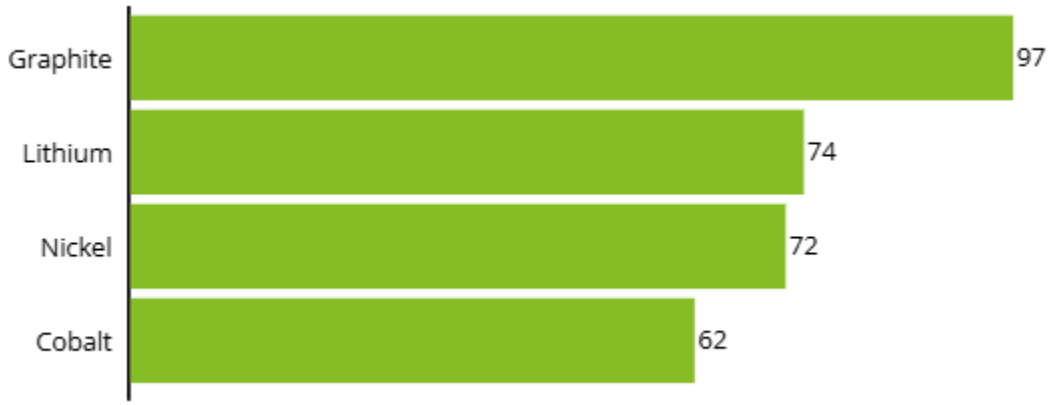
Environmental and Social Dimension

Mining operations for critical minerals often occur in ecologically sensitive regions, making environmental stewardship a top concern. High water consumption, tailing storage risks, and biodiversity impacts demand rigorous environmental management plans. In the case of India lack of proper conduct of Environmental Impact Assessments is a major hurdle in allaying the ecological damage brought by critical minerals exploration, discovery and processing. Another problem in this regard is that industrial houses associated with different activities in the realm of critical minerals through influential networks ensure that policies are framed in a manner that is appealing to their businesses and doesn't act as a hindrance.

Critical minerals exploration finds itself amidst the centre of social problems in the form of conflict between companies associated with mining and the discovery of critical minerals on one hand and the indigenous forest dwellers on the other. They face a host of issues, which range from non-exercising of traditional forest rights to non-entry in forest premises for minor forest produce collection. Displacement due to critical minerals exploration is not counted separately by countries and is counted under the section ‘displacement due to mining’. This poses critical issues in analysing the actual situation and devising specific measures. A need for differentiation between displacement occurring due to the mining of critical minerals and other minerals is thus required.

Emergence of Circular Economy

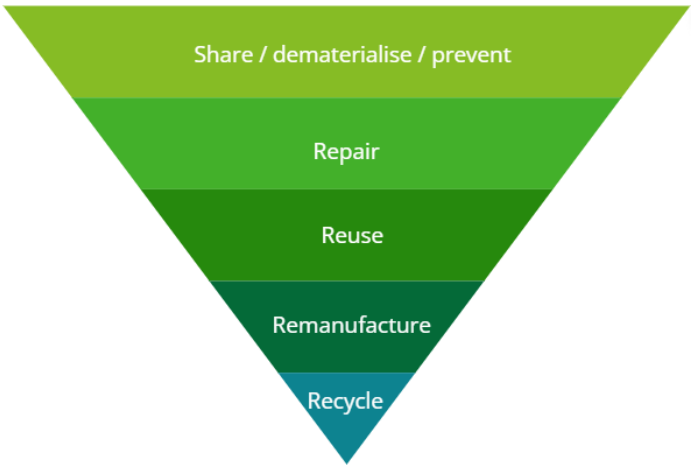
Critical minerals exploration is at a crossroads, with control of supply chains by dominant countries like China on one hand and aggravation of environmental damage on the other. Circular Economy, i.e. utilisation of the waste generated in an activity through recycling and reusing, seems a formidable step in this direction. The benefits of its adoption in the critical minerals realm will be multifaceted - One, it will reduce dependency of countries on certain nations for raw materials due to reduced demand for them; Two, provide for cleaner production activities with lesat waste generation, thus adding to carbon neutrality goals of the countries’ Third, reduce imports of a nation and thus helping a nation to reduce its trade deficit with other nations like India.



Source - Benchmark Mineral Industrial Data

To understand in a better manner what a circular economy for critical minerals looks like, one can consider the case of the United Kingdom. As per reports and estimates, 235,000 tonnes of battery material waste would be provided by 2040 in the form of electric vehicles, that is eight times more than in 2030; solar panel cumulative waste will reach 30,000 tonnes by 2030 and rise to 1 million by 2025; electronic waste will exceed 2.5 million tonnes by 2040. Investment in new, efficient facilities is required to ensure the recycling of materials. For instance, 300 mobile phone batteries provide enough cobalt for one EV battery. Further recycling 21 million tech items in UK homes can fulfil the requirement of critical minerals for UK gigafactories.

The priority should be to keep materials in use for longer by sharing, leasing, repairing, reusing, remanufacturing and, finally, recycling the assets in which they exist [24].



Source - EU Waste Hierarchy

Further, there is a necessity to embrace circularity, with companies across the globe undertaking redesigning and reengineering to develop resilient production units that are based on the idea of circularity.

Financing of Critical Minerals Exploration

Financing a critical minerals project is the next big task at hand, especially for the financially strained Global South nations, which have to allocate resources also for human development and development in other sectors of the economy, unlike the developed nations, where the transition to renewables is the sole challenge at hand. To overcome financial hiccups, investments by the private sector are a must to usher in growth and development in this sector. However lack of implementation of de-risking investment measures is acting as a hindrance to the participation of the private sector in countries like India.

The governments of the Global South nations must understand the apprehensions of the private sector and establish Critical Minerals Investment funds that are sovereign, sovereign-backed, as a measure for de-risking and promoting private sector investments. Further exploration of policies like Production Linked Incentive, Government Bonds to raise capita, Public Private Participationl needs to be promoted to ensure investments in this realm. 'Exploring infrastructure and trade-backed financing models, such as offtake agreements, prepayment financing, and commodity-backed lending, to ensure smooth mineral evacuation and supply security' [25], is another alternative. Multilateral funding banks like the New Development Bank and, Asian Development Bank can assist in providing capital for long gestation critical minerals projects, easing the burden on government expenditure.

Need for Sustainable Supply Chains

A closer look at the situation presents glaring facts, and thus it becomes necessary for the world to develop alternatives to supply chains of critical minerals and eventually reduce dependency on China.

India has fared pretty well in developing alternate supply chain routes by launching the Special Purpose Vehicle KABIL. KABIL is a joint venture company among the three Government Enterprises: National Aluminium Company Ltd. (NALCO), Hindustan Copper Limited (HCL) and Mineral Exploration & Consultancy Limited (MECL), in the ratio of 40:30:30, under the aegis of Ministry of Mines, Government of India, formed to ensure supply side assurance of critical and strategic minerals and mineral security of the nation. The main aim of KABIL is to develop partnerships with other countries and ensure secure imports of critical minerals in the country. Accordingly, KABIL has entered into contracts with Chile, Australia and Argentina in the realm of mining and exploration of critical minerals like lithium. Further, India, through the Geological

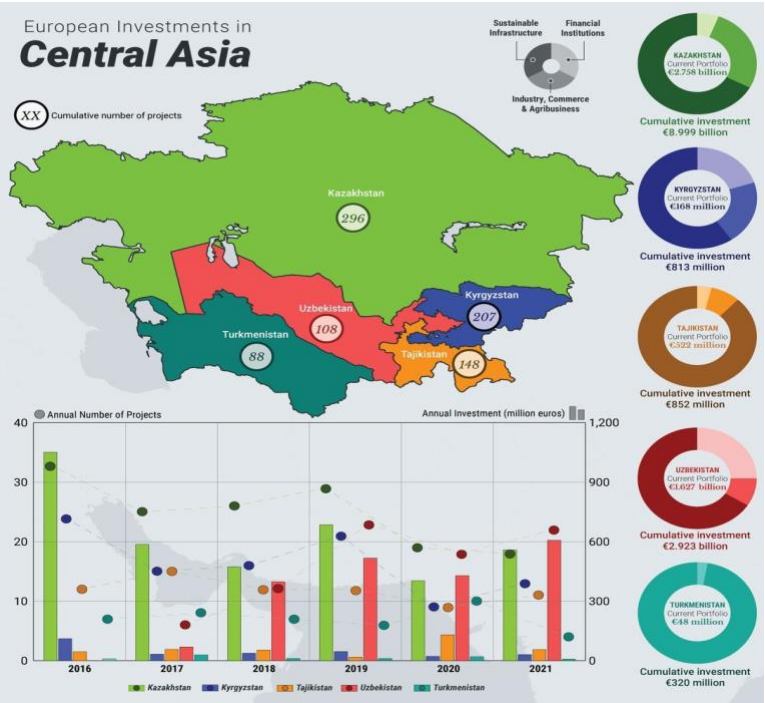
Survey of India, has led exploration drives in the past to search for critical minerals, with it achieving success when 5.9 million tonnes of lithium were discovered from the Salal-Haimana region of the Reasi District of Jammu and Kashmir.

Apart from this, greater collaboration with countries like Peru, Angola, etc. needs to be developed and established. They can become reliable partners in the realm of developing sustainable supply chains, providing a win-win situation for these countries and the entire world. Countries also need to focus on the aspect of developing a circular economy in critical minerals to ensure reduced requirements of raw materials and promote recycling. This would help countries across the globe to remain untouched by supply chain disruptions.

Exploration in new regions like the Caucasus, Africa and Central Asia is a must since they can prove to be reliable partners and help the world to reduce its dependency on China for critical minerals.

 # Central Asia Region

"Central Asia boasts a significant share of the world's essential minerals, holding 38.6% of its manganese ore, 30.07% of chromium, 20% of lead, 12.6% of zinc, and 8.7% of titanium, alongside other valuable resources. Kazakhstan, in particular, emerges as a contender against China's dominance in rare earth elements production, which accounts for 70% globally" [27].



Source - European Bank for Reconstruction and Development, 2022

This has eventually resulted in a frenzy of investments being made in the exploration and discovery of Critical Minerals, with the USA, EU and India entering the fray. The major objective of all these nations and organisations is to develop alternate supply chains and reduce their dependency on China, a major player in this domain.

India, to reduce its dependence on China with regards to critical minerals, has become resilient to supply chain disruptions and to forge and consequently expand ties with the nations of Central Asia, has shown intent in the realm of joint exploration and discovery of Critical Minerals with five Central Asian Nations - Kazakhstan, the Krygyz Republic, Tajikistan, Turkmenistan and Uzbekistan at the 4th Meeting of India-Central Asia dialouge held on 7th June, 2025 in New Delhi.

The USA has embarked on a journey of expanding its influence in the region, often considered a ground of Russia and China's Influence. Under Biden's administration government of the USA rolled out the ERICEN- Economic Resilience Initiative for Central Asis, under which 25 million dollars have been earmarked on an annual basis to boost trade diversity. In September 2023, the U.S. hosted the US-Central Asia summit with the objective of 'to forge diverse, sustainable, and reliable critical mineral supply chains, innovate in mining and raw material processing, and foster regional industrial cooperation to lessen strategic dependencies'[27].

The European Union is not far behind other countries in tapping the underexplored potential of Central Asia in the realm of critical minerals. The chart below provides details about different companies that have invested in the domain of critical minerals exploration in Central Asia.

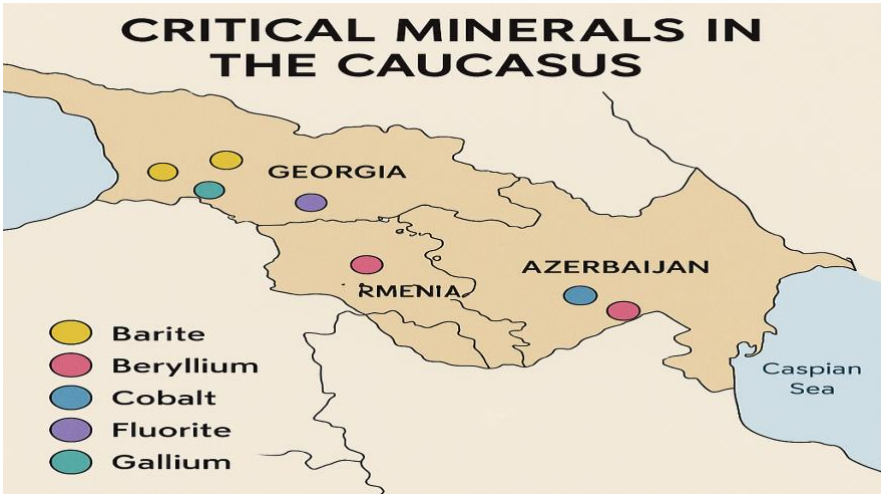
Critical material	Project name	Location	Project start	Project type	EU investor name	Country
Lithium, cobalt and nickel	German company HMS Bergbau AG acquired a controlling stake in Kazakh company Creada Corporation, which holds exploration licenses for adjacent documented lithium, cobalt and nickel deposits.	Kazakhstan	2022	Extraction and export	HMS Bergbau AG	Germany
Lithium	Construction of a mining and processing plant for the extraction and processing of lithium in the East Kazakhstan region for USD 500 million.	East Kazakhstan region, Kazakhstan	2024	Extraction and export	HMS Bergbau AG	Germany
Graphite	EBRD is acquiring a stake of approximately 17.4% in the mining company Sarytogan Graphite for the equivalent of EUR 3 million.	Karaganda region, Kazakhstan	2024	Extraction and export	Sarytogan Graphite and EBRD	Australia and EBRD
Lithium, copper and antimony	The MoU signed between the Danish firm FLSmidth and the Ministry of Industry and New Technologies of the Republic of Tajikistan.	Tajikistan	2024	Exploration and mining	FLSmidth	Denmark
Rare earth metals	Development of rare earth metal deposits needed for the production of solar panels in the Samarkand region.	Samarkand region, Uzbekistan	2023	Extraction / processing in Uzbekistan	TotalEnergies	France

Investment by EU Companies in Critical Minerals Exploration in Central Asia

Source - Start Slow to Go Fast? Unlocking EU-Central Asia Cooperation on Critical Minerals, May 2025 by Friedrich Ebert Stiftung

Caucasus

The Caucasus region (Georgia, Armenia and Azerbaijan) is home to critical minerals, though in smaller quantities when compared with Central Asia. This region is home to minerals which include copper and zinc, significant for defence technology. This region acts as an alternative to supply chain disruptions created in Ukraine post the invasion by Russia. The US has been involved in high-level discussions in the region to discuss and explore the potential of infrastructure development and the exploration of minerals.



Countries Investing in the Caucasus

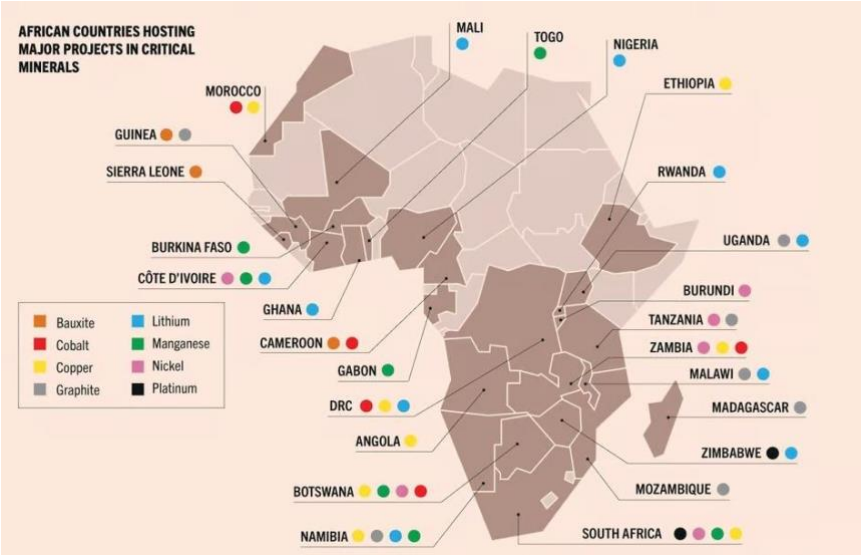
Country	Strategic Interests & Actions
United States	- Targeting Georgia and Armenia for copper, zinc, and antimony - Supporting infrastructure via the Middle Corridor to access Central Asian and Caucasus minerals
India	- Exploring partnerships under the National Critical Mineral Mission (NCMM) - Engaging with Eurasian countries for rare earths and uranium
China	- Historically dominant in refining; now facing pushback - Limited direct mining in the Caucasus, but active in logistics and trade routes
European Union	- Promoting mineral diplomacy with Georgia and Azerbaijan - Funding feasibility studies and tech transfer for sustainable mining

Companies Active or Eyeing the Region

Company	Country of Origin	Focus Minerals & Projects
Kazatomprom	Kazakhstan	Though based in Central Asia, it's expanding influence into the Caucasus for uranium and beryllium
U.S. Geological Survey (USGS)	United States	Conducting joint exploration and feasibility studies in Georgia and Armenia
Tajikistan Antimony JV	U.S.–Tajikistan	Processing antimony with U.S. investment; potential expansion into the Caucasus
Azerbaijan's State Oil Company (SOCAR)	Azerbaijan	Diversifying into mineral logistics and refining infrastructure for copper and zinc

 # Africa

Africa has also emerged as a major player in critical minerals in the world, with reserves of lithium, graphite, cobalt, coltan, manganese, platinum, tantalum and bauxite. Several countries of the world are in fray to tap the rich sources of critical minerals and boost trade ties with African countries.



Source - Africa Minerals Strategy Group

Countries Investing in Africa's Critical Minerals

Country	Focus Areas & Initiatives
India	- Strategic partnerships with Ghana, Namibia, and Argentina for lithium, cobalt, and rare earths - Public sector firms like KABIL and NMDC are acquiring concessions in Argentina and exploring in Africa
Japan & UK	- Joint investments in African mines to stabilise supply chains and build local refining capacity
China	- Major acquisitions like the Bikita Lithium Mine in Zimbabwe - Dominant player in the cobalt and lithium sectors across DRC and Zimbabwe

United States	- Supporting the Lobito Corridor to transport copper and cobalt from the DRC and Zambia - Hosting West African leaders to deepen trade ties and secure manganese, bauxite, and lithium
European Union	- Financing projects like Kabanga Nickel in Tanzania through the Minerals Security Partnership

Companies Leading Exploration & Investment

Company	Country of Origin	Focus Minerals & Projects
Sindhu Trade Links Ltd.	India	Investing $100M in lithium, rare earths, and iron ore across India, Africa, and Australia
Q Global Commodities & F9 Capital	South Africa & UK	$1B investment in lithium, copper, and nickel across Southern and Eastern Africa
Sinomine Resource Group	China	Acquired Bikita Lithium Mine in Zimbabwe for $180M; building dual lithium processing plant
Atlantic Lithium & Piedmont Lithium	Ghana & Australia	Developing Ghana's first lithium mine (Ewoyaa Project) with $185M investment
Société Minière de Boké	Guinea	Planning $1B investment in bauxite production and refining
La Compagnie Minière de l'Ogooué (ERAMET)	France	Leading manganese production in Gabon

Another alternative to China's dominance lies in greater collaboration between QUAD members in the realm of critical minerals. The QUAD members have their respective strengths in critical minerals: Australia is a critical minerals-rich country, the USA possess an upper hand in the technological capability for mining; Japan has the capital and extensive experience in exploration and mining, while India has a huge swathe of unexplored and unexploited minerals and constitutes the world's largest market. Closer cooperation between the four nations of the

Indo-Pacific would provide an alternative to other countries, helping them to escape the tyranny of China and make their economy climate change resilient, and in turn, fulfil sustainable developmental goals.

Conclusion

As we stand at the tip of global energy transformation, there is an urgent need to secure equitable and sustainable access to critical minerals. The path ahead is not simple: it demands bold collaboration, innovative thinking, and a commitment to balancing economic growth with environmental stewardship and social justice. For countries in the Global South, there are both risks and remarkable opportunities in this realm. Overcoming supply chain vulnerabilities induced by China, fostering responsible mining practices, and investing in circular economy solutions are not just technical challenges, but a test of shared values of conservation of the environment and countering climate change.

Rather than perpetuating old patterns of resource scarcity and geopolitical rivalry, the world has the chance to build inclusive and equitable partnerships that benefit all—miners, manufacturers, consumers, and, most importantly, the communities who call these mineral-rich regions home. By prioritising transparency, sustainability, and cooperation, the world can ensure that the green energy revolution uplifts people and planet alike, leaving no one behind on the journey to a climate-resilient world.

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