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Geopolitical litmus test

Can Europe and India deepen ties through critical raw materials cooperation?

Europe and India are rapidly embarking on a clean energy transition with the share of renewables skyrocketing in their respective energy mixes. This heightens concerns about dependence on critical raw materials (CRMs), such as cobalt, nickel and graphite, that are needed for renewable energy technologies, and whose supply chains are largely dominated by singular exporters such as China. It is not the case that Europe and India lack reserves of, for instance, lithium, but there are barriers to extracting them, and even if new mining activities are undertaken, it will take time.

This policy brief reviews how the two parties are juggling with their dependence on China-dominated CRM dependent value chains. Both realise that derisking, diversification and/or decoupling cannot be easily and quickly achieved. While the EU is nervous about being drawn into a wider regional conflict between the United States and China, India's attempts to deal with the China threat has drawn it into various issue-based strategic partnerships. It makes sense for the two blocs to reframe the discussion on de-risking and instead cooperate on joint investments into Research & Development into alternatives to some CRMs, developing competitive supply chains for new materials and cooperating on the re-use and recycling of existing materials.

Critical Raw Materials Dependencies

In 2023, the European Commission introduced the Critical Raw Materials Act. The legislation seeks to both identify potential supply chain risks for materials deemed critical for European Industry and the wider green energy transition[1]. India has launched a similar domestic initiative, identifying 30 CRMs in a report envisioned as a roadmap for a more self-reliant India[2]. Both parties have begun to refer to these supply chain risks as "threats", spurring global competition for control of these resources[3].

These policy initiatives fit into a wider global pattern of a desire for greater diversification

1 The European Commission "Regulation establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/1020" 16 March 2023, page 1.

2 Indian Ministry of Mines, "Critical minerals for India", June 2023, page 32-33.

3 Shebonti Ray Dadwal, "India's Challenges in Accessing Critical Minerals", Indian Foreign Affairs Journal, Volume 15, Issue 2, April/June 2020, Page 111-114.

within the mineral supply chain to reduce existing dependencies. This has become ever more prominent in recent years with rising demand for these goods, which in the case of lithium alone is expected to increase 89-fold by 2050[4]. In large part, the growing demand is linked to the growing renewable energy capacity that requires critical raw materials. Renewables now account for over 21.8% of the overall energy share among the European Union member states[5]. In India, renewable sources accounted for 20.5 percent of India's electricity generation in 2022.[6] In particular, solar energy has helped support the growing demand for energy in the country[7].

However, the supply chains for these minerals have increasingly become unstable. The Covid-19 pandemic revealed how major shocks to global trade can hamper the reliable supply of goods[8]. In addition, much of the global supply chain underpinning these industries is based in or around Chinese refining and mining conglomerates. China is the main refiner and supplier of resources such as graphite, germanium, rare earth minerals (REE), etc.[9, 10]. China has been willing to use its role as a major supplier of CRMs to apply political pressure when needed.

For instance, in 2010 China limited CRM exports to Japan, after they had apprehended fishermen illegally operating in the disputed seas between the two countries[11]. More recently, China has limited the export of CRMs such as graphite, to the EU, in response to an EU export ban on advanced chipmaking machines to China[12]. Europe now aims to increase production at home, diversify supply chains and seek alternative partnerships in a generic effort labelled as 'De-Risking'[13]. The Critical Resource and Materials Act entails both measures to expand sourcing of CRMs in member states, and commission new partnerships with relevant third parties. The Act outlines diversification goals for the import of CRMs, by 2030 no singular third party country should account for more than 65% of any strategic mineral[14]. The EU has already begun taking steps in this direction by concluding agreements with countries such as Argentina[15], Canada[16], and Kazakhstan[17].

For India the response likewise has been aimed at both shoring up domestic sources of minerals, while also exploring the potential for bilateral agreements with outside parties. The Indian government has begun to more actively explore potential for domestic sources of key minerals[18], through formats such as the National Mineral Policy which specifies the governments strategies to further investments and expansion of it extraction industry.

Thus far any partnership between India and the EU has been hampered by the inability to finalize a trade deal between the two parties[19].

4 Supra note 1.
5 European Environment Agency, "Dashboard – Renewable energy in Europe 2023", 5 December 2023.
6 Madhumitha Jaganmohan, "Share of renewable sources in electricity generation in India from 2010 to 2022", Statista, 2 January 2024.
7 Will Norman, "Solar dominates India capacity additions in 2023 but still lags behind target", PVtech, 24 January 2024.
8 Ian King, Debby Wu, Demetrios Pogkas, "How a chip shortage snarled everything from phones to cars", Bloomberg, 29 March 2021.
9 Directorate-General for Internal Market, Industry, Entrepreneurship and SME's "Study on the Critical Raw Materials for the EU 2023", 16 March 2023, page 6.
10 Supra note 1, page 63.
11 Keith Bradsher, "Amid Tension, China Blocks Vital Exports to Japan", The New York Times, 22 September 2010.
12 Euractiv, Reuters, AFP, "China to curb export of graphite, a key battery material", Euractiv, 20 October 2023
13 Reuters, "The EU's hunt for critical minerals", Reuters, 18 December 2023.
14 General Secretariat of the Council of the EU, "Regulation (EU) 2024/1252 of the European Parliament and of the Council", 11 April 2024.
15 European Commission, "Global Gateway: EU and Argentina step up cooperation on raw minerals", 13 June 2023.
16 European Commission, "EU and Canada set up a strategic partnership on raw materials", 21 June 2021.
17 European Commission, "Strategic Partnership between the European Union and Kazakhstan on sustainable raw materials, batteries and renewable hydrogen value chains", 8 November 2022.
18 Rajesh Chadha, Ganesh Sivamani, "Critical Minerals for India", CSEP, February 2022, page 3-4.
19 Reuters, "EU only wants free trade deal with India that gives it 'real' market access", Reuters, 20 October 2023.

The relationship has often been characterized by periodic breakthroughs in relations followed by slumps despite the obvious benefits to both parties from deepening ties. CRMs could present themselves as a part of another tool pack and proposal to orient the conversation more on what either party can benefit from one another, rather than the upset of the previous years.

CRM dependencies: looking deep into the value chains

To identify these supply weaknesses and assess potential areas for collaboration, it is important to first highlight what respective definitions of CRM India and Europe have, what minerals they both designate as "high risk" or "critical", and the reasoning for this.

The EU distinguishes between critical and strategic minerals. Strategic minerals have a high importance in specific strategic sectors and may face high barriers to access them. Critical minerals on the other hand denote minerals which are critical for the functioning of the European economy and face a high risk of supply disruptions. The European Commission will designate minerals as "critical" if it passes a threshold defined by a combination of economic importance, with supply risks[20]. Currently the list includes 34 minerals among which are groupings such as PGM, LREE and HREE, these encompass a wider grouping of platinum and rare earth elements[21].

India has also published a similar list citing 30 minerals as being critical for the Indian economy. The Indian government defines these minerals as critical due to their lack of availability either in extraction or refinement processes and their potential to cause supply chain disruptions[22]. They should also constitute an important role to the Indian economy or national security. These 30 were selected first from a screening of what lists other major global economies had provided, followed by an input process from relevant ministries that resulted in the creation of a criticality index[23].

Figure 1 on the next page denote the list of critical minerals for the EU and India respectively. It also highlights the overlap between the two.

There is a significant overlap between the two lists, although divergences still exist. Notably some high-profile minerals, manganese and aluminium, are considered critical for the EU, while India does not list them. Additionally, India considers tin a vital metal, whereas the EU does not. There are metals that both parties have denoted as critical or strategic. Cooperation efforts should be focused on what minerals both parties have sorted into this category.

What is noteworthy here is the extensive number of rare earth elements (REE) and platinum group elements (PGE) listed by both parties. These are of particular concern as in 2019 China alone was a supplier of 60% of the world's REE and processed over 80% of them[24], while in the case of platinum, South Africa accounts for over 60% of the total global production[25]. These minerals are difficult to source and replace and feature prominently in products needed for the energy transition in batteries and wiring, as well as the construction of critical infrastructure such as wind turbines and solar panels. Singular parties have much influence and control over these goods that they produce, making the global economy disproportionately dependent on a select group of producing and refining countries for minerals critical to the functioning of key industries and the future development of clean energy grids.

20 Directorate-General for Internal Market, Industry, Entrepreneurship and SME's, "Methodology for establishing the EU list of critical raw materials", 2017, page 2-4.
21 Supra note 9, page 4.
22 Supra note 2, page 32.
23 Supra note 2, page 2-3.
24 IEA, "The Role of Critical Minerals in Clean Energy Transitions", World Energy Outlook Special Report, March 2022, page 13.
25 Supra note 23, page 30.

Figure 1:

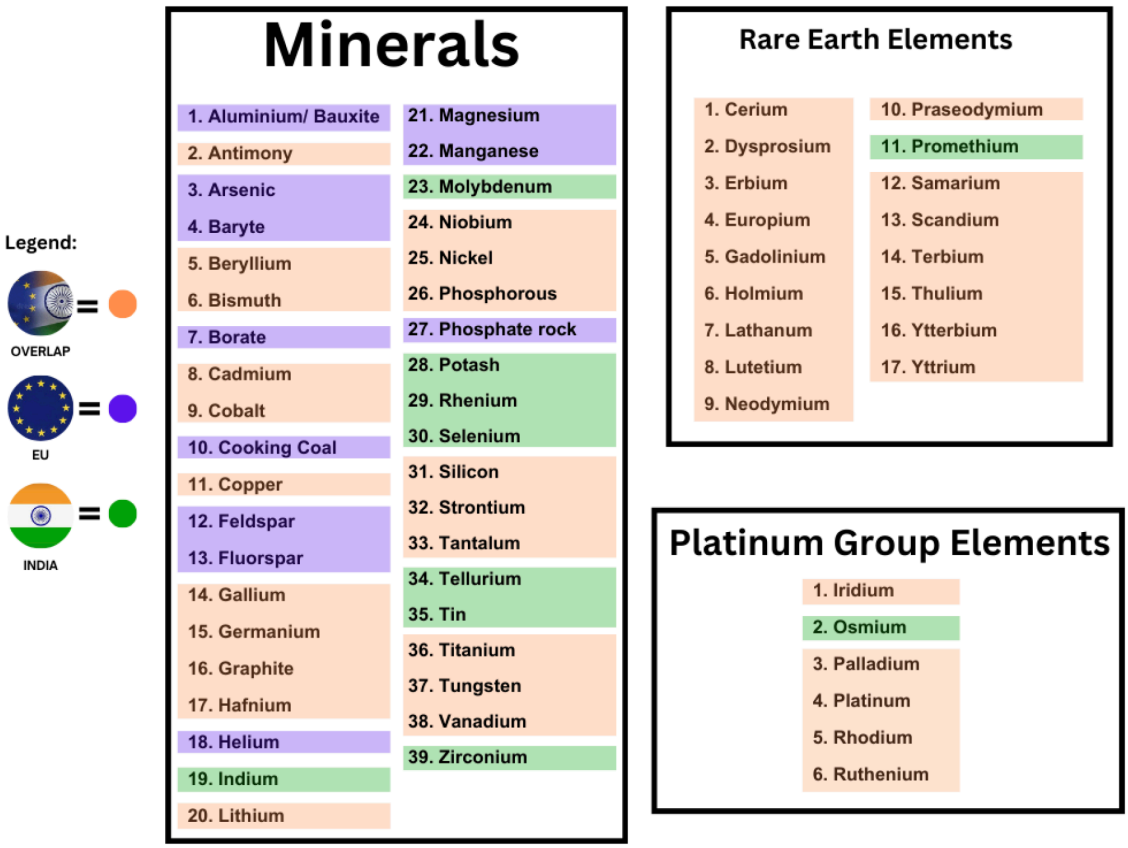

Figure 1: This figure displays the various materials and minerals that both the EU and India have designated as critical due to their supply insecurity. The blue colour represents materials and minerals that the EU considers critical, while the green colour denotes elements that are exclusively found on the Indian list. Orange denotes an overlap between the two.

Opportunities and Barriers to mining and refining

Mining

CRMs are infamous for their rarity. There are a few locations where high enough concentrations of certain elements are found that they are commercially viable. Cobalt in the Democratic Republic of Congo is a prime example of this, housing over half of the world's known reserves[26]. Information on the location of potential reserves is also difficult to access. Companies often seek to limit open access to information on mining locations across the globe, as they view it as information valuable for their competitors. These information blackouts arguably function both as high barriers to entry for new competitors into the business, and catalysts for competition among different political groupings for access to these resources.

Large scale mining operations are also infamous for the high cost they extract on the communities located in close proximity to them. These mines both consume large amounts of water and cause heavily pollution to groundwater

26 NS Energy, "Profiling the six largest cobalt reserves in the world by country", NS Energy, 7 June 2021.

reserves.[27] Tailings from mining operations have a detrimental effect not just on local ecosystems but also on human health[28]. CRMs can thus be a source of tension and conflict in the regions where mining occurs. Examples of where the presence of international mining conglomerates and their operations feed violence and conflict are often seen when there is impunity. The EU and India should at least be mindful that heavy mining industries can provoke civil unrest or conflict that hinders the supply of minerals to the global economy and shape their policies to accommodate such concerns. If ignored, these concerns risk supply chain instability through conflict[29]. Prime examples of this being instability in Congo fuelled by the mining of resources such as cobalt[30], or indigenous peoples in Ecuador attacking mining operations[31]. Incorporating local stakeholders such as community leaders, civil society organisations will be key to ensuring a stable source of mineral supply.

There are also significant efforts underway to survey potential locations for high concentrations of minerals within both Europe and India. Recent discoveries of CRMs have been made in both Norway[32] and Sweden[33], with the economic potential expected to be significant. Similarly, in India, the Geological Survey of India discovered inferred resources of lithium in Jammu and Kashmir. A core emphasis of the strategies for both the EU and India has been the continued exploration of potential mineral sources within their respective jurisdictions or partnerships. While this would certainly help to alleviate some demand, it likely will not be sufficient to meet the rising needs for minerals. Joint exploration of new resources would both help to increase the supply of the global minerals, and potentially help to diversify the supply chains by introducing new players into the markets. It is a recommendation frequently mentioned by groups in India[34] and Europe[35] encouraging their respective governments to build sustainable global partnerships with other major economies.

Refining

While significant barriers stem from the difficulties in sourcing the minerals, much of the problems facing stakeholders like the EU and India stem from refining and processing these minerals. Many of the minerals are difficult to extract from their ores or come so at a high cost[36]. Significant infrastructure investments are required in a country's refining industry to be able to process REEs, platinum groups, and minerals such as cobalt[37]. Currently China possesses a near monopoly on the refining of many CRMs particularly goods such as REEs. Chinese companies are also eager to maintain their position as a major refiner and often use their control of the market to set prices strategically so that profits are optimised or competitors cannot enter[38].

There are severe environmental costs associated with these refinement operations. Refineries are hazardous industries that often require extensive permitting and maintenance to limit

27 Shivani Lakshman, "More Critical Minerals Mining Could Strain Water Supplies in Stressed Regions", World Resources Institute, 10 January 2024.
28 Chenxu Su, Nahyan Rana, Shuai Zhang, Bijiao Wang, "Environmental Pollution and human health risk due to tailings storage facilities in China", Science of The Total Environment, Volume 928, 10 June 2024.
29 Claire Doyle, "The State of Play for Critical Mineral Policies: A Berlin Climate Security Conference Roundtable", New Security Beat, 23 October 2023.
30 Center for Preventative Action, "Conflict in the Democratic Republic of Congo", CFR, 21 February 2024.
31 Aimee Gabay, "Ecuador: Indigenous villages fight 'devastating' mining activity", Al Jazeera, 15 February 2023.
32 EPRS, "Norway to mine part of the Arctic seabed", EPRS, 26 January 2024.
33 NPR, "Rare earth minerals deposit found in Sweden", NPR, 13 January 2023.
34 Supra note 18, page 5.
35 Marie Le Mouel, Niclas Poitiers. "Why Europe's critical raw materials strategy has to be international", Bruegel, 5 April 2023, page 7-8.
36 Terry McNulty, Nick Hazen, Sulgiye Park, "Processing the ores of rare-earth elements", MRS Bulletin, Volume 47, pages 258-266, 21 March 2022.
37 Jared Cohen, "Resource realism: The geopolitics of critical mineral supply chains", Goldman Sachs, 13 September 2023.
38 Ernest Scheyder, Eric Onstad, "Insight: World battles to loosen China's grip on vital rare earths for clean energy transition", Reuters, 2 August 2023.

the environmental damage, although it cannot be prevented[39]. This makes establishing domestic refining centres in the EU and India difficult. Firms in the EU must both conform to its strict environmental standards, while also ensuring that the refining model produces finished minerals whose price is competitive with those of producers like Malaysia, Indonesia, and especially China. In India much the same is the case, although there has been a political pivot in seeking to shore up domestic refinement capacity. While there is a lower economic barrier to entry due to lower input costs, the country's extensive bureaucratic rules and regulations make setting up refining processes difficult[40]. Moreover, protectionist trade practices do not necessarily help in establishing such industries either. India has fallen short of its renewable capacity installation goals in part due to the introduction of tariffs on imported solar PV modules[41].

In establishing new centres for refining, it may also be essential to investigate the potential in furthering recycling initiatives for some of these minerals. By limiting the need to import minerals from outside of their markets they can help to reduce dependencies and support de-risking initiatives. But recycling often requires continued investment to ensure that the minerals gained from it remain price competitive. Minerals that are difficult to recycle such as cobalt and rare earth elements[42] are included in magnets and batteries. They require significant processing to first separate them from other elements they are alloyed with in these products, and then again refined to be usable in new products.

39 Rosaile Arendt, Vanessa Bach, Matthias Finkbeiner, "The global environmental costs of mining and processing abiotic raw materials and their geographic distribution", Journal of Cleaner Production, Volume 361, 10 August 2022.

40 Reuters, "Policy barriers, bureaucracy could slow pace of investment in India - Moody's", Reuters, 23 May 2023.

41 Will Norman, "Solar module imports nosedive in India following BCD tariff, JMK Research finds", PVtech, 29 November 2022.

42 Aarti Kumari, Sushanta Kumar Sahu, "A comprehensive review on recycling of critical raw materials from spent neodymium iron boron (NdFeB) magnet", Separation and Purification Technology, Volume 317, 15 July 2023.

EU and India Strategies

The issues listed above highlight the respective challenges each actor faces when de-risking their mineral supply chains. But a central question remains as to how the EU and India can support each other in achieving their goals of stable supply and diversification. This section will outline their existing strategies and highlight potential areas of mutual interest and cooperation.

EU

The EU seeks to reduce its dependency on any single state actor in the minerals market. It wishes to encourage a diverse range of states and actors to enter the market to limit the effects of potential shocks of crises on the supply of CRMs. The Critical Raw Materials Act adopted in March[43] specifies how CRM mining or refining projects can be designated as "Strategic Projects" by a Critical Raw Materials Board chaired by the European Commission. These projects are given priority status in EU law for administrative and judicial procedures. Strategic Projects are both aimed at internal initiatives with EU member states but also with external third party countries, and take into account the EU's Global Gateway Strategy. For external projects in emerging or developing markets these projects must be mutually beneficial for both the EU and the third party alongside contributing added value to the country where the CRMs originate[44].

The EU is reliant upon strong international trade systems to continue to supply these minerals, as production within the EU is currently low, and it is unlikely that the EU alone can meet the projected demand increase for minerals. The EU is therefore investing in partnerships with countries that supply these minerals such as Kazakhstan and Argentina that have great potential to scale up their current production of minerals such as lithium and REE.

43 Council of the EU, "Strategic autonomy: Council gives its final approval on the critical raw materials act", 18 March 2024.

44 General Secretariat of the Council of the EU, "Regulation (EU) 2024/1252 of the European Parliament and of the Council", 11 April 2024, page 4.

The risks with this system have been that they continue to rely on long and convoluted supply chains reliant on international trade. Should a repeat event like the COVID-19 pandemic occur, the EU may again find itself short on goods and products produced in countries that are inaccessible for trade. To circumnavigate this the EU will not only require greater domestic production and refinement, but also closer international partnerships with clear specifications for how each party is to act in the case of an emergency. It will also require multiple partnerships for any single mineral to limit supply risks. This is essential to both build trust and to ensure that the flow of minerals continues and limits the damage from any crisis.

This is imperative considering the current geopolitical environment of East Asia. Should competition between the USA and China continue to escalate, the EU may suddenly find itself cut off from supplies of critical minerals, particularly REEs. The EU has often supported US security policy in the region, to the detriment of its relationship with China by stationing naval vessels in the Indo-Pacific. If an escalation should occur, China may determine that limiting or stopping the export of CRMs to Europe as an adequate response.

India

In the coming years demand for energy in India is predicted to grow exponentially, mostly from industrialization and urbanization[45]. The country is currently heavily reliant on coal for many of its energy needs. This dependency is likely to increase as the country witnessed a slump in the addition of renewable energy capacity in 2023, whereas coal production grew by 11%[46]. To achieve its net-zero goals the country must begin to more aggressively introduce renewables into its energy mix. Durable and long-term policies will be needed not only to ensure that India does not excessively fall back on reliance on fossil fuels, but also to ensure that it has access to the resources needed, such as CRMs, to install more renewable energy capacity[47].

India has thus far mainly emphasized domestic supply over reliance on international partners, both regarding the mining and processing of critical minerals. The goals have been to support a pivot towards domestic suppliers and to support the growth of refining industries within India with the National Mineral Policy (NMP) acting as a guide for development of the mining sector and for establishing reliable mineral supply[48]. The government has established a royalty regime for some critical minerals to boost production domestically[49]. Many experts believe that this will prove inefficient as India is currently heavily dependent on the import of foreign goods to satisfy domestic demand. For this to work there would likely have to be some form of deregulation of India's business and industry laws. India's protectionist practices have hampered the continued development of its domestic solar industry[50]. Should India's efforts to establish a domestic industry continue to lag behind, the country will find itself increasingly dependent upon China to fill the gap.

Nevertheless, India has begun to actively forge critical minerals partnerships with likeminded countries such as Australia, Japan, and the US. For example, India joined the US-led Mineral Security Partnership (MSP) and Supply Chain Resilience Agreement of the Indo Pacific Economic Framework (IPEF). Similarly, the Critical Minerals Investment Partnership with Australia, Resilient Supply Chains Initiative (SCRI) with Australia and Japan, and the recent agreement for lithium exploration and

45 International Energy Agency, "Electricity 2024: Analysis and forecast to 2026", January 2024.

46 Shreya Jai, "Coal production in the country increases by 10.75% in 2023: Govt", Business Standard, 2 January 2024.

47 Subrata K. Mitra, Markus Pauli, jivanta Schottli, "Climate Change and India: Balancing Domestic and International Interests", The Journal of Indian and Asian Studies, Volume 3, Issue 2.

48 Ministry of Mines, "National Mineral Policy 2019", Government of India, 2019.

49 Anand Saurav, "Cabinet sets royalty rates for 12 critical minerals to boost indigenous mining, eyes reduction on imports", Energyworld, 29 February 2024.

50 The Economist, "India's solar power rollout is flagging", The Economist, 23 February 2023.

mining project in Argentina, among others are indicative of India's interest in collaborating in both upstream and downstream critical mineral supply chains.[51]

Some of India's public sector undertakings (PSUs) such as Coal India Limited, NLC India Ltd, Khanij Bidesh India Ltd (KABIL), and NTPC Ltd, and their subsidiaries are being encouraged and incentivized by the Government of India to acquire critical mineral assets abroad, including in the "Lithium triangle" – Chile, Bolivia, and Argentina.[52] India has also entered into a partnership with Australia to invest $3 million each in five critical mineral exploration projects located in Australia, in which KABIL is taking the lead.[53] In South Asia, Sri Lanka has emerged as a country of interest for graphite mining for India's Ministry of Mines.[54]

However, these are recent initiatives that will take time to materialize in tangible results, depending on geopolitical dynamics, sustained cross-border institutional partnerships, eased domestic regulations and accelerated infrastructure development, and robust research and innovation (such as processing technologies). For example, in comparison to other members of MSP, India's extraction and processing capabilities are relatively lesser, which could constrain India's participation in these partnerships.

51 Rishabh Jain, "Critical minerals – these are India's initiatives to strengthen the value chain and future opportunities", CNBC, 15 March 2024.

52 Shubhangi Sharma, "India to Capitalise on Coveted 'Critical Minerals Club' to Acquire Overseas Assets", News18, 15 February 2024.

53 Shreya Jai, "India Australia to invest $3 mn each in critical mineral exploration", Business Standard, 06 April 2023.

54 Aggam Walia, "Indian companies eye critical minerals mining in Sri Lanka, Australia as Mines Ministry expands search beyond South America", Indian Express, 04 March 2024.

Steps to take for Europe and India

In the analysis of the respective strategies, it becomes quite clear that there remain significant gaps and hurdles for both parties to achieving their goals of greater supply chain stability. India's approach mimics that of the EU insofar as there is an emphasis on building close partnerships with countries such as Australia and the United States. Though simultaneously there is a clear emphasis on developing the country's domestic market for the extraction and processing of minerals, which in turn face a multitude of challenges to become competitive. Similarly, the EU will require further extensive partnerships with third party countries to both mine and refine CRMs in line with the CRMA.

Both actors offer complimentary policies that can support and further each other's mutual goal of a more globally durable and open supply chain for critical minerals. Below are a series of recommendations for how this can be done through collaboration between the two groups.

Look jointly at R&D into alternatives to currently used CRMs

Currently critical minerals constitute an essential part in many industries and end consumer products. Already much work is underway to determine if products can be redesigned or innovated upon to use less of certain minerals. The EU and India should consider to jointly investigate where substitutions are possible. They could potentially draw upon existing partnerships such as EU-India Innovation Platform, India-EU Trade and Technology Council, and EU-India Clean Energy and Climate Partnership to achieve these goals.

The EU and India should pursue triangular partnerships for securing alternative sources of CRMs with third party countries

The two actors should leverage their respective global positions to more constructively reach out to countries of the Global South, such as D.R. Congo, Peru and Ghana, that are usually upstream in the critical mineral supply chains. By promoting holistic and transparent cooperation and investment opportunities that benefit the local communities, there is a higher likelihood of creating a more durable and open market for CRMs. This could be done through existing frameworks such as the strategic projects specified in the EU's Critical Raw Materials Act, or through India's Critical Mineral Investment Partnerships.

Consider targets for minerals sourced and refined in designated partnership countries

The EU Commission should consider the merit of additional targets for refinement and mining that include operations in trusted partnership countries such as India. By doing so the EU can meet goals for greater strategic autonomy without having to promote inefficient industries within the Union itself. Particular emphasis for this would be placed on minerals that both countries consider to be critical.

For India, the important steps include increasing incentives to scale up responsible production and refining of CRMs and inviting more investments into technology and infrastructure, some of which can be met with enhanced private sector involvement. This is where the private sector CRM actors in India and the EU can establish collaborations.

Cooperate on recycling and the product standards that are needed to enable this

A collaborative approach involving both EU and India in establishing and upscaling recycling centres, for goods such as REE, could help to address material shortages and limit pollution in ecologically vulnerable regions. Efforts in this direction are already being made; more joint collaborations could accelerate the global recycling efforts better.

About the Planetary Security Initiative
The Planetary Security Initiative sets out best practice, strategic entry points and new approaches to reducing climate-related risks to conflict and stability, thus promoting sustainable peace in a changing climate. The PSI is operated by the Clingendael Institute.

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