

Workshop on Critical Raw Materials for Low Carbon Technologies

January 30 - 31, 2024

The Ambassador, New Delhi

PROCEEDINGS REPORT



CONTENTS

A BRIEF	3
INAUGURAL SESSION	5
Plenary 1	
Strategies and Policies for Developing Resilient Critical Minerals Value Chain in India	7
Technical Session 1	
Roundtable on Securing critical mineral supply chains in a fragmented world	9
Plenary 2	
Navigating Geopolitics: India's Strategic Role in the Critical Minerals Landscape	11
Technical Session 2	
Roundtable on Critical Minerals in India: Enabling Sustainable Mining Practices	13
Plenary 3	
Emphasizing ESG Practices in Critical Raw Materials Mining	14
Technical Session 3	
Roundtable on Environmental and Socially Responsible Practices for Critical Raw Materials	16
Technical Session 4	
Panel Discussion on Modelling and Analytical Needs for Critical Raw Material	18
Plenary 4	
Localising Critical Minerals Value Chain in India	20
Technical Session 5	
Roundtable on Increasing domestic value addition in an uncertain technological landscape	23
Technical Session 6	
Panel Discussion on Closing the Loop: Improving Recyclability for CRM Sourcing	25
CLOSING PLENARY	27
APPENDIX: AGENDA OF THE WORKSHOP	29

A BRIEF

Objective of the Workshop

The workshop on 'Critical Raw Materials for Low Carbon Technologies' was organized to delve into India's potential strategies for harnessing Critical Raw Materials (CRMs) to enable a sustainable low-carbon energy transition. Through a collaborative effort among CEEW, CSEP, ICRIER, IISD and Shakti, the workshop aimed to address the strategic importance of critical raw materials such as Copper, Lithium, Nickel, Silicon, Manganese, and Neodymium, which are essential for the deployment of low-carbon technologies. Our collective goal was to navigate the complexities of concentrated supply chains and limited investments that create a risk of high price volatility and supply disruptions. This two-day event convened government officials, industry leaders, civil society organizations, and other vital stakeholders to deliberate on the challenges and opportunities of securing these materials and strengthening India's low-carbon technology value chains.



Pic 1: Photograph of organisers

Overview of Sessions

Day 1 commenced with an inaugural session, outlining the workshop's objectives. Plenaries delved into strategies for India to secure the Critical Raw Materials value chain, the role of geopolitics, and sustainable practices in critical mineral procurement.

Technical sessions during Day 1 explored supply chain security and sustainable mining practices, emphasizing the need for a cohesive approach. Day 2 focused on environmental, social, and governance (ESG) practices, analytical requirements, localizing value chains, and enhancing recyclability. Discussions encompassed diverse perspectives from industry experts, policymakers, and researchers. The full agenda of the workshop is attached as annexure.

The workshop provided a comprehensive platform for dialogue and collaboration, addressing India's critical mineral challenges and opportunities. It emphasized the importance of integrating ESG principles, leveraging technology for sustainable mining, and fostering domestic value addition. Stakeholders engaged in fruitful discussions, identifying key strategies to enhance India's position in the global critical minerals landscape. The closing plenary highlighted key takeaways and outlined future actions, underscoring the workshop's significance in shaping India's critical mineral policies and practices. Overall, the event catalyzed collective efforts towards achieving India's objectives in critical mineral procurement and sustainable development.

INAUGURAL SESSION

The Inaugural Session focused on setting out the brief for participants and sharing inputs on what India can do to strengthen its position on securing Critical Raw Material (CRM) supply for its energy transition.

Koyel Kumar Mandal, Chief of Programmes, Shakti Sustainable Energy Foundation delivered the welcome address and shared the following:

- The ongoing energy transition can offer multiple benefits in terms of development, job growth and other economic opportunities to the country. CRMs are essential ingredients to this transition. India is vulnerable to supply and price shocks due to risks in its supply chains.
- Various supply and demand side responses do exist but each comes with challenges. On the supply side, India can look for these materials globally or collaborate with a coalition of like-minded organizations such as the Mineral Security Partnership. But globally, we are also seeing an increase in resource nationalism as resource-rich countries are more and more nationalizing their value chains.
- India may also meet the demand by establishing value chains in the country and extracting these materials from its existing reserves. However, there is a need to offer more incentives to the private sector and ensure responsible extraction.
- Recycling can reduce the demand for fresh raw materials but there are challenges concerning technology.
- On the demand side, India can consciously adopt those Low-carbon technologies whose required constituent minerals are not critical and therefore averse to supply risks. There are ongoing efforts already in this direction but more pathways for the country on these lines need to be explored.
- Policy mandates and sectoral targets need to be adopted by the Government to provide clear market signals to the private sector and therefore, garner their interests and investments.
- It will be important that the Indian manufacturers buy the raw materials from Indian markets rather

than continue importing from other countries. The sustainable demand in India needs to be ensured and the role of manufacturing policies such as PLIs and their success will be critical.

- Access to technology and indigenous development will be important. India needs to put significant efforts into Research and Development along the lines of other countries which have been making strides in this area.
- The critical minerals strategy for India will involve solving both policy and markets. Informed foreign policies rooted in the current geopolitical landscape and comprehensive domestic policies will be needed to make progress.

Shri B. L. Kantha Rao, Secretary, Ministry of Mines, delivered the **Keynote Address** and highlighted the key efforts made by the Government of India to secure the critical mineral supply chain. He also posed some key questions for the participants for deliberation during the two days of the workshop:

- **National Geoscience Data Repository (NGDR):** The NGDR portal has been launched by the Ministry of Mines which houses basic geological, geochemical and geophysical data collected by the Geological Survey of India (GSI) for India's earth mass of 3.28 million sq. km. and exclusive economic zone (EEZ) of 2.37 million sq. km. The portal is available to any public or private sector organization that is interested in exploration. Integration of data from states, hydrology departments and the Director General of Hydrocarbon (DGH) will also be undertaken. The government of India will undertake 1055 exploration projects for the FY 2024-25 but the private sector is encouraged to take up more exploration projects in India.
- **Notified Private Exploration Agencies:** The Ministry of Mines had notified 16 private exploration



Pic 2: Secretary Shri V. L. Kantha Rao, Secretary, Ministry of Mines delivering the keynote address during inaugural session

companies certified through the Quality Council of India (QCI) and accredited through the Ministry. These agencies can take up exploration projects which will be funded by the Government through the National Mineral Exploration Trust (NMET). Four more agencies were added during the Second State Mining Ministers' Conference in Bhopal. Other private agencies can share their proposal through PSUs.

- **New Licensing Regime for Junior Miners:** A new regime has been brought in where any private entity can obtain an exploration license. Until now, only mining leases (ML) and composite licenses (CL) have been issued by the government. As a special provision for the critical minerals, the junior miners can now quote a revenue share of the royalty earned through the mining that they will earn as a reward for exploration in an area. Through the reverse bidding process, the government will award the exploration license to the junior minor with the lowest quoted share of revenue in the royalty.
- **Auction of Critical Mineral Blocks:** In November 2023, an auction of 20 critical blocks was started and another 20-30 blocks will be auctioned in March 2024. The number

of exploration projects by GSI has been doubled.

- **Mining in other countries:** India is exploring various bilateral and multi-lateral frameworks such as the Mineral Security Partnership (MSP) to secure critical minerals. Recently, an Indian PSU signed an agreement with an Argentinian PSU to jointly explore and develop five Lithium Blocks in Argentina.
- **Building In-House Processing Capability:** The Ministry of Mines has been supporting the various public sector institutions for R&D on processing technologies. The scheme has been liberalized and MSMEs and start-ups are also now being supported through the scheme. Currently, there is a knowledge gap in the industry on processing technologies and Shri Rao encouraged the partner institutions to organize a convening of industries, academic, R&D institutions and civil society organizations to deliberate on this issue.
- **Recycling:** Recycling can help with the in-house production of raw materials in the country and the government is deliberating on possible ways and policies to incentivize and develop a recycling ecosystem in the country.

Plenary 1

Strategies and Policies for Developing Resilient Critical Minerals Value Chain in India

Session Lead

Centre for Social and Economic Progress (CSEP)

Background

Understanding the need for a swift response to the emerging need for Critical Minerals, the Ministry of Mines set up a committee in 2023 and identified 30 critical minerals, many of which are needed for India's low-carbon technologies. The government also plans

to bring out a Critical Minerals Policy. In August 2023, the Indian Parliament cleared amendments to the Mines and Minerals (Development and Regulation Act), 1957, paving the way for commercial mining of six critical minerals – Lithium, Beryllium, Niobium, Tantalum, Titanium and Zirconium. The Offshore Areas Minerals (Development and Regulation) Act, 2002 was also amended to allow commercial mining of mineral resources in offshore areas. In November 2023, the government proposed auctioning 20 critical and strategic mineral blocks. The session organised by the Centre for Social and Economic Progress (CSEP) aimed to highlight India's need for critical minerals to achieve the net-zero target by 2070 and to lay the path for achieving this goal.



Pic 3: Panellists during the plenary on Strategies and Policies for Developing Resilient Critical Minerals Value Chain in India

Key Highlights

- Given the net-zero emissions target by 2070, India's demand for critical minerals will likely rise exponentially. Today, a major challenge is transitioning from an import-dependant to self-sufficient country for the minerals required to manufacture requisite green technologies.
- India has large resources of critical minerals like Cobalt, Copper, Lithium, Zinc and REEs (such as Neodymium). Still, only a small percentage of these resources have been converted to mineable reserves. Many critical minerals are deep-seated, thus requiring high-risk investments in exploration and mining. A key policy focus must be incentivising private-sector investment in domestic mineral exploration. The Ministry of Mines has introduced a new Exploration License system in August 2023.
- The Exploration License (EL) allows any private exploration company to bid for the reconnaissance and detailed exploration of various minerals listed in the MMDR Act. EL follows a reverse bidding process wherein the exploration company bids for a share of the auction premium if the mining lease gets granted. Eligible explorers would bid on their desired percentage share of the auction premium payable to the state government by an eventual ML holder (contingent on a successful discovery and subsequent auction), with the lowest bid winning the EL auction.
- The panel also noted that for an effective domestic exploration sector, there is a need to increase investment in exploration and enhance technological efficiency.
- The discussions highlighted the need to focus on sustainable mining practices across the value chain and to mitigate negative externalities on communities living in mining-affected regions.
- The discussion on the need for pre-embedded clearance noted that there have been excessive delays in providing post-lease clearances. The government must auction encumbrance-free mining land to avoid litigations and conflicts in the mining region.
- Critical mineral processing is still at a nascent stage in India, with domestic processing capacity available for only a few minerals, including copper, zinc and graphite. It is important to measure the capacity of domestic processing companies and assess India's comparative advantage in mineral processing. Critical minerals strategy for India must incentivise the processing of minerals to attract more investment.
- The panel also recommended that there is a need for developing domestic recycling capacity for critical minerals. Currently, there are no effective policies in place that focus on extracting minerals from waste and end-of-life products.

Technical Session 1

Roundtable on Securing critical mineral supply chains in a fragmented world

Session Lead

International Institute for Sustainable Development (IISD)

Background

The International Institute for Sustainable Development organised a closed-door technical roundtable discussion on “Securing critical mineral supply chains in a fragmented world”. The session focused on the challenges and opportunities faced by India from key vulnerabilities across the critical minerals supply chain. These vulnerabilities stemmed from the geographical concentration of production, processing, and supply chains, as well as the uncertainties associated with geopolitical events and technological disruption in critical mineral markets. Stakeholders from the government, academia, and the private sector engaged in extensive discussions on the challenges and opportunities of creating a sustainable and resilient supply chain and shared recommendations for government, industry and civil society.

The following questions were tested with the participants during the discussion:

- How is the international landscape of critical minerals

evolving and what opportunities and challenges does that present for India?

- How can India best engage with emerging international frameworks, such as the MSP, on critical minerals?
- What is India’s role in the global push for diversification of RE supply chains and where do the country’s interests converge and diverge with other allies?
- What challenges have KABIL and other Indian PSUs faced in securing critical mineral supplies and what reforms can help them to accelerate the sourcing of critical minerals?
- How can PSUs partner with the private sector, such as OEMs and technology manufacturers, to reduce the offtake risk of the purchased mineral?
- How can India’s trade policy better support its critical mineral objectives by lowering tariff barriers for imported minerals?
- How can India leverage its role as an emerging leader of the Global South to fulfil the desire of mineral-rich emerging nations to capture more local value addition, while meeting its interests in mineral processing?
- How can India engage with its allies to promote responsible and inclusive supply chains of critical minerals?
- What is the role of multilateral banks and international financial institutions in supporting low-cost financing across the critical minerals supply chain?



Key Highlights

- **Increased support for research and development of indigenous technologies:** Technology development in critical mineral processing and the battery midstream is still in a nascent stage in India. To reduce India's dependence on Western countries and China, there is a need to enhance public and private investments in research and development of indigenous mineral processing and substitution technologies. A designated institution or center at an academic institution could be created as a Center of Excellence focused on Rare Earth Elements (REE) and critical minerals.
- **Regulating Risk:** Industry experts highlighted the need for the government to also play the role of a facilitator for private companies to secure critical mineral supplies. Resource-rich developing countries can present challenges in terms of contract and expropriation risk, with some cautionary examples in the past. To derisk investments made by the private sector, it was suggested that the Indian government integrates risk clauses in existing Free Trade Agreements and Bilateral Investment Treaties. Additionally, India can support international conversations around changing the nature of export controls in resource-rich countries, such as through phased export restrictions rather than immediate bans, to reduce mineral supply disruptions.
- **Innovative Financial Instruments:** The critical mineral supply chain is highly capital-intensive, making it essential to explore different financial instruments to overcome limitations around the availability and scale of public finance. The use of financial instruments like green bonds have been limited in the mineral supply chain but can help manage price volatility. Experts suggested that India can create appropriate incentives to encourage their use for critical minerals.
- **Prioritization of critical minerals list:** Experts lauded the government's recent efforts, particularly the launch of the official list of critical minerals by India. They suggested that the next step should be to categorize these 30 minerals based on priority in terms of resource availability, end-use requirements, and strategic importance. This would enable the government to focus its efforts on a few key minerals and sequence its sourcing strategy to meet India's industrial needs.
- **Need for a whole of government approach:** Experts highlighted the need for a whole of government approach given the interlinkages between clean energy and critical mineral supply chains. End-use demand generation is essential for building India's critical minerals strategy. For example, the local manufacturing of battery production is falling behind projections, with mixed results in other clean energy technologies. India's critical minerals strategy should focus on the entire value chain from mineral to clean energy. Experts cited the example of China's successful strategy to develop a national licensing framework on cutting edge technologies.
- **Role of state governments:** Several roundtable participants highlighted the need to involve state governments in India's critical minerals strategy formulation, given their importance across the supply chain. Experts cited the need to involve them in discussions around exploration of critical minerals and incentives around investments in mineral processing and substitution technologies.
- **Adoption of ESG Standards:** Experts suggested there is a need to harmonize ESG standards and practices for developing countries, like India, which are seeking fair value addition and not just resource extraction. They mentioned that the mining sector has traditionally operated in a manner that has alienated people and communities, leading to land conflicts, which have been a roadblock in developing the sector. There is a risk that conflicts around critical mineral extraction can delay or disrupt the energy transition. Adopting ESG standards can ensure social buy-in from communities involved in mining, but there is a need to gear up industry in its implementation.

Plenary 2

Navigating Geopolitics: India's Strategic Role in the Critical Minerals Landscape

Session Lead

International Institute for Sustainable Development (IISD)

Background

India is increasingly assuming a more prominent global role in the critical minerals landscape by

engaging in resource diplomacy with resource-rich countries as well as through international frameworks, such as the Mineral Security Partnership and the G-20 summit.

In this panel discussion organised by the International Institute for Sustainable Development, experts from academia, industry, and diplomatic missions shared their insights on how India can gain a foothold in the global critical mineral supply chain through strategic cooperation and partnerships with like-minded nations.



Pic 4: Panellists during the plenary on Navigating Geopolitics: India's Strategic Role in the Critical Minerals Landscape

Key Highlights

1. Strategic Partnerships

- Australia and the US are natural partners for India given the growing geopolitical alignment with these countries and their desire to diversify supply chains. However, the critical minerals industry in these countries has been mostly driven by the private sector. This has required an adaptation in their government's approach given India's focus on government-to-government partnerships and reliance on public sector units (PSUs) to secure critical mineral supplies.
- Multilateral initiatives like the MSP are important but can be slow to respond in a very dynamic critical mineral supply chain. This creates space for bilateral agreements that usually come with existing regulatory frameworks, making it faster to achieve outcomes.
- There is great scope for south-south cooperation between India and other resource-rich developing countries, such as in Africa. Several countries are not part of the broader Western political and economic alliance nor are they aligned with China and Russia, making India a safe alternative third choice for collaboration.
- India can also look at better leveraging other international frameworks, such as the Quad, given the complementarities between the four countries across the critical mineral supply chain. Engaging with countries like Japan on processing technologies could be important in building a diversified supply chain.

2. Industrial ecosystem

- Trade restrictions and barriers can be a major impediment to creating a resilient critical mineral supply chain. An international expert highlighted the potential for India to leverage its trade policy to secure supplies, which has been found to be more effective than even industrial policies in some cases.
- Limited demand for processed minerals in India is holding back the development of critical mineral processing facilities within the country. For India to increase its processing capacity, it is important for the industry to access mature markets, like the US, which can be facilitated through bilateral agreements between the two countries. Developing mineral processing facilities today would prepare India for future domestic production of critical minerals.
- An industry expert highlighted that the capital and operational expenditure of setting up battery component facilities in India can be more competitive than developed nations when considering state policies and incentives. However, there needs to be more efforts to increase awareness of India's incentive programs among foreign companies.
- There has been an increasing focus on ESG standards in global agreements and partnerships, such as the Mineral Security Partnership, where ESG is a defining principle of the alliance. There is a detailed guidance note formulated for MSP projects by borrowing from existing frameworks and initiatives on ESG.

Technical Session 2

Roundtable on Critical Minerals in India: Enabling Sustainable Mining Practices

Session Lead

Centre for Social and Economic Progress (CSEP)

Background

This session aimed to get stakeholders' input on how India can improve the current mining policies towards sustainable growth of the domestic critical minerals sector. With this objective, the panellists were prompted with three questions for discussion during the roundtable:

- What challenges are faced in exploring and allocating critical and deep-seated minerals?
- What are India's advantages in the critical minerals value chains, and where can India consolidate with global value chains?
- How can India strengthen its Environment Impact Assessment (EIA) and Social Impact Assessment (SIA) regulations to enable sustainable mining?

The following recommendations were shared with the participants and tested during the discussion:

- Eligible parties should bid on the share of the value of the minerals that they would pay to the state government on successful discovery and mining;
- The proposed CL should expand its scope to allow reconnaissance and thus have a greater maximum area grantable to exploration companies;
- The reconnaissance component of the CL may be granted for an area up to 1000 km², with safeguards in place to prevent companies from not conducting exploration activities within a specified time; the leaseholders could be required to provide evidence of work done periodically; and
- After three years of reconnaissance, the leaseholder should relinquish 75% of the original area. If there is sufficient evidence of mineral content, as per the existing CL norms, the leaseholder should be allotted

an area of 25 km² within the explored area for further prospecting and subsequent mining of specific minerals. These recommendations would allow exploration companies to sell or mine any resources they discover.

Key Highlights

- Two major concerns regarding ELs were highlighted in the discussions:
 - » exploration companies are not conferred any mining rights under this licensing regime, and
 - » the returns on exploration investment may only be received long-term when mining activities commence in the explored region.
- The discussion focused on prioritising sustainable mining practices and protecting the rights of the communities living in mining-affected regions. There is a growing concern due to the increased conflicts in land rights that have led to many communities not being adequately compensated when displaced. Similarly, granting mining leases in forest areas or wildlife zones has led to long delays in granting environmental clearances.
- The discussions brought out the need for changes in mineral allocation policies to account for the rights of communities and ecosystems, including providing pre-embedded clearances for mining leases.
- The discussions also called for global technology cooperation in exploration, mining, processing and recycling. Cooperation and information sharing can also help reduce the negative externalities across critical mineral value chains in India by imbibing international good practices and standards. India's government and private sector need to increase their investment in technology development to boost their domestic mineral capacity.
- It is important to create strategies for processing critical minerals that are domestically mined, providing incentives to mineral processing companies.

Plenary 3

Emphasizing ESG Practices in Critical Raw Materials Mining

Session Lead

Indian Council for Research on International Economic Relations (ICRIER)

Background

Incorporating ESG principles into critical raw material mining is not only a matter of social responsibility but

also a strategic business decision. It helps mitigate risks, enhances reputation, and ensures the long-term viability of mining operations in a rapidly changing global business environment.

The panel discussed various facets of ESG from different perspectives. The plenary focussed on discussing strategies that can be implemented to ensure sustainable and responsible mining practices and CRM value chain development while adhering to environmental regulations and standards in the industry.



Pic 5: Panellists during the plenary on Emphasizing ESG Practices in Critical Raw Materials Mining

Key Highlights

- The discussion revolved around the numerous facets of Critical Raw Materials (CRM) in the context of India. Speakers touched upon the **regulatory** angle, alluding to the legislations like the Indian Forest Act, Forest Conservation Act, etc., championed by the Ministry of Environment, Forest and Climate Change (MoEF&CC) to ensure sustainable mining and raw material collection practices. Similarly, it was highlighted that the country has also made strides in the **financial** aspect, as is evident from the formulation of the Business Responsibility and Sustainability Reporting (BRSR) code, which aims to link the financial results of a company with its ESG performance.
- It was stated that while efforts are being made, their effectiveness is contested. The BRSR reporting serves as a good starting point, and it is expected that regulatory mechanisms will be gradually strengthened and investors will become more assertive over time. Therefore, adherence to ESG standards is anticipated to become crucial for mining companies, and regulations are expected to eventually percolate down to on-the-ground implementation.
- Given the ubiquitous nature of CRMs and their ever-increasing demand, panellists underscored the need for exploring alternatives to the 30 critical minerals as identified by the Ministry of Mines (MoM). This would be needed to minimize reliance on sparse CRMs that require extensive mining. For instance, using sodium instead of lithium in batteries.
- In terms of actions undertaken to minimize ecological damage, it was highlighted that many mining companies are willing to undergo comprehensive portfolio audits; allocating funds to communities to hire independent experts who would serve as watchdogs to ensure accountability and true benefit & profit sharing. The idea behind the same is that supply chain security cannot be maintained till such time that there is community consent.
- The speakers indicated that the criticality of minerals arises on two accounts: the first is due to the risk of supply, and the second is for its lack of substitutability. It is expected that the future demand for the same will arise from the renewable energy, defence, aerospace, and cleaner mobility sectors.
- Given that minerals are generally found in association with other substances, it is important to be cognizant of the fact that the extraction and transformation processes involved tend to be water and energy-intensive. The speakers drew attention to the need for undertaking in-depth Life Cycle Assessments (LCAs) to gauge the greenhouse gas (GHG) and ecological footprint (land, water, ecotoxicity, etc.).
- It was indicated that the ESG transition in the mining sector should comprise four key aspects, namely (a) trust among the mining communities, (b) reporting via third-party audits, (c) traceability (via LCA, data collection, and inventorization for public consumption) and (d) consumer knowledge (who would be interested in knowing whether what they are consuming is sustainable or not).
- It was stated that there exist multiple commonalities between UK and India as far as CRM is concerned. This is evident from the government outlook, ambition and requirements of the two countries. For instance, UK had launched its CRM strategy wherein it had released a 'watchlist' for key minerals, many of which overlap with India's identification. Similarly, both countries are a part of the Mineral Security Partnership (alongside other players such as the US, EU, etc.) that aims to ensure the resilience of supply. The importance of circularity for relieving pressure on primary demand is also an aspect that is common for both India and UK.
- The speakers also elaborated on the long legacy of mining in the UK, by way of which the country has been a strong proponent of ensuring supply chain resilience and responsible mining & sourcing practices. The UK is spearheading this agenda at the global level through international partnerships and forums. Additionally, the country is also engaged in mapping the availability of critical minerals along with the associated ESG risks.

Technical Session 3

Roundtable on Environmental and Socially Responsible Practices for Critical Raw Materials

Session Lead

Indian Council for Research on International Economic Relations (ICRIER)

Background

The session focussed on how ESG (Environmental, Social, and Governance) can be made stringent and more meaningful in energy transition in particular. It

mentioned however that it is important to understand the next steps and specifics needed to be maintained in addition to ESG in critical minerals. The session began by providing a snapshot of the key takeaways from the previous session and upheld the question “Why is there a need for ESG”? The session emphasized that there exist costs associated with the compliance of ESG norms but also highlighted the importance of having such norms. The discussion focussed on gauging whether ESG compliance is a cost in terms of additional regulatory burden or it is an investment in terms of increased social reputation and other economic factors. However, a common knowledge of which norms to follow is a crucial determinant.

Key Highlights

- It was discussed that there are already many mandates, but now it is crucial to move towards incentives-based mechanisms promoting environmentally and socially responsible CRM sourcing. Then it is important to understand how to generate gains for companies actively working towards this compliance.
- It was felt that tapping into international markets could be a solution. It would not only help pass through the ESG cost of compliance but also ensure greater market readiness. Since countries like the EU and US have higher ESG standards, India has to undergo stringent audits globally. However, ESG compliance can also increase India's competitiveness globally.
- With battery costs reducing over time, there are enough margins available with companies to comply with ESG standards. Speakers expressed that processing technologies can also now be easily made compliant with ESG standards, which could consequently end up reducing costs. However, funding is required to innovate such technologies. It was emphasized not to compete with China solely on scale and price, but also to explore partnerships with other countries for reliable sourcing of critical materials.
- Awareness of ESG principles will play a critical role. Therefore, capacity-building and education programs should incorporate them into the curriculum, including training officials and integrating ESG into STEM and other training programs.
- It is necessary to examine ESG from a holistic perspective, looking at the system from both the macro and micro perspectives. Currently, the resources sector is quite heavily taxed, and the primary focus is on generating revenue through auctions. However, there needs to be a renewed focus on recycling collected revenues through bodies such as the District Mineral Foundation (DMF) to increase social welfare. Getting greater social acceptability of mining projects would also ensure that projects do not get delayed and there are no ensuing cost overruns.
- Certain low-hanging fruits may be tapped as far as policy measures are concerned. Some examples that were given were rules for scrapping of 2-wheeler vehicles, parity in GST rates for replacement and new batteries, etc. The policy also needs to incentivize associated minerals to improve the viability of CRM mining at the company level.

- Upstream and downstream linkages in ESG would require the utilization of national and state-level funds.
- Harmonizing standards and practices for reporting in ESG is required. In addition, involving state government in both setting up of ESG standards and monitoring of compliance with standards was discussed.
- SEBI targets not only to gauge the company's ESG compliance but also to trace their upstream and downstream partners' activities via regulating their Scope 3 emissions. SASB and GRI are also working on making sector-specific activity matrix disclosure norms more detailed.
- Since critical minerals are import-dependent, recycling becomes important. Small unorganized players pay more to get the material directly from customers. Therefore, formal recyclers, lacking access to scrap are unable to achieve the critical mass needed for profitable operations. There is a need to ensure traceability and material balancing at every stage so that support is provided to genuine recyclers by the government.
- ESG would create jobs because the transition towards EV batteries and auto components would require skills that would increase employment. Thus, it was concluded ESG is not just a cost but also could be an opportunity for the economy.
- Integration of ESG components with one another gets lost when we talk about ESG compliance altogether. Individual components and how they bolster one another should be focused.

Technical Session 4

Panel Discussion on Modelling and Analytical Needs for Critical Raw Material

Session Lead

Shakti Sustainable Energy Foundation (Shakti)

Background

To move the market to increase supply and improve responsible sourcing, governments and industry will need

to create clear demand signals, and map supplies and potential price uncertainties that need to be addressed through the formulation of robust policies. Many countries have started developing modelling capabilities for critical minerals to inform such decisions. Developing these models requires collaboration among value chain players to ensure data availability and transparency. To create a cogent articulation of this need, this technical session organised by Shakti, in collaboration with the International Copper Association, discussed the necessities and requirements for building critical raw materials modelling capability in India.

Key Highlights

The session began with a presentation by the Fraunhofer Institute on the Copper stock and flow model it has developed for India with the support of

the International Copper Association. UC Davis ZEV Centre presented the Global Dispatch Model that it has been developing by mapping mine-level data to identify when and under what circumstances, the resources (raw materials) will become competitive.



Pic 6: Panellists during the Panel Discussion on Modelling and Analytical Needs for Critical Raw Material

The discussions revealed 3 important reasons for building CRM (Critical Raw Materials) modelling capabilities, notably:

- **Economic and Trade Aspects:** These studies help stakeholders comprehend the economic significance and trade dynamics of CRMs. By analysing supply chains, production costs, and market demands, stakeholders can make informed decisions about investments, risk management, and securing supply chains against disruptions.
- **Geopolitical Aspects:** CRM modelling sheds light on the geopolitical landscape, identifying which countries dominate the supply of critical materials and the processing stages. This understanding is crucial for assessing vulnerability to supply chain disruptions and strategizing for more diversified and secure access to these materials.
- **Environmental, Social, and Governance (ESG) Considerations:** As global consciousness towards sustainability grows, CRM modelling studies become essential in ensuring that the sourcing and production of critical materials align with ESG criteria. This involves evaluating the environmental impact of extraction and processing, ensuring that social rights are respected in mining communities, and promoting transparent and accountable governance practices. Consequently, these studies support investors and companies in making responsible decisions that align with sustainability goals.

The panellist made the following recommendations:

1. Data

- **Technology Choice and Material Intensity:** The low carbon technology choice and the intensity of CRMs within it significantly influences mineral demand, necessitating integration of material intensity into energy demand models for accurate future demand predictions.
- **Geological Data:** Supply-side data often lacks clarity. While USGS data is considered reliable, comparison with other national geological surveys (Australia, UK etc.) highlight the incomplete picture of material sources, emphasizing the need

for information sharing and authentication across nations.

- **Harmonized System (HS) Codes:** Current HS codes lack the specificity required to accurately track CRMs for Low Carbon Technologies (LCTs), due to their inability to distinguish between different material grades. A revision of HS Codes, with discussions initiated at the WTO, is crucial to address the unique requirements of CRMs.
- **Recycling:** Recycling data gaps are prevalent due to significant informal sector involvement in collection and processing, suggesting a need for assumptions and data interpolation to develop a comprehensive analytical model that offers deeper recycling insights.
- **Embedded CRMs:** Tracking difficulties arise for materials embedded into goods, like nickel in stainless steel or copper in the alloy. Knowledge of CRMs embedded can give us a full picture of our reliance on CRMs, and also help recyclers improve their efficiency.

2. Opportunities

- **Modelling Capacity:** There is a need to build more capacity within academia and civil society for modelling and analytical work. Much of this data is proprietary in the hands of a few organisations. The information asymmetry needs to be fixed to enable effective cooperation between different stakeholders within the CRM ecosystem.
- **Tracking and Labelling:** Responsible sourcing practices are required to ensure long-term security. Large Auto OEMs have already begun demanding higher ESG standards voluntarily to meet investor requirements. This will require transparency in mineral sourcing data, mineral content-quality data, and means of tracking across value chains. There is an opportunity to ensure mineral tracking and labelling practices are adopted, which can bridge many of the concerns mentioned above.
- **Data Transparency:** Industry and Governments have a critical role in enabling transparency in data, to help actionable insights.

Plenary 4

Localising Critical Minerals Value Chain in India

Session Lead

Council on Energy, Environment and Water (CEEW)

Background

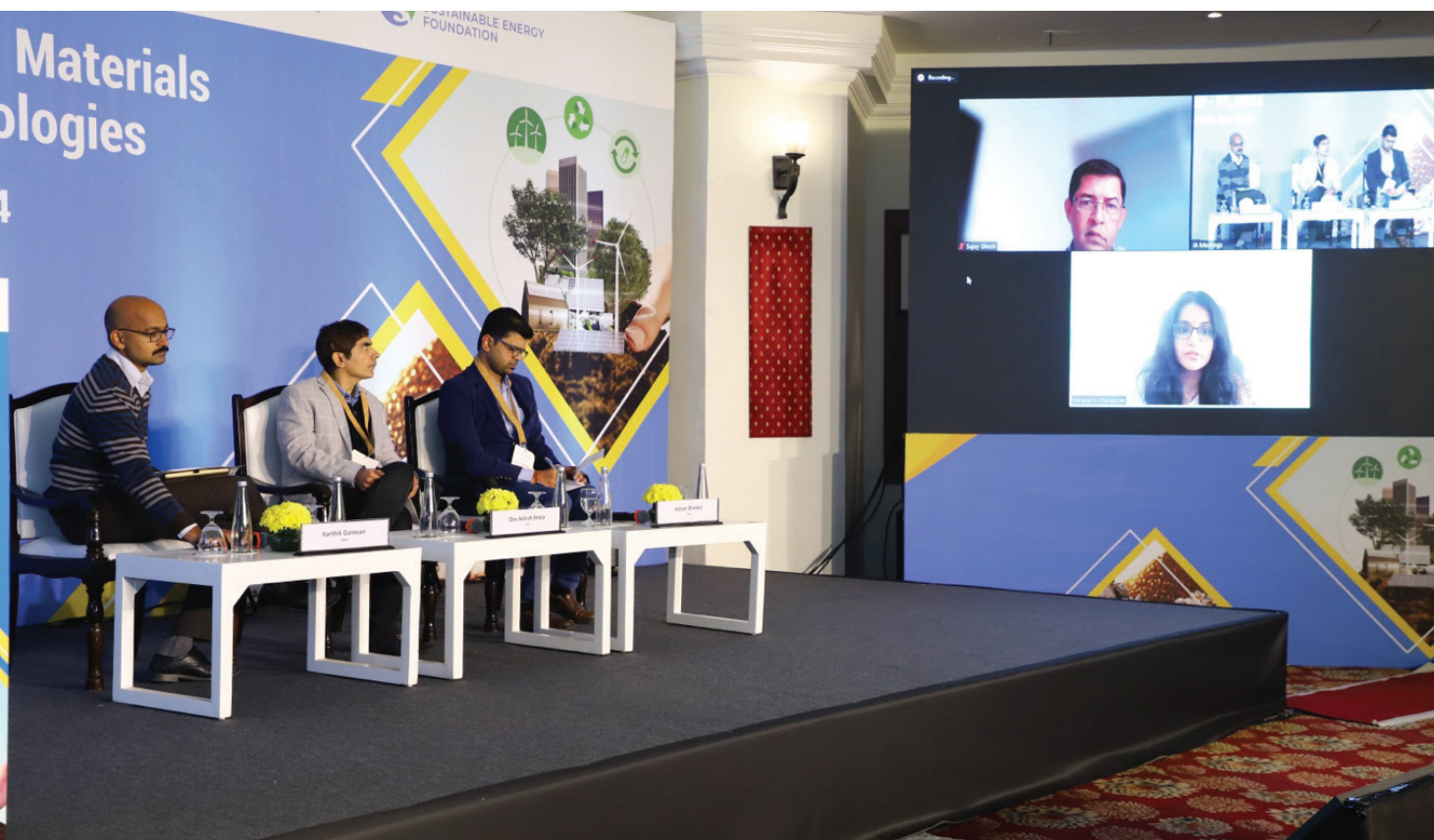
The government of India has implemented a host of policy measures including the Production Linked Incentive (PLI) to boost domestic manufacturing and promote self-reliance in the clean energy sector. The Solar

PLI Scheme, launched in 2021, focuses on indigenising up to 90 per cent of the solar value chain. The Battery PLI scheme promotes the manufacturing of advanced cell chemistries and indigenising up to 60 per of the value chain. A secure availability of critical minerals will be important for India to achieve such targets. In addition, early action in the sector also provides an opportunity for India to create new jobs and aid the economic growth in the country. The plenary focused on discussing the requirements for creating a responsible critical minerals value chain in India.

Key Highlights

- Though there is a market surplus of solar modules, the primary differentiator for India will remain its inherent demand due to its 2030 targets of adding 500 GW of renewable capacity. Moreover, this demand will further increase due to EV targets as well as targets for

green hydrogen. With all the expansion in solar sector that is going on in India along with Environmental, Social and Governance (ESG) compliance and Carbon Border Adjustment Mechanism (CBAM) compliances globally, India can be an important manufacturer and supplier globally aptly fitting into the China+1 strategy.



Pic 7: Panellists during the plenary on Localising Critical Minerals Value Chain in India

- India also has substantial room for sustainable and ethical sourcing which will give it an edge not only in domestic market, but for exports as well as for inviting investments into manufacturing.
- Photovoltaic (PV) manufacturing industry has been categorised through cycles of excess capacity, consolidation, price correction and excess capacity coming again. Historically, most of this excess capacity is state sponsored by China. It has created enough inventory and capacity to cater to demand until 2032.
- Possibility of monopolisation and weaponisation of the value chain are there and as a reaction, countries are putting into place policies which will help their domestic solar sector come up. Flip-flops on policies is also there. Gestation period of creating an ecosystem is at least 5 years and to develop that ecosystem, some regulatory consistency is required.
- The pace of transmission build-out lags the pace at which manufacturing gets build out.
- People who are involved in higher degree of vertical integration will eventually win in the price competitiveness race. Profit pools are in the upstream of solar value chain.
- Thin-film technology may continue to increase its market share due to non-dependency on silicon value chain for its raw materials and components. Thin-film solar is a promising alternate technology India can strengthen its technological capacity in.
- Lack of cost optimisation and inventory liquidation is evident in component and materials by big players.
- While ensuring vertical integration, Indian manufacturers are also looking forward to ecosystem support within the country. Components of supply chain such as production equipment for solar, skilled labour force etc can be had only with support from government.
- To have a successful PLI, enough offtake needs to be there in the market, PLI incentives should be disbursed on time, access to low-cost financing for CapEx as well as OpEx, manufacturing clusters and hubs equipped with raw materials other than polysilicon, wafer and module such as glass, EVA, encapsulants etc need to be built and support to MSMEs by the government through PLI are required.
- Enough tie-ups across border should be there to access the technical know-how of industry. The cell technology, ancillary products and production equipment should be an IP that is owned by India.
- Majorly Indian start-ups are involved in downstream battery processes such as battery packs and analytics to help OEMs design better battery packs. From the perspective of cell technology, anode material manufacturing has been focal point of Indian start-ups.
- Private capital will come in for the battery sector only when there is traction, orders etc. So far, government grants have supported early-stage companies. Cell companies and recyclers have not been incentivised by the government. Government can incentivise these mid-stream companies to kickstart the ecosystem.
- No problems have been faced in sourcing training and training talent for thin-film technologies. Shipping of experienced talent to overseas projects made the core workforce trained to operate the machines. This core-workforce further trained tier-2 and tier-3 engineers with 0-2 years of work experience.
- Solar panel waste and EV battery waste can be areas of diversification for e-waste recyclers. Initial seed capital for this can come from government.
- 90 per cent of recyclers are not fully focussed on renewable recycling. They are into recycling of other materials also.
- R&D budget for recycling, technological understanding of recycling, and understanding of players which currently exist in recycling ecosystem need to be there to build renewable recycling industry domestically.
- For the purpose of providing financing for gigafactories, venture capitalists are also interested in knowing the circularity of materials, responsible sourcing etc.
- Cadmium tellurium composite used in thin film technologies is not toxic, when converted to waste,

it qualifies as a non-hazardous waste and has been certified so based on global standards. Moreover, thin-film technology produced in India considers circularity and has been giving away materials such as glass cullets for bottle industry, semiconductor waste recycled is used for making new components.

- Continued support in form of Approved List of Module Manufacturers ALMM, trade barriers etc is required for basic price protection. Manufacturing potential within India needs to be unlocked.
- Many solar panels and other renewable products are not manufactured in India, and the information about what has gone into making them is not available to domestic recyclers, which makes them unable to recycle the waste efficiently. Dialogue

between stakeholders of the value chain, especially manufacturers and recyclers, needs to be there.

- Incentivisation of recyclers who venture into categories of waste where critical minerals such as rare earths etc can be recovered.
- India is not an export-oriented economy, as 85 per cent of components are imported in silicon solar value chain. It is going to be inherently more competitive with initiatives such as the Inflation Reduction Act (IRA). Therefore, a focus is towards developing alternate emerging technologies such as Thin-film, perovskite, HJT and TopCon rather than chasing market monopoly is the way forward for India.

Technical Session 5

Roundtable on Increasing domestic value addition in an uncertain technological landscape

Session Lead

Council on Energy, Environment and Water (CEEW)

Background

The role of critical minerals at the intersection of technology, energy, and resource management is the focal point of almost all major discussions globally. With the world's transition towards renewable energy technologies accelerating, the demand for critical minerals, essential components in clean energy production, has increased. However, the future of this demand is characterized by significant uncertainty,

influenced by rapidly evolving technological innovations, geopolitics, and sustainability imperatives. Given this context, it becomes crucial for India to develop its capabilities across the clean energy critical mineral value chain, encompassing mining and processing.

This roundtable served as a platform for experts, policymakers, and industry leaders to engage in a comprehensive dialogue about the uncertainties surrounding the demand for critical minerals in the renewable energy sector, shedding light on the challenges and opportunities this dynamic landscape presents for a sustainable and low-carbon future and brainstorming on the role India can play through domestic value-addition, in tackling these uncertainties. Through this discussion, we gained a deeper understanding of the complex forces shaping the critical minerals market and demand to chart a path towards a responsible and resilient mineral supply chain for India.

Key Highlights

- Developing technologies in mining and processing is essential for strengthening India's critical mineral value chain. However, India should look forward to building its capabilities to cater to domestic and global critical mineral demand. Given the geopolitics, India can aim to position itself not only to achieve price competitiveness in products but also to become a non-China alternative to cater to global demand. This way India can hold a sweet spot in the future global critical mineral value chain.
- While a lot of research and development is already happening at the lab scale in India, the commercialisation of critical mineral processing technologies remains a challenge. Government encouragement to startups in the mineral sector is a good starting point to bridge the gap between industry and academia.
- Clear long-term policy consensus is required to support domestic manufacturing which takes into account both deployment and local indigenisation goals.
- Collaborations between Indian companies and international players in the solar and battery industry can enhance technology transfer and knowledge exchange. Such partnerships can help Indian manufacturers stay updated with the latest advancements and improve their global competitiveness
- Indian recycling companies should not look at just Indian market but should try to target global market for recycling. Since the complexity of the chemical composition in the available imported scrap often poses challenges for recyclers, it is essential to guarantee that recyclers have access to the necessary technology for processing both domestically generated and imported scrap.
- Vertical integration in the manufacturing process, from raw material production to the assembly of final products, can be a competitive advantage. India

has the potential to develop a vertically integrated supply chain for solar panels and lithium-ion batteries, ensuring greater control over costs and quality.

- The presence of startups in clean technology manufacturing reflects a growing entrepreneurial spirit in India's clean energy sector. These startups

bring fresh ideas, agility, and innovation, contributing to the overall competitiveness of the industry.

- India is a good place to do low-cost R&D. The existing human capital in complimentary industries needs to be trained and diverted towards energy transition. This way strong skill-force can be provided by India for global clean energy value chains in long-term.

Technical Session 6

Panel Discussion on Closing the Loop: Improving Recyclability for CRM Sourcing

Session Lead

Indian Council for Research on International Economic Relations (ICRIER)

Background

The session focused on the issue of recycling for critical raw mineral (CRM) sourcing, elaborating on the related diverse aspects that need to come together to ensure a successful strategy towards following net zero pathways.



Pic 8: Panellists during the Panel Discussion on Closing the Loop: Improving Recyclability for CRM Sourcing

Key Highlights

- Incentivizing CRM recycling would need the development of a graded incentive system emphasizing key parameters- the quality of recycled products, recycling, and recovery efficiency, technology adopted, investments, and potential implications on the state economy. The focus should be on 30 CRMs identified by the Ministry of Mines and greater incentives should be given to those producing products of higher purity.
- Current recycling processes primarily involve re-melting and not refining collected waste. Re-melted scarp yields inferior quality products, thus there is a critical need for technological solutions to enhance efficiency and elevate the quality of the final recycled product, emphasizing the need to mitigate risks associated with low-quality recycled goods and imported materials.
- The informal sector forms a crucial component of recycling. The requirement is to understand their needs and subsume them into the formal ecosystem. Start-ups in the field can play a role in the system in the form of waste aggregators.
- There is a clear need to recognise that “recyclers” are not a homogenous group of entities, but rather a heterogenous set constituting collectors, segregators, remelters, and material recovery facilities.
- Producer responsibility organizations (PROs) will aid in formalizing the recycling ecosystem as they serve as a vital connecting link between original equipment manufacturers (OEMs) and recyclers. They need to be seen as an important part of the reverse supply chain.
- Resource Recovery Parks (RRPs) will enable an exchange of waste from various streams to provide related benefits to all types of engaged recyclers in the park. The RRP should provide for all supporting infrastructure to the recyclers like storage, R&D facilities, etc., to ensure a holistic development.
- RRP can engage and support the informal sector in waste recycling and collection activities. For this RRP should be strategically located in dedicated zones to facilitate the movement of informal recyclers, who play a pivotal role in waste collection efforts.
- There is a need to enhance the working conditions of the informal sector in a secure environment, encompassing environmental, economic, and occupational safety aspects to protect them from related hazards.
- Dependence on imports to achieve the required critical mass of waste stream is not feasible. In the current overall metal flow in the country, the import of scrap is smaller in comparison to domestic scrap because of the non-availability of good quality recyclable scrap from the international market. The reason is that the international market treats scrap as a resource and hence it is traded strategically and not available easily.
- Available imported scrap is of complex chemistries which is difficult to recycle. There is a need to ensure that the required technology to process the scrap being generated or imported is first available to the recyclers. Furthermore, an import dependency to ensure the availability of scrap could lead to the rise of dumping as well as environmental concerns.
- A comprehensive understanding of the government on the supply and value chains involved will aid the auditing procedures. There is a need to ensure lab-scale devolution of material recycling technologies to aid the technology transfers to industries ensuring greater commercial deployment. While there are currently initiatives spearheaded by institutes such as the Centre for Materials for Electronics Technology (C-MET) and National Metallurgical Laboratory (NML), more needs to be done in this regard.
- Creating a market for recycled materials and products is a pivotal necessity to incentivize the recycling process. For this, it is essential to set standards for recycled products to create an efficient market for these products. Incentives for the usage of recycled products also need to be provided.
- Emphasis should also be laid on product design so that products become more conducive to recycling technologies.

CLOSING PLENARY

Dr Veena Kumari Dermal, Joint Secretary, Ministry of Mines delivered a special address in the closing plenary and shared the following with the audience:

- Ministry of Mines has been working under the framework of Atmanirbhar Bharat for the Critical Minerals sector and through the initiative, has been making an effort to solve any challenges communities are facing in the mining areas.
- On the lines of the US, UK, Canada, the EU and other countries of the G7 and G20 grouping, India has identified 30 critical minerals for its economic transition. 24 of these minerals have been given a legal status and been added to Part D of the MMDR Act.
- Due to more inclination of states towards auctioning mines for bulk minerals, the amendment in MMDR was made in August 2023 to bring the mining of critical minerals under the purview of the union government. 20 blocks have been put out for auction by the Ministry of Mines and have received a good response from the private sector. The auctioned blocks contain Lithium and Nickel minerals and Glaucanite Potash among other minerals. Another 20 blocks will be put out for auction next month which contain Cobalt and Titanium minerals and Phosphates.
- The private sector needs to play an important role along with the government in ensuring the development of a resilient CRM supply chain in India. Exploration licenses to attract junior mining companies were introduced last year and 20 exploration blocks have been handed over to the state government. Ministry of Mines is currently doing handholding to ensure timely auction of these exploration blocks.
- KABIL signed an agreement with Argentinian Catamarca province enterprise, CAMYEN SE and secured exploration and exploitation rights for five Lithium blocks in the Katamaka province of Argentina. It will be spending INR 200 Crore for the exploration of the block.



Pic 9: Dr Veena Kumari Dermal, Joint Secretary, Ministry of Mines delivering a special address in the closing plenary

- Ministry of Mines has also signed MoU with Argentina, Australia, Chile, the US and other resource and technology-rich countries and is exploring multiple strategies to secure these materials including MSP and part of various partnerships such as US-India Critical and Emerging Technologies partnership (UCET), I2U2 etc.
- The Ministry of Mines has revised the Science and Technology program to support applied research on processing technologies. As per the revised shortlisting criteria, any project needs to have 20% industry participation for approval under the scheme.
- India Rare Earths Limited (IREL) has developed technology for the processing of Rare Earth Minerals and zeroed in on a technology for the processing of Neodymium. Availability of processing technology is a measure concern for the private companies interested in mineral extraction. Ministry is exploring technology transfer between the US and India for this purpose under UCET. Environmental sustainability of processing technologies is still a concern, especially for REEs and needs to be addressed.
- Ministry is also building on the Critical Minerals it championed through India's G20 presidency and planning to action it forward through the G20 presidency hosted by Brazil this year.
- The session leads presented findings from their respective sessions, offering a comprehensive overview of discussions and insights gained, thereby enriching the collective understanding of the topics addressed. Dr Dermal reacted to many of the points raised by the leads.

Vatsala Joseph, Interim CEO, Shakti Sustainable Energy Foundation

in her vote of thanks highlighted that insights shared during the workshop will help us finalize the Study on 'India's strategy for securing Critical Raw Materials' that the five organizations have been conducting since the beginning of last year.

The collaborative effort between the organizations has not only brought together diverse perspectives but has also created a platform for meaningful dialogue and collaboration. She mentioned that collaboration, through its efforts, will continue working on solutions to address the complexities of concentrated supply chains and the risks associated with high price volatility and supply disruptions for Critical Raw Materials and develop actionable strategies for India.

APPENDIX: AGENDA OF THE WORKSHOP

Day 1: January 30, 2024

09:30 am	Registration
10:00 am	Inaugural Session <p>This session will set out the brief for participants and share inputs on what India can do to strengthen its position on securing CRM supply for its energy transition.</p> <ul style="list-style-type: none">• Welcome Address: Koyel Kumar Mandal , Chief of Programmes, Shakti Sustainable Energy Foundation• Keynote Address: Shri VL Kantha Rao, Secretary, Ministry of Mines
10:40 am	Plenary 1: Strategies and Policies for Developing Resilient Critical Minerals Value Chain in India <p>The objective of the session is to highlight India’s need for critical minerals for moving to the net-zero target by 2070 and to lay the path for achieving this goal.</p> <p>Chair: Rajesh Chadha, Senior Fellow, CSEP Keynote Address: Pankaj Satija, Managing Director, Tata Steel Mining</p> <p>Panelists</p> <ul style="list-style-type: none">• R. Saravanabhavan, Deputy Adviser, NITI Aayog• Rakesh Paliwal, Head, Strategy & Business Development, Aditya Birla Group• Amit Bhargava, Partner, Metals and Mining, KPMG
11:40 am	Tea
12:00 pm	Plenary 2: Navigating Geopolitics: India’s Strategic Role in the Critical Minerals Landscape <p>The session will focus on emerging geopolitical trends and explore the role India can play in creating a resilient and more diversified critical raw material supply chain for the world.</p> <p>Moderator</p> <ul style="list-style-type: none">• Siddharth Goel, Senior Policy Advisor, International Institute for Sustainable Development <p>Panelists</p> <ul style="list-style-type: none">• Sanjiva De Silva, Counsellor, Australian High Commission• Prमित Pal Chaudhari, Advisor at Shakti Foundation and South Asia Practice Head, Eurasia Group• Damon Du Bord, First Secretary, US Embassy New Delhi• Vikram Handa, Managing Director, Epsilon Carbon• Tom Moerenhout, Critical Minerals Lead, Columbia University Center on Global Energy Policy• Grégoire Bellois, Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development

01:30 pm	Lunch
02:30 pm	<p>Technical Session 1: Roundtable on Securing critical mineral supply chains in a fragmented world</p> <p>Chair: Siddharth Goel, Senior Policy Advisor, International Institute for Sustainable Development</p> <p>Session Lead: IISD</p>
	<p>Technical Session 2: Roundtable on Critical Minerals in India: Enabling Sustainable Mining Practices</p> <p>Chair: Rajesh Chadha, Senior Fellow, CSEP</p> <p>Presenters:</p> <ul style="list-style-type: none"> • Ganesh Sivamani, Research Associate, CSEP • Karthik Bansal, Research Analyst, CSEP <p>Session Lead: CSEP</p>
04:30 pm	Tea and Networking and Close of Day 1

Day 2: January 31, 2024

09:45 am	Registration
10:00 am	<p>Plenary 3: Emphasizing ESG practices in Critical Raw Materials Mining</p> <p>The session will explore environmental and social challenges associated with creation of CRM value chains and strategies that can be implemented to ensure sustainable and responsible mining practices.</p> <p>Welcome Address: Dr. Amrita Goldar, Senior Fellow and Theme Lead, ICRIER</p> <p>Moderator: Dr. Arpita Mukherjee, Professor, ICRIER</p> <p>Presenter: Ritika Verma, Research Assistant, ICRIER</p> <p>Panellists</p> <ul style="list-style-type: none"> • Amit Verma, Director (Economics and Finance) , NITI Aayog • Aimee Boulanger, Executive Director, Initiative for Responsible Mining Assurance • Souvik Bhattacharjya, Associate Director, Resource Efficiency & Governance, TERI • Prof. Jyoti Parikh, Executive Director, IRADe • Yashodhara Dasgupta, Advocacy Director, UK India Business Council (UKIBC)

11:15 am	Tea
11:30 am	<p>Technical Session 3: Roundtable on Environmental and Socially Responsible Practices for Critical Raw Materials</p> <p>Moderator: Nidhi Srivastava, Independent Law and Policy Consultant Session Lead: ICRIER</p>
	<p>Technical Session 4: Panel Discussion on Modelling and Analytical Needs for Critical Raw Material</p> <p>Panel Discussion</p> <p>Moderator: Vivek Chandran, Director, Critical Raw Materials Programme, Shakti Sustainable Energy Foundation</p> <p>Panellists</p> <ul style="list-style-type: none"> • Aditya Ramji, Director, India ZEV Research Centre, UC Davis • Dr. Luis Tercero Espinoza, Head of Business Unit Raw Materials, Fraunhofer ISI, Germany • Mayur Karmarkar, Managing Director, International Copper Association India • Alexandra Hegarty, Critical Minerals & Methane Analyst, International Energy Agency • Rishabh Jain, Senior programme lead, CEEW <p>Session Lead: Shakti, in collaboration with International Copper Association, India</p>
01:30 pm	Lunch
02:15 pm	<p>Plenary 4: Localising Critical Minerals Value Chain in India</p> <p>The session will explore the opportunities and challenges India can face as it aims to increase the domestic value add in the clean energy sector.</p> <p>Moderator: Karthik Ganesan - Fellow and Director, Research Coordination, CEEW</p> <p>Panelists</p> <ul style="list-style-type: none"> • Sujoy Ghosh, Country MD, First Solar India • Dev Ashish Aneja, Vice President, C4V • Prof. Kalyan Bhaskar, XLRI • Mirunalini Chellapan, Director, Swelect energy systems

<p>03:30 pm</p>	<p>Technical Session 5: Roundtable on Increasing domestic value addition in an uncertain technological landscape</p> <p>Moderator : Rishabh Jain, Senior programme lead, CEEW</p> <p>Session Lead: CEEW</p>
	<p>Technical Session 6: Panel Discussion on Closing the Loop: Improving Recyclability for CRM Sourcing</p> <p>Moderator: Dr. Amrita Goldar, Senior Fellow, ICRIER</p> <p>Presenter: Kartik Nair, Research Associate, ICRIER</p> <p>Panelists</p> <ul style="list-style-type: none"> • Dr. Vijai Singhal, Former Chief Environmental Engineer, RSPCB • Mayur Karmarkar, Managing Director, International Copper Association India • Dr. Suneel Pandey, Director, Environment & Waste Management, TERI • Dr. Parveen Kumar, Head Research and Development, Exigo Recycling <p>Session Lead: ICRIER</p>
<p>05:30 pm</p>	<p>Tea</p>
<p>05:45 pm</p>	<p>Closing Plenary</p> <p>The session will focus on presenting key takeaways from the technical sessions to the stakeholders.</p> <ul style="list-style-type: none"> • Presentation of the Key Takeaways by Session Representatives • Special Address: Ms Veena Kumari Dermal, Joint Secretary, Ministry of Mines • Vote of thanks by Vatsala Joseph, Interim CEO, Shakti Sustainable Energy Foundation
<p>06:45 pm</p>	<p>Close of Day 2</p>



**SHAKTI
SUSTAINABLE ENERGY
FOUNDATION**

Shakti Sustainable Energy Foundation

The Capital Court, 104B/2, 4th Floor,
Munirka Phase III, New Delhi 110067, India

www.shaktifoundation.in