Supply Chain Workshop Series

Critical Minerals

Report and Recommendation

MONASH University

Australia India Chamber of Commerce

MinterEllison

Most Critical

Up to 2020, there were 73 critical minerals identified in 25 sovereign criticality assessments, including some which were global in scale. Among the most common to be listed as critical are Rare-earth elements (REE), gallium (Ga), indium (In), tungsten (W), platinum-group elements (PGE) including platinum (Pt) and palladium (Pd), cobalt (Co), niobium (Nb), magnesium (Mg), molybdenum (Mo), antimony (Sb), lithium (Li), vanadium (V), nickel (Ni), tantalum (Ta) and, tellurium (Te)), chromium (Cr) and manganese (Mn).

Contents

His Excellency Manpreet Vohra
High Commissioner of India

Foreword ›

Australia, India and Japan are 3 major democracies and natural partners in the Indo-Pacific region. They offer unmatched complementaries to each other in many economic sectors.

These are particularly evident in the field of critical minerals, which will define the future of clean energy and green economy technologies.

Australia's vast resources of critical minerals and rare-earth elements (REEs), India's fast-growing market and massive manufacturing capacity, and Japan's investment surplus and technological capabilities dovetail perfectly to build a resilient supply chain leveraging the strengths of each partner.

I am delighted, therefore, to see that this important Supply chain workshop series on critical minerals has been conducted, and a comprehensive report published. I compliment all organisers, participants and other stakeholders for this valuable and timely initiative.

Governments are alive to the opportunities and challenges across the value chain of critical minerals, and are actively engaging one another, as are businesses. Pursuant to a G2G agreement between India and Australia in June 2020, India's Khanij Bidesh India Ltd (KABIL) recently signed a detailed memorandum of understanding (MoU) with the Australian Critical Minerals Facilitation Office (CMFO). This will facilitate joint investment in select critical mineral assets in Australia. In addition, the new India–Australia Economic Cooperation and Trade Agreement will further accelerate economic integration of the 2 countries.

Multilaterally, our collaboration to strengthen supply chain resilience is ongoing. The Trade Ministers of India, Australia and Japan launched the Supply Chain Resilience Initiative last year and continue to meet regularly.

Determined cooperation in the field of critical minerals presents a historic opportunity for like-minded countries of the Indo-Pacific region and beyond to join hands in realising the great potential that exists in this strategic sector. It will provide jobs and ensure energy security. This will contribute to our shared desire for peace, prosperity and a sustainable future.

His Excellency Yamagami Shingo
Ambassador of Japan to Australia

Foreword ›

Critical minerals, including rare earths, have always been indispensable for manufacturing certain high-end industrial products that are essential to our lives and activities.

These minerals are particularly crucial for clean energy technologies, and as the entire world grapples with the common challenges of climate change and energy transition, ensuring their supply has become all the more important in recent years.

Japan, which has pledged to achieve net-zero emissions by 2050, is no exception. With the demand for critical materials expected to continue to rise, rapid development of resilient and diverse supply chains is vital to accomplish this goal.

Faced with supply challenges of rare earths, Japan has been working with Australian partners to develop additional alternative supply chains, with success. However, given the current international situation, it is clear that more needs to be done to ensure the stable supply of these materials. To this end, Japan is currently actively engaged in discussions with partners in the Indo-Pacific and beyond, including Australia, India and the US, with industries and academia, as well as with relevant international organizations including the International Energy Agency.

This is an emerging and cross-sectoral challenge that requires inputs from a variety of stakeholders in order to conduct effective consultation. This report, which brings insights and ideas to this process of consultation, and which is the fruit of a comprehensive exercise involving a range of stakeholders, is thus a valuable contribution to this end. We look forward to continuing to work closely with interested partners and academia on this issue, with a view to translating our consultations into concrete steps in a timely manner.

Professor Robin Batterham AO

> "The lesson of history is that first movers with new technology do get advantages, but the big wins take time and significant resources"

Foreword ›

Everyone has the same goal, to deliver major innovation sooner, cheaper and better than planned.

Companies and governments are funding less and less long-term projects.

So who will make the big moves that will change the face of supply chains and achieve the results we're looking for in the critical minerals sector?

Watching the progress of the workshop series, which coincides with the recent focus on Australia and India's economic relationship, I'm encouraged by stakeholders' enthusiasm for discussing critical minerals partnerships. These partnerships will help ensure more funding for longer term work, and build more patience for seeing results.

It's very easy to talk about setting up an alliance – it isn't so easy to make it happen. It's increasingly rare for a company, research group or government to have the capabilities and the stamina to stay the course from breakthrough to completion.

Alliances are the way to get around this. They can include competitors, be they in business or research, or even governments.

Alliances can be stage-gated, set up to 'fail fast' and they can be flexible.

We need to make it easier to fund alliances.

Professor Robin Batterham AO is the Kernot Professor of Engineering at the University of Melbourne. He's also the former President of the Academy of Technology and Engineering, former Chief Scientist of Australia (1999–2005) and former Global Head of Innovation at Rio Tinto. He is the Chair of the selection panel for the Australia India Strategic Research Fund, and is a member of the Australia India Council. He has twice chaired the International Mineral Processing Congress, and he has chaired the International Energy Agency Expert Group on Science for Energy.

Executive summary

Supply chain security risk

The Australian, Indian, Japanese and US governments are aware that critical minerals, including REEs, will be increasingly in demand as countries transition to renewables. These governments are also aware that, for some critical minerals, there is only one supply chain, or that one or a few sovereign players dominate supply chains. This means the future supply of critical minerals could be at risk. In response to the governments' efforts to build stronger Indo-Pacific partnerships, the critical minerals supply chain workshop series brought together government, corporate, research and industry stakeholders in Australia, India, Japan and other regions to undertake a design-thinking process, helping to generate ideas and possible solutions to this growing sector.

Workshop sessions

Four sessions were held over 2021:

1. Partnerships for Indo-Pacific supply chains and critical minerals
2. Battery minerals extraction, production and trade
3. Rare-earth elements: will we be too late to the Electric Vehicle (EV) revolution?
4. Principles of collaboration.

Each session provided participants with a specific focus question, then breakout groups were asked to determine "Where are we now?", "Where do we want to be?" and "How do we get there?"

Combining the answers from the 4 workshops revealed that 3 categories cut-through each discussion:

- exploration and technology
- markets and investment
- government and regulation

1 Exploration and technology

As a relatively immature industry that historically has been under-appreciated, there's still a lot of work to do to determine the locations, quantities and qualities of critical minerals in Australia and India. Critical minerals are often more complex to mine and process, usually using waste streams from other mining processes. They also present novel environmental challenges that must be overcome to meet environmental protection standards. It's also common for critical minerals materials, at their various processing and manufacturing stages, to be highly differentiated chemically, and with respect to their environmental provenance. These factors mean it can be challenging to establish transparent markets. Setting up quality grading standards and certification processes for critical minerals materials can assist with market transparency, and make the materials that meet high standards – such as those subject to Australian, Indian, Japanese and US standards – more attractive to buyers.

As such, developing critical minerals supply chains is complex. The crucial first step is agreeing on the priority minerals and the projects that will support their production.

2 Markets and investment

Due to the immaturity of the industry, it's harder to predict return on investment, particularly when many factors are unknown. Investors rightfully want to know what supply/demand ratios will look like, what the price for certain commodities will be and how supply will be guaranteed to negotiate offtake agreements. Currently, there aren't many good answers.

What we do know is that demand in this sector will increase, and without early investment, partnerships and identification of value chain gaps, it will be almost impossible to develop a sustainable and competitive supply chain in the Indo-Pacific region.

3 Government and regulation

There have been many government announcements since 2021 indicating that Australia, India, Japan and the US see the need for better cross-border regulation to enable initiatives that support cross-regional partnerships and trade. However, legislative frameworks like royalties, intellectual property (IP) and other structures still need to be reviewed to manage minerals and REEs within these revised regulations.

Governments from the Indo-Pacific region can help by supporting frameworks and resources that build the industry until it can sustain and stabilise itself, similar to other industries in the past.

Recommendation

The recommendation of these workshops is to develop a **Critical Minerals International Alliance (CMIA)**, with representatives from each participating region with an interest in a supply chain across the Indo-Pacific. It would be managed by industry experts and coordinated by market representatives, who would facilitate an Indo-Pacific critical minerals supply chain. The CMIA would ensure issues raised throughout the workshops are addressed and the objective of facilitating cross border partnerships is achieved.

The recommendation proposes that participating regions match the investment into the CMIA, All regions would be represented and works together on issues such as IP, project funding, resources etc. Further details about the model and responsibilities are included in this report.

Introduction

During 2021, Austrade, the Australia India Chamber of Commerce (AICC), Monash University and MinterEllison conducted a workshop series, comprising 4 sessions. The objective was to bring together stakeholders from government, industry, corporate and research sectors across the regions, to work through the opportunities and the challenges involved in building an additional and diversified supply chain for critical minerals.

Critical mineral and REEs

Critical minerals are metals and non-metals that have a significant risk of supply disruption, and where such a disruption would have a material impact on industries, economies and/or sovereign security. Rapid growth and innovation in electronics and low-carbon technologies means many critical minerals are used in the manufacturing of batteries, mobile phones, flat-screen monitors, wind turbines, electric cars and solar panels, and in a multitude of other applications. The metals that are important for transitioning to low-carbon economies are often referred to as 'clean-energy metals', some of which are also critical minerals.

Australia and India's new relationship

As 2021 progressed, so did the focus on Australia and India's economic relationship. A number of government meetings were held after the countries signed a memorandum of understanding, with both agreeing to explore opportunities to increase bilateral trade, investment, research and development (R&D) and alternative supply and value chains in critical minerals. In addition, the recently signed Australia–India Economic Cooperation and Trade Agreement provided further incentive for the countries to collaborate on projects in the sector.

Australia is a globally significant source of critical minerals, and India is a globally significant export market for processing, consumption and secondary exports. Strengthening government relationships is a crucial step in developing new market opportunities. However, more work is required before companies will look to invest.

Purpose of the workshops

A number of reports, including Austrade's Unlocking Australia-India critical minerals partnership potential, have detailed the many complex opportunities and challenges for critical minerals supply chains, the critical minerals industry and partnerships in the Indo-Pacific region.

Many of these reports including 'An Indian Economic Strategy to 2035' by Mr Peter Varghese, recommend bringing together key stakeholders, including from government, industry, research and corporate sectors, to determine how to encourage progress.

Aligning to these recommendations the workshops brought together all sector representatives, using a design thinking process they were asked to think about a vision for the future and how we could get there. With so much expertise and diverse perspectives contributing to the discussions, the facilitators encouraged innovative solutions and to pose questions starting with **'What if'?**

> "We need to ensure parallel tracks that different stakeholders are working on, are working in the same direction - industry and academia think tanks and policymakers need to work together."
>
> *Dr. Rajesh Chadra, Centre for Social and Economic Policy*

Workshop sessions

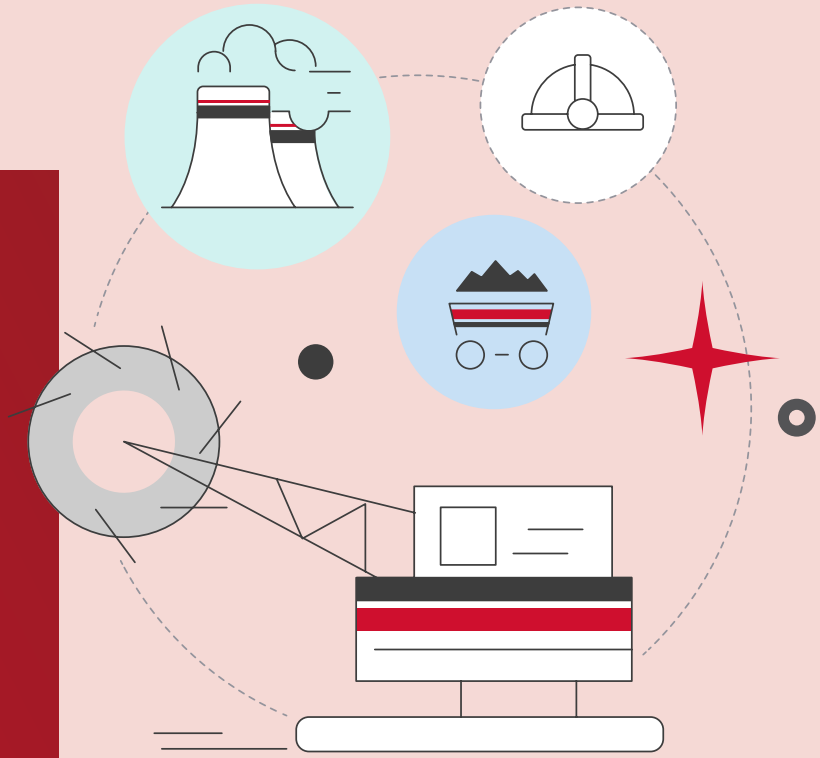
Topics and overview

Objective

Bring together stakeholders from government, corporate and research sectors to understand the challenges and opportunities for investing in critical mineral supply chains in the Indo-Pacific region.

Outcome

Present to Australian, India, Japan and US government representatives a roadmap and action plan that will improve and encourage joint ventures in critical minerals



Workshop sessions

Topics and overview

Methodology

Format: 4 workshops and presentation events
Date: May to December 2021
Participants: Minimum of 20 invited participants in each workshop
Time: 2.5 hour online facilitated workshop
Objective: to make recommendations using design-thinking methodology across a series of topics as follows:

Workshop 1: 20 May

Partnerships for Indo-Pacific supply chains, critical minerals:

Encouraging collaborative partnerships and investment models across regions, governments, research and private sectors to secure critical mineral supply chains in the Indo-Pacific region.

Workshop 2: 22 July

Battery minerals extraction, production and trade:

What should the roadmap look like? A discussion of industry policy reform, competing agendas, capacity constraints, infrastructure needs, investment needs, legal protections and alignment with modern manufacturing strategy.

Workshop 3: 23 September

Rare earths: Will we be too late to the EV revolution?:

Scaling models and incentives for investing in future demand of key rare-earth metals, for their use in magnets, motors, metal alloys, electronic and computing equipment, catalytic converters, petroleum refining, batteries, lasers, colouring agents in glass and ceramics, medical imaging, phosphors, and special glass.

Workshop 4: 25 November

Principles of collaboration:

Clarifying goals, roles and working through win-win scenarios. Specifically:

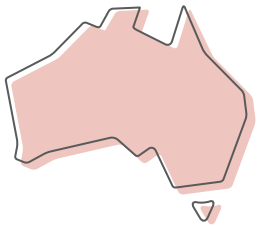
- the role of other partners (for example, Japanese and US investment)
- the role of governments (for example, bilateral arrangements, special treatment, negotiation leverage, global regulation)
- the role of regional infrastructure projects
- how to encourage other industries and sectors to set up similar programs?

Where are we now?

Determining the current landscape is the first step of the endeavour.

While we already have a number of reports that outline the industry's key issues, the workshop series provided a forum for stakeholders to give their direct experience and insight from multiple perspectives.

This provided more detail and understanding of the challenges and concerns inhibiting progress.



Australia produces 50 per cent of the world's lithium. 100 per cent is sent to China for processing.

What did they say:

More to explore

Governments recognise the role of critical minerals in the clean energy transition, as well as the future need. However, mining and processing critical minerals is challenging. This is due to the difficulty of finding them and then identifying their quality. The small number of operations around the world means knowledge is limited.

Understanding worth

It's hard to attract investors and establish a market for critical minerals when there's a lack of transparency in some markets, or in the price.

Obsolete technology

As demand increases, new technology may replace the current technology, helping scale development and processing. This further accentuates some of the challenges around pricing and transparency for investment.

Teething pains

Legislative frameworks around royalties and other structures aren't set up to manage new minerals and their processing, which creates policy and market hurdles.

Say it louder

Governments are communicating well with each other, but it does not seem to be filtering down to businesses, which are moving outside the Indo-Pacific region to set up projects. Zeolite and urea are 2 examples of minerals that are vital to India, and in abundance in Australia, but India sources them elsewhere.

Waste not

Underuse of waste streams is losing possible income streams. For example, one large company made $5 billion by going through old tailings and extracting boron – improving sustainability, the environment and profit.

High-risk perception

Processing and the beneficiation of products is still bespoke to the actual material you're trying to get. Finance providers don't always understand these experimental chemistry sets, which often slows development. Risk profiles for investing in REEs and critical minerals are rarely accurate because they are more closely aligned with investing in standard commodities and operations.

Complex industry

The critical minerals space is very complex, in part because the markets have attracted little interest from major mining companies at this point. This is because critical minerals markets are – individually – small compared to major commodities such a copper and iron ore. That means the market consists of small and mid-tier companies compared to the big 4 miners. Smaller companies may lack the resources to identify opportunities, and to establish partnerships in the wider Indo-Pacific region.

What did they say:

Intellectually

One of the big questions relates to sharing IP, and how to move IP from one nation to another to take advantage of different economic benefits in different areas? How do you move, for instance, IP and know-how back and forth in an environment while ensuring that people feel their investment can be protected and recouped.

Price volatility

With rapidly increasing demand, highly differentiated products, and concentrated supply that is growing sporadically, it is common for critical minerals prices to be volatile.

Shared technology

Carbon offset technology is not available in all countries due to IP restrictions. Not only does this create an issue for potential environmental damage, but there is a lack of evolution and innovation to create better processing methods.

Political barriers

India and Australia both have infinite potential in mining critical minerals. But to identify the deposit and build a mine and the processing capacities, we need to have supportive governments and an environment that fosters exploration.

Closed shop

It's difficult for new competitors to get into the industry. Typically, transactions occur with an existing or established supplier because of the uncertainty around those markets. Effectively, they're trying to enter a closed shop.

Workshop 1 focus question:

What is needed to encourage investment into critical mineral supply chains so that there is a resilient and profitable alternative in the Indo-Pacific region?

Summary:

Critical minerals markets are usually immature or emerging. Stronger partnerships, with communication networks and connections, are needed to help proliferate new developments and best practice.

Three broad categories were evident in each discussion across the 4 workshops:

- exploration and technology
- markets and investment
- government and regulations

Exploration and technology

- Identifying what minerals are required, where they are and their quality (particularly due to lack of reporting on current sites where these minerals previously had little value) are all challenges.
- Processing is in experimental phases, requiring different types of raw materials and chemistry processing.
- Underuse of waste streams means possible income streams and sustainability objectives are lost.

Markets and investment

- The immature market, with unclear supply/demand ratios, makes it difficult to attract investors.
- A lack of transparency into supply and price hinders offtake agreements.
- With operations mainly run by small and medium-sized enterprises (SMEs), it's difficult to take advantage of opportunities for partnerships and change the competitive mindset.

Government and regulation

- Industry standards require reviews to ensure industrial developments are accepted.
- Legislative frameworks like royalties, IP and other structures aren't set up to manage minerals.
- Government agreements are yet to incentivise partnering on projects.

Where would we like to be?

Creating a vision of the critical minerals industry and supply chains in the Indo-Pacific region gave participants an opportunity to draw a picture of the future that everyone would like to see and build collaboratively.

What did they say:

Be better

A first-class operation means not wasting resources, and ensuring mines are making the most of all the streams extracted and processed. This will require revaluating existing tailings, dams and waste streams to ensure we're extracting all we can for an efficient supply chain.

Shared priorities

There is work to be done in defining what minerals are most critical. At the moment, there are different views in India, Japan and Australia about what are the most critical minerals. A cohesive approach would ensure we are focusing on the same goals.

Keep it clean

The demand for critical minerals is rising due to public perceptions of climate change issues, so it would be counterproductive to solve one issue while creating another. There must be high environmental standards for exploration.

Stronger together

Australia has the minerals, Japan has the technology, India has the manufacturing capability, and many countries are able to invest. Partnering together to develop a complete supply chain would strengthen the value proposition and encourage growth.

Mutual investment

Cross-regional investment for highly technical, innovative and specialised processing of raw material into usable products in both Australia and India would build capabilities in the right locations. This is something that Australia, India and other countries can work together on.

Crystal clear

Building up the knowledge base about how these techniques work would help investors and customers to better understand the market. While it will always be an opaque market because of its specialised nature, prices aren't always transparent. But by increasing the general knowledge base, more can be done.

> We need business catalysts –interactions that facilitate and build meaningful interactions and orchestrate relationships."

Mahadevan Shankar CEO Arzuh International

What did they say:

Simpler legislation

International trade and investment laws related to the Indo-Pacific supply chain of critical minerals could be streamlined and formulated into standard partnership agreements that satisfy each jurisdiction, and include agreement on technology, the supply chain and the components that go into batteries, e.g. EV's.

Reduced supply chain risk

Reducing dependence on any one country as a predominant supplier of raw materials and ingredients will reduce risk.

Mission statement

There needs to be agreement at a political level on what we are working towards. It's essential to develop a clear vision and mission statement in collaboration with all involved regions and across multiple levels of the supply chain, to address the direction of processing, systems, finance, governance and more.

Same page

There are different standards across the industry. Different players take different approaches to all the processes, from the technology to approval standards. So we need to get on the same page.

Policy framework

To guide standards, there should be clarity on how far deposits can be processed from deposit sites, such as a precursor level, and where the finished product is taken. Ensuring there are policy frameworks for the development of processing and deposits is essential.

Perfect world

We need a vibrant critical minerals industry where nothing is wasted from our mines. Short and long-term projects need to coincide and value add where it makes sense.

"In the 1800s, Western Australian pegmatites were mined for tin, then they became tantalum deposits and now they're regarded as lithium deposits, reflecting the materiality of the deposit at the time. Across the nation, we have this enormous resource potential but it tends to be the world-class deposits that attract the capital for development, so we need to identify what else we have and find markets."

Allison Britt, Director: Mineral Resources Advice and Promotion, Geoscience Australia

Workshop 2 focus question:

What will accelerate long-term commitment in the battery minerals market and encourage cross-regional partnerships?

Summary:

As the demand for critical minerals increases, the current supply chain becomes more vulnerable to global disruptions, leaving countries and companies at risk of shortfalls in supply.

There is an opportunity to consider a model that differs to that for traditionally mined materials. We can also identify the points in the value chain where each region can offer the most value and produce a competitive end product.

Achieving this will require a strategic and adaptable approach as the market stabilises.

Exploration and technology

- It's vital to agree on the priority minerals and therefore the projects that support their production.
- Systems are needed for measuring or grading the quality of the mineral supplied, and operations that correlate with commodity pricing.
- Carbon offset technology and environmental standards should be shared between countries.

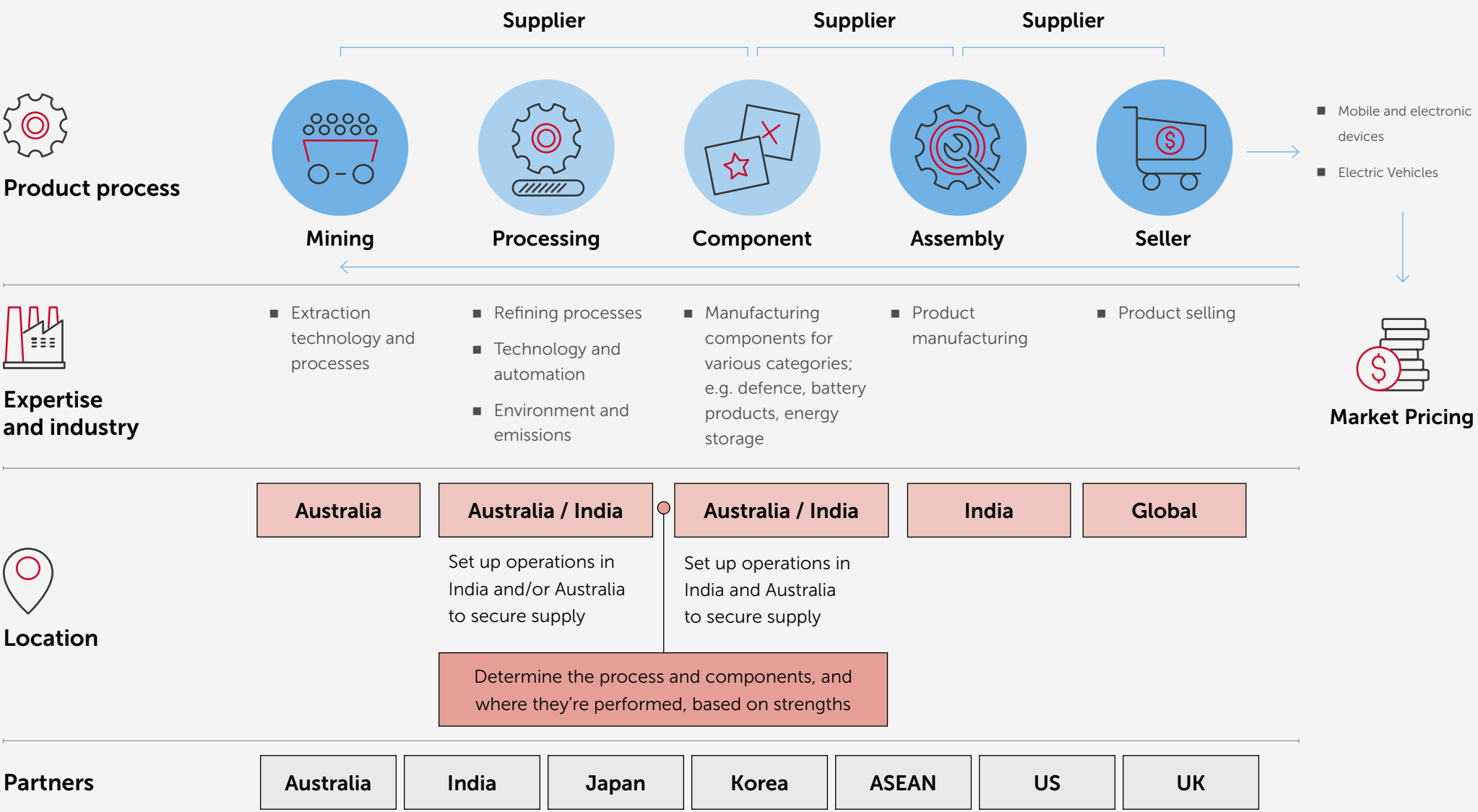
Markets and investment

- Information about opportunities should be made available through shared market reports.
- Early investment in projects should be made possible by using an equity-level investment mechanism that's backed by governments and allows for investing in multiple projects.
- It's essential to identify points of partnership and collaboration across the value chain.

Government and regulation

- A clear framework with resources are required to help build the industry until it can sustain and stabilise itself.
- Free trade agreements must be revised for critical minerals, to incentivise their import for processing.
- Supply needs to be guaranteed and secured with defined international standards.

Value chain opportunities

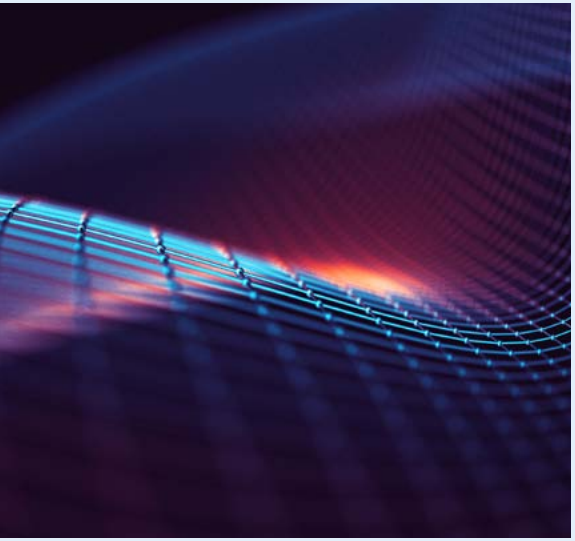


How do we get there?

The design thinking process establishes where we are, where we want to be and, most importantly, how we can get there.

By bringing together expertise across all sectors and regions, all perspectives were taken into account.

Breakout groups of government officials, scientists, mining company CEOs and investors collectively agreed on what is needed to go from where we are to where we want to be.



What did they say:

Prospectus

The first step of the roadmap is to develop a business model. There are already a number of research bodies that can be tapped into – the issue is the investment model. Helping companies identify and understand the market opportunities that can be created across the Indo-Pacific region is vital. A two-man band is so focused on the day to day of completing projects that they're not necessarily aware of what opportunities exist in another nation. We need to define the value chain business model to build partnerships.

Operational frameworks

In line with international trade guidelines, we need to simplify frameworks and requirements for cross-border partnerships to encourage regions to partner on projects related to the supply chain.

Break down barriers

Due to differences in culture and legal systems, it may be helpful to involve intermediaries, chambers and business councils that understand the various nuances and legislative environments.

Guarantee of supply

The current supply is scattered and small in scale. If markets were working at scale, there would be a steady supply alternative. Governments could subsidise a potential excess of supply until the market stabilises.

The more the merrier

A public-to-private partnership is needed. Governments are talking, but the private sector needs to be included in these discussions. Chambers of commerce, universities and research institutions all have an important role to play. This is not just in Australia and India, but in places like Japan and Korea, which are looking to invest in critical minerals and apply technological developments.

Keep score

Who is doing what by when – It would be good to see that the great ideas and actions generated by stakeholders are considered and implemented, resulting in the creation of a list of projects. Perhaps we could list short-term and long-term objectives, and produce a key case study to foster discussion.

What did they say:

Access to incentives

The Australian Government's loan facility is a good initiative, but how do SMEs take advantage or understand the criteria and opportunities?

Long-term relationships

Creating cross-border partnerships requires an investment in developing long-term relationships that fulfil expectations and build trust. We could create a facility or service for introducing like-minded companies seeking joint venture opportunities.

Divide and conquer

We need to have forums where B2B can flourish. It may be more efficient to form small subsets of groups that will specifically address issues by area, such as R&D, technology transfer and policy.

Learn the lessons of the past

We could examine best practices and the many success stories from established industries like copper and iron ore to shrink timeframes.

Come together

The critical minerals sector is dominated by SMEs. We could bring companies together from across nations into one centre, helping them to find and establish partnerships.

High standards

We need to bring nations together to develop an international standard in the international market, with competition based on quality rather than lowest cost. We also need to be transparent about product composition and processing methods. Taking these steps will help companies identify and meet the same standards.

"This is an opportunity to shift our mindset from the traditional model to one which challenges the value add we deliver in Australia while we work with India to develop true business-to-business partnerships. One of the biggest barriers is that we have not defined the value chain business model for a partnership to be built on."

Dr Vanessa Guthrie AO
Non-Executive Director
Lynas Rare Earths

Workshop 3 focus question:

How can we promote partnership investments into REEs for a future market?

"

The energy transition is a upon us now and the demand for critical minerals is already outstripping supply. Investment is needed in critical minerals exploration and development projects at a much earlier stage then traditionally done. It will be these earlier stage investments that accelerate the production of critical minerals to meet forecasted demands but more importantly give supply chain security to the early stage investors."

Scott Drelincourt, Managing Partner, Critical Minerals Group

Workshop 4 focus question:

How could a Critical Minerals Partnership Centre for Indo-Pacific facilitate partnerships across regions?

Summary:

Like every project in every organisation within every industry, there needs to be accountability to help connect all the variables that will deliver and achieve results.

By developing a mission statement, with short- and long-term goals, and a vision for the future, a framework can be established to attract companies and investors.

Collaborating in sub-sectors across government, industry, research and service sectors across regions will more efficiently and effectively solve the challenges the industry faces.

Exploration and technology

- We could harness groups of venture capitalists and philanthropists to fund investigations into exploration and technology challenges across different markets.
- We need to establish partnerships to close technology gaps in processing and exploration in dual locations.
- We should evaluate waste streams and tailings for potential opportunities.

Markets and investment

- We need to develop a clear business model to help foster partnerships across the value chain, and to determine the point of potential partnerships between countries.
- We need to develop sub-groups that can help develop communication channels, governance measures and business catalysts.

Government and regulation

- Governments should continue collaborating on reports for the economic viability of the sector.
- Each country needs to work to understand the drivers behind the industry to protect its national interest in the future.
- Governments should support phases of development in the critical minerals sector, then hand these to the industry once it has stabilised.

Recommendations

Critical Minerals International Alliance

Over the course of the 4 workshops, there were common themes in the discussions of the industry's challenges and opportunities. Unlike other key mining sectors dominated by big multinationals, the critical minerals sector is filled with many SMEs, with niche capabilities, that are working on many and varied projects. This adds complexity, but it also creates an opportunity to connect and build a network with common goals and support.

What if stakeholders, governments, industry, and the research, investment and corporate sectors across the region became stakeholders in an CMIA to facilitate partnerships in the development of an additional critical minerals supply chain?

There are a number of examples of industry bodies that have successfully established a similar network. This includes the International Network for Acid Prevention, an international body to mobilise data, information, experience and resources to manage sulphide mine waste and prevent AMD. There is also the International Council for Mining and Metals, which assists with common environmental, social and governance (ESG) issues across the industry.

This is not something that a single government, company or research organisation can, or should, do alone. It needs to be an international initiative – one that the Indo-Pacific is poised to deliver.

Funding and management

Australia has a number of government-funded organisations managed by industry experts, such as the Advanced Manufacturing Growth Centre (AMGC). AMGC is an industry-led, not-for-profit organisation and is run by a board and management team of industry experts.

Borrowing this type of model, there may be an opportunity for Australia, India and other countries in the Indo-Pacific region to create an alliance focused on building a robust and sustainable supply chain for critical minerals.

With government support, the alliance would be managed by a board, with representatives from industry and the investment, corporate and research sectors in each participating region. It would be led by a CEO and management team appointed by the board. The organisation's prime responsibility would be acting as a 'business catalyst', providing members with access to project partnerships, resources and technology.

Purpose

Either through a purpose-built body or within existing structures, the alliance would aim to champion cross-border partnerships in the Indo-Pacific region to help develop an additional supply chain for critical minerals. This will be done by facilitating:

- diversified supply chain projects
- collaborative business models
- best-practice ESG regulation, trade and technology access
- Project finance
- business development
- industry connections
- certification and regulation.

Users

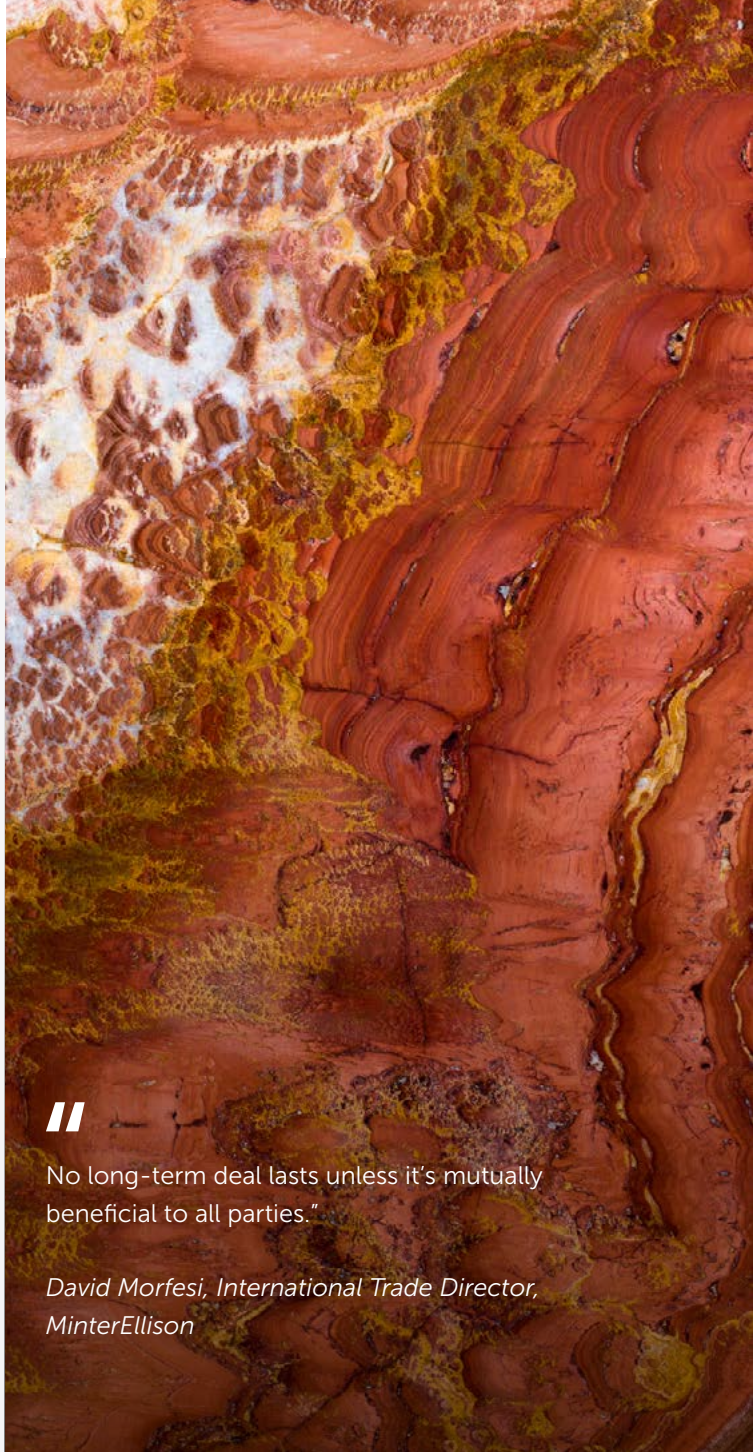
There are significant opportunities for growth across the value chain. By encouraging Indo-Pacific, cross-regional partnerships that combine regional strengths – whether it's in resources, investment, technology or manufacturing – all regions will become stronger.

A purpose-built alliance will be particularly helpful to:

- supply and demand companies across the value chain
- cross-regional investors
- research bodies, technology providers and innovators.

Roles and responsibilities of CMIA

- advocate and advise on cross-regional governance and trade policy regulation
- help members access a A$2 billion loan facility
- produce international market outlook reports
- facilitate guarantee credit support and/or offtake agreements
- offer procurement and market support
- establish research development advisers
- share best practice upstream and downstream processes
- align ESG policy and competitive advantage
- involve lobby groups, and federal and state minerals councils
- establish communications between members to promote cross-regional supply chain projects and opportunities
- advocate for and support members
- provide referrals to an investor centre or advisors
- link networks so members can connect and develop partnerships
- develop business models and strategy for investing in critical minerals
- offer business development and marketing tools
- establish trade and legal frameworks for partnerships and governance
- Procure IP sharing and collaboration platforms
- create models for finance and investment to support grant applications and encourage investment in projects
- set up 'Indo-Australian Critical Minerals Research Hub' in line with the AIC's Australian Researcher Cooperation Hub India (ARCH-India) with participation from the US, the UK, Japan and Korea



"No long-term deal lasts unless it's mutually beneficial to all parties."

David Morfesi, International Trade Director, MinterEllison

Critical Minerals International Alliance stakeholder model

Govt dept members – Aus, India, US, Japan, UK, Korea – Fund and Appoint

Board members industry and research reps – Aus, India, US, Japan, UK, Korea

CEO and management team

Exploration and technology
priority minerals and the projects that will support their production

Markets andinvestment
supply/demand ratios and pricing supply guarantee and offtake agreements and joint partnerships

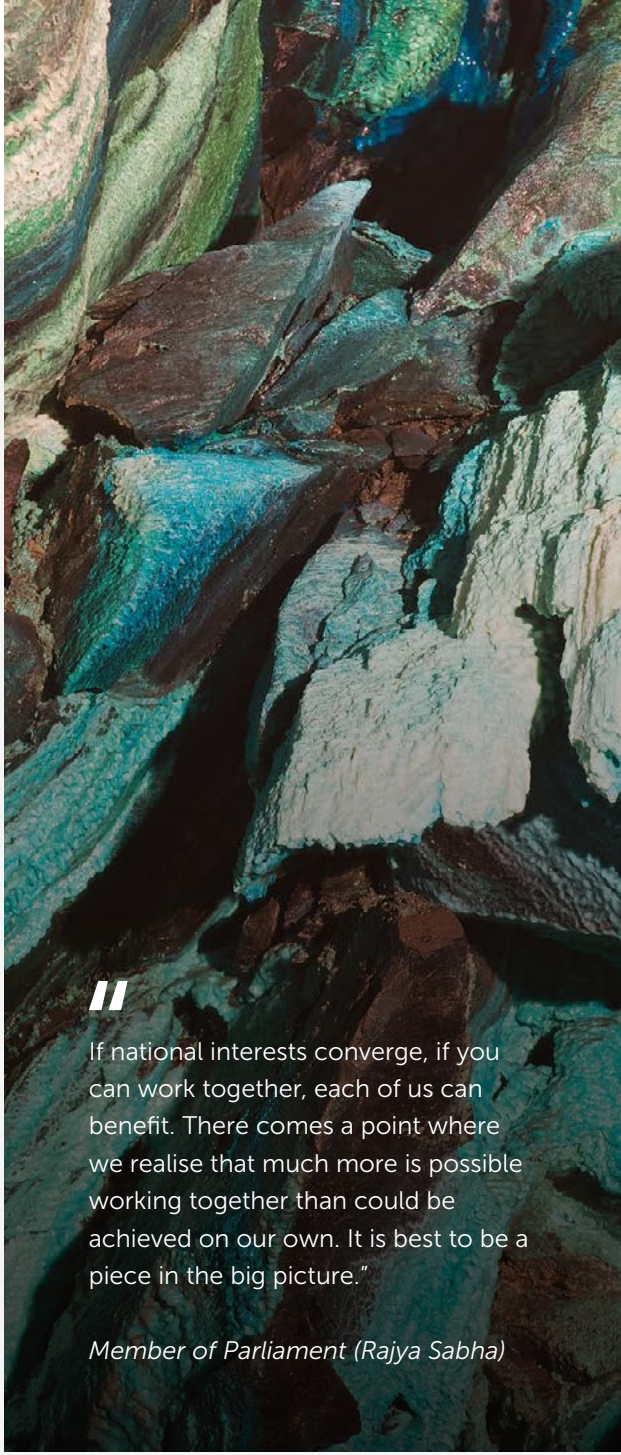
Government and regulation
royalties, intellectual property (IP), foreign investment and tariffs review and reform

Advisory members
Business Advisors, Research Institutes and Government Departments

Member organisations
Australia India Chamber of Commerce; American Chamber of Commerce in Australia; Australia Japan Business Cooperation Committee; Confederation of India Industry; Minerals Council of Australia, and Australasian Institute of Mining and Metallurgy

Beneficiaries:

- Critical Mining and Rare Earth mining companies
- Other Mining companies yet to mine critical minerals in Australia and India
- Advanced manufacturing companies
- Scientists and Research bodies in mining including universities and government funded departments, eg. Monash, Geoscience Australia, CSIRO and counterparts in India and Japan
- Technology and automation developers for mining and manufacturing
- Mining industry bodies in regions eg.Ministry of Mines in India,
- Member bodies eg. International Chambers
- Consultants and advisors in setting up partnerships, project and funding access advice, IP sharing etc



"If national interests converge, if you can work together, each of us can benefit. There comes a point where we realise that much more is possible working together than could be achieved on our own. It is best to be a piece in the big picture."

Member of Parliament (Rajya Sabha)

Next steps

"

The processing to metals and products can be both tricky, capital intensive and the waste streams can be problematic. We should think more about these issues and use the upcoming clean energy transition to reimagine what these processing facilities could look like. For instance, cheap renewables + modern processing technologies + data/ AI/robotics/automation should deliver cost competitive outcomes. This needs everyone to come together if we are going to be able to sustainably supply the impending demand.

Stephen McIntosh, Non-Executive Director of Chalice Mining, ARENA, AROSE And Datarock; Special Advisor to the Critical Mineral Consortium; and former Group Executive for Growth and Innovation, Rio Tinto.

Timeframe:

1 January 2023

Objective:

Commitment of QUAD/Multilateral governments to invest in a Critical Minerals International Alliance.

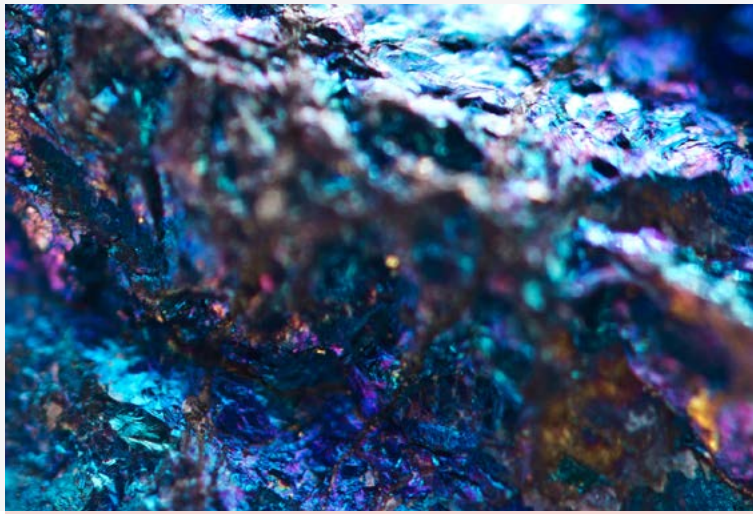
Resources:

International Chambers of Commerce, Industry Bodies and Advisors

1. Continue conversations with stakeholders across government, industry and research organisations to progress the issues and opportunities identified throughout the workshops.

2. Determine a model and responsibilities for an overarching international alliance to progress the requirements for a supply chain in the Indo Pacific for Critical Minerals such as:
   - Developing the business case for investment across the value chain
   - Identifying and facilitating partnerships for supply chain and technology innovation.
   - Determining standards and scaling models for supply priorities.
   - Setting up access to resources and incentives for partnerships across regions to develop an additional critical minerals supply chain.

3. Oversee a business model that is equitable, inclusive and focuses on innovation and connectivity with all stakeholders across all regions.



Participants and acknowledgements

Facilitators:

- David Whittle – Monash University
- David Morfesi – MinterEllison

Guest Speakers:

- Shri Palaniswamy Subramanyan Karthigeyan – Deputy High Commissioner in the High Commission of India, Canberra.
- Hon. Suresh Prabhu – Member of Parliament (Rajya Sabha)
- Sanjiva de Silva – Counsellor for New Delhi, Department of Industry, Science, Energy and Resources, Australian High Commission
- Ramakrishna Dastrala – Director of Trade and Investment, Australian Trade and Investment Commission
- Professor Robin Batterham AO – Melbourne University

Participants

- Simon Scott – MinterEllison
- Mohan Yellishetty – Monash University
- Tim White – Austrade
- Allison Britt – Geoscience Australia
- Christine Coonan – Mitsui
- Richard Samuels – Critical Minerals Facilitation Office
- Karunakar Rao – Datacode
- Dhrubjoyti Nath – Datacode
- Partha Mazumder – NTPC Ltd
- Peter Cox – PCA Directions
- Mehel Mohanka – TEGA industries
- Stephen McIntosh – Critical Minerals Consortium Board
- Dr Rajesh Chadra – CSEP
- Ganesh Sivamani – CSEP
- Sanjiva de Silva – Australian High Commission
- R H Khwaja – former Secretary (Mines), India
- Amit K Verma – IIT (BHU) Varanasi
- Prashant Singh – Rishihood University
- Rajesh Gopinathan – Confederation of Indian Industry
- Y S Reddy – Fomento Resources
- Harish Rao – Australia India Chamber of Commerce
- Gopi Shankar – Global Victoria
- Sundar Singh – Vimson Group
- Sid Marris – Minerals Council of Australia
- Y Nagendra – Thriveni Earth Movers
- Dr Vanessa Guthrie AO – Non-Executive Director – Lynas Rare Earths
- Vincent Agar – Australian Vanadium
- Mahadevan Shankar – Azur International
- Scott Drelincourt – Critical Minerals Group
- Motoshita Masaharu – University of Japan
- Jeff Townsend – Critical Minerals UK
- Pradeep Koneru – Trimex Sands
- PR Sinha – Trimex Sands
- Ron Green – Austrade Japan
- Brajesh Kumar Dubey – Indian Institute of Technology Kharagpur
- Keisuke Nansai – National Institute for Environmental Studies (NIES), Japan
- Sujeong Lee – Principal Researcher, KIGAM, Korea
- Rina Kim – Senior Researcher, KIGAM, Korea

References

Links to resources referred to during workshops

- An India Economic Strategy to 2035, A report to the Australian Government by Mr Peter N Varghese AO
- The Role of Critical Minerals in Clean Energy Transitions, International Energy Agency
- Unlocking Australia–India critical minerals partnership potential, Austrade
- Backing Australia's critical mineral sector, media release from Prime Minister Scott Morrison
- Australia-India Cyber and Critical Technology Partnership grant
- The Indian critical minerals strategy, Arch India
- Developing critical mineral trade and investment to India, media release from the Hon. Dan Tehan MP
- National Electric Mobility Mission plan 2020, International Energy Agency
- National mission on transformative mobility and battery storage, NITI Aayog
- Australia-India-Japan Trade Ministers' Joint Statement on Launch of Supply Chain Resilience Initative, meeting between India, Australia and Japan, India Chamber of Commerce
- Joint Statement on a Comprehensive Strategic Partnership between republic of India and Australia, Department of Foreign Affairs and Trade

Statistics

1.4b
cars on the world's roads

There are an estimated 1.4 billion cars on the world's roads today. To head off the worst effects of climate change, every single one will need to go electric eventually.

1 kg
of magnet

In each car, there is roughly one kilogram of magnet that's providing the motion needed to fire engines and power electric windows.

Roughly
30%

of this material is made up of rare-earth material known as neodymium and praseodymium (NdPr).

3x
stronger

This material is 3 times stronger and 1/10 the size of conventional magnets – and essential to the process.

In 2016, Japanese car manufacturer Honda tried and failed to build a hybrid vehicle without REEs.

60 Nd

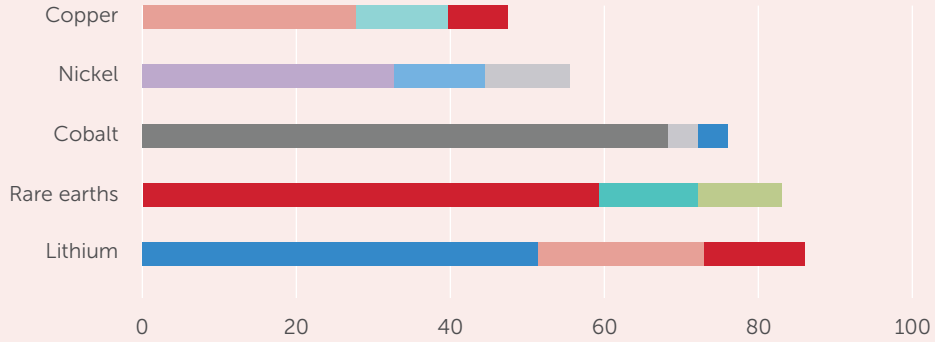
59 Pr

Over the next decade, the use of NdPr in EV magnets alone could soak up 40 per cent of total demand, according to some projections.

Facts

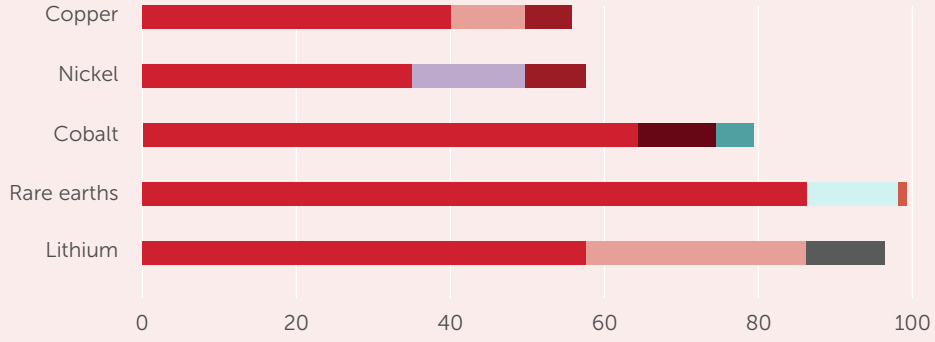
Where clean energy metals are produced

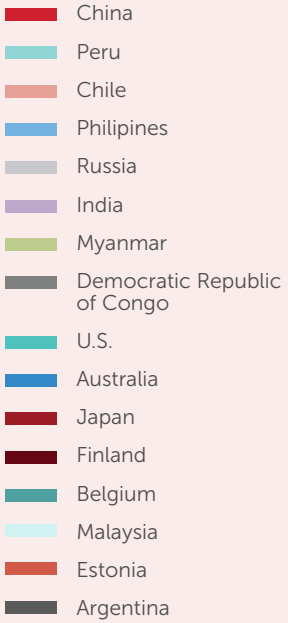
Production of key mineral resources is highly concentrated today.
Charts show top three producers.



And where they are processed

China dominates the refining and processing of key metals.





Source: International Energy Agency - By The New York Times

MinterEllison.

minterellison.com