

A response to questions raised in the Critical Minerals Strategy 2023 Discussion Paper

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Executive Summary

On 25th January 2023, a workshop was convened by the [Critical Minerals Consortium](#) (Monash University), [MinterEllison](#) and the [Australia India Chamber of Commerce](#). The purpose of the workshop was to formulate a response to the federal government's request for input into its Critical Minerals Strategy. In attendance, were over 60 representatives of industry, government, and research. The workshop considered four of the questions posed in the federal government's [Critical Minerals Strategy discussion paper](#), and the results of the discussions have been captured in the form of key focus areas and insights. This report summarizes the outcomes for each question considered in the workshop.

A common theme that emerged in the workshop is the need for international collaboration between governments, industry and academia. This reinforces the findings of a previous series of workshops, which culminated in a recommendation to create a Critical Minerals International Alliance.

Summary responses to each question are given below.

The first question

How can government support the capability of critical minerals companies and other relevant entities to identify, engage and grow new target markets?

Key opportunities

The key opportunities are:

- Do more to support the mining of minerals that facilitate the adoption of renewable energy.
- Develop a reverse perspective, identifying in detail the opportunities for prospective critical minerals suppliers.
- Consider marketability of minerals in framing ESG regulations and processes.
- Develop the workforce.
- Attract international talent.
- Facilitate cross-border cooperation between governments, research institutions and industry.

Key insights

Key insights included:

- Critical minerals are not necessarily 'minerals'.
- There are many causes of minerals criticality in many complex, small and dynamic markets.
- The supply side for upstream critical minerals will mainly be made up of small and mid-sized enterprises.
- In framing interventions, the federal government should be cognisant of the differences by state and region.

The second question

How should Australia engage with international partners to support the diversification of supply chains? What should this engagement focus on (including which countries)?

The cure to supply concentration is diversified and resilient supply chains. For example, Australia produces almost ~50% of world's lithium and the rest of the minerals required to produce lithium-ion batteries but the main constraint to mid-stream or downstream expansion seems to be the availability of capital, scale and/or technology, rather than a lack of ore. Australia is well placed to leverage its world-leading METS sector capabilities and tremendous mining technical knowhow by working with its international partners and allies. While the [Critical Minerals Office](#) is working with key countries (the US, India, Japan, Korea,

the UK, and European Union members) to strengthening engagement, these partnerships are either bilateral or trilateral at most. A more meaningful and enduring partnership should be multilateral in nature and must include governments, industry, trade associations and academia and research.

The third question

How can Government and business work together to ensure private sector insights on the context and complexity of current supply chains and markets can inform policy design?

Key opportunities

The key opportunities are:

- Industry, government, and academia have the ability to work together strategically at an early stage.
- We can leverage a comparative advantage in profitable upstream segments of the supply chain and focus on other specific segments on the supply chain where Australia can build and maintain similar comparative advantage, efficiency, and utility.
- We can take advantage of the fact that our potential international critical minerals supply chain partner countries are facing similar start-up questions. Their respective governments are also developing policy and funding mechanisms, that encourage development across borders, and promote and support the growth of the whole supply chain, to all partners' mutual benefit.
- We can work together to identify and support work with a diverse group of trading partners in order to support resilient and efficient supply chains.
- We can take advantage of existing relationships, including government-to-government, industry-based, and multi-disciplinary (such as our AICC National Working Group on Critical Minerals). Utilizing these existing relationships, we can consolidate the necessary information to develop and inform policy based on evolving industry needs and objectives. These existing relationships will also assist us to adapt to developing international standards, growing demand for existing and next-generation products, and the changing roles of each partner nation in the embryonic development of alternate Critical Minerals supply chains.

The fourth question

How can the Australian Government support the sector's integration with key clean energy supply chains, both domestic and international?

The Australian Government can support critical minerals' integration with clean energy supply chains by investing in research and development projects to reduce the cost of extracting and integrating these minerals in renewable energy technology. They can also provide incentives for businesses to use and develop these minerals, as well as promote them as viable alternatives for traditional energy sources. Additionally, the government could support the development of international standards for the responsible extraction and use of critical minerals and create a framework for monitoring and evaluating their use in clean energy supply chains. Finally, the government could provide resources to support and promote education and training initiatives to ensure that the workforce is equipped with the necessary knowledge and skills to work with critical minerals.

A common theme that emerged in the workshop is the need for international collaboration between governments, industry and academia. This reinforces the findings of a previous series of workshops, which culminated in a [report](#) and concept for a Critical Minerals International Alliance (Appendix – Critical Minerals International Alliance).

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Introduction

To develop a response to the Australian Government's request for input into its Critical Minerals Strategy, a hybrid (in-person and online) workshop was conducted at Monash University on 25th January 2023. The workshop was convened by the [Critical Minerals Consortium](#) (Monash University), in partnership with [MinterEllison](#) and the [Australia India Chamber of Commerce](#). In attendance, were over 60 people from industry, government and research with an interest in the development of our Critical Minerals industry.

To ensure an efficient and considered response focused on priorities for the development of the critical minerals sector and seize opportunities associated with net zero transformation, the discussions were facilitated and focussed on four of the questions in the Critical Minerals Strategy 2023 Discussion Paper which were:

- How can government support the capability of critical minerals companies and other relevant entities to identify, engage and grow new target markets?
- How should Australia engage with international partners to support the diversification of supply chains? What should this engagement focus on (including which countries)?
- How can Government and business work together to ensure private sector insights on the context and complexity of current supply chains and markets can inform policy design?
- How can the Australian Government support the sector's integration with key clean energy supply chains, both domestic and international?

This report details the responses for each question considered in the workshop.

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Government support for capability

Question: How can government support the capability of critical minerals companies and other relevant entities to identify, engage and grow new target markets?

Overview

The workshop addressed the question by identifying opportunities (key focus areas), facts, risks, and uncertainties (insights).

The key opportunities are:

- Do more to support the mining of minerals that facilitate the adoption of renewable energy.
- Develop a reverse perspective, identifying in detail the opportunities for prospective critical minerals suppliers.
- Consider marketability of minerals in framing ESG regulations and processes.
- Develop the workforce.
- Attract international talent.
- Facilitate cross-border cooperation between governments, research institutions and industry.

Details are provided below.

Key focus areas

In formulating market solutions, consider the causes in detail

There are many causes of mineral criticality so solutions that work in one market, may not work in another. The government should conduct or support root cause analysis on a market-by-market basis, to inform the formulation of market-specific interventions.

Do more to support the mining of minerals that facilitate the adoption of renewable energy

If the governments of the world value renewable energy, then they must support the mining and processing of the enabling minerals. This includes a re-evaluation as to how emissions from production of critical minerals are compared to the emissions from other sources. For example, the mining of lithium and coal both give rise to scope 1, 2 and 3 emissions. But mining lithium ultimately avoids the need to burn coal, and so also contributes to emission reductions (possibly scope 4). There is a lack of incentives to achieve scope 4 emissions reductions, and currently most companies don't even report scope 4.

Reverse prospectus

The federal government should facilitate the development of a *reverse-prospectus*. The availability of in-depth, high quality market analysis for a wide range of critical minerals markets would help small and mid-sized enterprises to target their efforts. To be truly useful, the analysis would need to be regularly updated and refined over an extended period of time. The analysis should not only forecast demand, but also investigate and report on the details of what type of company will be buying, what the essential characteristics of the minerals must be, what substitutes are available, and how the minerals will contribute value to the customer. Disciplines required to develop a reverse prospectus include (but not be limited to) economics, minerals processing, and materials science.

Consider marketability in framing ESG regulations and processes

ESG credentials are marketable features for products, especially for minerals used in technologies that reduce CO₂ emissions. In framing and administering ESG requirements, the federal and state governments should consider international marketability, alongside local and national environmental, social and direct economic needs. Factors that are useful in this regard:

- **Consistency** – The highest possible degree of national consistency in the formulation and application of regulations will give confidence to buyers that Australian-sourced materials meet high ESG standards.
- **Competitive standards** – ESG standards need to be competitively high compared to other potential suppliers.
- **Achievable** – The standards must be achievable by small and mid-sized enterprises in Australia.
- **Traceable** – There must be some method by which critical minerals can be traced through the supply chain such that their ESG credentials travel with them. Becoming a leader in a tracking solution (for example through the use of blockchains) could provide Australia with a competitive advantage.

Developing the workforce

China has built scientific and industrial capability in critical minerals over several decades. Australia has world-leading METS sector capabilities and tremendous mining technical knowhow. However, to compete with China in critical minerals markets, additional capabilities will be required, particularly in downstream processes in the supply chain. The federal government should guide and support research and teaching organizations to develop the additional scientific and industrial capabilities needed.

Attract international talent

The federal government could do more to attract international talent with expertise in critical minerals, including experts from China.

Facilitate cross-border cooperation between governments, research institutions and industry

The Australian government should do more to significantly improve cross-border cooperation between governments, research institutions and industry by supporting the establishment of the Critical Minerals International Alliance (Appendix – Critical Minerals International Alliance).

Long-term and well-funded programmes

The best way for government to support capabilities is for long-term, stable and well-funded programmes targeting critical minerals markets, including encouragement of in-country processing and valorisation.

Funding needs to be targeted to solving the big structural problems with the sector. These are complex and long term, and therefore aren't covered in existing schemes that aim to support individual projects, for example on getting a rare earth mine up and running.

Long-term research funding

We need long term funding for research to really be able to tackle and solve these multidimensional problem (geology, processing, economics, ESG, market dynamics, resource competition, regulatory frameworks etc.), and to be able to train the workforce of the future. In short, make use of the talent and willingness of universities.

Insights (key facts)

A sense of urgency and slow regulatory processes

There is a real sense of urgency for action. A major issue with building our critical minerals sector is that it needs to be done quickly if we are to meet net zero targets. Regulatory processes are way too slow, training the skilled workforce takes many years, and there is no way to fast track this, and timeframes from resource discovery to production are

decades long, so even if new resources are discovered today, they won't be producing till the 2030s at the earliest. We need decisive and effective actions.

Critical minerals are not necessarily 'minerals'

Often lists of critical minerals (as defined by the US and European Union) focus on elemental names such as lithium, cobalt, and neodymium. However, this oversimplifies the picture. For example, the critical form of lithium is not actually a mineral, it is a battery chemical containing lithium. Such battery chemicals are far removed from lithium ores such as spodumene.

There are many causes of minerals criticality in many complicated, small, and dynamic markets

Cobalt, rare-earth elements (in many different forms), and downstream lithium products (for example – lithium chemicals) are examples of products where *concentration of supply* is a significant cause of mineral criticality. However, there are many other possible causes of criticality¹ including:

- Barriers to entry (technological, capital) combined with relatively small market size (compared to copper, iron, coal)
- A small number of geographically diverse customers, making it hard to achieve economies of scale on the supply side.
- Opaque markets, meaning price discovery is very difficult.
- Highly differentiated products including different forms of the same underlying mineral in different stages of the supply chain.
- Some markets are dominated by co-production (For example, much cobalt is a co-product to copper) distorting the usual market connection between price and supply.

To solve a problem, we must understand the problem

If governments, academia, and industry are interested in participating in any given critical mineral market, it is essential that they share an understanding with respect to the details and complexities of the market, and the root causes of criticality.

The supply side for upstream critical minerals will mainly be made up of small and mid-sized enterprises

Critical minerals (as defined by the US and European Union) generally have small markets, compared to iron, coal, copper, etc. This makes most critical minerals markets unattractive to major global mining companies.

ESG requirements are local and global

In Australia, environmental standards for mining are set by the federal government through legislation such as the Environmental Protection and Biodiversity Conservation Act (EPBC Act) and regulations under state and territory laws. The primary aim is to apply standards that meet local and national needs. However, excellence in ESG is increasingly seen as a differentiator for products in global markets. Accordingly environmental regulations should be evaluated not only for their direct utility, but also for their effect on the marketability of the products produced under the regulations.

On-shored or near-shored downstream processing

Many critical minerals have complex downstream processing requirements. To achieve the required industrial scale, it will often be necessary for one large processing facility to service multiple mines. This requirement needs to be met by an industry that will likely be dominated by small and mid-sized enterprises.

¹ For a more detailed discussion of minerals criticality assessment see Whittle, D., M. Yellishetty, S. D. Walsh, G. Mudd and Z. Weng (2020). Minerals Criticality Assessment from an Australian Perspective. [ALTA 2020 Uranium and REE Conference](#). A. Taylor. Perth.

In framing interventions, the federal government should be cognisant of the differences by state and region

For example, miners from Western Australia report as a significant issue – a lack of infrastructure (transportation, power, water) near to critical minerals deposits. In contrast, miners in Victoria report that permitting is a more significant issue.

China has developed high levels of industrial and scientific capability

For example, there are around 100,000 people in China registered with the professional association for REEs. According to Treasurer, The Hon Dr Jim Chalmers MP, China filed 11,000 patents in critical minerals extraction and processing between 2015 and 2019, which stands as a testament to their strong industrial and scientific capability.

Not enough graduates in engineering and science

In Australia, bringing on a skilled workforce to enable the sector is a huge issue – we are not graduating enough engineers and scientist to support the sector, and there is no light and the end of the tunnel at the moment. The government should have a targeted skilled migration program first up, and then have effective support for universities and TAFEs. to trains graduate (BEng, BSc and PhD) that are equipped and ready for the industry.

Consistent support for resource discovery

Resource discovery/exploration is often ignored; it is assumed we have plenty of resources in the ground and we know where they are, we just need to know how to process the ores and then value add. But this is not true for many metals. The pipeline of deposits that can feasibly be exploited in the future is relatively small, considering that ESG, infrastructure, water, and other factors will mean many deposits will never be mined. We need a focus on ensuring discovery of new resources (some of which will be in tailings and mine wastes) are recognised, and that these are resources that can be feasibly mined (near enough to infrastructure corridors with energy and water available for example).

Geoscience Australia has done some commendable work in this area, and support for their work in critical minerals should be expanded and sustained for the long term.

Onshore supply chains need not be contiguous

Australia's participation in supply chains need not be contiguous from minerals in the ground to some exported product, and then end. There is an opportunity for Australia to re-enter the supply chain, for example by producing batteries using battery chemicals processed overseas.

Tapping into superannuation to finance critical minerals supply

This is not a new idea but was raised in the workshop and deserves consideration.

Radical solutions

In Australia's past, marketing boards for wool and wheat have been successful in supporting many small and medium sized producers in their interactions with global markets. Although the times for the wheat board and the wool board have passed, and Australia's international trade commitments have changed, perhaps there is still something to be learned for critical minerals from the earlier wool and wheat interventions.

Insights (uncertainties)

Marketability of ESG

Whilst ESG credentials are widely viewed as marketable aspects of a mineral product, it makes sense to validate that assumption, and qualify it by market.

Markets are not predictable

Although we have called for government support in developing and maintaining a reverse-prospectus for critical minerals, we recognise the inherent difficulty in reliably making predictions for any market. Scenario planning could play a role in supporting planning in conditions of great uncertainty.

Insights (risks)

China is a capable and sophisticated player in the market

China has been highly successful in building a dominant market position in many critical minerals markets through sophisticated planning and execution of its strategy. Whatever is done to build alternative supply chains, it will likely be met with a sophisticated response from China.

Authenticity in ESG

To be truly successful, it is necessary to fully engage with the community and environmental groups, and this must not be forgotten in considering the marketability of ESG credentials. The world will figure out if we are not authentic.

Engagement with international partners

Question: How should Australia engage with international partners to support the diversification of supply chains? What should this engagement focus on (including which countries)?

Overview

The cure to supply concentration is new, diversified and resilient supply chains. For example, Australia produces almost ~50% of world's lithium and the rest of the minerals required to produce lithium-ion batteries but the main constraint to mid-stream or downstream expansion seems to be the availability of capital, scale and/or technology, rather than a lack of ore. Australia is well placed to leverage its world-leading METS sector capabilities and tremendous mining technical knowhow by working with its international partners and allies. While the [Critical Minerals Office](#) is working with key countries (the US, India, Japan, Korea, the UK, and European Union members) to strengthening engagement, these partnerships are either bilateral or trilateral at most. A more meaningful and enduring partnership should be multilateral in nature and must include governments, industry, trade associations and academia and research.

During 2021/22, the Critical Minerals Consortium, Monash University, the Australia India Chamber of Commerce, MinterEllison and Austrade conducted a series of workshops. The recommendation of these workshops is to develop a Critical Minerals International Alliance (CMIA) (Appendix – Critical Minerals International Alliance). It is strongly recommended that a broad group of partner countries work towards establishment of such an alliance that is equitable, transparent and goal oriented.

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.

Key focus areas

Value capture and transport efficiency

Australia earns less than one percent of the ultimate value of lithium-ion battery packs. Approximately, 99.5% of the value of lithium is added through offshore processing, cell production, and battery assembly. To capture more of the value, Australia must capture more of the supply chain, for example through downstream processing and the production of lithium-based chemicals. Locating processing facilities near to mines can provide a competitive advantage as well, with potential for a six-fold increase in efficiency in transport and logistics.

Established and Emerging Markets

While the government should continue to work with its largest and longstanding trading partners (like the US, Europe, the UK and Japan), it should not lose sight of emerging markets like India (size and scale, high-tech industries and capital), Korea (technology and capital), Indonesia (size and scale) and Latin American countries where the climate change mitigation targets (renewable energy transition) are astronomical with minimal to no resources to support the transition.

Consistent ESG standards

The ESG credentials of a product contribute to its value. When a supply chain crosses many borders, attention needs to be paid to ensuring that ESG standards are consistently applied.

Technology transfer

To achieve the sophistication required for large and complex supply chains, trading partner countries should support technology transfer.

R&D sharing through IP Libraries

A Critical Minerals International Alliance, supported by the Australian and other governments should set up shared IP libraries to support R&D investments, avoid duplication, optimize allocation of resources, and save time.

R&D Partnerships

R&D partnerships should operate with the following three core principles, namely:

- **Complementarity**

Establish partnerships based on complementarity and build a mechanism that values and acknowledges the importance of strong relationships both within and outside the country.

- **Collaboration**

Promote exchanges and collaborations between academics and researchers in fields of minerals criticality assessments, critical minerals extraction, processing and separation and any other research priorities identified. Establish and sustain more bilateral (or multilateral) funding schemes that will enable outcome-driven research and education around critical minerals through competitive PhD and post-doctoral scholarships for researchers from partner countries. This will advance science diplomacy whilst reinforcing the ongoing trade diplomacy.

- **Value**

Set up achievable targets and make sure we deliver tangible improvements in a timely manner, not measured only by output of journal publications or reports but also through impact on policy and industrial practice, including number of patents filed.

Insights

Mineral groupings

It is useful to consider the minerals in certain groups. These groupings can be functional, for example:

- **batteries:**

- Li-ion [Li, Ni, Co, Mn, Graphite, High Purity Alumina]
- Vanadium

- **electric vehicles** (rare earths for EVs and wind turbines, magnesium for alloys)

- **electrification:**

- solar PV inputs (Si, Ga, Ge, In)
- electrolyzers (Platinum Group Elements and Ti catalysts)
- electromagnet / permanent magnets (Nd, Fe, B and other RE magnets).

Value

Value will flow from:

- the application of dynamic criticality assessment of minerals for Australia and its trading partners (leads to a more sophisticated understanding of any given critical minerals market)²
- implementation of collaborative framework, both national and international for evaluation and recoveries of critical minerals from legacy waste streams
- training and upskilling of workforce to promote large-scale operation to high ESG standards
- ensuring Australia is attractive to international partners with the current market price volatility
- providing resources to support permitting and approvals within the critical minerals sector
- conducting due diligence and background checks for potential international partners to ensure work is carried out with integrity, including maintenance of ESG standards and protection of IP
- diversifying the supply chain and ensuring we are able to maximise international partner relationships
- understanding how changes in technologies and substitution of materials may influence demand for specific critical minerals in the future.

Supply chain concentration: Key facts

Some key facts about supply chain concentration, especially around downstream processing of critical minerals:

- Chile leads the world for extracting copper and rhenium while China leads the world in processing them.
- Indonesia leads the world for extracting nickel, but China leads the world in processing it.
- Democratic Republic of Congo leads the world in extracting cobalt and China dominate the processing of it.
- Australia produces ~50% of world's lithium but China does ~90% processing and refining.

Examples of industry bodies

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.

² For example, see Yuan, Y., M. Yellishetty, G. M. Mudd, M. A. Muñoz, S. A. Northey and T. T. Werner (2020). "Toward dynamic evaluations of materials criticality: A systems framework applied to platinum." *Resources, Conservation and Recycling* **152**: 104532. Yuan, Y., M. Yellishetty, S. Northey, W.-Q. Chen, M. A. Muñoz, G. M. Mudd and T. T. Werner (2020). Assessing Platinum and Palladium Price Dynamics through the Lens of Metals Criticality. Monash University.

Government and business working together

Question: How can government and business work together to ensure private sector insights on the context and complexity of current supply chains and markets can inform policy design?

Overview

The workshop addressed the question by identifying facts, opportunities, risks and uncertainties.

The key opportunities are:

- We (industry, government and academia) have the ability to work together strategically at an early stage.
- We can leverage a comparative advantage in profitable upstream segments of the supply chain and focus on other specific segments on the supply chain where Australia can build and maintain similar comparative advantage, efficiency, and utility.
- We can take advantage of the fact that our potential international critical minerals supply chain partner countries are facing similar start-up questions. Their respective governments are also developing policy and funding mechanisms, that encourage development across borders, and promote and support the growth of the whole supply chain, to all partners' mutual benefit.
- We can work together to identify and support work with a diverse group of trading partners in order to support resilient and efficient supply chains.
- We can take advantage of existing relationships, including government-to-government, industry-based, and multi-disciplinary (such as the [AICC National Working Group on Critical Minerals](#)). Utilizing these existing relationships, we can consolidate the necessary information to develop and inform policy based on evolving industry needs and objectives. These existing relationships will also assist us to adapt to developing international standards, growing demand for existing and next-generation products, and the changing roles of each partner nation in the embryonic development of alternate Critical Minerals supply chains.

Key focus areas

Funding is the key

Funding is key to develop small to medium start-up projects, particularly where the supply chain and downstream markets are continuing to develop, and business risk is consequently higher than in established markets.

Industry input to policy making

It is correct to focus on Industry-led inputs into policymaking. Industry focus is required to address start-up phases of Australian supply chain entry, in order to solidify our current position.

International coordination

Australian industry and government can work together to strategically focus, and narrow their approach to markets, both to emphasise strengths and amplify the impact of investment. For example, choosing which critical minerals to concentrate on, which international partners to target at which points on the supply chains, and how those supply chain partners, and their respective governments, can support each other to facilitate and provide a foundation for the growth of resilient supply chains. Such an initiative is aligned to findings in a previous workshop series that gave rise to the concept of a Critical Minerals International Alliance (Appendix – Critical Minerals International Alliance).

Stepped funding has the greatest impact

As stated above, funding is crucial, but purposeful, strategic funding that is "stepped" can have the greatest impact. Supply chains should be evolving and agile, requiring funding mechanisms that recognise that beneficial outcomes evolve over time. Reporting, achievement of milestones, and effective and informative study of evolving supply chains appurtenant to funding mechanisms can help ensure that the right amount of funding flows to the right projects and at the right stages of their development to deliver maximum impact. This level of detail can also facilitate the positive impact of that support on relationships with both international supply chain partners and their respective governments (including planning their own domestic policy and funding based in part on having strongly and smartly supported supply chain partners necessary to their own success).

Forward-thinking policy

Policy should be forward thinking in encouraging and facilitating the use of emerging technologies not only as end outputs, but as tools for trade and building modern and efficient supply chains. Technologies such as Blockchain, when utilised effectively by Industry, can add benefits of traceability, efficiency and agility into the supply chain. Policies and incentives can be tailored to support Australia's effective role in those supply chains.

Insights

- It is important not to disregard Industry's inputs to date, through engagement with the previous government, including those inputs regarding support for emerging industries and technologies. Industry imperatives have not likely changed, and a frank exchange of ideas, proposals, facts, and risks necessarily should build on collective experience to date.
- While funding is of paramount importance, one repeated observation is that large industry members are not investing in smaller industry members or smaller projects. Here is a gap in which private sector and government can collaborate on policy to encourage investment and magnify its impact.
- Some commentators have suggested that one problem with current funding is its effectiveness in facilitating sustainable, efficient, and successful outcomes. Funding is allocated, but some note the lack of mechanisms to help ensure successful utility of government support, including rigor in following-up with milestones, charting future prospects and plans on how to achieve goals, how the funding positively impacts Australia's role in supply chains, and plans for efficient use of funds at appropriate stages of development.
- In areas of production where economies of scale give a strong comparative advantage, such as basic cell manufacture, the private sector and government can work together to identify Australia's strengths, and devise policy solutions to address short, medium, and long-term interests and aspirations across upstream and downstream links on the supply chain from extraction to production.
- None of these aspirations can be reached without the workforce to deliver the desired outcomes. An emphasis on the STEM education required to contribute to Australia's long-term success in this area, including government support for training and education identified (working closely with industry) as necessary to its success, is vital.
- Mining industry participants are not transparent with each other regarding their holdings or interests, as a natural construct of the market and industry. Dialog between the private sector and government must be informed by this, so that the proper balance between commercial secrecy, potential benefit, and sharing of information can lead to practicable outcomes. In colloquial terms, the government cannot "buy a pig in a poke", but the industry participants can't "let the cat out of the bag." Accordingly, some level of comfort needs to be built for both the private sector and government, particularly where heightened disclosure for both sides would deliver better tangible results.

Integration with key clean energy supply chains

Question: How can the Australian Government support the sector's integration with key clean energy supply chains, both domestic and international?

Overview

The Australian Government can support critical minerals' integration with clean energy supply chains by investing in research and development projects to reduce the cost of extracting and integrating these minerals in renewable energy technology. They can also provide incentives for businesses to use and develop these minerals, as well as promote them as viable alternatives for traditional energy sources. Additionally, the government could support the development of international standards for the responsible extraction and use of critical minerals and create a framework for monitoring and evaluating their use in clean energy supply chains. Finally, the government could provide resources to support and promote education and training initiatives to ensure that the workforce is equipped with the necessary knowledge and skills to work with critical minerals.

Key focus areas

- **Value chain value add**
Determining what parts of the value chain are reasonable to compete in may assist in focussing clean energy requirements and funding.
- **Green mining practices**
Incentivise implementation of green energy across mining companies.
- **Green grade supply**
Implement a grading system that attracts higher prices from European markets with demanding transparency and ESG requirements.
- **Pricing and finance**
Provide longer-term debt to renewable energy development and fixed pricing guarantees on supply to attract corporate investment and provide price stability.
- **Off take agreements**
Facilitate partnerships with clean energy supply chain partners internationally across the value chain for niche markets demanding higher grade supply.

Insights

- The security of supply is highly important, there can't be a supply disruption.
- Integration with clean energy supply through transport, grid and storage should be the minimum required by all Australian mining companies.
- Look at supply chains for batteries, hydrogen, rare earth magnets and understand what metals are required and where within the supply chain we would like to explore and develop a green supply chain.
- If we do not have the entire supply chain within Australia, we could have an investment overseas in the remaining stages of the supply chain that is being managed in an ethical and responsible manner.
- Develop a brand as an ethical and responsible supplier.
- Determine where our strengths lie and build a supply chain around it with our partners.

- We need more skilled people to support the needs of the industry.
- Connect industries with the research institutions to commercialise innovation.
- Government to support the development of start-ups technologies to help us stand out against competitors.
- Connect the research institutions with businesses to begin developing upon research.
- Product lifecycle management and reporting correctly will determine more effective strategies for dealing with environmental risks.
- We need to be able to measure all the inputs, outputs, and efficiencies.

Appendix – Critical Minerals International Alliance

A common theme that emerged in the workshop is the need for international collaboration between governments, industry and academia. This reinforces the findings of a previous series of workshops, which culminated in a recommendation to create a Critical Minerals International Alliance.

Austrade, the Australia India Chamber of Commerce, Monash University, and MinterEllison conducted a workshop series in 2021, comprising four sessions. The objective was to bring together stakeholders from government, industry, corporate/legal and research sectors across the regions, to work through the opportunities and the challenges involved in building additional and diversified supply chains for critical minerals, including rare earth elements. The resulting report explores recommendations from the workshops on principles for collaboration, battery minerals extraction, production, and trade, and proposed creation of a Critical Minerals International Alliance (CMIA) with representatives from each participating region.

The purpose of the CMIA is to champion cross-border partnerships for critical minerals and rare earths elements projects in the Indo-Pacific region to facilitate the creation of competitive and sustainable alternative supply chains.

The CMIA will bring together experts from different sectors across the region, with diverse perspectives and backgrounds. Such collaboration will support the development of sustainable and innovative industries that can compete in the marketplace, much more effectively than if each country in the region worked independently. By building a shared understanding of the key challenges and opportunities to creating resilient, secure, and sustainable supply chains for critical minerals in the Indo-Pacific region, and drafting actionable recommendations, both general and supply chain specific, the CMIA can facilitate direct supply chain connections, deliver informed research and advice, and advise on and guide industry-focused policy making across the region.

The CMIA might begin its work by identifying priority supply chain gaps, risks, and challenges. Later projects might focus on policy options to accelerate mining and production; possible investment scenarios to scale up mining and production in the quickest possible time frame; best practices for job creation, training, and workforce development; how to ensure projects are structured to maximize equity and community benefits; factors that incentivise friend-shoring while maintaining compliance with multilateral obligations; infrastructure improvements and related permitting issues; and carbon footprint, environmental and sustainability issues.

In advance of each meeting, workshop or roundtable held by the CMIA, working group leads would provide read-ahead materials and questions that attendees would come prepared to discuss. Opinions from across the region, from industry, academia, governments, and the corporate/legal sector, would all then inform the CMIA's recommendations.