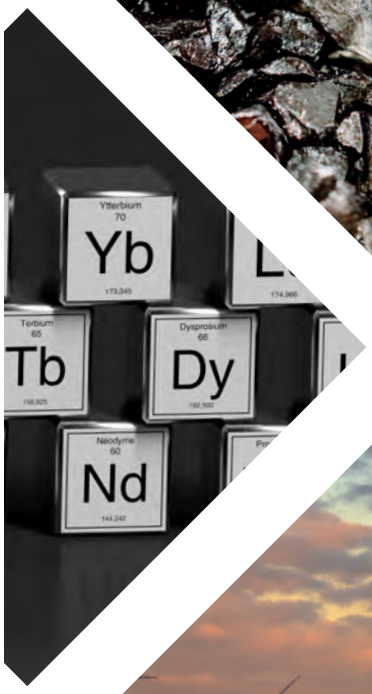
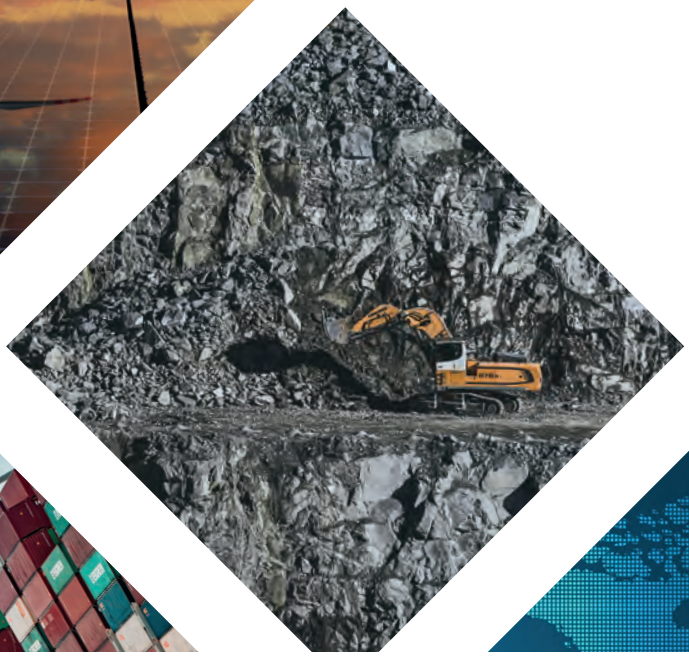
REIA

Rare Earth Industry Association



THE CHALLENGE BEYOND THE DOWNSTREAM

2026



1 Introduction

REIA's Advisory Board Vice-Chair, Rod Eggert recently wrote that "we are in the midst of a profound re-assessment of globalization and industrial policy. Over the past 15 – 20 years, much of the Western world has transitioned from 'least-cost' globalization to the embrace of national focused, state-led industrial policy. The story of rare earths and other critical minerals provides a lens through which to view these developments".[1] Commentary and views abound on the impact of these policies on the rare earth industry, but ultimately it is up to individual companies, such as REIA members, to develop individual and collective strategies to ensure their survival, growth and prosperity.

There are many issues impacting the rare earth industry, particularly when it comes to government policy and geopolitics. Some of the matters companies are faced with include:

- Geopolitical and international trade issues (e.g. export controls to achieve market leverage, tariffs, price floors and subsidies);
- The rapid evolution of technologies and applications and their rare earth requirements (e.g., AI, defense, aerospace, electric mobility, robotics and industrial automation, clean energy, domestic appliances etc.);
- The demand and use of rare earths and their interplay with other critical elements e.g., cobalt, graphite, lithium;
- Threats from technologies that may reduce the demand for rare earths in key applications;
- The complexities of mineral resource availability and processing through the supply chain;
- The dynamics of demand and pricing, and
- Skills, workforce availability, capital availability and ESG.

This discussion piece seeks to raise awareness of challenges facing the rare earth industry, facilitate discussion and thinking, and hopefully assist industry, policy makers, investors, media and the public to better navigate the future.

2 Market Perspective

The global rare earth market, and China's relative contribution, separated into upstream, midstream and downstream is shown in Figure 1. It is made up of many markets, each linked to a particular, or group, of rare earth elements, and their enabling role in a diverse range of technologies and applications e.g. catalysts, glass, polishing, metal alloys, magnets, batteries, phosphors, ceramics etc. There are no rare earth shortages at the mine (upstream).

However, China dominates midstream processing and the downstream, resulting in concerns that the intrusion of trade tensions may interrupt global supply chains.Its dominance has arisen as it holds the world's largest rare earth mineral reserves and adopted state-led policies which have resulted

[1] https://eastasiaforum.org/2026/02/22/critical-minerals-and-the-reimagination-of-globalisation/

in well connected local supply chains. It has a high technology manufacturing ecosystem which creates demand for rare earth materials, in turn supplying products to the world. It is naive to view China as having a monolithic and monopolistic industry. Its industry is made up of companies (some state-owned, others privately) under the strong influence of government, which compete vigorously with each other, and with companies in other parts of the world. Chinese companies are becoming increasingly vertically integrated and expanding globally through offshore affiliates and investments. To everyone outside of China, interactions are coloured by its export controls.

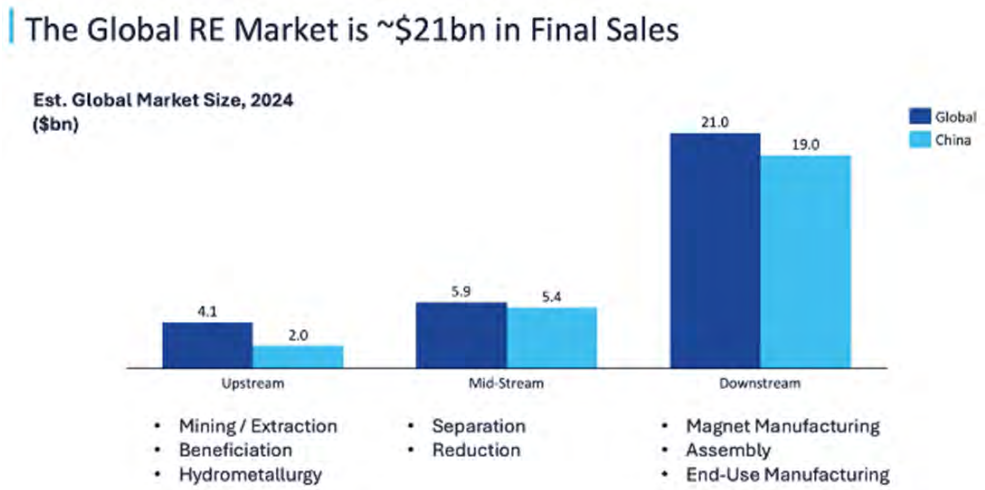


Figure 1. *Global rare earth market (Argus Media Consulting Services)*

The rare earth upstream market is ∼ USD 4 – 6 billion, Figure 1, which is modest compared to other base and key technology metals markets e.g. iron ore ∼300, aluminum ∼270, copper ∼250, nickel ∼62, and lithium ∼33. The rare earth market by value is dominated (96%) by the rare earth elements Nd, Pr, Dy and Tb which are used in magnets, particularly neodymium-iron-boron (NdFeB). Rare earth magnets are of key importance to many high value end use applications, including electric vehicles, wind turbines, industrial automation, domestic appliances, robotics, and aerospace and defense applications, as performance advantages flow from their use. Current global demand for sintered NdFeB is ∼190,000 tonnes, with a growth rate of 8.7% CAGR predicted for the period 2023–2035. This is driven primarily by demand from electric vehicles and wind generation. China accounts for ∼90 – 94% of global rare earth magnet production, and ∼60% of NdFeB global demand.

In terms of the supply chain from mine to magnet to high value end use product, the challenge in the future will be meeting the demand of the 'downstream and beyond'. There is a tendency to think that the downstream is the end of the rare earth value chain. This is not the case. The downstream, using the analogy of a Tier 1 automotive supplier, is where key systems, modules and components are made. Beyond the downstream are the much larger end user markets, with their demand pull, where high value-added products and their associated technologies reside. For example, the global automotive market is estimated to be USD 2.75 – 2.9 trillion (EV market USD ∼1.59 trillion). Future strong demand will come from companies situated in countries that have a high technology manufacturing ecosystem (Figure 2). Continuing and expanding demand from China is expected as its manufacturing industry carries on supplying the global market.

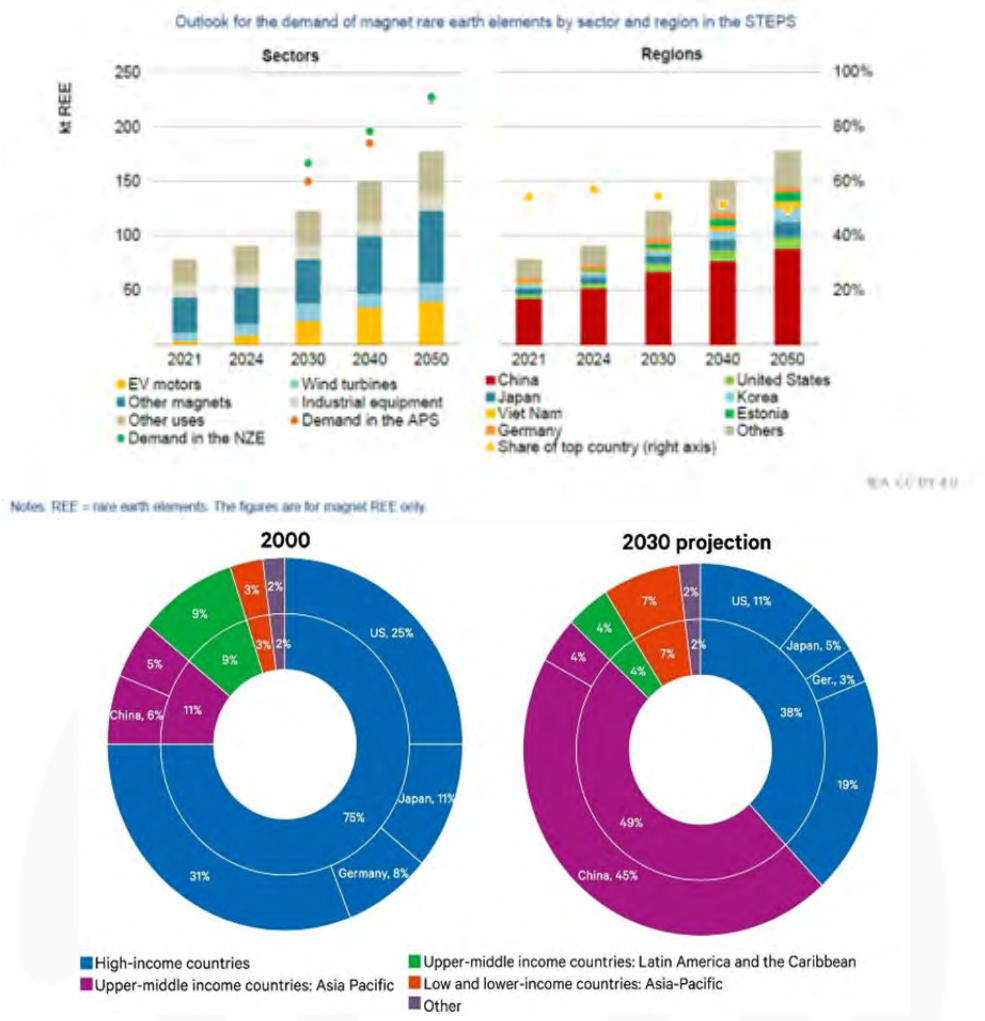


Figure 2. *Rare earth market demand by sector and region and increasing importance of China*

The 'downstream and beyond' is critical to growth of the rare earth market, through its 'demand pull' of rare earth elements through the supply chain. This is where high value products are manufactured, offering higher margins, better profitability and ongoing growth. Rare earth companies throughout the supply chain will need to make an increased effort to better understand product needs and technologies, to sell the performance advantages that come with the use of rare earth elements, and related materials. Getting the benefits from the downstream and the markets it serves requires different thinking. It requires a system engineering approach and an understanding and tailoring of rare earth, and related material characteristics, to meet application requirements.

Pricing rare earths as they move through the supply chain is a vexed issue. The downstream sector has historically behaved quite opportunistically, consistently seeking the lowest price and showing modest interest (even more restrained in the past) in contributing commitments and funding for the long-term development of additional supply chains. Supply chains can only develop with commitment and fair pricing between the entities that make up the supply chain. There are some signs recently that price alone may not be the decisive factor in strategic decision making. Supply-chain resilience and independence are also equally important.

Recycling and the use of secondary raw materials, particularly from end of life applications, have historically played only a minor role in the rare earth value chain. With the introduction of instruments such as the CRMA and the End of Life Vehicles Regulation, policy efforts in Europe are clearly putting pressure on companies to act more sustainably, reduce resource waste, and systematically integrate circular material flows.

Electric vehicles (EVs) are a good example of a system engineering approach. The challenge is to achieve the metric of maximum vehicle range at an affordable total cost of ownership to the consumer. The solution is a system engineering approach involving a range of technologies, e.g. light-weight metal alloys, electric machines, batteries and power electronics. The vehicle designer has options as to how these various technologies are deployed. Of note, the use of non-rare earth containing traction motors in EVs is overstated, as an EV's electric drive motor may typically contain 1 to 2 kg of NdFeB costing $\sim$ US$200, which is a small part of the overall vehicle cost.

Focusing on the downstream and beyond also requires a greater appreciation of the use of rare earth-based materials, in combination with other related critical materials or technology metals, e.g. lithium, cobalt, nickel, graphite etc., as all jointly contribute to the technology outcome. It requires insights, not just into the science, engineering and manufacturing ecosystem, but also engagement with industry and manufacturing associations representing other technology metals.

3 Rare Earth Demand beyond the Downstream

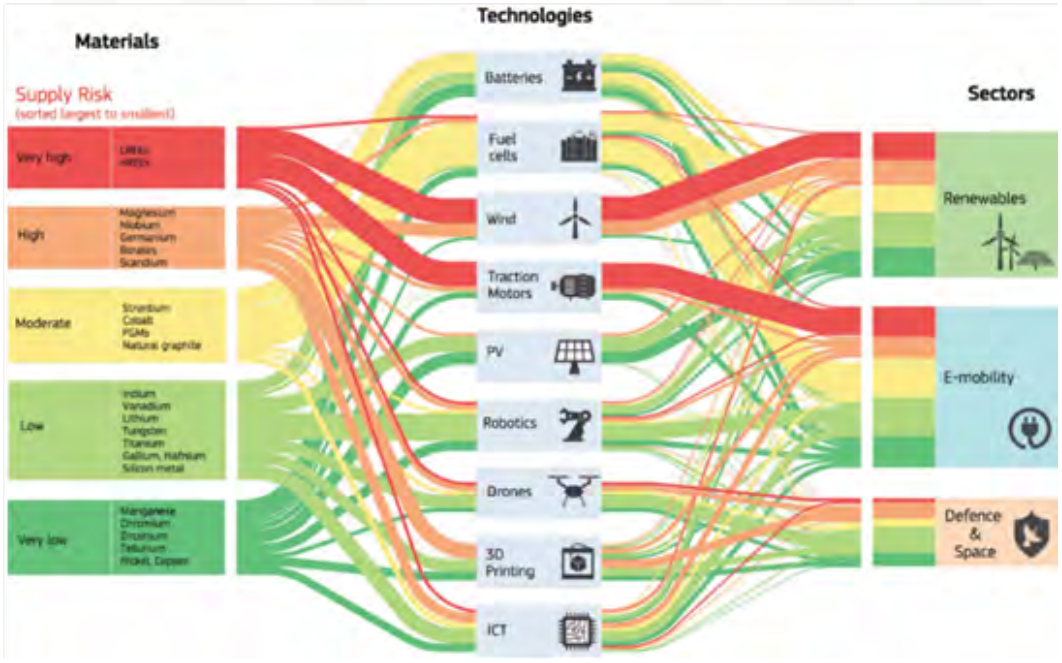


Figure 3. *Material demand flow from technologies and sectors*

Figure 3 tracks the demand for rare earths and other critical materials by technology and sector. It highlights that today's demand for rare earths is strongest in wind and traction motors for E-mobility applications. Those companies that target renewables and E-mobility are most likely to prosper. (There are indications robotics demand may expand faster than initially predicted.)

Defence applications are relatively small and alone cannot support rare earth mineral and material supply chains. This is an important consideration, as recently national governments are using defence related activities (and budgets) as a justification to take financial positions in potential critical mineral resource and processing projects. Without solid off-take agreements returns on investment are questionable. This is particularly true if there are too many 'potential projects', that detract from the need for direct capital, expertise and effort to bring well credentialed projects into production. Well considered investment and expertise are needed to develop civilian demand (leveraged off defence spending commitments).

4 Industrial Strategies — Nationalization vs Globalization

Critical Minerals Strategies (we prefer the term 'materials' as it frames the opportunity across the full value chain, from exploration and extraction through processing, manufacturing, and recycling) aim to add value to a country's economy, by ensuring its national and economic security is protected. Such strategies have the aim of supporting, and rebuilding, if necessary, the local value chain and its associated industries (both import and export). Also, through bilateral or multilateral agreements, they be aligned with, and contribute to the industry of partner countries.

Countries have responded in a variety of ways to the retreat of global supply chains, as result of countries introducing export controls, tariffs, price floors, subsidies etc., and for what seems to be the demise of a 'rules-based trading system'. Middle level powers e.g. Japan, Canada, and Australia, have put in place a range of policies, including bilateral and multilateral agreements with like-minded countries. Australia has recently signed a free trade agreement with the EU. India has put in place initiatives with Australia and Brazil. The US plans Project Vault where the Export-Import Bank of the United States (EXIM) will deploy USD 10 billion, combining both public financing and private capital to support the US extraction and processing sector. Brazil, a country with attractive mineral resources has recently announced that it will require foreign partners to process rare earth minerals domestically as a condition for access to its reserves. Many of the policy initiatives between countries are still under development and have yet to mature into well-defined strategies. In some instances, they are little more than expressions of intent. The real test will be the translation of policies and agreements into tangible outcomes.

Activities in financial markets pertaining to rare earth and critical materials seem somewhat transactional, focusing on merges and acquisitions of companies, often at an early stage of development in the upstream to gain access to product to meet the longer-term 'assumed' demand of the further stages of the supply chain. Unfortunately, the demand for such products is certainly not here today or likely tomorrow, especially when there is limited midstream processing and limited downstream consumption. It is to be seen whether these upstream investments yield meaningful returns over time, and whether the investment needed in other areas of the supply chain materialises.

Irrespective of the push-pull dynamics of nationalistic versus globalization interests, it is imperative for trusted collaboration among like-minded allies to bring the processing, rare earth application, policy, academic and industrial experts together to seek solutions. It is 15 years since the China/Japan RE incident in the South China Sea 'spooked' rare earth markets for a short period of time.

It was a wake-up call for rare earth industry outside China, but it has been quickly forgotten, as today China continues to dominate markets. At the same time, much of the REE technical and industrial expert experience outside China has moved on. Expertise and experience are required across the whole supply chain, particularly in the areas of separation, alloy and metal production, and magnet manufacturing.

The use of the term 'Critical Minerals or Critical Materials' has become a catch-all, with some jurisdictions identifying a dozen or more elements under the banner. The global market for rare earths is relatively small portion of this catch-all. Governments, industry and financial institutions are faced with a wide range of critical materials project proposals, and these parties lack skilled experts to select solid opportunities. Consequently, reviews become cumbersome, with extended deadlines, and of greater concern disconnected to broader industrial, economic and national security goals.

5 Closing Thoughts

- Markets 'beyond the downstream' and the demand they create are key to a healthy rare earth industry.
- China has a significant lead across the entire rare earth supply chain and in critical material markets. Its leadership will continue, with its advanced manufacturing ecosystem, that produces high value products. China will also be a rare earth market. Other jurisdictions should learn from China, as they develop their own rare earth industry.
- Like-minded countries need to collaborate in advancing critical material supply chains, contributing where they can effectively and efficiently, with a focus on building mid-stream processing and next generation applications and demand. This approach offers lower cost investment within shorter-term development time horizons, than greenfield resource developments.
- A well-functioning market for rare earths outside China, with transparent and competitive pricing throughout the supply chain, will benefit all players. To achieve this aim, particularly in the medium term, targeted and coordinated political and regulatory support may be required.
- High technology applications require a systems engineering approach, as a range of individual technologies, each with their own unique materials requirements, working in concert are needed to meet the desired outcome.
- The rare earth industry outside China needs a skilled workforce to replace those who have left the industry and meet industry demand as it grows. This will involve partnerships with universities, trade schools and specialist education institutions.
- REIA in collaboration with its members across the full rare earth supply chain and other critical material associations can engage with 'downstream and beyond' market players.

6 About REIA's Advisory Board

REIA's Advisory Board provides input, opinion and advice to the Management Board and Operations Team on technical, policy and strategic issues related to all aspects of rare earth value chains. This may include developments in mining, processing, recycling, sustainability, supply chain resilience, market dynamics, regulation, and end-use applications. It serves as an important source of expertise, helping to ensure that REIA's activities are informed by a broad range of perspectives from across industry, academia, government, and other relevant stakeholder groups. Through its collective knowledge, the Advisory Board helps REIA identify priorities, assess risks, and respond effectively to the evolving needs of the rare earth industry.

The Advisory Board is currently composed of:

- Ian London (Chair) – C2M2A
- Dr. Roderick Eggert (Vice Chair) – Colorado School of Mines
- Dr. Stephen Collocott – AUS ISO/TC298 Mirror Committee
- José Garcia Santamaria – NuMobility
- Jula Lanzer – Mercedes-Benz
- Jack Lifton – Jack Lifton LLC
- Shimizu Kotaro – MURC

For further information visit: https://global-reia.org/about-us/reia-advisory-board/