Executive Summary:

Critical Minerals

Strengthening Resilience in Ontario's Trade Relations

Quarterly Specialized Report
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Executive Summary

Ontario's critical minerals sector is a cornerstone of the province's economic strategy. With significant deposits of nickel, copper, lithium, platinum, cobalt, and other strategically important minerals, Ontario is well-positioned to meet the growing global demand for these essential resources. In 2024, the province's mineral wealth generated $13B in mined production and supported 74K jobs in mining, processing, and mining supply and services, including a substantial Indigenous workforce. Ontario's world-class manufacturing sector complements its rich mineral resources, creating a unique advantage. The integration of mineral extraction in the north with manufacturing capabilities in the south fosters opportunities for a vertically integrated critical mineral supply chain. The province's Critical Minerals Strategy, published in 2022, outlines a comprehensive plan to position Ontario as a global leader in responsibly sourced critical minerals. Covering the period from 2022 to 2027, the strategy aims to drive prosperity by enhancing geoscience information, supporting exploration, growing domestic processing, and creating resilient local supply chains.

Ontario's mining industry is on the rise, with nine active mines and ten processing facilities producing nickel, copper, platinum group elements (PGE), and cobalt, achieving a total production value of $3.6B in 2024. As of 2025, there are 20 significant critical mineral projects in the province, as well as promising processing and recycling projects. Key deposits in the Sudbury Basin and the Ring of Fire in the far north further bolster Ontario's strategic advantage in this sector. The federal and provincial governments have made significant investments to support the development of critical mineral projects and value chains, spanning from mining to manufacturing and recycling. These investments are channeled through various programs and supportive policies, such as the federal Critical Minerals Infrastructure Fund and Strategic Innovation Fund, and the provincial Critical Minerals Innovation Fund.

Ontario's robust network of research and innovation stakeholders drives advancements in mining technologies, sustainable practices, and economic growth through cutting-edge research and development (R&D). The province's mining workforce plays a pivotal role in the economy, contributing significantly to both local and global markets. Ontario's critical mineral trade is a testament to the province's remarkable ability to punch above its weight on the global stage. In 2024, the mining, processing, and mining supply and services industry directly contributed $14.4B to Ontario's GDP – 1.3% of the total. The province's rich deposits of nickel, cobalt, lithium, and other critical minerals are indispensable for the production of high-performance batteries that power the next generation of electric vehicles (EVs). Ontario's strategic position in global trade is further strengthened by its active participation in international trade agreements and missions. These efforts aim to attract foreign investment and establish global partnerships, ensuring a sustainable future supply chain.

This report analyzes Ontario's critical minerals sector through research and expert interviews, focusing on economic impact, strategic advantages, and future opportunities. It covers the province's mineral wealth, manufacturing capabilities, global supply chain integration, and strategic trade position, highlighting the importance of critical minerals for EV production. The report concludes with insights into opportunities for Ontario to strengthen its position within the global critical mineral sector.

1. An Introduction to Critical Minerals

Critical minerals are essential raw materials that form the backbone of modern technology. They are essential for creating a wide range of products, from solar panels and semiconductors to wind turbines and advanced batteries used in storage, transportation, and national defence. The world relies on these minerals to develop and sustain these technological advancements. Ontario maintains a list of 33 critical minerals which the province has deemed critical to Ontario's economy and its trading partners. These are presented in the adjacent figure.

1.1. What is Considered a Critical Mineral?

Common examples of critical minerals include lithium, nickel, cobalt, graphite, and zinc. Despite variations in country-specific lists, there is a consensus that critical minerals have few or no substitutes, are strategic and somewhat limited in availability, and are increasingly concentrated in terms of extraction and processing locations. For a mineral to be considered as critical in Canada, there should be a reasonable chance of the mineral being produced by Canada, and there must be evidence that its "supply chain is threatened". It also needs to meet one of the following criteria:

- Be essential to Canada's economic or national security;
- Be required for the national transition to a sustainable low-carbon and digital economy; and
- Position Canada as a sustainable and strategic partner within global supply chains.

Ontario further defines critical minerals as raw materials that do not have many viable alternatives, with higher supply risks due to market demand and geopolitical considerations, which is discussed further in later sections. Ontario's critical mineral strategic outlook is focused on several sectors, though notably on opportunities related to EV production.

The transition to a clean energy system is expected to significantly boost the demand for critical minerals, positioning the energy sector as a key player in mineral markets. The rise of EVs is a major driver of this shift, as EVs require substantial amounts of these minerals for their batteries and motors. The specific mineral resources required vary by technology. Lithium, nickel, cobalt, manganese, and graphite are essential for optimizing battery performance, lifespan, and energy density. Rare earth elements (REEs) are crucial for permanent magnets, which are vital components in wind turbines, EV motors, and radar systems. Additionally, electricity networks require substantial amounts of copper and aluminum, with copper being fundamental to all electricity-related technologies.

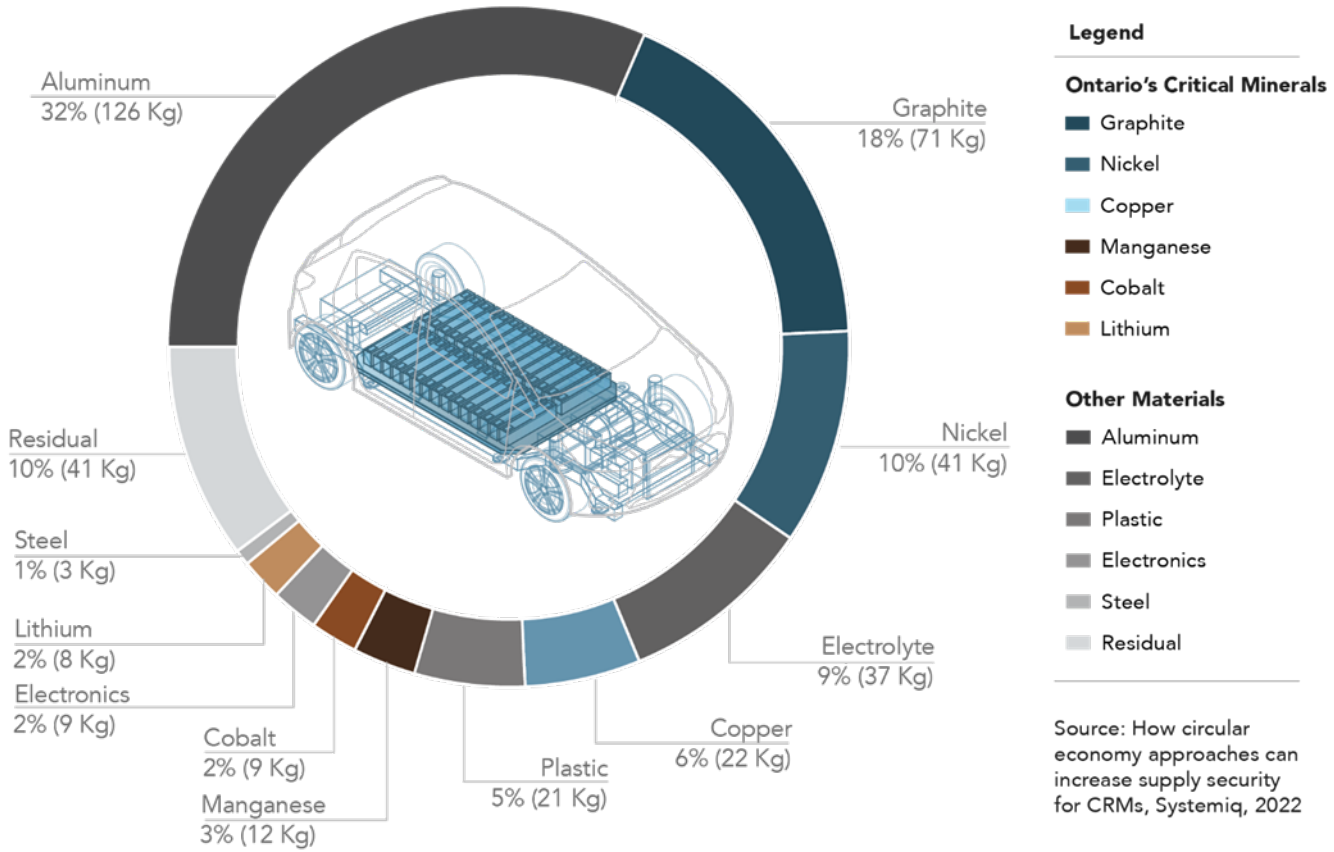
"The development of critical minerals in Ontario is really a story about northern prosperity. Across government, we have strengthened partnerships and made strategic investments to ensure we have the legacy infrastructure in place to support the opportunities ahead."

The Honourable Greg Rickford, Ontario Minister of Indigenous Affairs and First Nations Economic Reconciliation, Minister Responsible for Ring of Fire Economic and Community Partnerships

1.2. The Importance of Critical Minerals for EV Batteries

The mining industry is vital to EV batteries, providing essential raw materials like lithium, cobalt, nickel, and graphite. These critical minerals are fundamental to the production and performance of EV batteries. According to the International Energy Agency (IEA), an average EV requires six times more minerals by volume than a conventional car – mineral demand for EVs is expected to grow by nine to 30 times by 2040. The availability and stability of these raw materials directly impacts production and cost of EV batteries. Disruptions in mining operations can lead to shortages and increased prices, affecting the overall EV market. Ensuring a stable supply chain is crucial for maintaining consistent production rates and keeping costs manageable for consumers. The supply of critical materials also influences market prices, which directly affects the cost of manufacturing EV batteries. Recent decreases in raw material prices driven by increased supply and reduced demand, have led to reductions in EV battery costs, making EVs more accessible to a wider audience.

Materials Needed in an EV Battery



Source: How circular economy approaches can increase supply security for CRMs, Systemiq, 2022

1.3. The Critical Mineral Value Chain

The critical mineral value chain begins with geoscience and exploration, where scientists identify and assess mineral deposits. This is followed by mineral extraction, where resources are mined from the earth. The next stage is intermediate processing, which involves milling, refining, and purifying the extracted minerals to make them suitable for use in manufacturing. These processed minerals then move to advanced manufacturing, where they are incorporated into high-tech products such as batteries, electronics, and renewable energy systems. Finally, the value chain includes recycling, which ensures that valuable materials are recovered and reused, reducing the need for new extraction and promoting sustainability. Given the complexities of modern supply chains, companies are increasingly prioritizing vertical integration and geographic proximity of their value chains to mitigate risks and enhance efficiency. This setup ensures a steady and reliable supply of components, reduces lead times, and minimizes the risk of supply chain disruptions. Additionally, having trusted and transparent suppliers in a stable economic and political climate further enhances operational stability and efficiency. This approach is driven by several key factors:

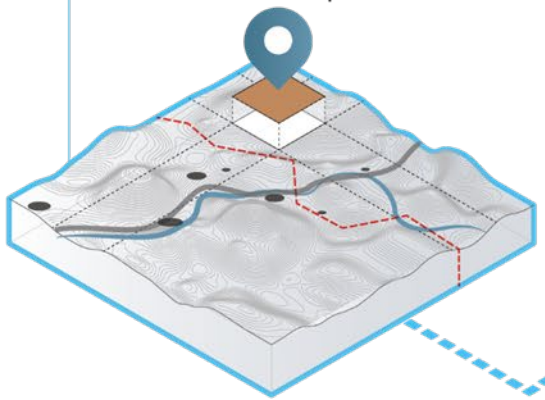
Geopolitical Risks: By consolidating operations within stable regions, companies can reduce exposure to geopolitical tensions and changing trade policies that might disrupt supply chains. This is particularly important for industries reliant on critical minerals, which are often sourced from politically unstable regions and have few to no alternative sources or substitutes.

Environmental, Social, and Governance (ESG) Concerns: Companies are under growing pressure to adhere to ESG standards. Vertical integration allows for better control over environmental practices, labour conditions, and governance throughout the value chain, ensuring compliance with ESG criteria and enhancing corporate reputation.

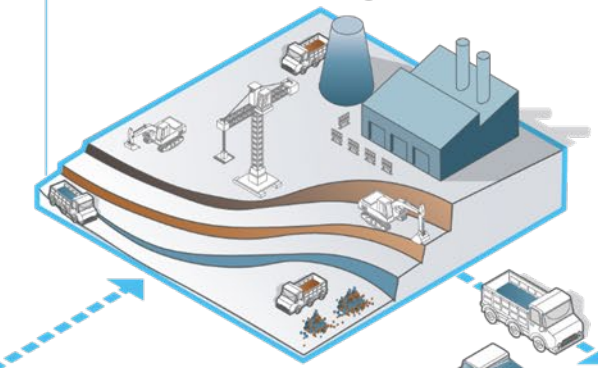
Cost Considerations: Proximity of value chain stages can significantly reduce transportation and logistics costs. It also allows for more streamlined operations, quicker response times, and better coordination between different stages of production.

Critical Mineral Value Chain

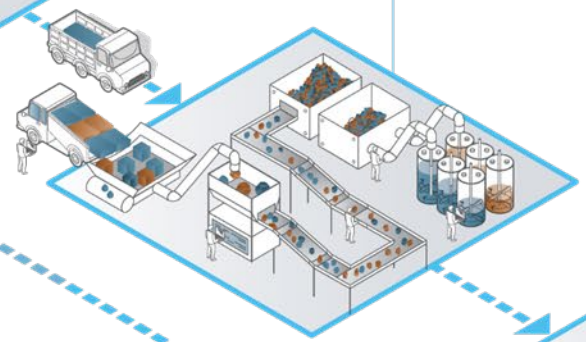
Geoscience & Exploration
Geologists identify and assess mineral deposits



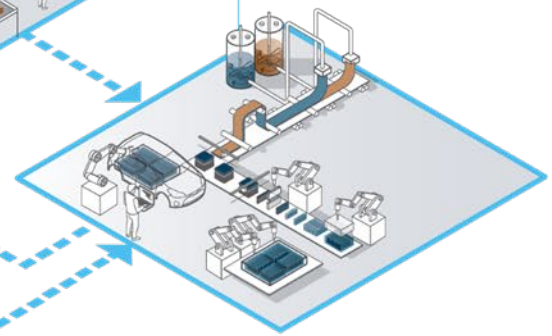
Mining & Extraction
Resources mined and extracted from the earth at facilities such as open-pit or underground mines and quarries. There are also increasing efforts to recover and extract residual minerals from mining waste materials such as tailings and waste rock



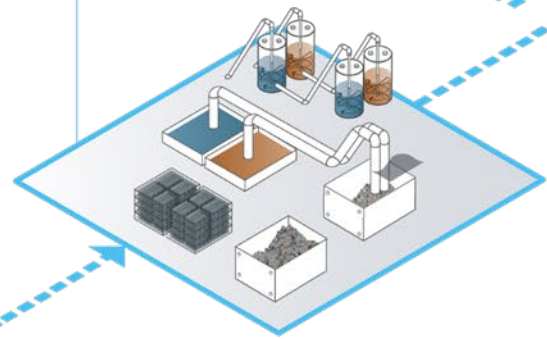
Intermediate Processing
Extracted minerals are milled, refined and purified in facilities such as refineries, smelters, and processing plants, to make them suitable for use in manufacturing



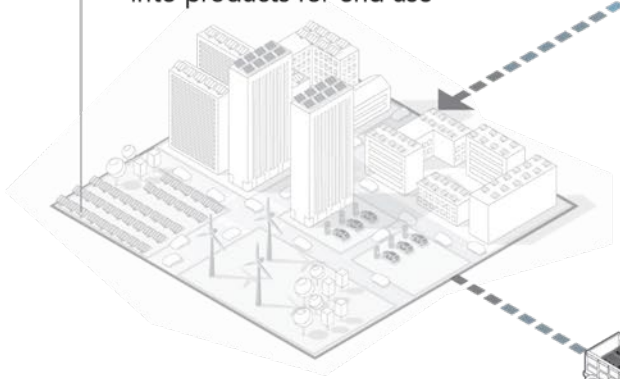
Advanced Manufacturing
Processed minerals incorporated into high-tech products such as batteries, electronics, and renewable energy systems



Recycling
Valuable materials are recovered and reused



Assembly & End Use
Manufactured goods are assembled into products for end use



1.4. Industries Reliant on Critical Minerals

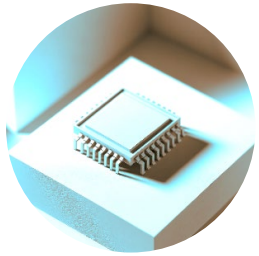
Critical minerals are essential to a variety of industries, each with its own value chain. A selection of key industries is presented here, outlining how specific critical minerals contribute to each industry, and detailing their functional roles and the technologies or components they support within these sectors:

- Automotive
- Energy
- Aerospace & Defence
- Semiconductors
- Advanced Computing

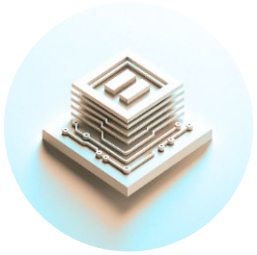
Automotive: Raw materials and critical minerals are fundamental to the automotive lifecycle, essential for both vehicle and EV battery production. Iron ore is used to produce steel, which is necessary for various components in vehicle assembly, including body panels, drive trains, suspensions, fuel tanks, tires, and steering and braking systems. For EVs, key minerals for battery production include cobalt, copper, nickel, graphite, manganese, and lithium. Lithium is particularly in demand, with a 30% increase in 2023 and demand expected to quadruple by 2040 to meet a net zero emissions by 2050 scenario.

Energy: Critical minerals such as lithium, cobalt, and REEs are essential for manufacturing batteries, solar panels, and wind turbines. The transition to a clean energy system is expected to significantly increase demand for these minerals. As the shift towards clean energy accelerates, technologies like batteries and renewable energy systems are becoming the fastest-growing segment of mineral demand with global needs projected to rise substantially over the next two decades in a future aligned with the Paris Agreement. This growth will see copper and REEs comprising over 40% of total global demand, nickel and cobalt reaching 60-70%, and lithium approaching nearly 90%. EVs and battery storage have already surpassed consumer electronics as the primary consumers of lithium globally and are expected to overtake stainless steel production in nickel consumption by 2040.

Aerospace & Defence: The aerospace and defence industry rely on high-purity minerals for manufacturing advanced technologies, from F-35s and nuclear submarines to commercial aircraft, drones, and satellites. NATO published a list of 12 defence critical minerals for advanced systems and equipment, many of which overlap with Ontario's list, including REEs, gallium, and cobalt. REEs are essential for strong alloys in aircraft engines and missiles, while Gallium supports semiconductors in navigation, communication, and flight control. Nickel and cobalt are used in superalloys, stainless steel, and battery cathodes, while hafnium serves as an alloying element in high-temperature alloys. Ontario mined nickel and cobalt report almost exclusively to premium applications in the manufacture of super alloys and other safety critical applications such as rotating parts of jet engines.



Semiconductors: The semiconductor industry is highly reliant on critical minerals, with at least 300 materials required throughout the manufacturing process. Key minerals include gallium, silicon, germanium and palladium. Semiconductors are crucial components in all electronics, facilitating data processing, storage, and transmission. They are the backbone of the automotive and mobility sector, powering essential vehicle functions. Semiconductors enable a wide range of capabilities, including driver assistance, electrification, communication, and entertainment. Gallium has been identified as having the highest potential of disruption due to few to no readily available substitutes and its global market concentration.



Advanced Computing: Critical minerals play a pivotal role in the advancement of computing technologies, such as artificial intelligence (AI), machine learning, data centers, and supercomputing. These minerals, including lithium, cobalt, and REEs, are essential to produce advanced computing systems, batteries, and other key components that power AI applications.

2. The Global Status of Critical Minerals

The global landscape of critical minerals is undergoing significant transformation, propelled by the growing demand for EVs and battery storage technologies. As the world increasingly relies on these minerals, the concentration of substantial reserves across a few dominant suppliers has led to heightened dependence on specific regions. This dependency has brought about notable trends, including significant diversification efforts and the increasing importance placed on recycling to support building supply chain resilience. Other key trends include significant price volatility and limited progress in ensuring responsible supplies of critical minerals globally. The interplay of these factors underscores the complex and dynamic nature of the global critical minerals market.

2.1. Global Demand Drivers

Over the coming years, demand for critical minerals is expected to be driven by clean energy applications, specifically growth in EVs and battery storage. In 2023, global demand for lithium rose by 30% and demand for nickel, cobalt, graphite and REEs expanded by 8-15%, driven by growing EV deployment. EVs cemented their position as the largest-consuming segment for lithium in 2023 and also increased their share considerably in the demand for nickel, cobalt and graphite.

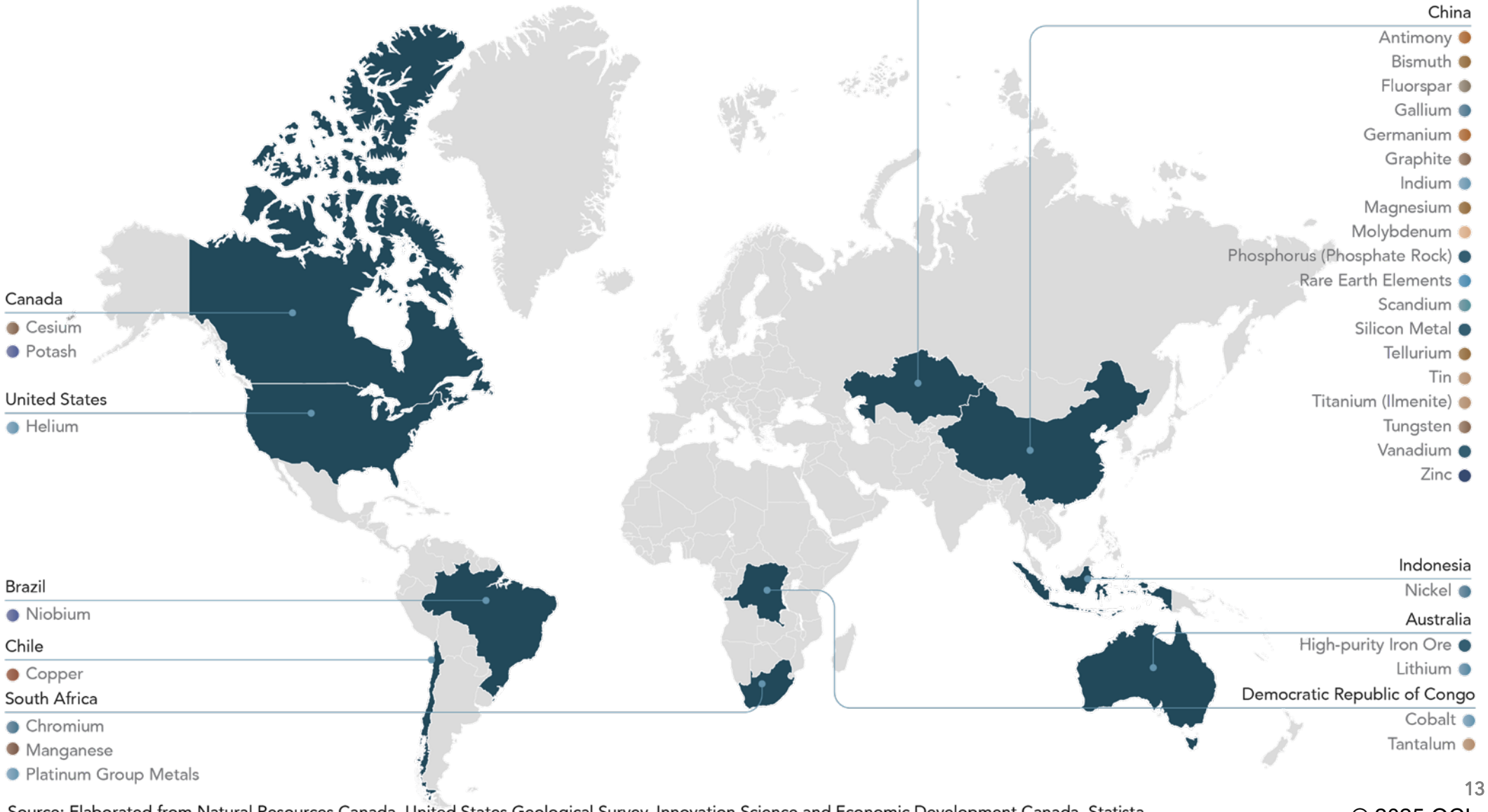
As a vital element fuelling the expansion of the EV industry, lithium demand is expected to increase tenfold by 2050, alongside the rapid deployment of EVs under the IEA's net zero emissions scenario. Over the past decade, the demand structure for lithium has undergone a significant transformation. Although lithium is used in various applications, batteries have quickly become the dominant driver of global lithium demand growth. Demand for other battery critical minerals such as nickel and cobalt is expected to be dominated by EV applications, although demand growth for cobalt has been slower given the market preference for low-cobalt or cobalt-free cathodes. Such trends are leading automakers to take proactive steps in ensuring the future supply of battery critical minerals. As a result, automakers are investing directly in the critical minerals value chain, including mining, refining, and precursor materials to mitigate risks associated with sourcing diversity, enhance transparency, and secure access to clean and responsible sources.

2.2. Significant Reserves and Refineries

Amongst critical minerals, dependency on a few dominant suppliers is particularly acute for cobalt and nickel. The global share of cobalt produced in the Democratic Republic of Congo for example has remained above 60% from 2020 to 2023. Certain countries have also been gaining significant ground in terms of the share of raw material produced, with Indonesia in particular increasing its share significantly for both cobalt and nickel, between 2020 and 2023. In 2023, the Indonesian share of mined nickel production rose to 52%, from 34% in 2020. The Indonesian share of mined cobalt also rose considerably, albeit from a lower base, to just over 8%. Indonesia also increased its refining operations for Nickel, with its share of nickel refining increasing to 37% in 2023.Yet, production locations do not always correspond with ownership. Despite Indonesian dominance in terms of production levels by country, Chinese entities own approximately 40% of global nickel production. In contrast, Indonesian companies hold less than 10%. The case is similar for cobalt in the Democratic Republic of Congo, as China relies almost entirely on it for mined cobalt.

As the map below demonstrates, China is the top global producer of most of the materials on Ontario's critical mineral list. For example, China is the leading producer of REE and holds the largest reserves worldwide, at an estimated 44M metric tonnes. While China is a dominant presence in the market, the country is making significant efforts to diversify raw material supplies, notably through investment in mining assets domestically, as well as internationally in Africa and Latin America. China is also seeking to expand refining facilities internationally with an aim to secure further strategic raw materials. Ultimately, as both demand and geopolitical competition rise, countries with substantial reserves or, more crucially, dominant positions in processing and manufacturing, are set to gain a significant advantage.

Leading Global Producers of Critical Minerals by Country [2024]



Source: Elaborated from Natural Resources Canada, United States Geological Survey, Innovation Science and Economic Development Canada, Statista

2.3. Trends

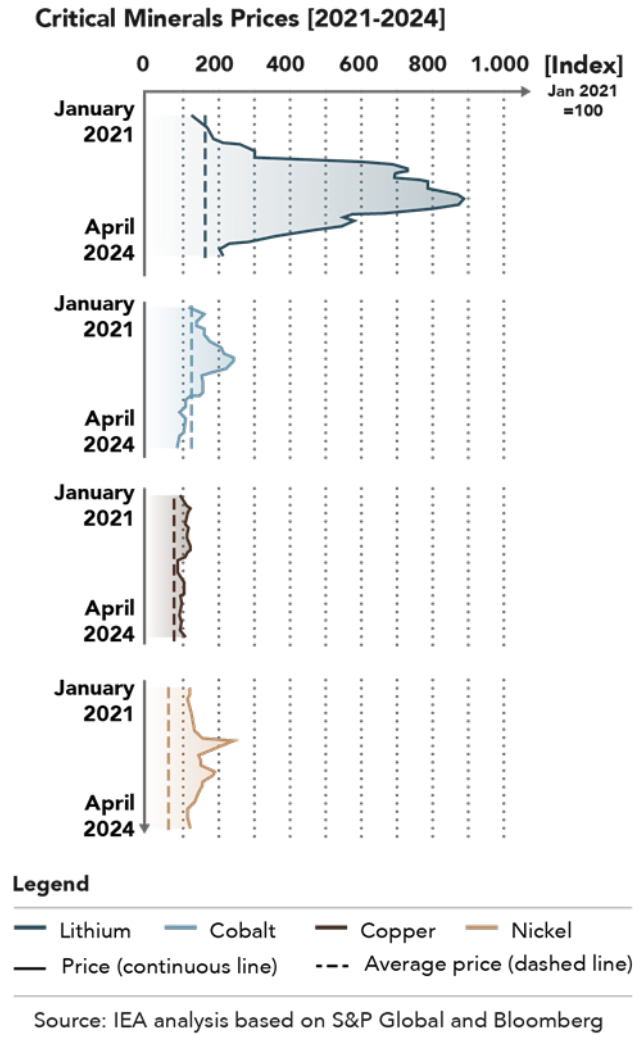
The global critical minerals landscape is being reshaped by key trends including a growing focus on responsible practices, volatile prices, increasing concentration of supply, and recycling. Understanding these trends is crucial for navigating the industry's future and its role in a sustainable economy.

Responsible Practices

A significant supply-side challenge that could impede the speed and security of the green technology transition is the ability to provide sufficient volumes of critical minerals in a clean and responsible manner now, and for expected demand growth. While there has been some progress in enhancing sustainable and responsible practices within the industry, with certain companies taking steps to minimize the environmental and social impacts of their activities, this progress is offset by the lack of reduction in emissions per tonne of mineral output, which has remained stable. Additionally, global water withdrawals increased by 10% between 2018 and 2021. There is limited evidence that sustainability is being prioritized in sourcing decisions, with cost remaining the primary decision-making factor.

Price Instability

Post-pandemic, critical mineral prices have experienced significant volatility, which is expected to continue. In 2023, battery minerals saw particularly steep declines, with lithium spot prices dropping by 75%, and nickel, cobalt, manganese, and graphite dropping by 30-45%. Copper prices remained relatively stable due to lower-than-expected supply. The volatility of other battery mineral prices can be attributed to a combination of supply and demand factors. Despite expectations for a strong post-pandemic recovery, supply expanded at a faster rate than demand, driven by China's expansion of battery plants and cathode and anode production capacity. On the other hand, lower-than-expected demand can be attributed to the slowing growth rate of EV battery sales. Additional factors reducing demand include significant build-up of inventory throughout the supply chain, including Chinese expansion and substantial procurement by downstream consumers after record high prices in 2022 to ensure business continuity. Further instability is expected with the introduction of United States tariffs.

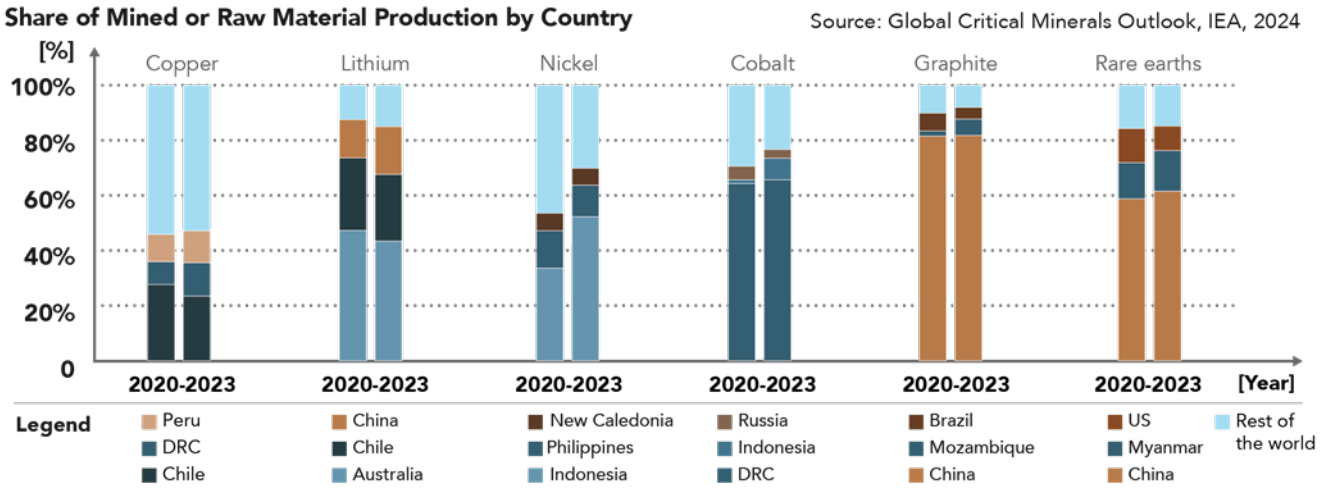


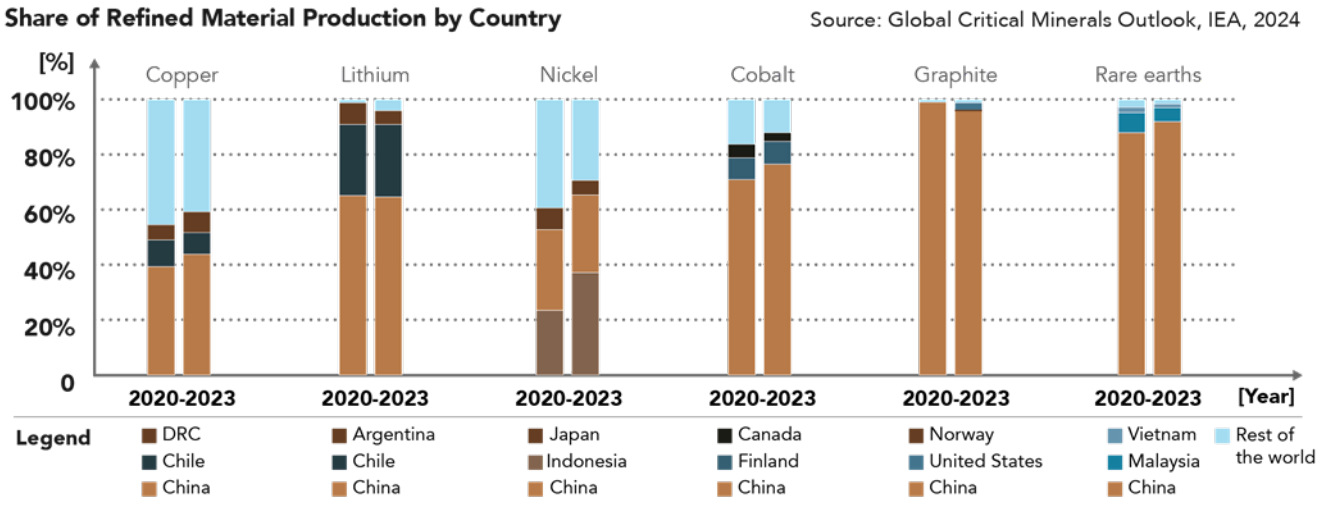
Source: IEA analysis based on S&P Global and Bloomberg

Efforts to Diversify Supply

Despite increasing awareness and policy support for the need to diversify critical minerals supply chains to ensure sustainable supplies, tangible progress has been limited. In fact, between 2020 and 2023, concentration of supply (extraction, processing and refining) has intensified in some instances, with dominant suppliers continuing to increase production. For instance, by 2030, nearly 50% of the market value from refining is expected to be concentrated in China. Ultimately, amidst rising geopolitical instability, resource-holding nations are increasingly making efforts to move up the value chain, while many consuming countries are focusing on diversifying their sources of refined materials.

The graphs to the right demonstrate the challenges in diversifying supply of both raw and refined materials, as the relative shares of copper, lithium, nickel, cobalt, graphite, and REEs by country has seen little change despite the renewed focus on diversification globally.





Yet the origin of supply does not necessarily imply ownership. The graphic to the right demonstrates that although production within these geographies is limited, European, American and Australian companies are key players in copper supplies, American companies with lithium supplies, and Chinese companies have a prominent role in nickel and cobalt production. The Democratic Republic of Congo is an example of a geography that has significant cobalt mining but very limited cobalt mine ownership. Australia is similar, with significant production and limited ownership of lithium, along with Indonesia in terms of nickel production versus ownership.

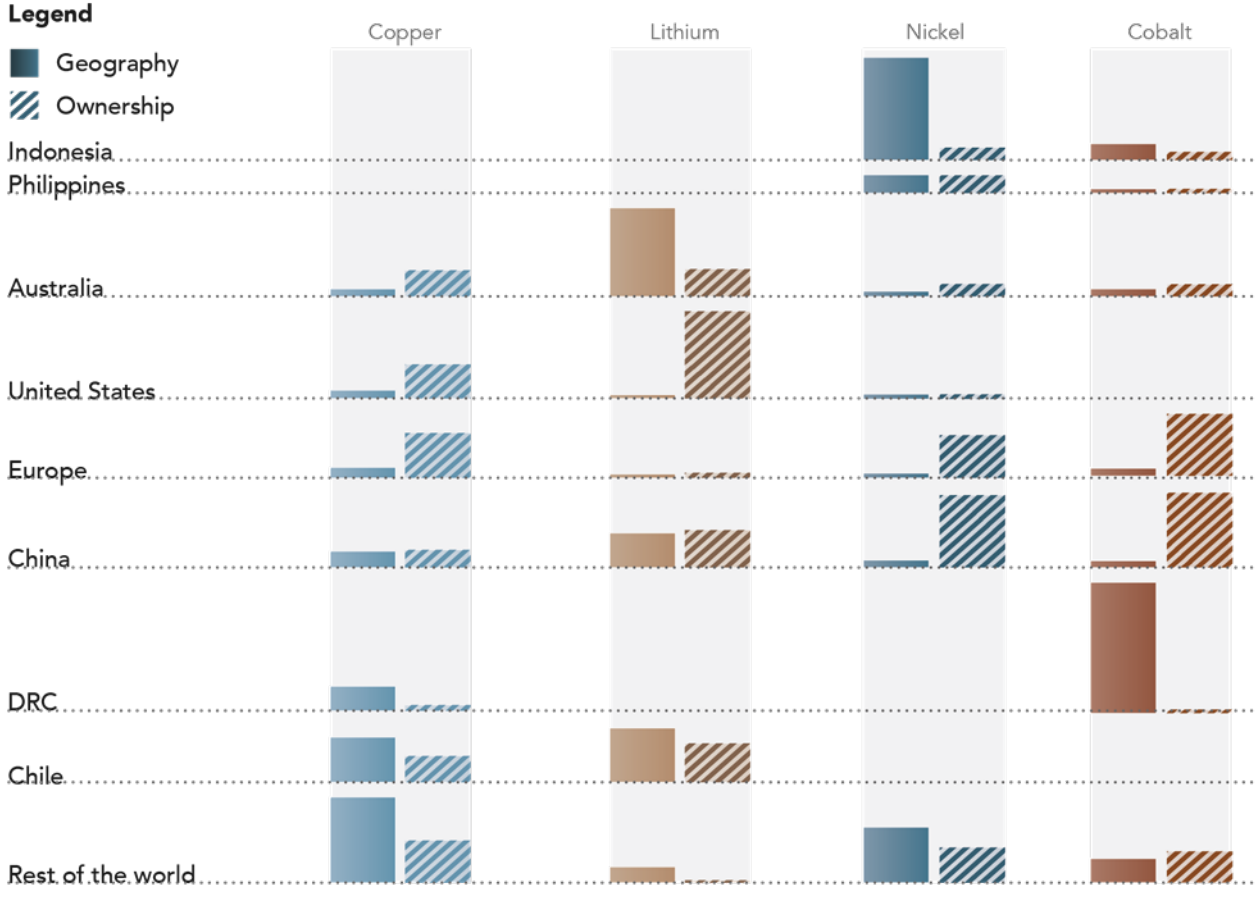
85%

of global lithium production is owned by companies from four countries (Australia, United States, China, and Chile)

74%

of global cobalt mining took place in the Democratic Republic of Congo in 2023

Mining Concentration by Geography and Ownership Matrix (2023)



Source: IEA analysis based on S&P Global and Wood Mackenzie [%]

Recycling

Recycling of clean energy technologies to extract critical minerals emerged as a key focus for both consumer and producer countries in 2023, especially as the market value has grown 40% over the previous three years. Recycling of critical minerals can play a crucial role in mitigating potential market restriction, safeguarding against price shocks and ultimately enhancing resilience of supply chains through reduced dependency on external players.

Since 2022, more than 30 new critical mineral recycling policy measures have been introduced around the world, generally covering strategic plans, extended producer responsibility, financial incentives, and cross-border trade regulations. Yet, despite a significant increase in policies promoting recycling, use of recycled materials has not kept up with rising consumption. In fact, the secondary supply of copper dropped from 37% in 2015 to 33% in 2023, and the supply of recycled nickel fell from 35% to 31% in the same period. Battery recycling will be key to increasing overall recycling rates as recycling of battery critical minerals like nickel, cobalt, and lithium is a rapidly growing commercial opportunity. Recycled metal production has surged, with recovery rates reaching over 40% for nickel and cobalt, and 20% for lithium in 2023. The market value of recycled battery metals grew nearly 11-fold from 2015 to 2023, with 40% of this growth in the last three years. Although EV batteries are not yet recycled at scale, there is significant potential for expansion.

>30

policy measures introduced across the globe in 2022 that target increased critical minerals recycling

40%

growth in globally recycled battery metals market value in the last three years

>40%

of theoretically globally available nickel and cobalt recovered in 2023

20%

of theoretically globally available lithium recovered in 2023

3. Ontario’s Critical Minerals Status

Ontario's critical minerals sector is robust, with significant deposits of nickel, lithium, platinum, cobalt, and other strategically important minerals. This rich mineral wealth underpins an industry that generated $13B in mined production in 2024 and supports 74K jobs in mining, processing, and mining supply and services, including a substantial Indigenous workforce. Ontario’s varied geology provides numerous opportunities for critical mineral exploration. Complementing its mineral wealth, Ontario's world-class manufacturing sector creates a unique advantage. The mineral resources in the north are well-integrated with the manufacturing capabilities in the south, fostering opportunities for a vertically integrated supply chain. This integration not only strengthens the province's economy but also positions Ontario as a key player in the global critical minerals market.

3.1. Ontario's Critical Minerals Strategy

Ontario's Critical Minerals Strategy, published in 2022, outlines a comprehensive plan to position the province as a global leader in responsibly sourced critical minerals. Covering the period from 2022 to 2027, the strategy aims to drive economic recovery and prosperity by enhancing geoscience information, supporting exploration, growing domestic processing, and creating resilient local supply chains. It also focuses on improving regulatory frameworks, investing in innovation, building economic opportunities with Indigenous partners, and developing a skilled labour force. Ontario's strategy is designed to leverage its strengths in mineral wealth and manufacturing to support the growing demand for EVs and battery production, ensuring a sustainable and economically prosperous future.

As of 2025, Ontario has a total of 35 operating mines – the majority being metal mines. Critical mineral mines in Ontario are producing nickel, copper, PGE, and cobalt, achieving a total production value of $3.6B in 2024. In 2024, $1.1B of mineral exploration investments were made in Ontario, making up 24% of total exploration investment across Canada.

As of 2025, there are 20 significant critical mineral projects in the province, and additional processing and recycling projects. By value in 2024, Ontario contributed 27% of Canada's cobalt, 35% of recoverable copper, 38% of nickel, and 72% of PGE. As global demand for these minerals surges, Ontario's mining industry is well-positioned for significant growth. By 2040, global nickel demand is expected to be 14 times higher than in 2021, while cobalt demand is projected to increase sevenfold and copper demand threefold. To help meet this demand, Ontario's significant mineral resources at key deposits in the Sudbury Basin and the Ring of Fire further support Ontario's strategic advantage in this sector.

$13B

mineral and metal production in Ontario in 2024

$3.6B

critical mineral production in Ontario in 2024

$1.1B

Ontario mineral exploration investment in 2024

74K

jobs supported by mining, processing, and mining supply and services in Ontario in 2024

20

significant critical mineral projects in Ontario

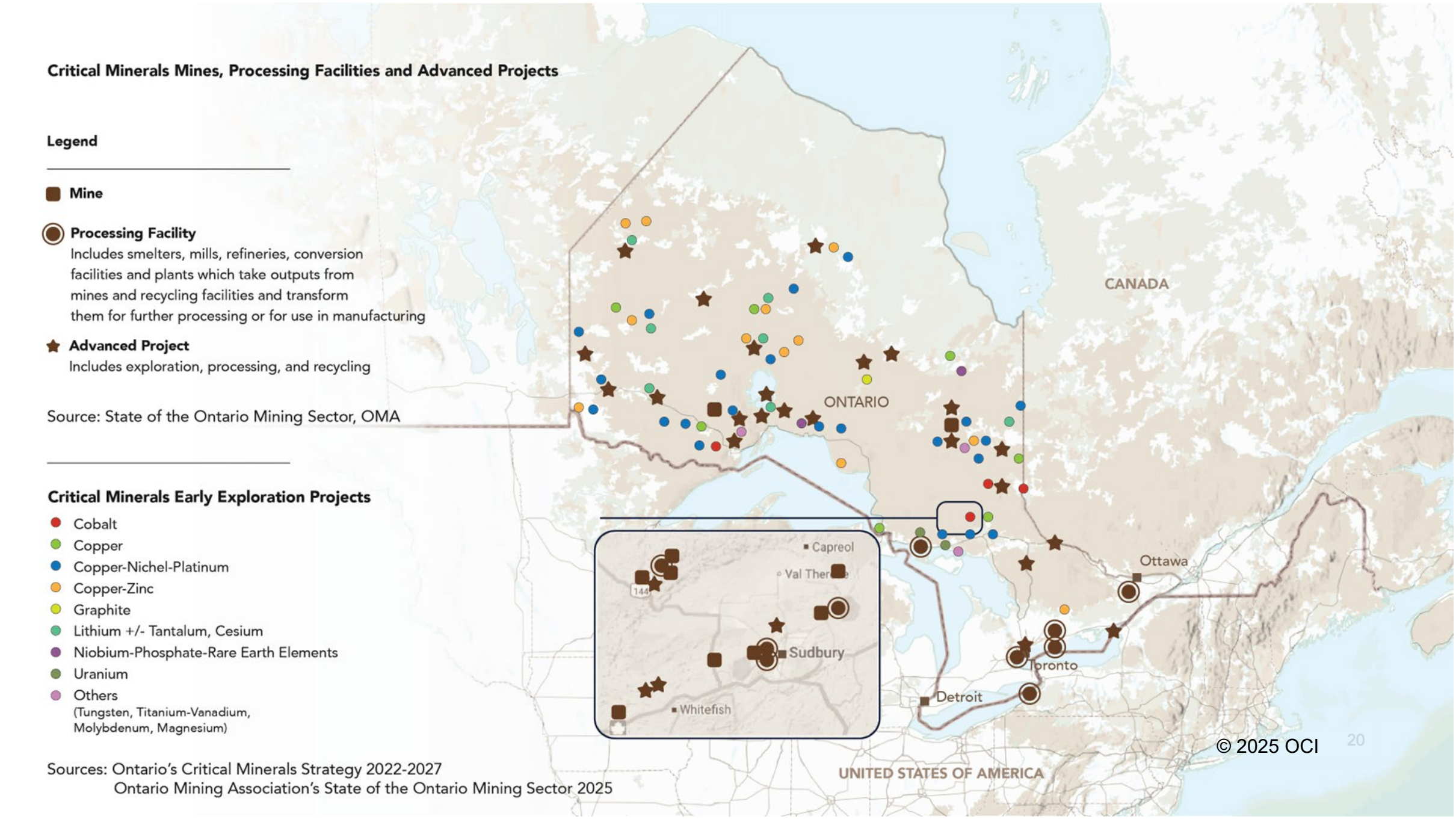
9

active critical mineral mines in Ontario

35

active mines in Ontario

Critical Minerals Mines, Processing Facilities and Advanced Projects



Indigenous People and Mining

The Ontario Critical Minerals Strategy and the Canadian Critical Minerals Strategy both identify Indigenous partnership and inclusion as central pillars of their strategic approach.

At the close of 2024, Indigenous workers represented about 11% of Ontario's mining workforce, with an average of 12% over 2023 and 2024. In contrast, Indigenous individuals accounted for less than 3% of the province's total workforce during the same timeframe. The mining sector is the largest private employer of Indigenous People in Canada. Most Indigenous mining employees, nearly 70%, are employed in the northeast area of Ontario, while 21% work in the northwest. Indigenous workers in the mining sector have a median annual compensation of $89K, 81% higher than the median compensation for Indigenous workers in all occupations. While information on Indigenous businesses is limited, a 2016 report from the Canadian Council for Indigenous Business reported 6% of all Indigenous businesses work in the mining and oil and gas extraction sector in Canada.

While no Indigenous-owned mining companies exclusively operate a major mine in Ontario, there are 142 active agreements between Indigenous communities and mining companies in the province, with over 40 pertaining to exploration activities, and 59 being Memorandums of Understanding (MOU). In 2018, Ontario entered into three resource revenue sharing agreements with 35 First Nations, represented by Grand Council Treaty #3, Mushkegowuk Council, and Wabun Tribal Council. Resource revenue sharing agreements distribute a portion of mining, forestry, and/or aggregate revenues to participating communities, which use the funds for economic development, health, education, community development, and cultural projects.

A recent industry development involves Nations Royalty, an Indigenous company, seeking partnerships with royalty-holding First Nations in northern Ontario. After starting to trade on the TSX Venture Exchange in 2024, the company acquired Nisga'a Nation's mining royalties in British Columbia. Nations Royalty plans to consolidate the royalties to attract investors, lower risks, and create revenue streams for its Indigenous owners and shareholders.

3.3. Investment in Ontario's Critical Minerals Supply Chain

The federal and provincial governments have made significant investments to support the development of critical mineral projects and value chains, spanning from mining to manufacturing and recycling. These investments are channeled through various programs and supportive policies:

Critical Minerals Infrastructure Fund: This federal fund supports infrastructure projects that enable the sustainable development and expansion of critical minerals production across Canada. In 2024, $13.8M in funding was allocated via the Critical Minerals Infrastructure Fund for five road and electricity infrastructure developments in Northern Ontario. In March 2025, the second Call for Proposals was launched, offering over $500M in funding for clean energy and transportation infrastructure projects to promote sustainable development and expansion of critical minerals production.

Critical Minerals Research, Development and Demonstration Program (CMRDD): This federal program provides $192.1M in funding for R&D projects focused on early-stage technology development and demonstration projects in the pre-commercialization phase. Several projects in Ontario have received CMRDD funding. Cyclic Materials Inc. received funding of over $4.8M for its demonstration plant in Kingston. Electra Battery Materials received $5M in funding for its black mass material recycling process in Cobalt and Temiskaming Shores. MIRARCO received $5M of funding for its material recovery technology pilot campaigns in Sudbury. Additionally, Ucore Rare Metals Inc. is demonstrating the commercial efficacy of its RapidSX™ REEs separation technology platform in Kingston, with funding of more than $4.2M.

Strategic Innovation Fund (SIF): This federal fund makes major investments in innovative critical minerals projects, with a primary focus on mineral processing, manufacturing, and recycling. The core objectives of the fund are to: encourage organizations to invest in R&D activities which result in the commercialization of new products, processes, and services; accelerate innovation; attract large-scale investments; and expand collaboration between the private sector, research institutions, and non-profit organizations. In March 2025, it was announced that the federal government has pledged funding of up to $120M via the SIF to support delivery of Frontier Lithium's lithium refinery project in Thunder Bay.

OCI's Critical Industrial Technologies (CIT) Initiative: This initiative, led by the Ontario Centre of Innovation (OCI), is a strategic program designed to accelerate the development, commercialization, and adoption of transformative technologies across Ontario's key industrial sectors – mining, advanced manufacturing, construction, and agri-food. The initiative supports Ontario-based small and medium-sized enterprises (SMEs) through a suite of targeted funding programs:

- Development and Commercialization Program: Offers up to $100K to help SMEs develop and bring to market IP-rich, critical technology solutions.
- Sector Adoption Program: Provides up to $1M for multi-partner consortia, including at least one SME, to integrate and demonstrate critical technologies in real-world industrial settings.
- Talent Development Internships: Invests in workforce development by supporting

internships and upskilling initiatives to prepare Ontario's talent for the future of industry.

Ontario's Critical Minerals Innovation Fund (CMIF): This is a strategic initiative aimed at bolstering the province's critical minerals sector. Launched in November 2022 as part of Ontario's Critical Minerals Strategy, the CMIF provides funding to projects that enhance exploration, mining, processing, and recycling of critical minerals. The fund promotes collaboration between industry, academia, and start-ups to drive the commercialization of innovative technologies. At the beginning of 2025, the Ontario government committed to investing over $7M via the CMIF in 17 projects aimed at accelerating the research, development, and commercialization of innovative technologies.

Ontario Junior Exploration Program (OJEP): This Ontario government initiative promotes growth and job creation, particularly in northern and Indigenous communities, by helping junior mining companies finance early exploration projects. In 2024, the Government of Ontario announced an investment of $13M to support junior mining companies in financing early exploration projects aimed at locating critical minerals for EVs and other advanced technologies.

Ontario Mining Tax Exemption: This is a financial incentive designed to support the development of new mines and major expansions of existing mines in Ontario. This exemption allows operators to exclude up to $10M of profit from taxation during the exempt period, which is three years for non-remote mines and ten years for remote mines. The exemption aims to encourage investment in the mining sector, fostering economic growth and job creation in the region.

OVIN's R&D Partnership Fund: The EV Stream of this program supports collaborative R&D projects that advance Ontario's EV ecosystem. With funding of up to $1M per project, the program enables Ontario-based companies to develop and commercialize next-generation EV technologies. A key focus of the EV Stream is the integration of critical minerals into Ontario's EV supply chain. By supporting projects that explore new methods of sourcing, processing, and utilizing these minerals, the fund helps strengthen Ontario's position as a global leader in sustainable and secure EV manufacturing.

Northern Energy Advantage Program (NEAP): This provincial program is designed to support Northern Ontario's largest industrial electricity consumers, including those in the mining sector, by helping them better manage electricity costs. Additionally, NEAP contributes to the development and expansion of critical mineral projects by ensuring that energy costs do not become a barrier to investment and growth. Through the expanded NEAP, industries can reduce operational expenses, fostering growth and innovation in the local economy.

Ontario Critical Mineral Processing Fund: The Ontario government has recently announced the new $500M Critical Minerals Processing Fund to support the province's mineral sector by providing strategic financial support for projects accelerating Ontario's critical minerals processing capacity. The goal is to ensure that Ontario mined minerals will be processed in the province by Ontarian workers

"As our economy grows with an increased need for critical minerals, our government is strengthening a made-in-Ontario supply chain, ready to fuel the technologies of tomorrow."

The Honourable George Pirie, Ontario Minister of Northern Economic Development and Growth

3.4. Ontario's Critical Minerals Stakeholders: Exploration & Processing

Ontario's critical minerals sector is a dynamic and collaborative ecosystem involving a diverse range of stakeholders. The roles and contributions of a selection of stakeholders are outlined here.

Avalon Advanced Materials: a Canadian mineral development company based in Toronto, specializing in the sourcing, processing, and distribution of rare metals and minerals, particularly lithium. Avalon's key projects include the Separation Rapids Lithium Projects, located near Kenora, Ontario. The company also has a Lake Superior Lithium Project, which is on course to develop Ontario's first lithium-hydroxide processing facility. It is predicted to produce 30K tonnes of battery-grade lithium hydroxide annually.

Canada Nickel: an exploration and development company headquartered in Toronto. The company is focused on advancing the next generation of high-quality nickel projects to support the transition to EVs. Canada Nickel's primary operation is the Crawford Nickel Sulphide Project, located just 45 kilometers north of Timmins. This project is one of the largest nickel sulphide resources globally and aims to produce 48K tonnes of nickel per year. Through its wholly-owned subsidiary NetZero Metals, the company also intends to develop nickel processing and stainless steel alloy production facilities in Timmins.

Electra Battery Materials: a Canadian mining company – headquartered in Toronto – dedicated to the sustainable production of battery materials for the EV industry. Electra's chief focus in Ontario is on its flagship cobalt refinery project. This facility is set to become North America's first cobalt sulfate refinery, playing a crucial role in the supply chain for EV batteries. When at full capacity, its Ontario refinery is expected to produce enough cobalt sulfate for more than 1M EVs per year. The company has also launched a black mass recycling trial at its cobalt refinery.

EV Nickel: a Toronto-based exploration and development company dedicated to advancing nickel projects to support the EV industry. In Ontario, EV Nickel's principal operation is the Shaw Dome Project, located near Timmins. The project is estimated to produce up to 40K tonnes of nickel per year.

Frontier Lithium: a mineral exploration and development company headquartered in Val Caron, Ontario. Frontier Lithium's main focus is the PAK Lithium Project. This project aims to be the first fully integrated lithium development initiative in Canada, encompassing mining, processing, and refining. The PAK Lithium Project is expected to produce over 19K tonnes per year of high-purity lithium chemicals essential for EV batteries. Frontier has also announced plans to develop a lithium hydroxide conversion facility in Thunder Bay to convert spodumene concentrate into battery-grade lithium hydroxide.

G6 Energy Corp: a Canadian company dedicated to the development and production of sustainable battery materials. Headquartered in Toronto, G6 Energy Corp focuses on creating a vertically integrated supply chain for natural graphite anode materials. The company owns the Kearney Graphite Mine, located less than 300 kilometers north of Toronto. This mine is one of the largest confirmed graphite resources globally and is fully permitted for commercial-scale production. It is predicted to produce 100K tonnes of graphite concentrate per year from 2029.

Glencore Canada: one of the largest mining companies globally, Glencore has been operating in Sudbury since 1928. The company primarily produces nickel and copper, with cobalt as a by-product. Its Sudbury operations include mining, milling, and smelting, contributing to Glencore's position as Canada's second-largest producer of mined and smelted nickel. The extracted materials from Sudbury and Raglan (Québec) mining sites are processed at the Sudbury Smelter, which also recycles secondary materials. In 2024, the Sudbury Smelter produced over 62K tonnes of nickel and nearly 14K tonnes of copper. Additionally, Glencore operates the Kidd Mine and Kidd Concentrator in Timmins, which annually produce approximately 40K tonnes of copper and 70K tonnes of zinc.

Green Graphite Technologies: a Canadian company dedicated to the sustainable production of high-purity graphite for EV batteries and renewable energy sectors. Headquartered in Montreal, the company operates a pilot facility in Kingston, Ontario. It has patented two technologies: GraphPure™ and GraphRenew™. These innovative processes purify natural flake graphite and recycled graphite, respectively, to produce battery-grade materials with minimal environmental impact.

GreenLIB: a pioneering company headquartered in Kingston, Ontario, specializing in sustainable battery recycling solutions. Their innovative, low-temperature, water-based pre-treatment process efficiently extracts and refines critical battery elements such as lithium, graphite, and aluminum. This eco-friendly approach not only minimizes environmental impact but also enhances the recovery of valuable metals like nickel and cobalt, ensuring stable yields and lower operational cost. The organization is aiming to process 16.5 metric tonnes of black mass annually by 2030.

Green Technology Metals: a North American-focused lithium exploration and development company headquartered in Thunder Bay. Its operations in Ontario consist of the Seymour Lithium Project, which is scheduled to begin operations in 2026 and will be a significant source of high-purity lithium for battery manufacturers, and the Root Lithium Project, which is situated in the Red Lake Mining District and focuses on expanding exploration targets and drilling to uncover high-grade deposits. The Seymour Lithium Project is estimated to produce 130K tonnes per year of spodumene concentrate, a key raw material for producing lithium chemicals, while the Root Lithium Project is estimated to produce 213K tonnes per year of spodumene. The company is also planning to build a lithium conversion facility in Thunder Bay.

Impala Canada: a global mining company with its Canadian headquarters in Toronto, it is dedicated to the extraction and production of palladium, a critical metal for reducing harmful emissions in gas-powered and hybrid vehicles. Impala Canada's main operation is the Lac des Iles Mine, located northwest of Thunder Bay.

International Lithium Corp: a Canadian-based lithium exploration and development company. In Ontario, International Lithium Corp's primary focus is the Raleigh Lake Lithium and Rubidium Project, located near Ignace. This project spans 48.5K hectares and is one of the company's most significant assets. It is estimated that it will be able to produce 540K tonnes per year of spodumene concentrate.

Magna Mining: a Canadian exploration and development company headquartered in Sudbury. The company is focused on advancing nickel,

copper, and PGE projects in the Sudbury Basin, one of the world's most significant mining districts. In Ontario, Magna Mining's main operations include the Shakespeare Nickel Project, the Crean Hill Project, and the McCreedy West Mine. The McCreedy West Mine, located on the north range of the Sudbury Igneous Complex, is an operating mine which produced 317K tonnes of ore in 2023.

Neo Performance Materials: a global leader in advanced industrial materials, headquartered in Toronto. The company specializes in manufacturing magnetic powders and magnets, specialty chemicals, metals, and alloys that are critical to many modern technologies. Neo Performance Materials operates a facility in Peterborough, Ontario, that focuses on refining rare metals – including tantalum, niobium, hafnium, rhenium, gallium, and indium – used in various applications, such as batteries, renewable energy, and semiconductors.

Northern Graphite: a Canadian mining company headquartered in Ottawa. Northern Graphite's primary project is the Bissett Creek Graphite Project, located between North Bay and Ottawa. This project is near-construction ready and is expected to produce 44K tonnes per year of high-quality, battery-grade graphite from 2026.

Rock Tech Lithium: a cleantech company headquartered in Toronto, dedicated to producing lithium for EV batteries. Located in the Thunder Bay Mining District of Ontario, its Georgia Lake Project is a lithium hard-rock deposit. Rock Tech is also developing Ontario's first lithium refinery at the former Norampac Paper Mill site in Red Rock, approximately 110 kilometers northeast of Thunder Bay. This facility will process lithium from the Georgia Lake Project and other sources to produce battery-grade lithium hydroxide. The Red Rock Converter is expected to become a premier lithium refining destination in Northern Ontario, with an estimated production capacity of up to 36K tonnes per year.

Tartisan Nickel: a Canadian mineral exploration and mining development company headquartered in Toronto. In Ontario, Tartisan Nickel's flagship project is the Kenbridge Nickel Project, located in the Kenora Mining Division. This advanced-stage project features a high-grade nickel-copper deposit with significant cobalt by-products. It is predicted to have an annual production capacity of 528K tonnes per year.

Vale Canada: another of the world's largest mining companies, with its Canadian operations headquartered in Toronto. Vale Canada is a major producer of nickel, copper, cobalt, PGEs, gold, and silver. Its Ontario operations are among the largest integrated mining complexes globally, comprising of five mines, a mill, a smelter, and a nickel refinery in Sudbury, and a cobalt refinery in Port Colborne. Ontario is also home to Vale's global Base Metal Headquarters, and its Technology Development Centre in Mississauga. In 2020, its Canada operations produced 99K tonnes of nickel and 93K tonnes of copper.

Volt Carbon Technologies: a leader in sustainable mineral processing and energy storage solutions, with several key projects based in Ontario. The Air Classifier Facility in Scarborough is dedicated to developing and commercializing Volt Carbon's patent-pending air classifier technology for the dry separation of graphite from ore. In addition, Volt Carbon operates a Mineral Processing Facility in Toronto. This facility focuses on extracting large-flake graphite from host rock using proprietary methods, supporting the production of expandable graphite and graphene. Furthermore, Volt Carbon is actively involved in the

Manitouwadge Flake Graphite Project in Northern Ontario, which involves staking 128 mining claim cells covering 2,662 hectares. This project aims to explore and develop flake graphite resources using the company's air classifier technology, situated in areas with known graphite occurrences.

Weber Manufacturing: a leading mold manufacturer headquartered in Ontario, specializing in high-precision tooling for industries such as automotive, aerospace, and home products. One of its standout features is the world's largest Nickel Vapour Deposition facility. The facility is capable of producing nickel shapes with 99.98% pure nickel. This advanced technology allows for the creation of highly precise molds and complex nickel components.

Wyloo: a mining company with its Canadian operations headquartered in Toronto. In Ontario, Wyloo's primary operation is the Eagle's Nest Project, located in the mineral-rich Ring of Fire region. This project is one of the world's best undeveloped high-grade nickel, copper and PGE deposits and is expected to produce 15K tonnes of nickel, 6K tonnes of copper, 70K ounces of palladium and 22K ounces of platinum per year once developed. In 2024, Wyloo signed a MOU with the City of Greater Sudbury to build Canada's first downstream battery materials processing facility. The facility aims to fill this critical processing gap in Canada's EV battery supply chain by producing low-carbon nickel sulphate and nickel-dominant precursor cathode active material (pCAM).

Zentek: a Canadian intellectual property development and commercialization company headquartered in Guelph, Ontario. One of Zentek's key projects is the Albany Graphite Project, located in northeastern Ontario near Hearst and Constance Lake First Nation. The Albany deposit is a rare hydrothermal graphite deposit, known for its high purity and ease of exfoliation, making it ideal for producing high-quality graphene. This project is expected to play a significant role in the production of battery-grade materials, supporting the transition to clean energy and EVs.

3.5. Ontario's Critical Minerals Stakeholders: Research & Innovation

Ontario's critical mineral industry is supported by a robust network of research and innovation stakeholders. These stakeholders drive advancements in mining technologies, sustainable practices, and economic growth through cutting-edge R&D. A selection of these is presented here.

Centre for Excellence in Mining Innovation (CEMI): established to help the mining sector achieve significant improvements in performance, CEMI – based in Sudbury – focuses on accelerating the adoption of commercially viable innovations and increasing the innovation capacity of mining service companies. It works closely with industry partners, academic institutions, and government bodies to address mining challenges and promote sustainable practices. CEMI's initiatives include the Mining Innovation Commercialization Accelerator (MICA) Network, which fosters collaboration among stakeholders from various fields to develop and commercialize technologies that enhance productivity and sustainability in the mining sector.

Centre of Excellence for Sustainable Mining and Exploration (CESME): a research and innovation hub based at Lakehead University in Thunder Bay. CESME is dedicated to encouraging and supporting research, education, and outreach activities related to the nature and

impacts of mineral resource exploration and extraction, particularly in Northern Ontario.

Centre for Smart Mining (CSM): an innovative R&D hub based at Cambrian College in Sudbury. Established to support the mining sector's adoption of new technologies, CSM focuses on de-risking and demystifying advanced mining solutions. CSM provides industry partners with access to cutting-edge equipment, specialized training, and applied research projects. The center's areas of expertise include digital technologies, underground communications, mechatronics engineering, battery-powered mining vehicles, and alternative tailings treatment technologies. The center collaborates with various stakeholders, including mining companies, SMEs, and academic institutions, to enhance the mining innovation ecosystem in Sudbury.

MIRARCO (Mining Innovation Rehabilitation and Applied Research Corporation): a leading not-for-profit research organization based in Sudbury. MIRARCO is affiliated with Laurentian University and focuses on providing innovative solutions to mining industry challenges through applied research. MIRARCO's research spans five core domains: Biotechnology, Geomechanics, Safety, Software, and Energy. It collaborates with industry partners, government bodies, and academic institutions to advance mining innovation. For more information refer to OVIN's recent Powering the Future report.

Ontario Mining Association (OMA): founded in 1920, the OMA is one of the longest-standing trade organizations in Canada. OMA serves as a unified voice for its members – ranging from major mining companies to suppliers and service providers – advocating for policies that promote competitiveness, innovation, environmental stewardship, and workplace safety. Through research, outreach, and partnerships, OMA champions sustainable growth and the development of a skilled workforce to meet the evolving demands of the mining sector.

OVIN Northern Regional Technology Development Site (RTDS): launched in 2022, this site covers the northern Ontario region. The RTDS aims to unite organizations from the mining and manufacturing sectors, higher education institutions, Regional Innovation Centres, incubators and accelerators, municipal and regional resources, industry, and other regional collaborators. By fostering collaboration among these entities, Ontario's EV supply chain can be further developed at every stage, from mining and refining raw materials to designing battery cells and EV powertrains, and manufacturing.

Rain Carbon: a global leader in the upcycling of industrial by-products into high-value carbon materials with its headquarters in Delaware, United States. In 2024, Rain Carbon announced the establishment of its North American Innovation Center for Energy Storage Materials in Hamilton, Ontario. This 30K square foot facility is dedicated to advancing sustainable energy storage solutions. The Innovation Center focuses on developing and commercializing new energy storage materials, including natural and synthetic graphite, silicon-carbon composites for lithium-ion batteries, and materials for emerging technologies like solid-state batteries, sodium-ion batteries, and hydrogen fuel cells.

3.6. Ontario's Critical Minerals Workforce

Approximately 23% of all direct mining jobs in Canada are in Ontario, employing 31K people across the province. Mining has also indirectly contributed to over 46K Ontario jobs. This workforce is also supported by a strong network of educational institutions, with over 50% of Ontario's colleges and universities offering mining, earth and environmental sciences, and related engineering programs. More than half of the labour force has a post-secondary certificate, while a quarter have a university degree.

Recent research by OVIN indicates that an additional 3,340 workers will be needed in the province's critical mineral sector by 2040 to avoid a projected 14% vacancy rate due to high demand and insufficient workforce strategies. The analysis identifies four broad categories of in-demand talent: Mining Production; Production, Trades, and Transportation; Mining Engineering; and General Engineering. In preparation for this need, Ontario has been investing in critical skills programs. Some examples are outlined here.

Skills Development Fund: launched in 2021, the program is comprised of two streams to support Ontario's workforce: the Training Stream to support hiring, upskilling, and training in key sectors to Ontario's economy, and the Capital Stream to provide funds to construct and renew skilled trades training centres.

Ontario Youth Apprenticeship Program: a school-to-work transition program for high school students to earn secondary school credits through work placements in a skilled trade such as automotive service technician, electric motor system technician, microelectronics manufacturer, and die designer.

Critical Minerals Talent Strategy: a series of strategic reports, released by OVIN as part of its Workforce and Talent Initiatives in May 2024, that expand on Ontario's Critical Minerals Strategy 2022-2027. The Critical Minerals Talent Strategy addresses the labour opportunities and challenges arising from the increased demand for critical minerals for EV batteries and the broader electrification value chain. It highlights the thousands of job vacancies that need to be filled to build a strong talent pool and a highly skilled workforce in critical minerals, automotive, and mobility sectors. The strategy identifies key opportunities such as engaging youth to raise sector awareness, increasing access to training and education, and promoting engagement with women, Indigenous communities, and other underrepresented groups.

OVIN Regional Future Workforce – Critical Minerals Pilot Program: a targeted initiative designed to build a skilled, future-ready workforce to support Ontario's growing critical minerals and EV supply chains. This pilot program focuses on engaging youth, post-secondary students, and underrepresented groups in regions rich in critical mineral resources. By fostering partnerships between industry, educational institutions, and community organizations, the program delivers hands-on learning experiences, career exploration opportunities, and skills development aligned with the needs of Ontario's critical minerals sector.

For more insights on addressing the talent needs and human resources challenges in Ontario's critical minerals sector, explore OVIN's talent and workforce report **Digging Deep: Improving Ontario's Critical Mineral Talent Landscape**.

4. Mineral Trade Outlook and Impact

Ontario's critical mineral trade is a testament to the province's remarkable ability to punch above its weight on the global stage. Ontario has established itself as a powerhouse in the mining industry, contributing significantly to the global supply of essential minerals.

Ontario's robust mining sector not only supports the local economy but also plays a crucial role in advancing global efforts towards sustainable transportation and clean energy solutions. By consistently meeting the growing demands of the EV market, Ontario has solidified its position as a key player in the international arena, driving innovation and fostering economic growth.

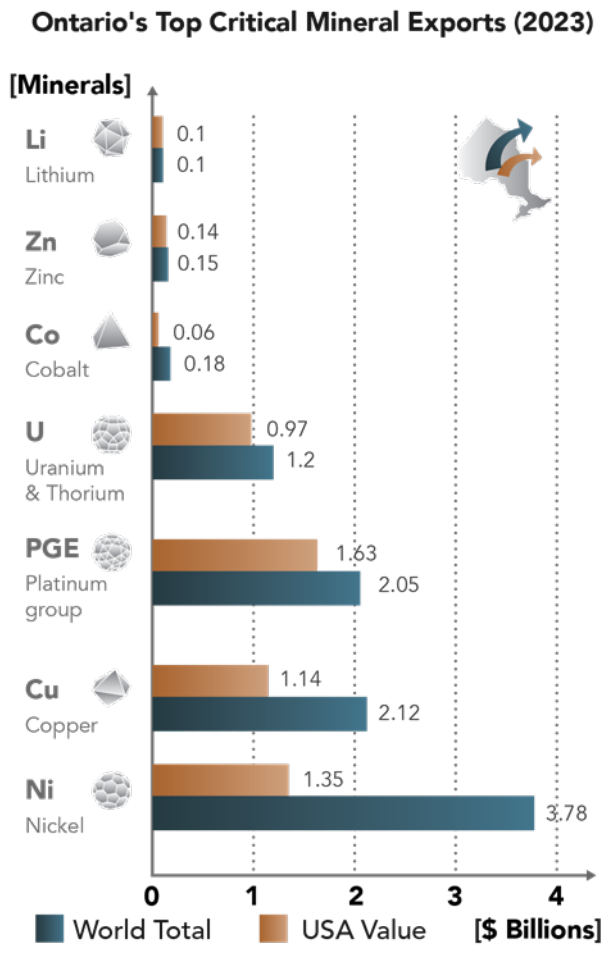
4.1. Ontario's Economic Impact & Exports

In 2024, the mining industry and associated sectors directly contributed $14.4B to Ontario's GDP, accounting for about 1.3% of the total. This included $9.3B from mining, $1.2B from processing, and $3.9B from mining supply and services. Capital expenditures in Ontario's mining industry, which include investments in buying, building, or upgrading mining assets, increased from $1.9B in 2015 to $3B in 2024. In 2024, capital expenditures for developing mine complexes in Ontario amounted to $782M, capital expenditures for non-residential construction amounted to $1.5B, and capital expenditures for machinery and equipment amounted to $705M.

Ontario's mineral and metals sector achieved remarkable success in 2023, exporting $64B worth of products, which represents a majority share of Canada's overall mineral trade, at 42%. The next largest exporter is Québec, at 24%. Of this impressive total, a significant 66% of Ontario's total mineral and metal export value was to the United States, highlighting the strong trade relationship between Ontario and its southern neighbour.

Ontario's most significant critical mineral exports in 2023 were, in order of value: nickel at $3.8B, copper at $2.1B, PGEs at $2B, and uranium and thorium at $1.2B. The next largest export was cobalt, valued at $176M, followed by zinc, at $154M, and lithium, at $103M.

In addition to the vital role that Ontario's mining and processing plays in international supply, Ontario also plays a crucial role in Canada's domestic mineral supply. A significant portion of Ontario's exports, 25%, are domestic mineral exports. The province is a leading producer of several key minerals, contributing 59% of Canada's nickel production by value, 43% of Canada's copper production by value, and 56% of Canada's cobalt production by value. In 2023, Canada's critical minerals trade balance (total exports minus imports) decreased by 11%. By value, 59% of Canada's critical mineral imports were from the US, 7% from China, and 5% from Brazil, with several other countries accounting for the remainder.



Source: OMA, State of the Ontario Mining Sector

4.2. Supporting the End-to-End Critical Mineral to EV Ecosystem

EV production increasingly depends on processed minerals rather than raw minerals, as advanced refining techniques are crucial to meet the specific material needs for batteries and other components. Mining and manufacturing are linked through the critical role of intermediate processing, where minerals extracted upstream undergo multi-step refinement to transform commodity-grade materials into usable inputs for manufacturers. Many experts note that there have been challenges around adding and maintaining the midstream within the country, with few facilities supporting much-needed intermediate processing. Canada currently operates 26 critical minerals processing facilities, with 10 in Ontario. At present, there are no operating lithium, graphite, or nickel processing facilities, which remains a midstream gap. Seeing this as an opportunity, Ontario is exploring investments for material processing to strengthen the connection between extraction and to final assembly.

The Ontario government has recently pledged up to $500M for a critical mineral processing fund to invest in facilities dedicated to converting Ontario's resources to support the EV value chain, focusing on lithium, graphite, zinc, cobalt, and others. In January, the government also awarded $500K to Canada Nickel to support the company's nickel processing facility development near Timmins. In another recent example, the MOU signed between the City of Greater Sudbury, Atikameksheng Anishnawbek, Wahnapitae First Nation, and Wyloo Canada is expected to support the establishment of processing facilities. This multi-million-dollar minerals processing plant will be the first in Canada to process nickel sulphate and nickel-dominant pCAM, two crucial minerals for EV batteries. It is expected to supply 250K EVs at minimum annually.

Ontario and its partners remain focused on positioning the province as an end-to-end location for EVs as the only jurisdiction in the western hemisphere with both an established automotive manufacturing sector and the critical minerals required for EV batteries. One of Ontario's focuses is lithium. As of 2023, Canada is ranked 7th globally for lithium production, with two large mines in Québec and Manitoba.

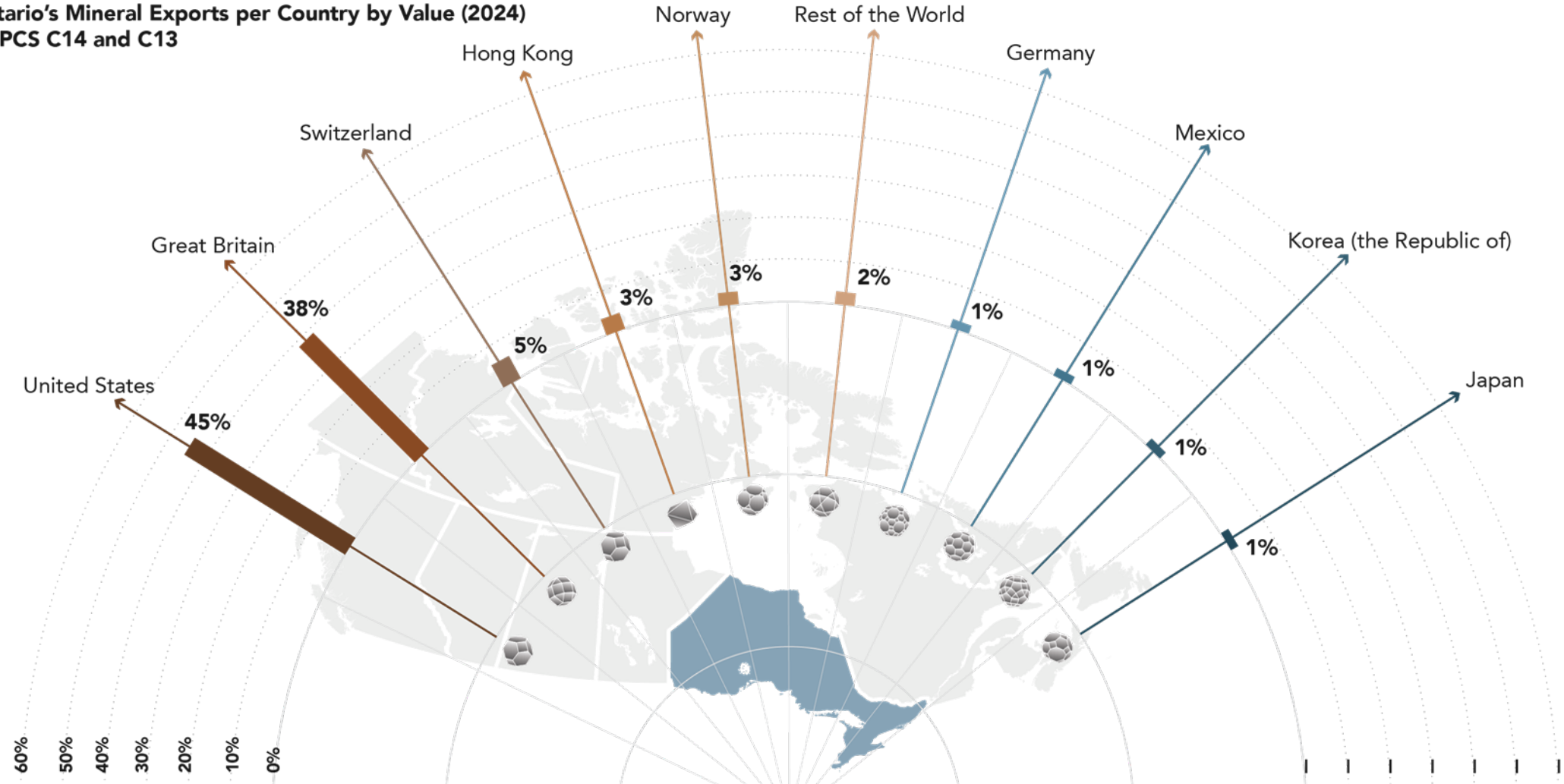
With Ontario being the number two automotive producer in North America, the province is perfectly positioned for the final steps of the supply chain with five major automotive assemblers building over a million vehicles annually. While lithium mines are not currently operating in Ontario, there are 11 critical minerals projects involving lithium, including advanced processing, representing 34% of current critical mineral projects. China generally dominates critical minerals processing, including for lithium. Raw material leaves Canada and is then reimported for assembly and end use, demonstrating the value of investing in intermediate processing to create greater supply chain resilience and bolster Ontario's positioning for an end-to-end EV ecosystem. This is already underway; in March 2025, Frontier Lithium announced a partnership with the Government of Canada to develop and operate a lithium chemicals conversion facility in Thunder Bay and in May 2024 Asahi Kasei announced their first major Ontario investment to build an EV battery separator plant in Port Colborne.

4.3. Trade Partners

Canada has been actively engaging with international partners to strengthen its critical minerals sector. Through strategic collaborations with countries like the United States, the United Kingdom, the European Union, Japan, South Korea, and Australia, Canada aims to build resilient and sustainable supply chains. These partnerships focus on enhancing trade, advancing R&D, and promoting responsible mining practices, positioning Canada as a global leader in the critical minerals industry. In 2020, the Canada-United States Joint Action Plan on Critical Minerals was signed. This is a strategic initiative designed to secure supply chains for essential minerals needed in various industries, including communication technology, aerospace, defense, and clean technology. In 2021, the Canada-European Union Strategic Partnership on Raw Materials was established. This partnership aims to secure and integrate raw material value chains between Canada and the European Union, enhancing collaboration on science, technology, and innovation. It also focuses on ESG criteria and standards. In 2023, Canada and the United Kingdom established a trade agreement to enhance collaboration on critical minerals. This agreement aims to build resilient, sustainable, and transparent supply chains by promoting secure and integrated United Kingdom-Canada critical mineral supply chains, driving higher ESG performance, and leveraging strengths for skill-sharing and R&D. In addition to federal-level trade agreements, Ontario is actively forging its own agreements to address the rising demand for critical minerals and green technologies. One such agreement is the MOU signed by Ontario and Nevada in 2023, which aims to strengthen mining collaboration in response to the growing global demand for critical minerals. In 2022, over $2B in trade moved between Ontario and Nevada, and the MOU seeks to increase this in the coming years. In 2023, Ontario and Michigan, together accounting for over 8% of annual trade between the United States and Canada and approximately 22% of North America's automotive production, signed an economic cooperation MOU. This agreement aims to support joint initiatives in priority areas such as EVs and related supply chains. In 2024, Ontario also entered into Economic Cooperation MOUs with Illinois, Indiana, and New Jersey, focusing on boosting trade and investment. While not specifically focused on critical minerals, these agreements aim to leverage emerging technologies and innovations to transform industries such as advanced manufacturing and materials. This commitment to cooperation seeks to stimulate manufacturing growth by backing regional and federal initiatives from all parties, aimed at facilitating the seamless movement of goods and labour across borders.

Ontario has also participated in international trade missions to promote its critical minerals sector. These missions aim to attract foreign investment and establish partnerships with global leaders. The Ontario Mining Mission to the 2024 International Mining and Resources Conference aimed to strengthen Ontario's global trade partnerships by showcasing the province's mining and environmental expertise on an international stage and designed to facilitate connections between Ontario companies and key players in the Australian mining sector, fostering opportunities for collaboration, investment, and market expansion.

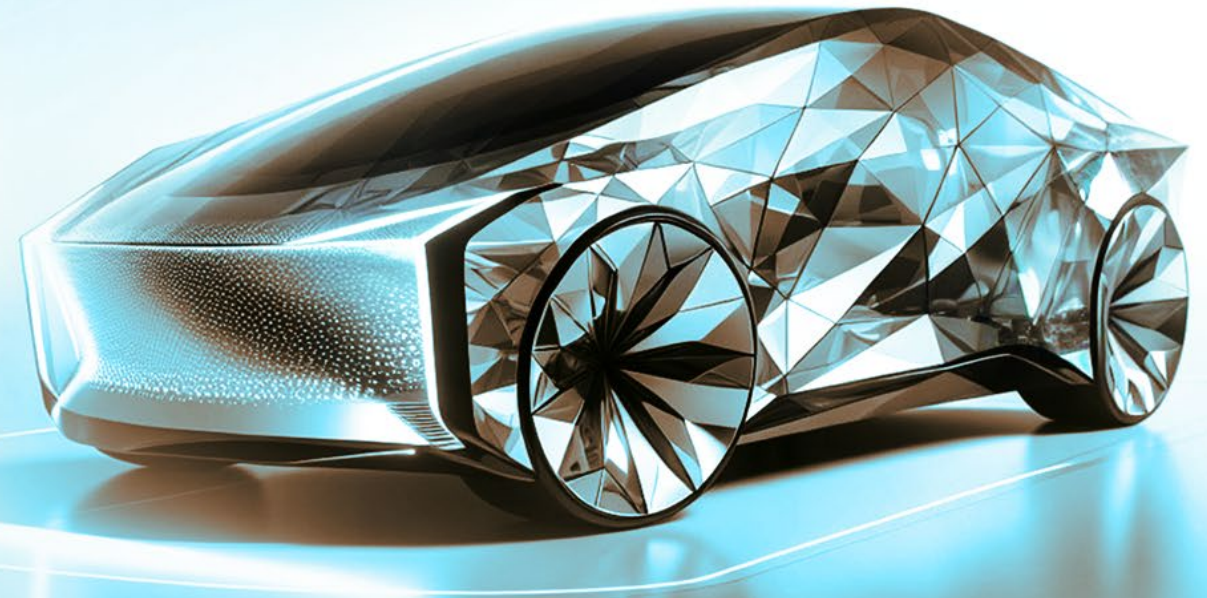
Ontario's Mineral Exports per Country by Value (2024)
NAPCS C14 and C13



Source: Statistics Canada. Canadian international merchandise trade by province and country, and by product sections, customs-based, annual (x 1,000). Metal and non-metallic mineral products

5. Opportunities for Ontario and Canada

Ontario stands at a crucial moment to strengthen its critical minerals sector, unlocking significant economic and environmental opportunities. By continuing to invest in the workforce and upskilling future generations, Ontario can ensure a steady supply of skilled professionals to meet the growing demands of this sector. Expanding processing and refining capabilities and capacity will enhance the province's ability to add value to raw materials domestically. Focusing on long-term strategies, such as streamlining approvals processes and supporting the recycling of valuable minerals, will create a more efficient and sustainable industry. Additionally, continuing to foster research and innovation will drive technological advancements and improve competitiveness. Central to these efforts is the inclusion and participation of Indigenous communities, ensuring that development is both equitable and respectful of traditional knowledge and rights. Together, these initiatives will position Ontario as a leader in the critical minerals sector, driving economic growth and sustainability.



5.1. Support Adoption of a Demand-Pull Approach, Long-Term Strategies, and Continued Focus on Midstream Processing Growth

To enhance Ontario's critical mineral sector, it is recommended that companies adopt a demand-pull approach. This strategy involves understanding customer needs before scaling up production, ensuring that the market demand justifies the investment. Experts underscore the importance of building strong relationships with customers to ensure market viability and sustainable growth. By prioritizing customer needs and fostering these relationships, companies can better align their production with market demands, ultimately leading to a more resilient and responsive mineral sector.

Experts also recommend that the province develop a comprehensive reindustrialization strategy. A key focus of this strategy could be on lightweighting mobility solutions, leveraging Ontario's competitive advantages. The province's access to low-cost electricity and high social and environmental performance standards makes it an ideal location for producing aluminum and alloys, which are crucial for lightweighting applications. Aluminum production is energy-intensive, and Ontario's affordable electricity rates provide a significant cost advantage. By prioritizing the shift from steel to aluminum unibody castings for scooters, motorcycles, and other mobility solutions, Ontario can capitalize on its strengths.

A long-term strategy lays the essential groundwork for a demand-pull approach by building the infrastructure, regulatory certainty, and talent pipeline needed to respond effectively to future market needs.

Furthermore, experts emphasize the importance of promoting market diversification as a key element of long-term strategy. They note that many mining organizations in Ontario have traditionally focused on the United States market due to geographic proximity and shared language. However, recent concerns over tariffs and trade uncertainties have highlighted the risks of overreliance on a single market. As a result, there is a growing call for strategies that support the exploration of new, non-traditional markets

Experts also highlight that as part of a long-term strategy, it is crucial to focus on building midstream capabilities. Natural Resources Canada projects that meeting the demand of battery factories will require $16.1B in midstream investment. This approach recognizes that the sector's success is not solely about mining and assembly but also about the entire supply chain, from extraction to end-use products. By developing robust midstream processes, such as processing, refinement, metallurgical activities, and even recycling, Ontario can ensure a steady and reliable supply of these essential materials.

By focusing on midstream development, Ontario can reduce its reliance on foreign suppliers, mitigate supply chain risks, and create a more resilient and competitive critical minerals sector. This strategy will ultimately support the broader goal of transitioning to a sustainable and technologically advanced economy.

5.2. Simplifying the Processes for Approvals

As Canada advances in its battery industry development, Ontario has the opportunity to drive growth by tackling existing challenges and boosting competitiveness. A crucial initial step is to simplify the permitting process, which the government has recently taken steps on through

introducing the Protect Ontario by Unleashing Our Economy Act. Among other legislative changes, the act aims to accelerate critical mineral development by improving government approval review times by at least 50%. Streamlining approval processes for permits and impact assessments across the battery supply chain – from initiating new mines to establishing battery recycling facilities – is vital for unlocking the province's rich reserves of critical minerals and materials necessary for battery manufacturing.

Experts have noted that making permitting and approvals more streamlined is an opportunity to ensure that investment not only remains in Ontario but in Canada as a whole. This can be achieved through government measures such as provincial and federal coordination, setting clear timelines, implementing simplified procedures like digitized applications and approvals, and fostering transparency through early and ongoing stakeholder engagement.

Additionally, this strategy must incorporate meaningful Indigenous participation and consent, in line with federal legislation and Ontario's commitment to high ESG standards. Experts note that collaborating with the relevant First Nations, Métis, or Inuit at the earliest possible project stage, rather than simply before proceeding to development, and working with them as project partners can make a significant impact to approvals timelines.

Simplifying the process for implementing supporting infrastructure, such as social infrastructure, utilities, and roads, is equally important for the development of new mines. Experts point to infrastructure as one of the keys to drawing and retaining workforces, especially for new mines, as communities require education, healthcare, and other essential facilities to support workers and their families. Efficient infrastructure is crucial for the smooth operation and expansion of mining activities. Streamlined procedures for infrastructure development can reduce delays and costs, making it easier for companies to establish new mines and enhance their operations. This includes simplifying the approval processes for building roads, bridges, and other essential infrastructure that connect mining sites to processing facilities and markets.

5.3. Scaling Investment in Ontario's Critical Mineral Workforce and Upskilling Future Generations

Ontario's mining sector faces a looming challenge. As engineers and the tech-savvy younger generation increasingly gravitate towards careers in software and AI, the mining industry risks losing its skilled workforce. A survey by the Mining Industry Human Resource Council revealed that 66% of young people would not consider pursuing a career in mining. This shift in career preferences threatens to undermine Ontario's position as a leader in the global mining industry. Additionally, experts note that the mining sector is facing a substantial shortfall in job replacements, with tens of thousands of positions unfilled each year. To address this, Ontario can prioritize investing in human capital – particularly in those areas highlighted in OVIN’s critical mineral talent and workforce report – ensuring that the province remains competitive and capable of meeting future demands.

While Canada boasts a robust network of educational institutions – with over half of Ontario’s colleges and universities offering

programs in mining, earth and environmental sciences, and related engineering – there remains a significant gap: none currently offer degree programs specifically focused on critical minerals. In contrast, China has established 39 university degree programs dedicated to training engineers in this strategic field. This disparity underscores the need for Ontario to continue exploring the development of specialized educational programs and training initiatives to cultivate a new generation of mining professionals.

Experts suggest that promoting the high-tech aspects of mining, such as data analytics, AI, and automated equipment, is crucial for changing perceptions and attracting the next generation. Furthermore, highlighting that mining plays a pivotal role in the energy transition and can contribute to environmental sustainability may also help to attract young people to jobs in the sector. Experts note that support for initiatives such as the Ontario Mining Association's 'This is Mine Life', Women in Mining, and OVIN's Regional Future Workforce – Critical Minerals Pilot Program, could help to reshape public perceptions around mining careers.

Additionally, the mining sector is one of the largest Indigenous employers in Canada. Experts note that growing Indigenous workforce participation requires ensuring that First Nations, Métis, or Inuit see themselves at all levels of the organizations contributing to the sector, demonstrating the further value of centring ESG, particularly diversity and inclusion, in the industry. The Canadian Council for Indigenous Business recently published a report dedicated to providing insights and tools for developing equitable workplaces for supporting Indigenous employees and their journeys towards leadership roles, which can be a valuable tool for corporations.

To address projected labour shortages, it is recommended that firms adopt comprehensive talent attraction strategies that include:

- Increasing awareness and recruitment from various industries and regions.
- Collaborating with educational institutions to ensure training programs align with industry needs.
- Implementing equity, diversity, and inclusion (EDI) policies to support underrepresented groups.

5.4. Centering Indigenous Inclusion and Participation

Canada's true competitive advantage is enabled by building genuine trust with Indigenous communities and ensuring communities have access to both financial and human resources to be meaningfully engaged and participating, ensuring equal footing with the large companies participating in the projects.

The Indigenous Participation Fund (IPF) is providing funding to Indigenous communities in Ontario to assist with costs for staffing and activities that improve their capacity to participate effectively in consultation, conducted pursuant to the Mining Act, and mineral sector opportunities. It was developed to help support Indigenous communities and organizations participate in regulatory processes under the Mining Act, and economic development activities associated with mineral exploration and development.

While considering the First Nations, Métis, or Inuit workforce is positive, there is significant opportunity waiting to be unlocked by also focusing on other elements across the entire project lifecycle. Some examples include

procuring Indigenous businesses during project design, construction, and operations. Experts also suggest appointing an Indigenous person to the project owner Board of Directors, bringing Indigenous insight and perspectives to the table, and leveraging traditional knowledge during mine closures and reclamation to support environmental impact mitigation.

Organizations should also think about project structuring as an opportunity for more effective Indigenous partnership. Experts note that there are several recent examples of positive industry and Indigenous collaborations where development corporations are owned by the community, similar to a Crown corporation, in which the executive team can be populated by a combination of the community and experienced mining professionals to work together to mentor and guide the projects. Experts note the importance of managing the relationship between the wider community and the development corporation to ensure that the corporation can make informed business decisions independently. Experts also note the importance of genuinely understanding the individual challenges of each community and the issues that need solutions before creating plans and programs aimed at equitably including First Nations, Métis, or Inuit.

The Ontario Junior Exploration Program (OJEP) is an example of a government initiative that supports junior mining companies in financing early exploration projects, particularly in northern and Indigenous communities. The initiative offers significant benefits for Indigenous communities by providing financial support, creating jobs, building capacity, fostering partnerships, and promoting economic growth.

5.5. Expanding Research, Innovation, and New Technologies

Ontario has a significant opportunity to strengthen research, innovation, and the development of new technologies within the critical minerals sector. By providing robust support for innovative organizations looking to drive advancements in extraction and processing technologies, Ontario can enhance its competitive edge in the global market. This support is crucial for advancing sustainable practices and improving the efficiency of mineral recovery, which is vital for meeting the growing demand for critical minerals used in EV batteries and other clean energy technologies.

One opportunity that has recently emerged is AI. Historically, mining has not fully adopted AI's advantages, but the sector is now beginning to recognize its transformative potential. Accelerating this adoption is crucial for the industry's growth and global positioning. To achieve this, Ontario could invest in AI R&D, promoting education and training programs that encourage students to pursue careers in mining technology. Facilitating industry collaboration between AI experts and mining professionals can foster knowledge exchange and innovation. Additionally, adopting best practices from other sectors that have successfully integrated AI, whilst considering its energy-intensive process, can help streamline processes, improve efficiency, and reduce costs.

Experts also point to opportunities for cross-market diversification, emphasizing the value of encouraging innovation across sectors. Events like DiscoveryX are highlighted as platforms where mining companies can explore how their technologies and expertise might be applied in other industries, fostering broader commercial

potential and collaboration beyond the traditional mining sector.

Supporting entrepreneurs and early-stage companies provides another significant avenue for leveraging emerging technologies and innovations, especially those being developed in Ontario. Experts have particularly noted the importance of supporting Chem-Tech startups, which are essential to building the midstream of the critical minerals sector through innovation in recycling and processing valuable materials. These smaller companies require supportive spaces and networks to realize their full potential. Experts highlight that to enable the development or commercialization of the research being done, supporting infrastructure should be provided, reducing the burden on burgeoning companies.

OVIN has taken purposeful steps towards supporting startups via its partnership with Mercedes Benz to establish three new mobility incubators in Windsor, Kitchener-Waterloo and Toronto. This groundbreaking initiative provides support to innovative automotive startups focused on AI, next-generation software, and advanced vehicle components.

By fostering enhanced collaboration across all actors in the EV battery supply chain, Ontario can facilitate better decision-making and increased flexibility, leading to higher efficiency and improved offerings. With its extensive network of mining and automotive players, Ontario is well-positioned to develop a fully domestic EV battery supply chain. OVIN is playing a central role in enabling collaboration via its Northern RTDS, which unites a breadth of organizations across the mining and manufacturing sectors, higher education institutions, Regional Innovation Centres, incubators and accelerators, municipal and regional resources, industry, and other regional collaborators.

Continuing to strengthen collaboration and leveraging diverse capabilities will be crucial for the province's success in this endeavor. Having a focus on key areas such as expanding research capacity through hiring researchers, enhancing capabilities by funding post-secondary institutions for equipment and tools, supporting commercialization with research project funding, and promoting thought leadership would support Ontario in serving as a world-class hub where various sectors collaborate with post-secondary institutions and government to maximize Ontario's critical minerals potential and drive the growth of a comprehensive battery supply chain, from minerals to manufacturing.

Experts have remarked on the substantial positive impact of government support for SMEs, especially those focused on capital-intensive and future-focused technologies. Government support through grants can legitimize technologies for greater market reach and credibility, promoting Canadian-based entrepreneurship and innovation. Organizations that bring together industry, academia, and government and catalyze networking and partnerships and idea generation, such as OVIN, are also important for contributing to the creation of local solutions.

5.6. Recycling as a Competitive Advantage

As the demand for battery materials is expected to rise over the next two decades, the security of mineral supply can sometimes be uncertain. This presents a significant opportunity for Ontario to invest in recycling end-of-life batteries, providing a reliable source of critical minerals. Investing in Li-ion battery recycling not only promotes sustainability but also positions Ontario as a leader in the burgeoning circular economy for EV

batteries, offering a secondary feedstock source for the value chain.

Experts have noted that Canada's industry advantages must also include cost-effectiveness, which can often involve lowering costs through efficient resource use and creating ways to reduce and reuse input materials, focusing on considering how recycling can be considered in all parts of a process, whether in mineral processing, battery production, or EV manufacturing. Currently, developers are not prioritizing the design of batteries with end-of-life considerations in mind, and recycling is not given the level of importance it warrants considering the current reliance on global trade. As recycling competes against new extraction, recycling processes need to be more cost effective than extraction to remain attractive. By continuing to invest in battery research and innovation and local recycling facilities, Ontario can reduce its reliance on imported minerals, create jobs, and strengthen its competitive edge in the EV market.

Experts have also pointed to creating incentives for organizations making batteries more easily recyclable as a potential opportunity. A robust recycling program will ensure that valuable materials are recovered and reused, supporting the sustainability of the EV industry. Investing in recycling capabilities now will position Ontario as a leader in sustainable battery management, benefiting its critical mineral sector and helping to mitigate the environmental impact of EV batteries.

5.7. Expanding Cross-Canada Collaboration and Support

In Canada, mining and managing internal trade are primarily the responsibilities of provincial and territorial governments. Often, this level of regulation can create barriers to interprovincial trade and cooperation. Interprovincial trade considers importing and exporting goods within Canada but also covers several other important areas such as free movement of labour, innovation, and external competitiveness. While collaboration amongst the provinces has been a traditional challenge, experts see the space as a significant opportunity, especially to enhance the mining sector's talent development and technological advancements. By collaborating with other provinces, Ontario can create a more robust and diverse talent pool. Experts also note that greater interprovincial collaboration would be helpful particularly for skilled mining labour that requires provincial authorization to practice. Joint initiatives such as inter-provincial training programs, shared educational resources, and cross-border internships can attract and retain skilled professionals in the mining sector. This collaborative approach can also facilitate the exchange of best practices and innovative ideas, enriching the overall talent development framework.

Experts also emphasize the importance of enhancing interprovincial collaboration among mining suppliers and addressing protectionist mindsets that hinder progress. Initiatives that foster cross-provincial partnerships – such as co-hosted events and joint networking opportunities – are highlighted as effective strategies to promote greater cooperation and integration across regions.

Provinces could also pool resources to fund R&D projects, share technological expertise, and co-develop cutting-edge solutions. Experts have highlighted the significant potential opportunity available for cross-Canada collaboration, especially connecting SMEs that can offer Canadian-based supply chain innovation and support to create win-win possibilities for

industry and entrepreneurs. This collective effort can lead to the creation of advanced mining technologies that enhance efficiency, safety, and sustainability. Forming strategic alliances with other provinces to develop joint talent development programs and technological research initiatives can enable the strengths of each province to be leveraged, creating a synergistic effect that benefits the entire mining sector. The Committee on Internal Trade estimates that eliminating provincial barriers can lower prices, increase productivity, and even totally contribute an additional $200B to the Canadian economy.

Additionally, connecting the provinces can offer significant environmental benefits as exporting raw resources and importing processed materials contributes to a notable carbon footprint. These types of emissions are not typically considered in the mining industry's control, though they remain in the value chain and are often neglected and not tabulated. The International Council on Mining and Metals estimates that average mining and metals company's Scope 3 emissions represent 75% of the total emissions profile. Supporting supply chains closer to end users can further the role of critical minerals in a low emissions future.

5.8. Enhance Branding to Promote World-Class Practices and Encourage Investment and Trade

As the global transition to a low-carbon economy accelerates, critical minerals have become essential to the technologies driving decarbonization. This presents a significant opportunity to elevate Ontario's profile as a key partner in these efforts. By actively promoting Ontario's strengths and brand – particularly its ESG leadership and strategic planning – the province can attract diversified investment, strengthen trade relationships, and build a resilient, future-ready workforce.

Ontario's world-class credentials are underpinned by its ESG performance and a robust Critical Minerals Strategy, which together signal long-term stability and investment confidence. These attributes are increasingly important as global markets seek secure, sustainable, and ethical supply chains. Canada's rise to the top of BloombergNEF's 2024 lithium-ion battery supply chain rankings – surpassing China – highlights the competitive edge offered by strong ESG credentials. Ontario plays a central role in this success, contributing to Canada's international brand and demonstrating leadership in areas such as clean electricity, high labour standards, and material traceability. These differentiators are not only vital for attracting investment and trade but also for appealing to a values-driven workforce. Promoting Ontario's ESG advantages and its role in enabling green technologies can help attract and retain talent. By showcasing Ontario's commitment to sustainability – such as investing in renewable energy and embedding long-term climate goals into strategic planning – the province can position itself as an employer of choice in the local and global mining and clean tech sectors.

The Ontario Critical Minerals Strategy (2022–2027) provides a clear, multi-year roadmap that communicates the province's priorities and ambitions to international stakeholders. This long-term vision enhances investor confidence, supports trade partnerships, and fosters collaboration. As the strategy enters its final years, Ontario has an opportunity to build on its momentum by developing a follow-up plan that highlights past achievements, reinforces its competitive advantages, and outlines future goals.

6. Glossary

AI	Artificial Intelligence
CEMI	Centre for Excellence in Mining Innovation
CESME	Centre of Excellence for Sustainable Mining and Exploration
CMIF	Critical Minerals Innovation Fund
CMRDD	Critical Minerals Research, Development and Demonstration Program
CSM	Centre for Smart Mining
EDI	Equity, Diversity, and Inclusion
ER	Economic Region
ESG	Environmental, Social, and Governance
EV	Electric Vehicle
IEA	International Energy Agency
IPF	Indigenous Participation Fund
MHP	Mixed Hydroxide Precipitate
MICA	Mining Innovation Commercialization Accelerator Network
MIRARCO	Mining Innovation Rehabilitation and Applied Research Corporation

MOU	Memorandum of Understanding
NEAP	Northern Energy Advantage Program
OCI	Ontario Centre of Innovation
OJEP	Ontario Junior Exploration Program
OMA	Ontario Mining Association
OVIN	Ontario Vehicle Innovation Network
PGE	Platinum Group Elements
REE	Rare Earth Element
R&D	Research & Development
RTDS	Regional Technology Development Site
SIF	Strategic Innovation Fund
SME	Small and Medium-sized Enterprises

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8. Disclaimers

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