ENGLISH VERSION

Metals and Minerals for Sustainable Development and Strengthened Competitiveness

Final report of the IVA's *Roadmap for Metals and Minerals* project

IVA
Royal Swedish Academy of Engineering Sciences

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- contribute to ensuring that there is good infrastructure in place to supply knowledge and expertise, for world-leading research and for internationally competitive education;
- identify, develop and leverage Sweden's strengths at the international forefront;
- aim to strengthen Sweden's capacity for transition in ever-accelerating technology and market shifts;
- promote effective cooperation between academia, the business community and the political sphere;
- help ensure that the right conditions are in place for competitive industry and communities;
- promote technological advancement, new business models and legislation, as well as an ethical framework for progress towards a sustainable society.

The UN's Sustainable Development Goals and the international climate agreement are important objectives for IVA activities.

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1. Foreword

»Secure access to strategic metals and minerals is essential for the transition to a fossil-free and competitive society.«

Secure access to strategic metals and minerals is essential for the transition to a fossil-free and competitive society. Demand for metals and minerals will increase sharply as fossil fuels are phased out in response to increased electrification and the implementation of new technologies. Today, control of mineral resources and value chains lies with a few companies and countries outside the EU.

Europe's supply chains are highly vulnerable. That became clear with Russia's invasion of Ukraine and the energy crisis that followed. Before that, the pandemic showed how dependent Europe is on imports of strategic components. The importance of controlling strategic raw materials and components is evident, not least in the technology race between the United States and China. The issue has become a much higher priority in the EU in recent years.

Sweden is one of Europe's most important mining countries in terms of technology and production, and is a pioneer in the field of sustainability. This offers great opportunities to develop and strengthen our industry and economy while playing an essential role in Europe's supply of metals and minerals.

The IVA's goal is to contribute to sustainable development, and to strengthen competitiveness. An important prerequisite for this is scientific foresight and a greater level of knowledge within society.

The IVA's *Roadmap for Metals and Minerals* project aims to help Sweden and Europe secure long-term, sustainable access to the critical metals and minerals that are needed for a transition to a fossil-free society, and to strengthen competitiveness.

The work was prepared during 2023–2024 by the project steering group consisting of:

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The steering committee supports the report as a whole, but not all individual statements.

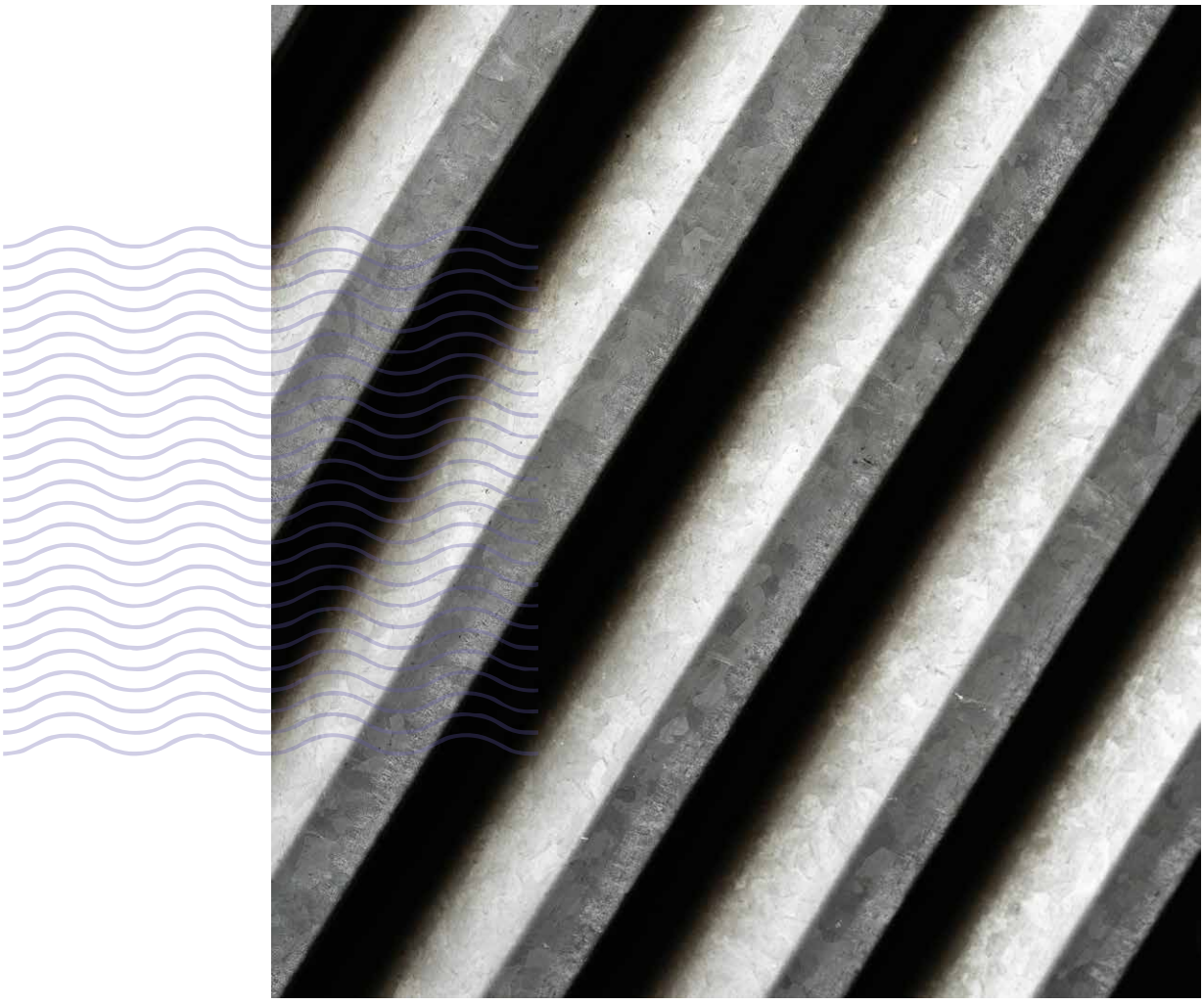
Reference groups: The project also had two reference groups. One political, with members from each parliamentary party, and one international, with representatives from companies and organisations in North and South America, Africa, Australia, Asia and Europe, as well as the European Commission. The international reference group has contributed knowledge and insights from a global perspective. Both reference groups have been important for the results and conclusions.

Project Funders: ABB AB, Epiroc AB, LKAB, Ragn-Sells AB, Sandvik AB, Zinkgruvan Mining AB, Mistra (Swedish Foundation for Strategic Environmental Research), Swedish Foundation for Strategic Research (SSF) and Swedish Mining Innovation, a joint initiative of Vinnova, Formas and the Swedish Energy Agency.

Information about the project's implementation and the people participating in the expert and reference groups can be found in the appendix 'About the project'. The aim has been to include representative sectors of society to ensure that the issues are highlighted and analysed comprehensively.

Stockholm, October 2024

Elisabeth Nilsson, Steering Committee Chair



2. Summary

»The Swedish mining ›cluster‹ gives Sweden and Swedish companies significant opportunities to contribute to the supply of critical raw materials to the EU and global markets.«

Demand for metals and minerals will increase sharply in response to the transition to a fossil-free society and other technological developments. This applies both to metals and minerals that are already widely used, and to new ones that will be needed in technologies for fossil-free energy, electrification and digitalisation. The world's need for metals and minerals is also increasing, reflecting a growing population and improved living conditions. Because of this, issues around the supply of metals and minerals and the efficient use of these resources are global.

Europe is highly dependent on imports of metals and minerals, and supply chains are vulnerable to disruption. This affects business development and can be exploited for geopolitical leverage. To secure the supply of critical raw materials[1] for Member States, the EU has therefore developed a new regulation, the Critical Raw Materials Act (CRMA), which came into force on 23rd May 2024. The CRMA's benchmarks are to be achieved as early as 2030, which gives Member States a very tight timeframe. The Government should take this into account in any future mineral strategy.

Sweden's prosperity and competitiveness are based on the sustainable refining of our natural resources. Combined with fossil-free electricity and access to water and land, our mineral endowment provides us with favourable conditions for attracting investment and business start-ups. The Swedish mining cluster, with world-leading companies in several key technology areas, gives Sweden and Swedish companies significant opportunities to develop and create economic value for the country, while contributing to the supply of critical raw materials to the EU and global markets.

Through the *Roadmap for Metals and Minerals* project, the IVA aims to contribute concrete proposals and recommendations about how Sweden can contribute to the supply of metals and minerals while strengthening Swedish and European competitiveness.

Pathway 1: Sweden should take a leading role in Europe's supply of metals and minerals.

Sweden has good geological conditions and the potential to mine and extract increasing amounts of critical metals and minerals. Swedish industry has good opportunities to develop new processes and technologies based on the expertise shared within the the country's mining cluster. Investments in this area can create economic and security policy values for Sweden and Europe, can contribute to sustainable mining and recycling of metals and minerals in other parts of the world, and can strengthen Sweden's position in global and European cooperation.

Recommendations

- Strengthen Sweden's ability to attract investments that capitalise on its mineral resources and access to fossil-free electricity.
- Create an EU-wide expert body, based in Sweden, to monitor the Critical Raw Materials Act.
- Ensure that investments in mines are included in the EU's green taxonomy.
- Establish a Swedish fund to finance strategic projects under the Critical Raw Materials Act.

1 The term "critical raw materials" refers to those raw materials identified by the EU as having a significant risk of supply disruption that could lead to undesirable consequences.

Pathway 2: Strengthen the Swedish mining, mining technology and recycling industries.

Sweden has excellent development potential in extracting critical metals and minerals, in producing strategic components, and in recycling. National initiatives are needed in several areas to ensure that the mining industry is at the international forefront and takes a leading role in the EU's supply.

Recommendations

- Increase targeted efforts to develop the mining, mining technology and recycling industries further.
- Establish a national knowledge centre in Sweden to ensure competence throughout the value chain, from extraction to processing, and through recycling metals and minerals.
- Create incentives for extracting new critical raw materials in active mines.
- Introduce tax rebates for exploration outside existing mining areas.
- Make it more attractive for foreign companies to explore in Sweden.

Pathway 3: Simplify for reuse and material recycling.

For the transition to a fossil-free society to be sustainable in the long term, resources must be used efficiently throughout the value chain, and circular flows must be enabled. Smart, resource-efficient and circular product design is an important piece of the puzzle to meet and mitigate the increasing demand for the new extraction of metals and minerals. Current regulations are geared towards a linear economy, and recycling rates for most critical metals and minerals are meagre. Several measures are needed to improve circular material and product flows.

Recommendations

- Create a level playing field and correct pricing for increased circularity.
- Stimulate supply and demand for recycled materials.
- Encourage circular business models.
- Adapt waste-management regulations to increase recycling and reuse.
- Stimulate standardisation work in established industrial forums to promote circular flows.
- Stimulate the commercialisation and upscaling of research and innovation linked to circularity.

Pathway 4: Create new international strategic partnerships, and strengthen existing ones.

Because the EU will never be self-sufficient in metals and minerals, it will always depend on functioning world markets. It is therefore important to develop strategic cooperation with mineral-rich countries. As a leading mining country, Sweden (preferably in cooperation with Finland) has a particular responsibility to build constructive relationships with countries and companies that are central to the global value chains.

Recommendations

- Sweden should take a more active role in the EU's strategic international cooperation to secure common value chains.
- Intensify Nordic cooperation.
- Strengthen and cement cooperation with similar, technology-leading countries, such as Canada and Australia.
- Expand cooperation with commodity-producing countries in Africa, South America and Southeast Asia.
- Enrol Sweden in the Extractive Industries Transparency Initiative (EITI).
- Increase knowledge of China's resources, needs and strategies.

Pathway 5: Develop and streamline authorisation processes and tools to manage conflicts of objectives and interests.

Sweden needs to upgrade its infrastructure and energy supply, and to invest in fossil-free industry. That will require investment in new industrial plants and mines, which presupposes land-use prioritisation. This in turn can lead to conflicts of interest and objectives that affect the acceptability of mines and other industrial activities.

The authorisation processes for activities that impact the environment are society's way of managing these conflicts of interest and objectives. Environmental assessment plays a central role here. Another critical issue for the mining industry is to improve the authorisation systems for processing concessions, and their management under the Planning and Building Act.

The authorisation processes need to be changed and streamlined. This requires a constructive discussion of both the environmental legislation itself and its applied processes. National policies must address fundamental conflicts of objectives and interests around land use.

Recommendations

- Provide more explicit guidance on how to apply national priorities in environmental assessments and municipal land-use decisions.
- Streamline environmental assessments related to the extraction and recycling of metals and minerals.
- Consider first-stage administrative review of environmental permits by an administrative authority.
- Increase financial compensation to municipalities that host metal and mineral extraction or other industrial investments.

Pathway 6: Wide-ranging investment in knowledge, research, and innovation in metals and minerals.

For Sweden to maintain and strengthen its position as a leading mining country with high-tech, world-leading industries in many areas, there is a need for research, innovation and knowledge-building. The sustainable exploration, extraction and processing of a number of critical metals requires new knowledge and technologies. Exploration and mine development must be seen as research and innovation, and these areas should be managed within the current innovation system. More knowledge is also needed about circular flows at all levels, in terms of both business models and technology.

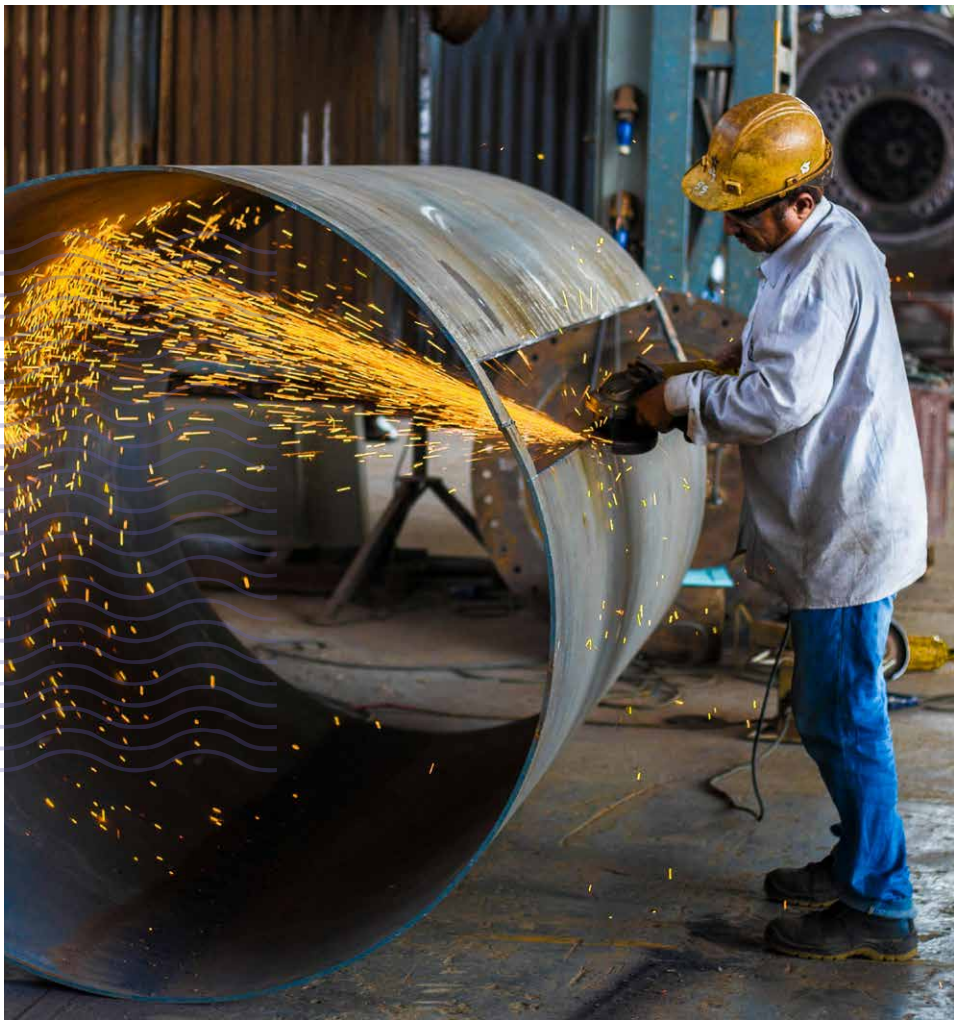
Recommendations

Invest in research and innovation in the following areas:

- Increased knowledge of Sweden's geological endowment through developed exploration.
- New techniques for mining lower-grade, deeper ore deposits.
- New processes for extracting more metals from ore concentrates, and from mining and other wastes.
- Behaviour of elements in different materials for limited environmental impact.
- Resource efficiency and circular flows.
- Conflicts of objectives and interests.

In addition to this, we need

- Public education initiatives on the fundamental importance of metals and minerals in society, and an increased focus on geoscience in schools, as a better understanding is needed to develop a sustainable society.



3. Introduction

»The transition to a fossil-free and competitive society increases the need for critical metals and minerals. Managing this transition requires a clear strategy.«

The transition to a fossil-free and competitive society increases the need for critical metals and minerals. Managing this transition requires a clear strategy that ensures the availability of these resources, promotes resource efficiency and circular business models, and supports the production of essential goods and services. The strategy also needs to address the conflicting objectives and interests around land use that arise from the increased extraction of critical metals and minerals. It must also tackle geopolitical, trade and security policy challenges that significantly affect Sweden's and the EU's room for manoeuvre.

The Government has started work on preparing a new mineral strategy to replace the one introduced in 2013; conditions have changed fundamentally since it was drawn up. Through its *Roadmap for Metals and Minerals* project, the IVA wants to contribute proposals that can form the basis for a minerals strategy for Sweden. The proposals require collaboration between politicians, industry, authorities, academia and other relevant stakeholders.

Our proposals are based on three component reports:

- Challenges for Meeting Increased Demand for Metals and Minerals. (IVA, 2024a)
- Circular Flows to Meet Increased Demand for Metals and Minerals. (IVA, 2024b)
- Increased Demand for Metals and Minerals – Strategies and Conflicts of Objectives and Interests (IVA, 2024c).

The reports can be downloaded from the IVA website: www.iva.se.

THE EU'S CRITICAL RAW MATERIALS ACT (CRMA)

The purpose of the CRMA is to secure access to critical and strategic raw materials in two ways:

- importing from the international market.
- extracting, refining and recycling within the Union.

Whether raw materials are imported or produced within the Union, production and processing must meet defined sustainability criteria.

The following benchmarks are set for critical raw materials by 2030:

- 10% to be mined in the EU;
- 40% to be processed in the EU;
- 25% of consumption to come from recycled within the EU; and
- Dependence on a single importing country should not exceed 65%.

The Commission and Member States will also act to promote technological development and resource efficiency to reduce the anticipated increase in demand for critical materials.

On 12th March 2023, the EU proposed a new regulation to secure the supply of critical raw materials for Member States. The Critical Raw Materials Act (CRMA), which entered into force on 23rd May 2024,[2] sets four benchmarks for extraction, processing and recycling, and for dependence on individual countries. (See info box) These benchmarks are to be achieved by 2030.

2 An EU regulation that has entered into force is directly applicable and valid in all Member States without being incorporated or transformed into national law. Once it enters into force, it becomes part of national law.

These are ambitious targets that are unlikely to be met. For this reason new, more realistic targets now need to be developed. The CRMA forms a basis for Sweden's continued work on the supply of metals and minerals. In addition to what is addressed in the CRMA, a number of other measures are needed for a comprehensive minerals strategy. Below, we discuss some suitable starting points for such a strategy.

Demand for metals and minerals rises sharply

Demand for metals and minerals will increase as a result of the technological transition that is now taking place. We are moving from a fossil-based society to one where energy supply and other new technologies are increasingly based on metals and minerals. At the same time, the world's population is growing, and living standards are rising, further increasing demand.

The need for critical metals and minerals that are used in applications such as batteries, wind turbines and solar cells, is increasing rapidly. Along with several other metals and minerals, these are defined by the EU as critical raw materials or commodities, as there is a significant risk of supply disruptions that could have major negative economic impacts. Strategic raw materials are also highlighted within those identified as being critical; these are crucial for the green and digital transitions, as well as for defence and space technologies. Demand for strategic raw materials is expected to grow quickly.

Increased resource efficiency and circularity are necessary for the transition to be sustainable. This also includes energy efficiency and a resource-efficient transport system. A number of measures will be needed in order to achieve this. Sweden needs to take the lead in technology and business development linked to digitalisation, transition and resource efficiency. Despite significant efforts, the need for investment in primary extraction will remain. It will be a long time before enough metals and minerals are in circulation for recycling to meet demand.

THE EU'S DEFINITIONS

Critical materials: A raw material is defined as critical if there is a significant risk of supply disruption and it has a significant impact on the economy.

Strategic materials: A raw material that is crucial for the green and digital transitions and/or in defence and space applications. All strategic materials are also defined as critical.

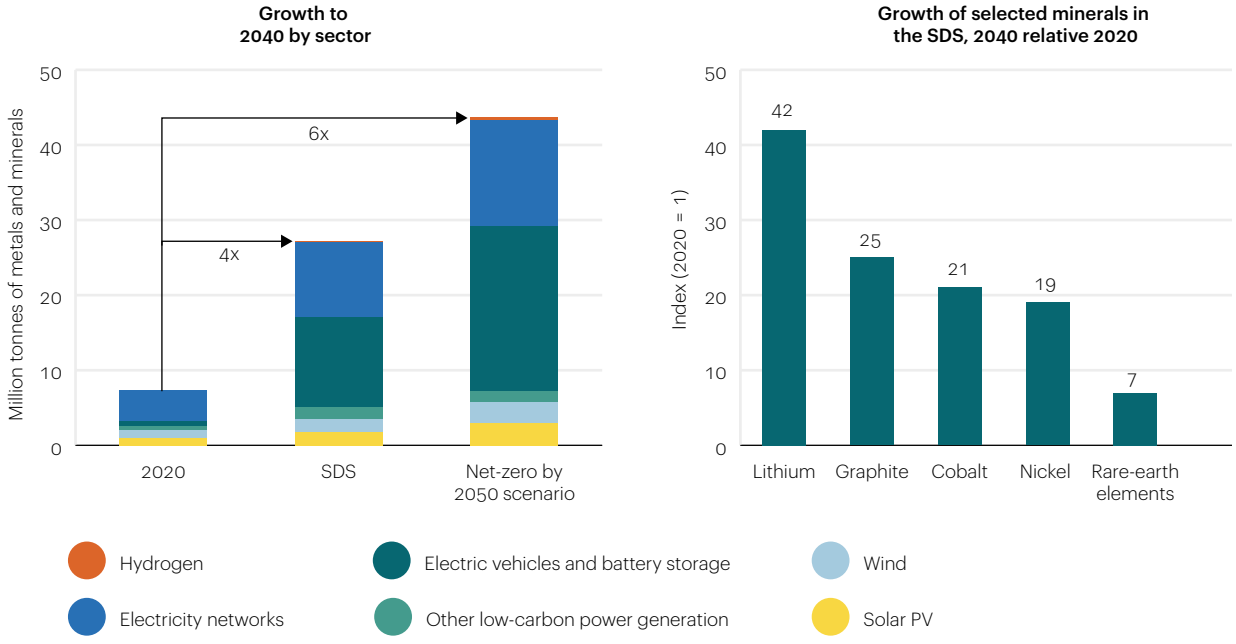
Europe's supply chains are highly vulnerable

Analyses show that Europe is highly vulnerable to disruptions in the supply chains of most of the critical metals and minerals that are needed to meet industry's needs in the transition to a fossil-free society (Carrara et al, 2023). The fundamental reason is that European industry depends extensively on imports of these raw materials from a few countries and companies. Analyses and actions based on a global perspective of value chains are needed to secure the supply of metals and minerals in Europe.

The vulnerability of supply chains has been highlighted by the pandemic, the geopolitical situation and Russia's war with Ukraine, where war and sanctions have blocked vital trade routes. The changed geopolitical situation has contributed to Sweden developing a new national security strategy, which includes strengthening our competitiveness and security of supply (Letter 2023/24:163). Similar work is in progress at the EU level.

At the same time, international trade is the foundation of Europe's and especially Sweden's prosperity. The EU's Critical Raw Materials Act aims to reduce Europe's dependence on imports, and hence its vulnerability concerning international trade, to ensure continued production and growth in the Union. Making an active contribution to this work is essential for Sweden at the EU level.

Figure 1: Demand for certain metals and minerals could increase 4–6 times by 2040 due to the transition of the energy system from fossil fuels to electricity. (SDS = Sustainable Development Scenario.) Source: IEA, 2022



INCREASED DEMAND FOR METALS AND MINERALS

There is a consensus that demand for metals will increase. At the same time, the scale of this demand, and which metals will be most critical, are subject to a great deal of uncertainty. Substantial investments in circularity are needed, but as demand for many metals and minerals is expected to multiply in the coming decades, recycling will not be able to meet the demand.

Factors driving demand

- Population growth
- Rising standards of living, economic growth
- Urbanisation (buildings, infrastructure, etc.)
- Electrification (batteries, digital technologies, heat pumps, electric motors, etc.)
- Fossil-free power generation (wind, solar, nuclear, etc.)
- Expansion of electricity networks

Factors dampening demand

- Technological development
- Increased resource efficiency
- Alternative materials and solutions
- Changes in consumer behaviour
- Circular flows (extended product life, reuse, remanufacturing, recycling)
- Substitution with alternative materials

Read more in the project's component reports *'Challenges for Meeting Increased Demand for Metals and Minerals'* (IVA, 2024a), Chapter 5, and *'Circular Flows to Meet Increased Demand for Metals and Minerals'* (IVA, 2024b), Chapter 6.

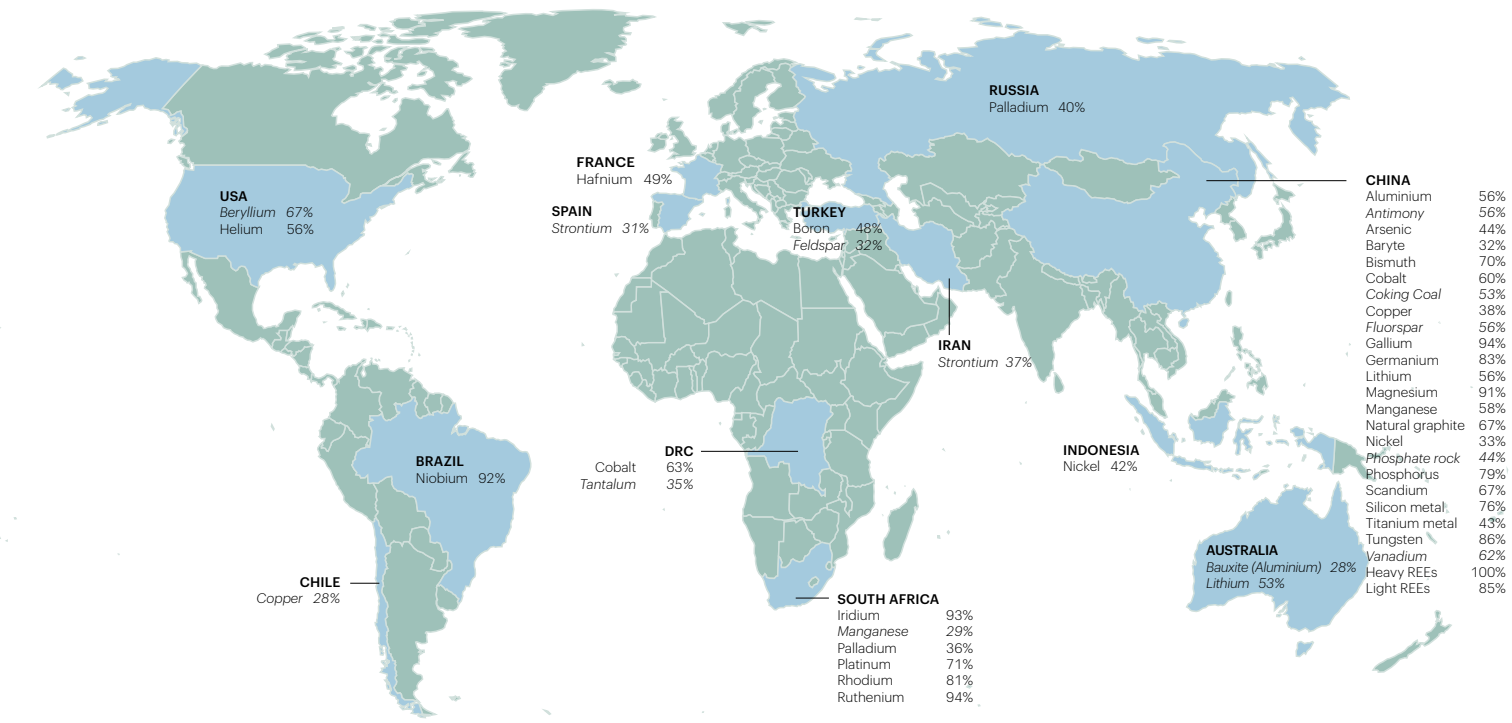


Figure 2: Countries accounting for largest share of global supply of raw materials listed as critical for the EU in 2023. The respective market share of supply is given in per cent for extraction *(italic text)* and processing (plain text). Source: Grohol & Veeh, 2023, and RMG Consulting, 2023.

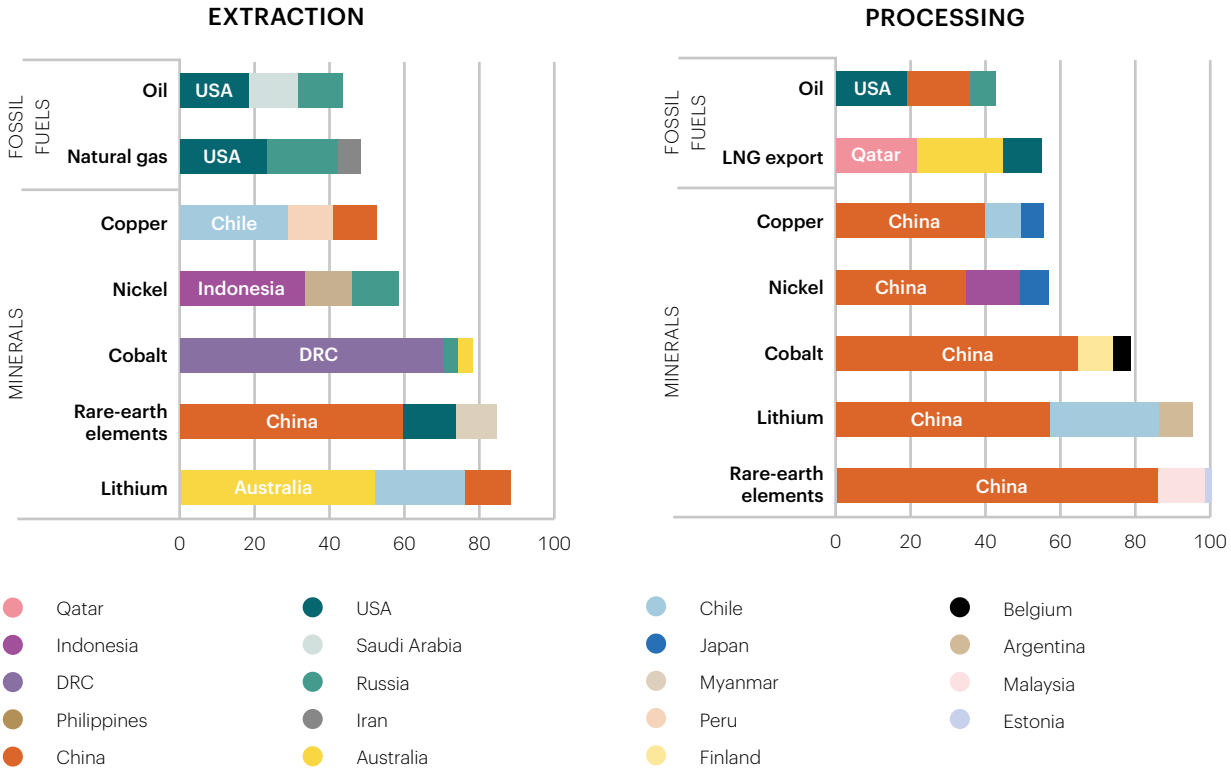
Sweden is one of Europe's most important mining countries. It produces over 90% of all iron ore in the EU, plus a significant proportion of copper, lead, zinc, gold and silver. As the demand for critical metals and minerals increases, interest has been growing in Sweden's potential for producing rare-earth elements in particular, as well as graphite, fluorite, phosphorus, vanadium and lithium.

Sweden's bedrock contains several of the metals and minerals that are now increasingly in demand. In some cases, they are found in the same orebodies as metals that are already being mined. This means that at the moment some critical metals and minerals that are now in demand end up in mine waste (tailings or waste-rock dumps) left over after a mine has extracted the metal it is targeting, or its ore has been sold for extraction in another country. Metals and minerals that are of interest may also be found in other deposits in places where there are currently no active mines.

The Swedish mining cluster can further contribute to Europe's supply of metals and minerals through increased exploration and new extraction, processing and recycling technologies. This will require significant investment in both human capital and industrial facilities.

Read more about geopolitical aspects in the component report *'Challenges for Meeting Increased Demand for Metals and Minerals'* (IVA, 2024a), Chapter 7.

Figure 3: The market concentration for metals and minerals used in the energy transition is greater than that for traditional fuels such as oil and gas. Source: IEA, 2022.



Positive developments in the Swedish mining cluster can be a lever for the whole industry

The increased demand for metals and minerals creates the need for new industries and input goods, generating business opportunities. Looking ahead, the Swedish mining cluster, with mines and smelters[3] together with suppliers of the mining equipment, transport systems and other technologies required, is well-placed to thrive. Recycling companies are also essential here in their role of increasing circular flows in the use of critical raw materials.

The change creates opportunities to strengthen the Swedish industry's competitiveness further. New knowledge and innovation built up in Sweden can create significant business opportunities in international markets.

3 The pure metal is extracted from concentrates by smelting. See the compound report *'Challenges for Meeting Increased Demand for Metals and Minerals'* (IVA, 2024a).

Swedish companies are now investing in becoming world leaders in the production of fossil-free steel, and in developing industrial ecosystems around new technology solutions. This generates new business opportunities through innovative partnerships, new technologies, new system solutions, spin-offs and advice. Similar efforts should be made to extract and recycle critical metals and minerals.

A factual and constructive discussion on conflicts of objectives and interests

A number of authorisation processes are involved when new mines and smelters are to be opened, or the operations of an existing mine are expanded. These are society's way of dealing with difficult and complex conflicts of objectives and interests relating to land use and the exploitation of natural resources in a legally secure and predictable manner.

The issues surrounding the establishment of new mining operations are complex. How they are handled affects society, the environment and the living conditions of many people. Environmental assessments and other parts of the authorisation processes can be improved and made more efficient, but the discussion on how this should be done must rest on a factual basis, respecting all the perspectives that need to be considered.

Several issues raised in the authorisation processes must ultimately be addressed through political means. They affect vi-

Figure 4: Sweden's mines and mineral occurrences in 2024. Source: SGU, 2023, Botnia Exploration, 2024.

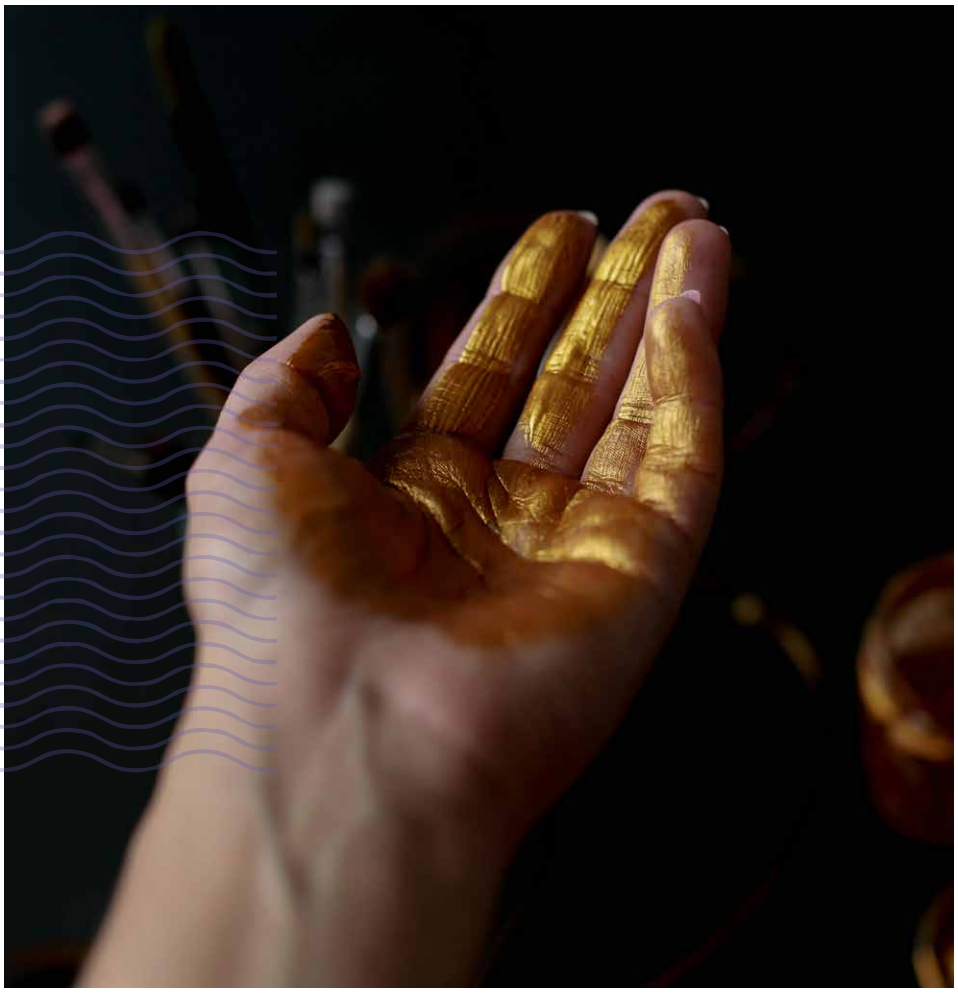
tal national interests within and between generations, countries and regions. Moreover, the solutions developed must be valid over several terms of office. There is therefore every reason to approach these issues with respect and humility, but also with a determination to find solutions at a pace commensurate with the urgency of the issues.

Read more in the component report *'Increased Demand for Metals and Minerals – Strategies and Conflicts of Objectives and Interests'* (IVA, 2024c).

Sweden's prosperity and competitiveness depend on the sustainable processing of our natural resources

Sweden's natural resources, such as ore, forests and hydropower, combined with many pioneering inventions and innovations, have laid the foundations for strong export companies, many of which are world leaders. Sweden's industrial success is based on a combination of investment in research and education, private initiatives and government investment in infrastructure for electricity grids, railways and energy supply.

A stable political system, a strong focus on sustainability issues, and a high degree of trust in society facilitate the implementation of new technology and create a favourable environment for innovation, contributing to Sweden's competitiveness and prosperity. Sweden is uniquely placed to take significant steps forward in industrial development. Because of this, Sweden can contribute to a sustainable future, creating interesting business opportunities and strengthening competitiveness in the global market.



4. Choices for a Swedish minerals strategy

»The Swedish mining cluster can create value for Sweden and Europe and contribute to the sustainable mining and recycling of metals and minerals in other parts of the world.«

Sweden should take a leading role in Europe's supply of metals and minerals

Sweden has the potential to mine and extract greater quantities of a wider range of metals and minerals. Favourable geological conditions also mean that there is significant potential for several of the raw materials defined as critical by the EU.

Sweden has a long mining and metal production history and a strong position as one of Europe's largest and most important mining countries in terms of production and technical capacity. The Swedish mining cluster, where mining companies and smelters interact with technology suppliers, consultants and academia, is a critical success factor. Many Swedish companies in the mining cluster are world leaders in their particular markets.

Sweden and Swedish industry have good opportunities to develop new processes and technologies based on the expertise that has been shared over decades. As a result, the Swedish mining cluster can create value for Sweden and Europe, and can contribute to the sustainable mining and recycling of metals and minerals in other parts of the world. The investments involved can also strengthen Sweden's position in global and European cooperation.

Strengthen Sweden's ability to attract investments that utilise the country's mineral resources together with land, fresh water and fossil-free electricity

Combined with fossil-free electricity and access to freshwater and land, its mineral endowment gives Sweden competitive advantages that can attract future investment and business start-ups to a greater extent than is currently the case. Giving the Geological Survey of Sweden (SGU) an expanded mandate and increased resources would allow it to work with Business Sweden and other export-promotion actors to actively attract international investment in exploration, extraction, refining and the production of strategic components. Such activities could include marketing campaigns, tax incentives and support for companies wishing to invest in Sweden.

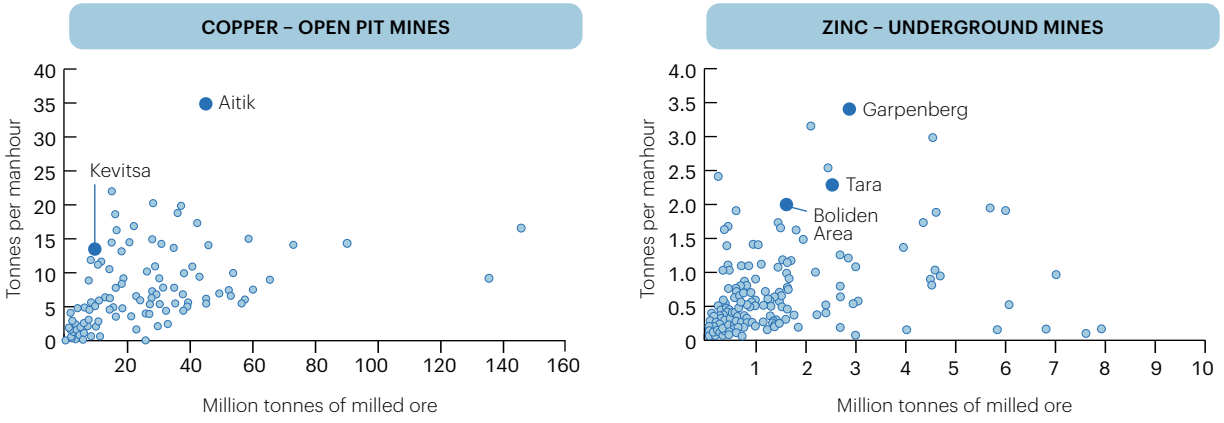
Create an EU-wide expert body for monitoring the CRMA, based in Sweden

The European Commission is responsible for monitoring the objectives of the CRMA. The Commission will need the Member States' strong commitment to this work. Sweden has a great deal of knowledge and is well-placed to take the lead in an advisory organisation with the purpose of monitoring and developing the work of the CRMA. The Swedish Government should work to ensure that a 'Critical Raw Materials Agency' – an expert body for critical raw materials – is established and located in Sweden.

Ensure that investments in mines are included in the EU's green taxonomy

The EU's green taxonomy aims to help financiers identify sustainable investment projects. Criteria have not yet been developed for the mining sector. The taxonomy's design therefore hampers the investments that are needed in the early stages of the metal commodity chain. For example, investments in battery factories are currently prioritised, but the steps that are needed for extracting the raw materials for the batteries are not being taken. The taxonomy also means that the European Investment Bank (EIB) currently only supports parts of the green technology supply chain. This also spills over to the Swedish National Debt Office's green credit guarantees, which apply the taxonomy's criteria.

Figure 5: Swedish mines are among the most efficient in the world. They operate in a global market and therefore need to be efficient and innovative to be competitive. High levels of automation and efficient processes compensate for higher costs in Sweden in terms of labour and input goods. Swedish mines also often have a better working environment and environmental situation compared to many countries outside the EU. Diagrams showing productivity relative to production in world zinc and copper mines. Source: Boliden, 2024.



Establish a Swedish fund for financing strategic projects under the CRMA

Establish a fund, preferably with the other Nordic countries, to incentivise Swedish and Nordic companies to apply to have their projects classified as strategic within the CRMA. Projects can receive financial support from the EU, but a national fund can speed up the process, reduce risk, and contribute to co-financing with EU funds. Germany, France and Italy have already allocated national funds for such projects (Metals and Mining, 2024). Getting more strategic projects in Sweden, with approved high sustainability requirements, would strengthen the country's position in European cooperation on metals and minerals.

Strengthen the Swedish mining, mining technology and recycling industries

Sweden has excellent development potential for extracting critical metals and minerals, for producing strategic components, and for recycling. National efforts are needed in several areas to ensure that the mining industry is at the international forefront and has a leading role in the EU's supply.

Increase targeted efforts to develop the mining, mining technology and recycling industries further

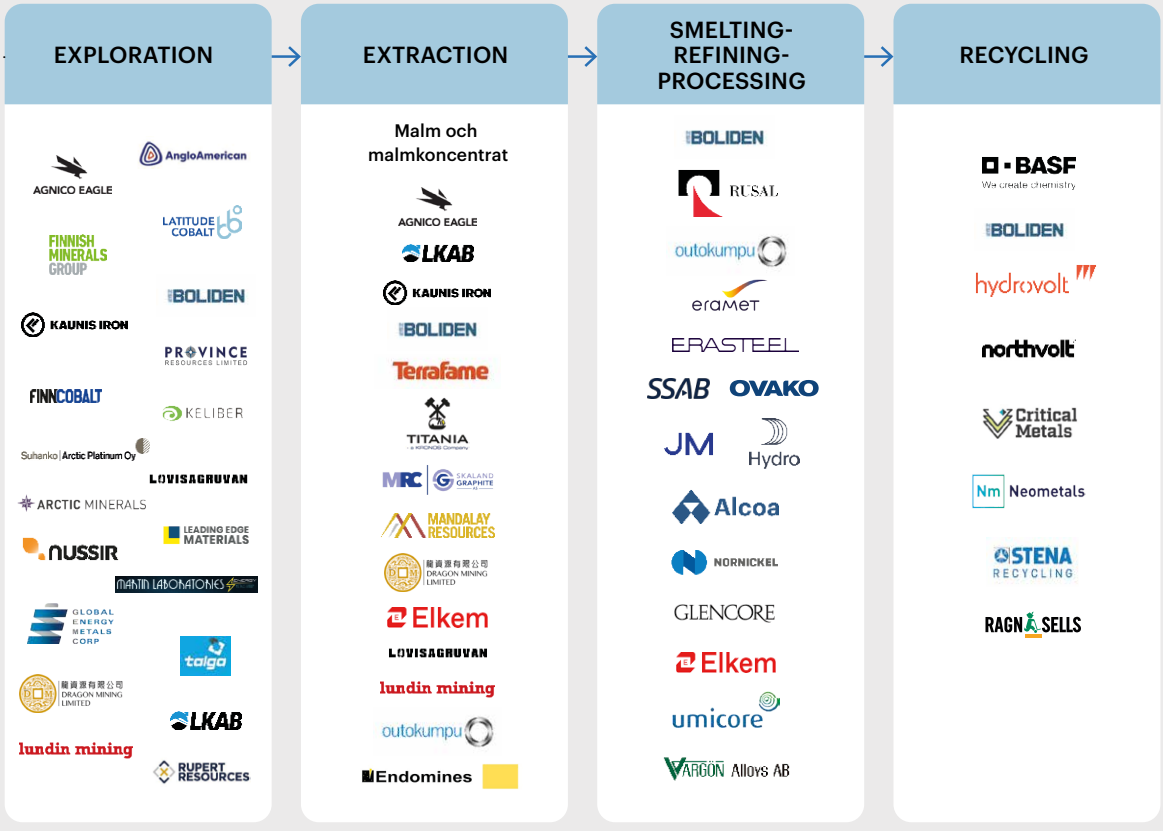
New activities and structures are required to meet market needs for crtical metals and minerals from Sweden. Long lead-times are involved in developing and financing these types of projects. To achieve the CRMA's goals according to the timetable up to 2030, targeted efforts are required for development in the mining, mining technology and recycling industries. These targeted efforts should include financial support, regulatory adjustments, government funding for research and development, and industry-academia partnerships.

Establish a national knowledge centre in Sweden to ensure competence throughout the value chain, from extraction to recycling metals and minerals

An independent Swedish knowledge centre should be created to ensure national competence and capacity throughout the value chain. The centre should be a hub for knowledge-building and transfer, and should have partners from industry, academia and the authorities. The focus should be

Figure 6: Illustration of the Nordic mining 'cluster'. Read more about the Swedish mining cluster in the component report *'Challenges for Meeting Increased Demand for Metals and Minerals'* (IVA, 2024a). Source: RMG Consulting, 2024.

The Swedish mining cluster consists of the mining sector, suppliers of mining equipment, industries that produce input goods for the mining industry, consultants and research and development resources at universities and companies. Downstream in the value chain are the steel and metal industries that process materials produced by the mining sector. The Swedish mining cluster accounts for 3% of the country's GDP, 8% of Sweden's exports and an estimated 100,000 to 125,000 jobs each year. On a provincial basis, it is the most important contributor to the provincial economies of Norrbotten and Västerbotten (Copenhagen Economics, 2021).



broad, and based on current knowledge. Issues related to the supply and demand of metals and minerals and geopolitics should be included. It should also include how production is developing globally, new green technologies, recycling, legislation, and the management of authorisation processes from an economic, legal and socio-economic perspective. Inspiration can be drawn from existing organisations in other countries, including L'Observatoire français des ressources minérales pour les filières industrielles (OFREMI) in France, the Deutsche Rohstoffagentur (DERA) in Germany and the UK Technology Metals Observatory in the UK.

Create better conditions for extracting new critical raw materials in operating mines

Sweden already produces several critical metals and minerals. They are typically by-products of iron, copper or zinc mining, and end up in mine waste or are more often exported to countries outside the EU. These are relatively small volumes compared to the main metal. The critical metals are traded in small, specialised markets where price trends can be very uncertain. Because of this, there is a high risk that investments in the facilities required for refining and processing will not be recovered.

Barriers can also be technical and legal. The technical solutions required for extracting metals that have not yet been refined in Sweden still have to be developed. Legal barriers exist in ownership, authorisation processes, responsibility for contaminated land, the definition of waste, environmental assessments and rules for landfill. Policies can help improve conditions and reduce uncertainty by offering guarantees and subsidies, and by facilitating cooperation between companies and research institutes to develop cost-effective extraction methods.

Create incentives for exploration outside existing mining areas

The majority of exploration in Sweden is undertaken close to existing mines with the aim of extending their lives. Because of this, there is much less exploration in areas that are further away from known ore and mineralisation. Useful knowledge therefore needs to be developed about all the 'blank spots' in the country in terms of their potential for ores and minerals.

Proposed measures are a 'material step' where the state contributes to reduced risk and increased activity for exploration, mine development and recovery, tax rebates for exploration work and the possibility of deducting losses in development companies (exploration companies) in profitable parts of a business.

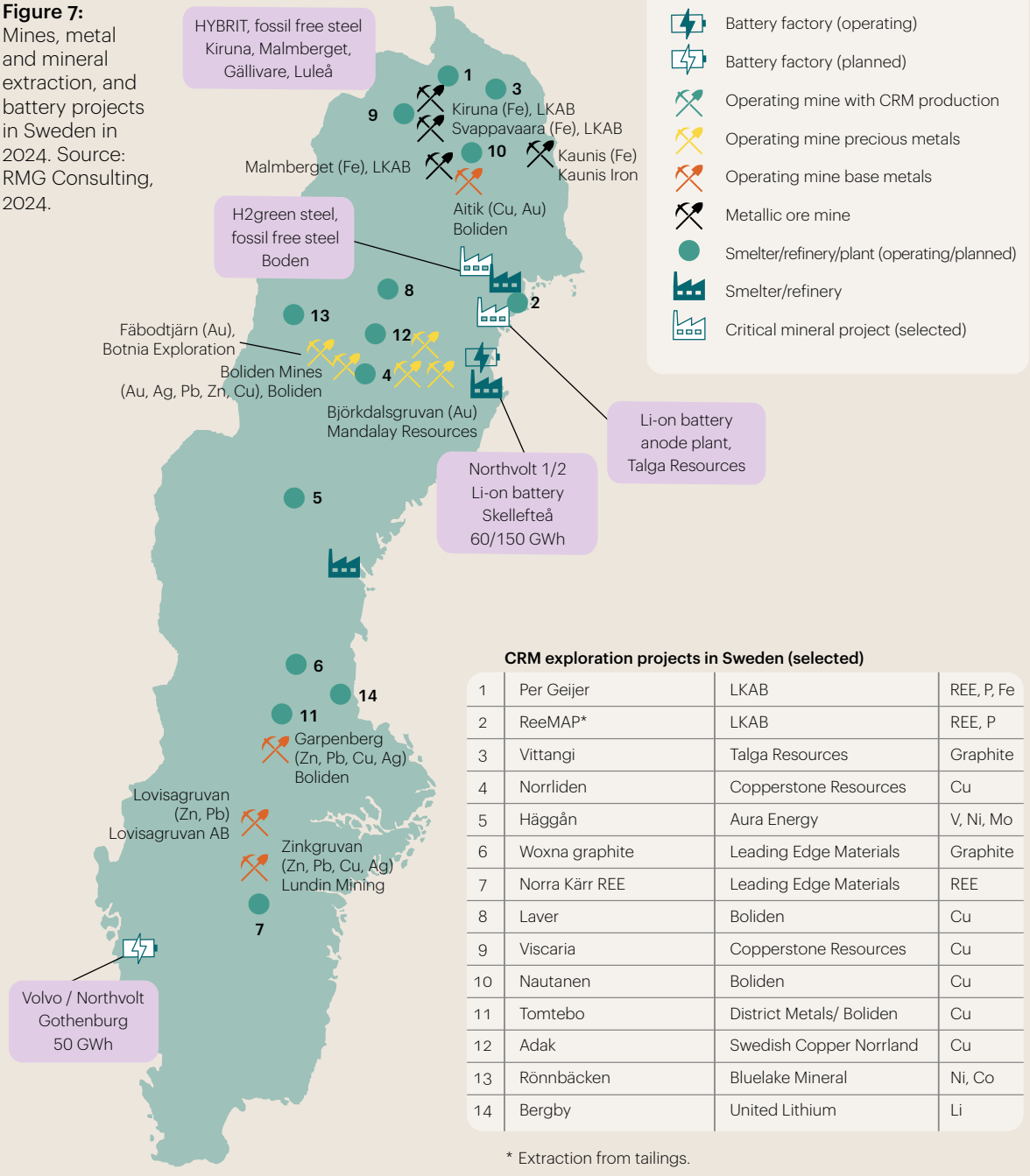
Table 1: Sweden's 13 active mines in 2024. Source: SGU, 2023, Botnia Exploration, 2024.

Company	Mine	Ore/Metal
LKAB	Malmberget	Iron ore
	Kiirunavaara	Iron ore
	Svappavaara	Iron ore
Kaunis Iron	Tapuli	Iron ore
Lundin Mining	Zinkgruvan	Zinc, lead, copper, silver
Lovisagruvan	Lovisagruvan	Zinc, lead, silver
Boliden Mineral	Garpenberg	Zinc, lead copper, silver, gold
	Kristineberg	Copper, lead, zinc, silver
	Renström	Copper, lead, zinc, silver
	Kankberg	Gold, tellurium
	Aitik	Copper, gold
Mandalay Resources	Björkdal	Gold
Botnia Exploration	Fäbotjärn	Gold

Make it more attractive for foreign companies to explore in Sweden

Today, Swedish mining companies account for almost 80% of all exploration in Sweden. At the same time, new methods and ideas are needed to develop knowledge of mineral deposits in the country's bedrock. Hence there is value in foreign actors investing in Sweden and contributing new techniques and working methods. Examples of measures to stimulate these actors include increasing knowledge of Sweden's geological endowment to reduce exploration risk, and financial incentives such as credit guarantees. More activities should be carried out to increase foreign investment in exploration and mines in Sweden and to create awareness, not least within the EU, of Sweden as a mining country.

Figure 7: Mines, metal and mineral extraction, and battery projects in Sweden in 2024. Source: RMG Consulting, 2024.



CRM exploration projects in Sweden (selected)

1	Per Geijer	LKAB	REE, P, Fe
2	ReeMAP*	LKAB	REE, P
3	Vittangi	Talga Resources	Graphite
4	Norrliden	Copperstone Resources	Cu
5	Häggån	Aura Energy	V, Ni, Mo
6	Woxna graphite	Leading Edge Materials	Graphite
7	Norra Kärr REE	Leading Edge Materials	REE
8	Laver	Boliden	Cu
9	Viscaria	Copperstone Resources	Cu
10	Nautanen	Boliden	Cu
11	Tomtebo	District Metals/ Boliden	Cu
12	Adak	Swedish Copper Norrland	Cu
13	Rönnbäcken	Bluelake Mineral	Ni, Co
14	Bergby	United Lithium	Li

* Extraction from tailings.

Make it easier to reuse and recycle materials

With metals and minerals playing a central role in the transition to a fossil-free society, to be sustainable in the long term, resources must be used efficiently throughout the value chain, and circular flows must be enabled. Smart, resource-efficient, and circular product design that allows for repair, reuse, remanufacturing and recycling is an important piece of the puzzle needed to meet and mitigate the increasing demand for primary metals and minerals sustainably. However, the current regulatory framework is adapted to a linear economy, and recycling rates are very low for most of the critical metals and minerals now included in the CRMA. To improve circular material and product flows, a number of actions are needed in different areas.

Create a level playing field and correct pricing for increased circularity

Prioritise general measures addressing the root causes of low circularity, such as different primary and secondary production rules and the incorrect pricing of external costs. Examples of measures positively impacting circular flows are the EU Emissions Trading Scheme and the new EU Corporate Social Responsibility Directive (CSRD).

Stimulate supply and demand for recycled materials

Create policy instruments and economic incentives to stimulate supply and demand for recycled materials. Swedish politicians should work to ensure that future EU regulations promote circularity, for example, through measures in circular design and requirements for recycling rates and the proportion of recycled materials in new production. However, the target for the share of recycled material in a product needs to be based on factors such as supply, demand, product type, product lifetime and the climate impact of production.

Encourage circular business models

Review and adjust regulations that inhibit circular business models. For example, current accounting rules make it difficult for companies to switch to selling functions instead of products, and the chemical tax on imported used electronics makes the large-scale reuse of IT equipment difficult. Work is also needed on the introduction of EU requirements on repairability for a greater range of products and more circularity in public procurement.

Adapt waste-management regulations to increase recycling

Work to improve and harmonise waste legislation concerning circularity in the EU and Sweden. Regulations that need to be reviewed include the transport of waste between different countries, waste storage to achieve the necessary volume for a process, and the classification of waste that currently makes it difficult for reusing it in new products. Waste must also be seen in the regulatory framework as the resource that it is.

HOW CIRCULAR IS THE WORLD IN GENERAL?

Every year, approximately 100,000 Mt of raw materials are used world-wide. According to the Circularity Gap Report (Circle Economy, 2023), only 7.2% of this is made up of recycled (secondary) material. Despite increased recycling efforts, on a relative basis the global percentage has gradually decreased since 2018. This is because the extraction of primary materials has risen even faster, driven by growing demand. The Circle Economy report emphasises the importance of using less, using products for longer, reusing/recycling, and mimicking natural cycles by phasing out harmful materials and processes and replacing them with renewable resources such as biomass.

The figures above include all resources, with society-critical metals and minerals accounted for as well. Although we frequently discuss the circular economy in Sweden, the country remains largely in a linear system while maintaining high consumption (RISE & Circle Economy, 2022).

Moreover, the extraction and processing of natural resources account for more than 55% of total global greenhouse-gas emissions and over 90% of land-based biodiversity loss. This includes all natural resources, not just metals and minerals (United Nations Environment Programme, 2024).

Stimulate standardisation work in established industrial forums to promote circular flows

Work on standards is urgent in the context of new EU legislation that includes reporting on recycled material or recyclability. As current standards do not define how to calculate the amount of recycled material, new legislation will need to clarify this. There is also a need for material standards for reference by both the processing and recycling industries in order to increase the availability of high-quality recycled materials. Other important areas for action include standardised requirements for recyclable products, and product standards that allow recycled materials.

Stimulate the commercialisation and scale-up of research and innovation linked to circularity

Many actions involve large investments. To contribute to these, the Government can support technology development, including demonstration and development projects. Time-limited production support for the recycling of particularly strategic materials should be considered. More investment in research and innovation is also needed (see Pathway 6 – 'Wide-ranging investment in knowledge, research and innovation on minerals and metals').

Read more in the component report *'Circular Flows to Meet Increased Demand for Metals and Minerals'* (IVA, 2024b).

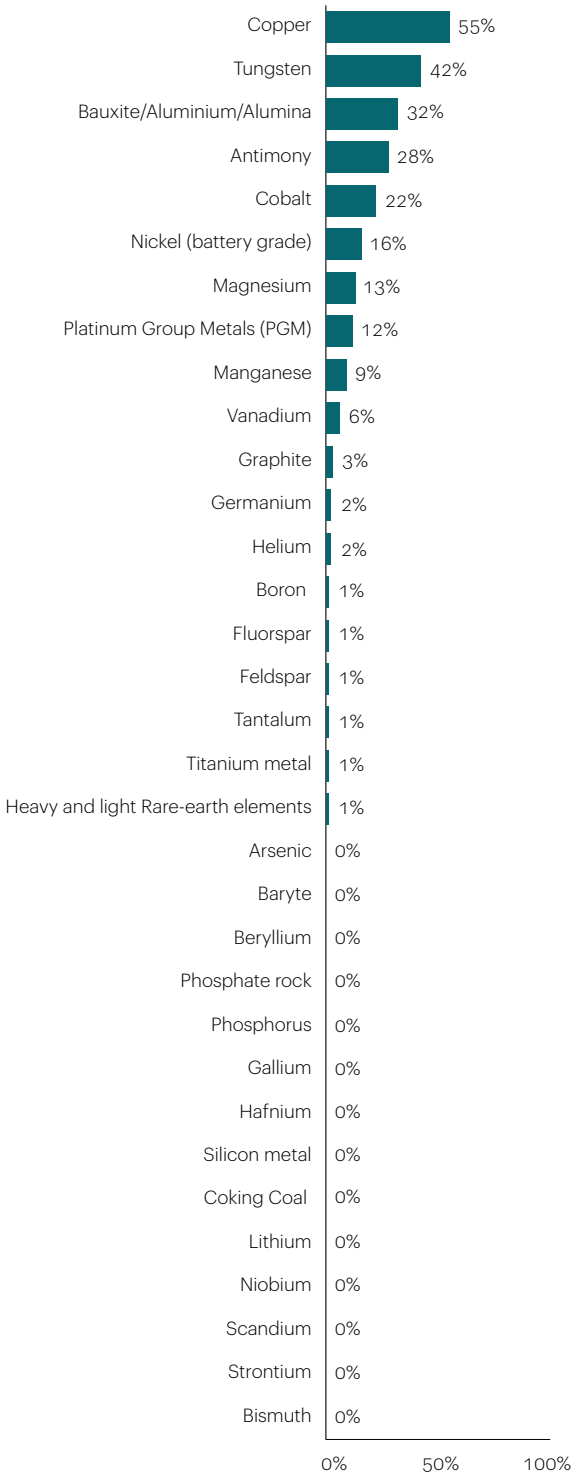
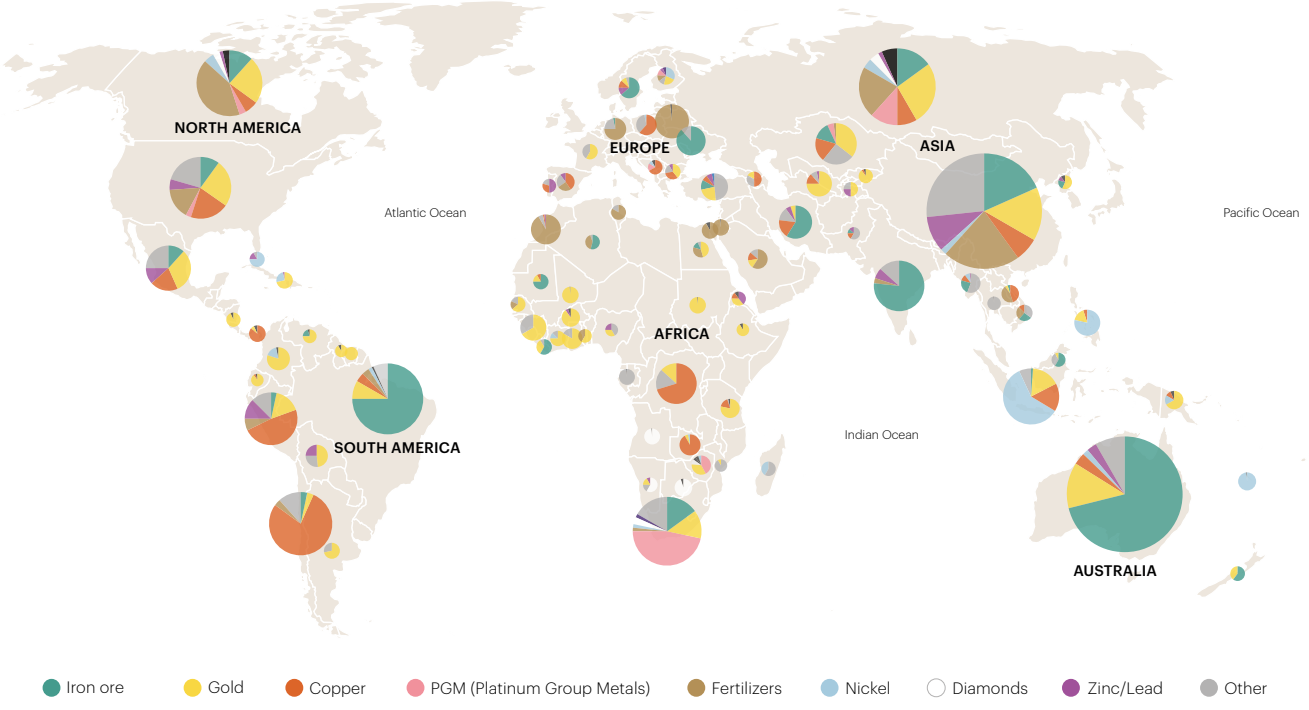


Figure 8: The chart illustrates EU-critical raw materials, and the proportion of these materials within the EU production system that are sourced from the recycling of post-consumer scrap. Scrap from manufacturing processes is excluded. This proportion is known as the end-of-life recycling input rate (EOL-RIR). Source: Grohol & Veeh, 2023.

The low figures can be attributed to several factors. There are shortcomings in recycling, but they may also be the result of a significant amount of material still being tied up in long-lived products, as well as to increasing demand. A drawback of this measurement method is that it does not account for any downgrading (material degradation); when this happens, the material can be used in fewer applications. In the long term, this becomes problematic. To maximise a material's utilisation, it should be as pure as possible. Read more about recycling rates in the component report *'Circular Flows to Meet Increased Demand for Metals and Minerals'* (IVA, 2024b).

Figure 9: Mining in a global perspective. The size of the circles represents the value, and the colours indicate the metals involved. As shown, the southern hemisphere is now dominant in mining, while Europe's contribution is modest. Source: RMG Consulting, 2023.



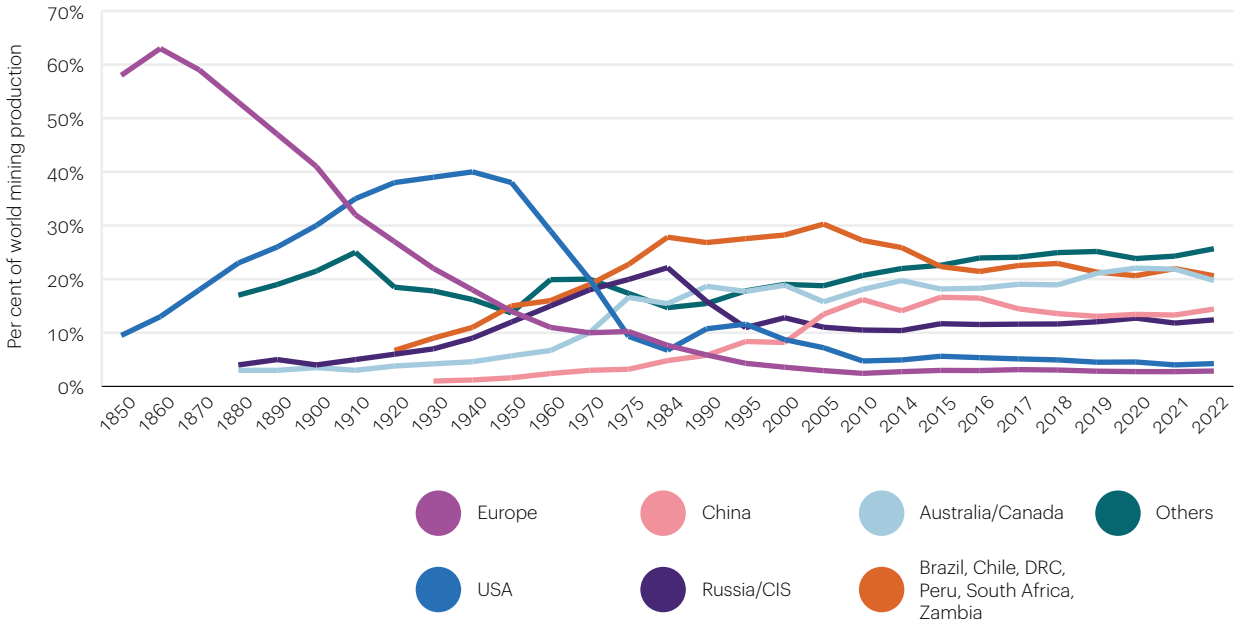
Create new international strategic partnerships and strengthen existing ones

The EU will never be fully self-sufficient in metals and minerals and is therefore dependent on well-functioning world trade. A key issue is establishing new strategic partnerships with the world's mineral-rich countries. With their strong mining clusters, Sweden and Finland have a particular responsibility to build constructive relationships with these countries, and with countries and companies central to the value chains for strategic components and goods based on metals and minerals. Sweden should evaluate with which countries and regions it should particularly develop cooperation, and then prioritise between them in various areas such as research and innovation, education and skills development.

Sweden should take a more active role in the EU's strategic international cooperation to secure common value chains

Europe cannot rely on a functioning global market to meet its needs. To reduce the vulnerability of supply chains, as part of the CRMA the EU will enter into new strategic partnerships with countries, inside or outside Europe, that have either mineral resources, processing capabilities or the manufacturing of strategic components. As Europe's leading mining and smelting countries, Sweden and Finland should take an active role in these collaborations by virtue of their extensive experience with the entire value chain.

Figure 10: Location of mining in relation to value, in different regions over the period 1850–2022. As can be seen, Europe and then the USA have lost importance in favour of countries and regions in the southern hemisphere. Source: RMG Consulting, 2023.



Intensify Nordic cooperation

By acting jointly in the global market, the Nordic countries can gain a stronger position against larger competitor countries. Sweden should therefore support and strengthen the Nordic Council of Ministers' initiatives throughout the mineral value chain. Today, many companies cooperate across borders in mining activities, and there is every opportunity to increase cooperation in research and between the various national authorities in the region.

The Nordic countries should also set up a joint raw-materials fund to co-finance strategic projects and to cooperate both bilaterally and in relation to the whole of Europe. Development cooperation with mineral-rich countries should be coordinated and strengthened through the Swedish SGU and the Finnish GTK.

Strengthen and cement cooperation with similar technology-leading countries, such as Australia and Canada

Sweden has long-established cooperation with Australia and Canada, themselves leading mining countries. They have similar conditions and challenges to Sweden's, but have more aggressive strategies for their supply and role in the market. Cooperation should be developed and put in place through joint projects and bilateral agreements, not least on critical metals.

Joint strategies should be developed to strengthen the countries' position in the global market and to meet increasing

demand. Sweden has more extensive domestic processing than Australia and Canada, which export ore and concentrates to a greater extent. The principal Swedish mining-machinery suppliers are also well-established in Australia and Canada. Cooperation can therefore occur on several levels, from joint research projects and technology development to concrete industrial collaboration. A great deal of cooperation is already taking place, but this can be strengthened.

Expand cooperation with commodity-producing countries in Africa, South America and Southeast Asia
Countries in the Southern Hemisphere are crucial to global mining production. They account for one-third of the total production of metals and minerals, and half the output of the critical metals.

Africa, South America and Southeast Asia have significant resources. While today they mainly export raw materials, many countries want to build up domestic processing. Examples include the ambitions of Zambia and the Democratic Republic of Congo to produce battery materials based on domestic deposits of cobalt and other metals. Nordic battery manufacturers have the opportunity here to secure part of their needs while the countries receive support to build sustainable production chains. Another example is the African Union's plans for a research and development centre for the enrichment, extraction and production of critical metals. Sweden could also play an important role here.

Bilaterally or through the EU, Sweden should expand cooperation with more countries in Africa, South America and Southeast Asia to strengthen its supply chains while supporting the economies of mineral-rich countries. Mines and minerals often play an important role in countries' economic development, since by strengthening their economies, social development can be promoted and poverty alleviated. With its strong mining cluster, Sweden has a particular responsibility to ensure that extraction and processing occur sustainably in these countries, so as to minimise environmental impact and contribute to social development. The Swedish International Development Cooperation Agency (Sida) and other aid actors, such as the Swedish Export Credit Agency and Swedfund, play essential roles as facilitators here.

Enrol Sweden in the Extractive Industries Transparency Initiative
Sweden should join the Extractive Industries Transparency Initiative (EITI), an intergovernmental organisation aimed at combatting corruption in the global mining industry and ensuring that taxpayers' money is used best. Swedish membership would enhance our reputation as a leading mining country, strengthen the Swedish mining cluster in the international market, and contribute to intensifying global efforts against corruption and tax evasion. More than 50 countries are members of the EITI, including Germany, the Netherlands, Norway and the UK. Sweden and Finland are so-called supporter countries but are not full members.

Increase knowledge of China's resources, needs and strategies
Increased knowledge of China's mineral dependency and mineral policy can help Sweden and the EU formulate a raw-materials policy based on facts about China's intentions and situation regarding the production and supply of metals and minerals. Despite being a major mining country, and its strong position as an exporter of several critical metals and minerals, China is heavily dependent on imports of several economically important minerals (including iron ore, copper and bauxite), accounting for around 50% of the global use of most metals and minerals.

There is knowledge about China's role in various metals and minerals markets in many parts of Sweden. If this could be gathered and made easily accessible via a knowledge centre, it would help to provide a better basis for decision-making on issues relating to Sweden's and the EU's relationship with China regarding trade in metals and minerals.

Develop and streamline authorisation processes and tools to manage conflicts of objectives and interests

Sweden needs to upgrade its infrastructure, develop its energy supply and invest in fossil-free industry. This requires the establishment of new large industrial plants and mines,

Figure 11: Greenhouse gas intensity of copper mines globally. The Swedish mines Garpenberg, Boliden area and Aitik are among the best in terms of carbon footprint. Source: Skarn Associates.

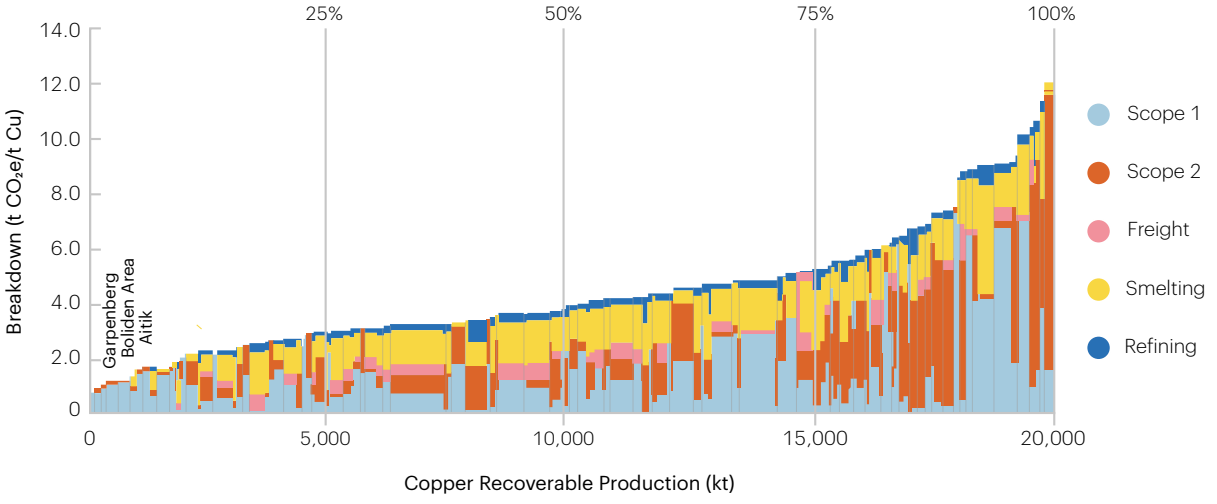
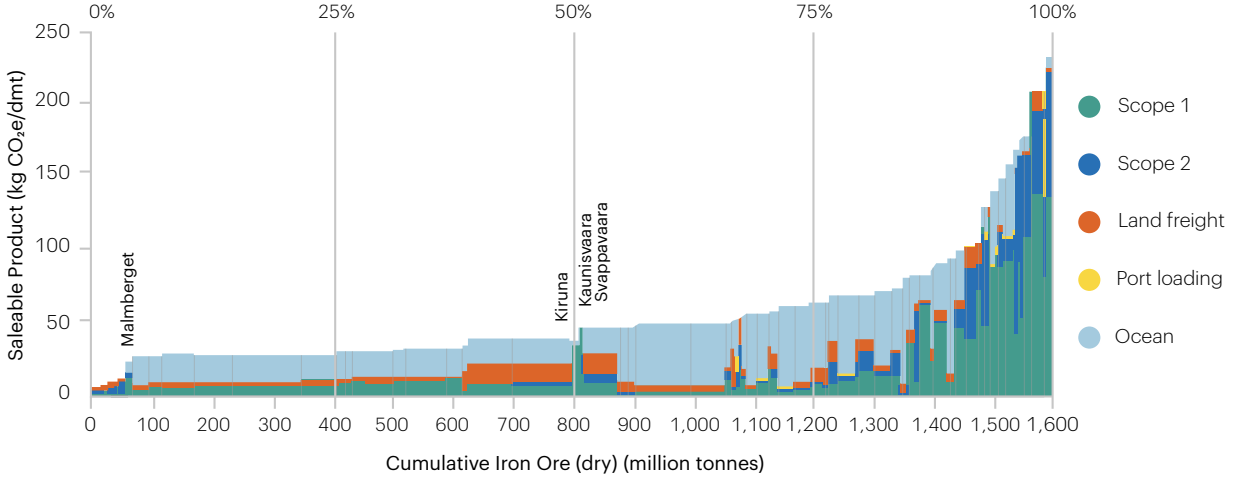


Figure 12: Greenhouse gas intensity of iron ore mines globally. Malmberget has among the lowest footprints, but also the mines in Kiruna, Kaunisvaara and Svappavaara have low carbon footprint in a global perspective. Source: Skarn Associates.



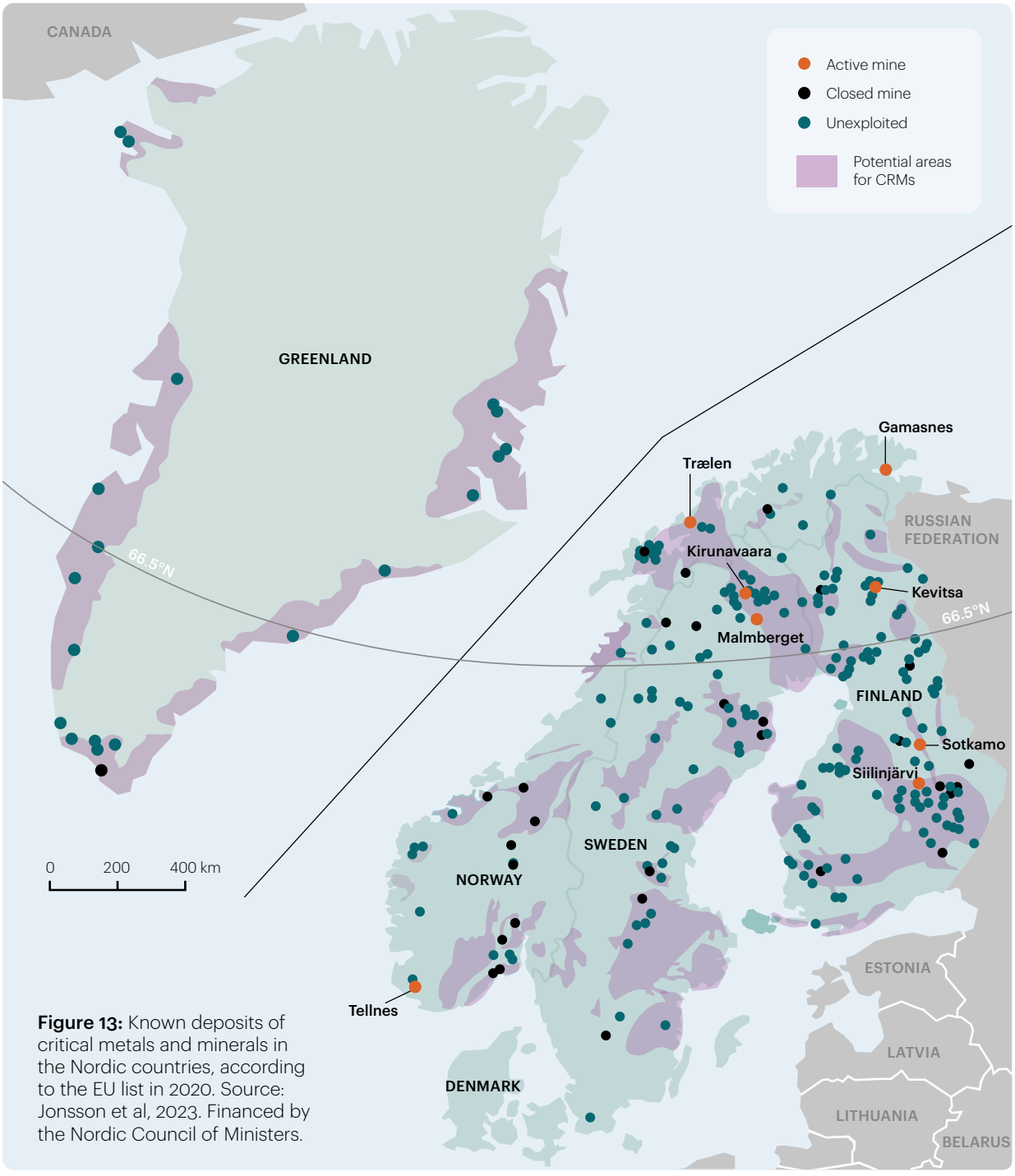


Figure 13: Known deposits of critical metals and minerals in the Nordic countries, according to the EU list in 2020. Source: Jonsson et al, 2023. Financed by the Nordic Council of Ministers.

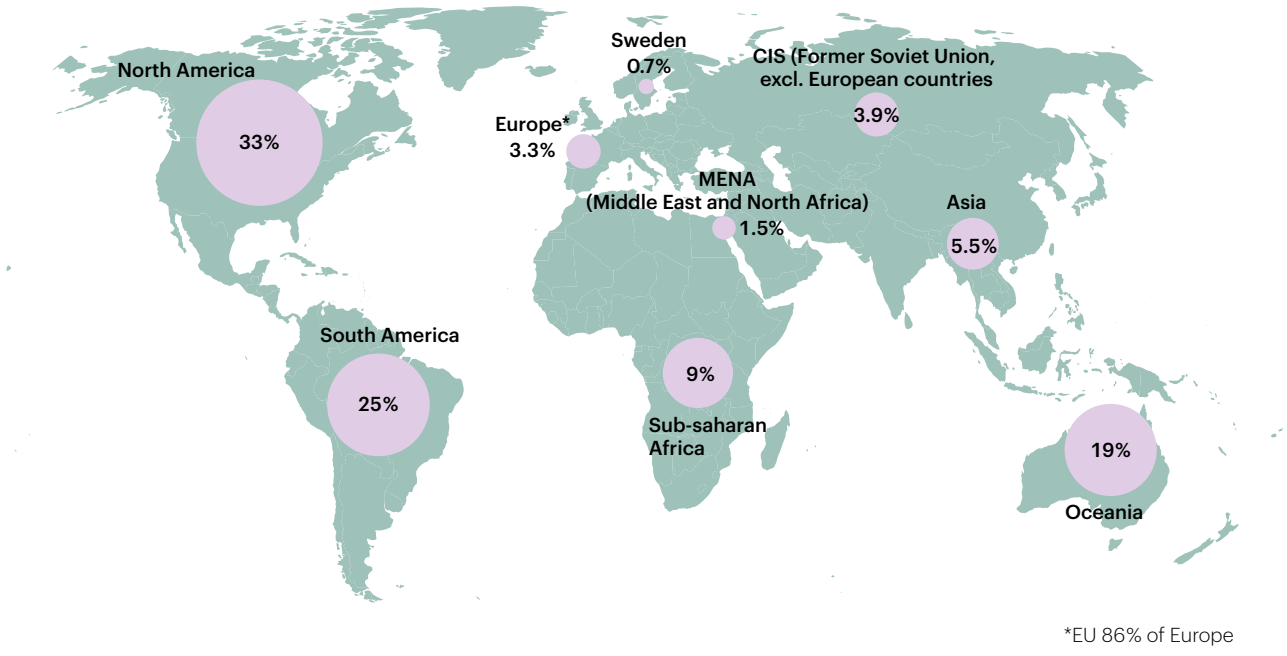


Figure 14: Distribution of investment in exploration in the world in 2022. The figures do not include exploration for iron ore. If this is included, Sweden's share of the total grows to around 1.2%. In total (including iron ore) over US$14 billion was invested in 2022, an increase of 16% compared to 2021. Source: S&P Global, 2023, adapted by RMG Consulting.

as well as the expansion of existing ones, and this in turn requires national prioritisation of land use.

These priorities involve a number of conflicts of interests and objectives that must be managed. These may concern competing industries, the impact on the local environment, and financial commitments in the municipalities where the establishments are located. Local decisions must take account of national priorities for land use. That is not the case today.

The authorisation processes for activities impacting the environment are our society's way of managing conflicts of interest and objectives. Environmental assessment plays a central role here, having been criticised and investigated in various government reports (see the component report *'Increased Demand for Metals and Minerals – Strategies and Conflicts of Objectives and Interests'* (IVA, 2024c)).

Permit assessments need to be changed and streamlined, which requires a constructive discussion, both on the environmental legislation itself and its applied processes. At the same time, it is crucial that policies at the national level address fundamental conflicts of objectives and interests in land use; for example, through the management of the planning instrument of national interests, which is the starting point for decisions at the local level. Current practice has shown that the planning instrument does not fulfil its function as a guide for local land-use decisions.

Statistics show that most environmental assessments are relatively quick. However, this does not apply to more complex cases, such as the establishment of a mine. If decisions on 'critical mineral' projects are held up in this way, their contribution to the 'green transition' will also be delayed. Work is under way to streamline and reduce the time taken for authorisation processes, including environmental assessments. We believe that there should be an investigation into the possibility of the Government taking over the handling of cases of significant strategic importance to the country, and what criteria must be met for this to happen.

Provide more precise guidance on how national priorities should be applied in environmental assessments and municipal land-use decisions

Current environmental legislation allows trade-offs to be made between different societal interests. However, more precise national guidelines are needed to provide guidance for trade-offs in decisions at the local level. The Government also needs to work at the EU level for greater flexibility in applying, for example, the EU Framework Water Directive, which is currently part of Swedish environmental legislation.

Streamline environmental assessments concerning the extraction and recycling of metals and minerals

Ensure that the application of rules on changes to activity and on reassessment for modern environmental conditions is effective. Clarify and develop the role of the authorities and the process management and administration of the review authorities, not least to reduce processing times. The authorities' expertise needs to be strengthened in this area. The county administrative boards' instructions should be amended in the near future to strengthen their advisory role in connection with the licensing process.

Consider examining environmental permits at an early stage under the administrative regime of an administrative authority

Sweden is the only country in the EU where a court reviews environmental permits at an early stage. In other Nordic countries, for example, permit issues are examined by administrative authorities. The starting point is then that questions of permissibility and authorisation are examined administratively. As environmental permit cases involve balancing many societal interests, there are reasons of both principle and efficiency for moving the review to an administrative process at an administrative authority. However, such a change would require a review of the entire review-stage system, so that it is not prolonged.

Increase financial compensation to municipalities affected by metal and mineral extraction or other industrial investments

Municipalities where metal and mineral extraction or other industrial investments take place currently receive a limited share of the economic value created by the investment. At the same time, a mining or other industrial establishment requires municipal investment in housing, infrastructure and welfare services. This reduces local acceptance of establishments and strains the municipality's financial situation. Value created locally must also boost the municipality and its inhabitants economically. This can be done by increasing the level of national taxes, such as the proper-

CONSIDER EXPLORATION AND MINE DEVELOPMENT AS RESEARCH AND INNOVATION AND TREAT ACTIVITIES WITHIN THE CURRENT INNOVATION SYSTEM

Exploration and mine development represent the renewal of the mining industry and are essential activities for its survival. Exploration and mine development is based on and contributes to fundamental natural sciences, and use modern technological methods such as advanced sensor technology and machine learning. It involves a creative moment when all the data obtained is to be transformed into information, knowledge and marketable products.

In the mining industry, there is a sub-sector, junior mining companies, which develop and sell mining projects at different stages of development, similar to early-stage development companies in the pharmaceutical industry, for example. It is therefore reasonable to consider exploration and mining development as industrial research and innovation and that such projects are treated in the same way as other development projects in national innovation systems.

ty tax, the business tax or the mineral levy, that accrue to the municipality. It can then compensate those affected by the establishment, for example, through better municipal services.

Wide-ranging investment in knowledge, research and innovation on metals and minerals

For Sweden to maintain and strengthen its position as a leading mining country with a world-leading high-tech industry in many areas, there is a major need for research, innovation and knowledge-building. New knowledge and technologies are needed for the sustainable exploration, extraction and refining of several critical metals. More knowledge is required about business models and technology to understand circular flows at all levels. Areas where research and innovation are of great importance are presented below.

Increased knowledge of Sweden's geological endowment through enhanced exploration
There is currently limited knowledge of the potential for critical metal and mineral resources in Sweden's bedrock. To date, exploration has focused mainly on traditional iron and base metals and not on the critical metals that are increasingly in demand. Knowledge of Sweden's bedrock geology and mineralisation needs to increase, and the Government has given the SGU increased support for intensified mapping, which is positive.

Increased knowledge of Sweden's bedrock, focusing on critical metals and minerals, is a prerequisite for new mines. New, innovative methods need to be developed for exploration, mainly focusing on new critical metals. It is essential to understand how geological processes enrich these metals, and how they can be detected with advanced technology.

New techniques for mining lower-grade, deeper ore deposits
Cost-effective technologies need to be developed for mining lower-grade ores that lie deeper than current orebodies.

New processes for extracting more metals from ore concentrates, and from mining and other waste
Most critical metals require completely different recovery processes from those used for iron and base metals. In this context, Swedish industry needs increased knowledge and technological development. Research and innovation are therefore needed into new metallurgical processes that will be required for separating more metals from ore concentrates, from mining waste (tailings and rock dumps) or from other waste containing critical metals and minerals.

Behaviour of elements in different materials for limited environmental impact
New ore types, processes and methods are creating new types of waste, sludge and pollutants, and experience and research into the behaviour of elements in such materials is still lacking. This can result in stable metals being released and concentrated in leachate, which can then spread into the environment. More knowledge is needed on minimising environmental impacts and increasing utilisation rates so that a larger proportion of a mined ore can be transformed into products rather than becoming waste.

Resource efficiency and circular flows
There is a lack of knowledge and technology for using metals efficiently in circular systems. Research and development are therefore needed in several areas, such as resource-efficient and circular design, circular business models, dismantling/sorting techniques, new recycling technologies, and maintenance for extended lifetimes. Knowledge is also needed about the secondary flows of these materials, where they are found, and what the material flows look like in Sweden and internationally. Research and development strengths should be utilised so that Sweden becomes a leader in resource efficiency and sustainable materials management.

Conflicts of objectives and interests
Increased extraction of metals and minerals involves several conflicting goals and interests. Social science research is essential for increasing knowledge about the nature of these conflicts. Research is also needed on how these issues can be resolved, and on appropriate forms of compensation. An international comparative perspective is vital.

In addition to this, there is a need for

Public education programmes on metals and minerals and an increased focus on geoscience in schools
Geoscientific issues are increasingly becoming part of society, and Sweden needs more people with geoscientific expertise. An increased focus on this area in schools is therefore required. At present, geoscience has a modest status in the curriculum for both primary and secondary schools. In upper secondary school, the geography course includes the subject, but this course is not compulsory for students who are studying the science or technology programme; there is a gap here. Neither is there a national resource centre for teaching geosciences. While the Royal Swedish Academy of Sciences (Kungl. Vetenskapsakademin – KVA) is pushing the issue, and the geosciences department at Uppsala University has expressed interest in hosting a resource centre in geography, funding is a problem.

Public-education initiatives are also needed for increasing knowledge about materials and their value chains. More people need to know which materials are used in everyday products, where these materials come from, and what happens to end-of-life products

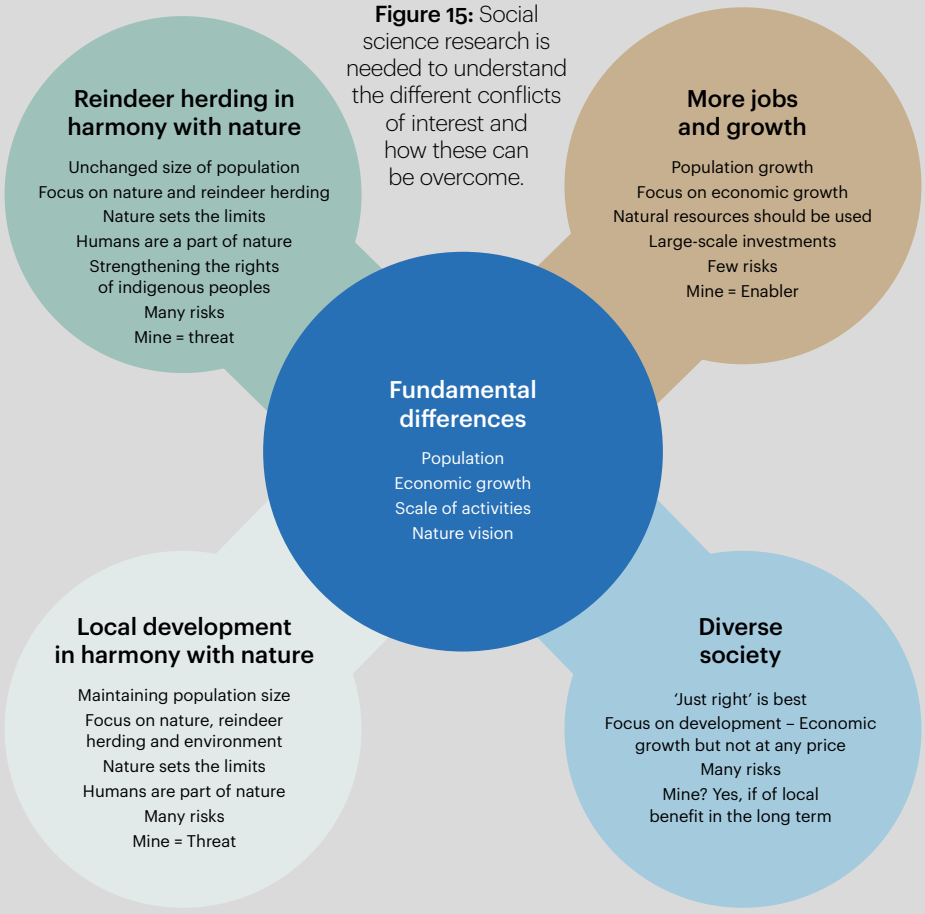
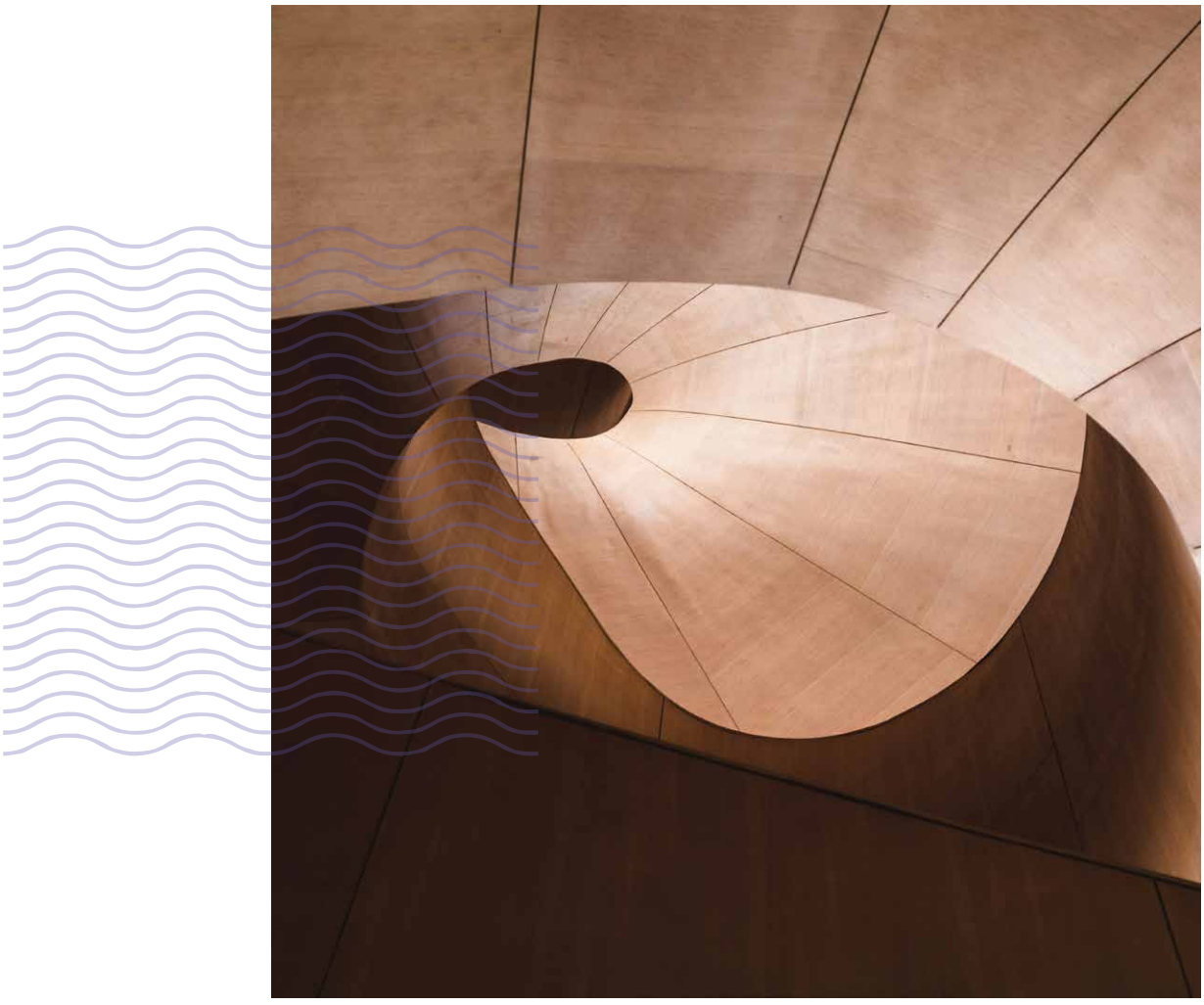


Figure 15: Social science research is needed to understand the different conflicts of interest and how these can be overcome.

The individuals of the local community are always the ones affected negatively by environmentally disruptive activities, while the effects of these can largely be positive from a national or international perspective. The difficulty lies in balancing these effects against each other and create local acceptance for something that is of national benefit.

In a research project, those involved used interviews to identify various aspects that influence the view of mining businesses. The study showed that stakeholders' views differ on the future, what is sustainable, what benefits the local community, and whether a mine contributes to or hinders local development.

The figure illustrates four different approaches that the researchers identified in their case studies. The study shows that there can be resistance to new establishments even in areas with existing mines, such as Kiruna. The fact that there are currently plenty of jobs in Kiruna may be one explanation for this. Resolving conflicts rooted in fundamental values is difficult. All the same, a dialogue on equal terms can lead to some consensus, mutual understanding of each other's views, and decisions being perceived as legitimate. Source: Lindahl et al. 2016.



5. Appendix

About the project

The IVA's *Roadmap for Metals and Minerals* project started in November 2022 and came to an end in December 2024. The project was led by a steering group that also decided on the plan that describes the project's goals, purpose and work processes.

Much of the project work has been carried out in three expert groups that produced the three component reports. During the project, these groups reported to, and received feedback from, the steering and political reference groups. The political reference group consisted of members of parliament from all eight political parties. It has been continuously involved in the project's work through several reference-group meetings, and through participation in seminars.

The project has also had an international reference group with representatives from organisations worldwide (see below). It has participated in project meetings and seminars, providing a global perspective on metal and mineral supply issues. These contributions have been invaluable, and have given the project's conclusions an international anchorage.

Steering Committee

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Expert Group Extraction

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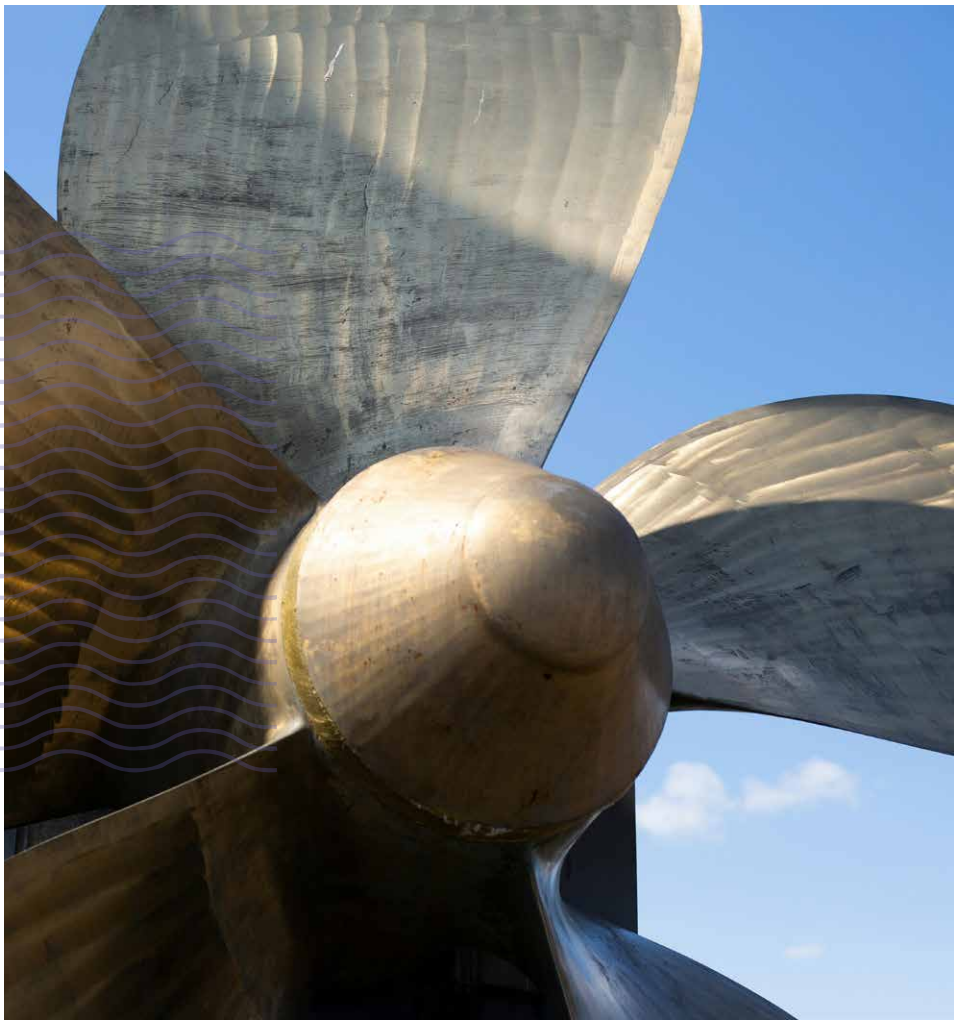

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