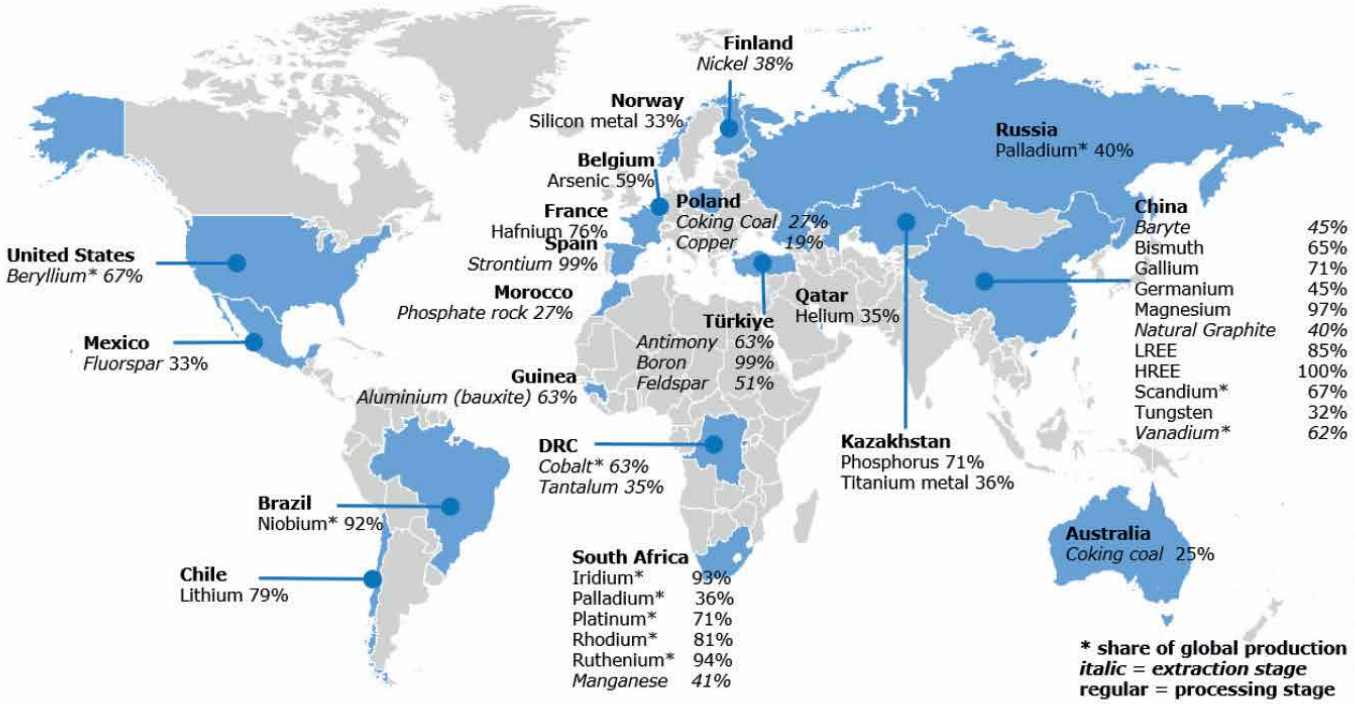
MINING & MINERALS FACT SHEET

A MORE DIVERSE, SUSTAINABLE SUPPLY OF CRITICAL RAW MATERIALS IN EUROPE

Main EU suppliers of individual Critical Raw Materials



Source: "European Commission, Study on the Critical Raw Materials for the EU 2023– Final Report"

Study on the Critical Raw Materials for the EU 2023.

The EU's Critical Raw Materials Act

The European Union aims to be the world's first climate neutral continent by 2050. Achieving the EU's Green-Deal vision depends on securing a reliable and increasing supply of raw materials crucial to building technologies for the world's green energy and digital transitions. The EU's Critical Raw Materials Act (CRMA) is a piece of legislation intended to mitigate that supply risk. It received final approval on the 18th of March 2024 and will have immediate application in all Member States.

What are Critical Raw Materials and Strategic Raw Materials?

The EU Commission has identified 34 Critical Raw Materials (CRM), including 17 Strategic Raw Materials (SRM) of high economic importance for the EU – but at a high risk of supply disruption. Critical because clean and renewable energy and digital technology will not happen without an ample and reliable supply of these metals for items such as smart phones, LED lighting, solar panels, and EV batteries. Some are strategic because of Europe's over dependency on just a handful of nation states in a world where geopolitical risk is increasing.

30
Zn
zinc

Zinc has not been classed as a Critical Raw Material by the EU Commission. However, it is still an important element that has been mined in Ireland since the 1960s. Several other Critical Raw Materials, such as germanium and gallium, are primarily produced from zinc ores. Potentially economic quantities of germanium have been identified in Irish ores and both may also be in existing and closed mines, as well as legacy mine waste facilities.

Periodic Table of the Elements

1 H hydrogen																	2 He helium
3 Li lithium	4 Be beryllium											5 B boron	6 C° carbon	7 N nitrogen	8 O oxygen	9 F¨ fluorine	10 Ne neon
11 Na sodium	12 Mg magnesium											13 Al* aluminum	14 Si! silicon	15 P‾ phosphorus	16 S sulfur	17 Cl chlorine	18 Ar argon
19 K potassium	20 Ca calcium	21 Sc scandium	22 Ti titanium	23 V vanadium	24 Cr chromium	25 Mn manganese	26 Fe iron	27 Co cobalt	28 Ni nickel	29 Cu copper	30 Zn zinc	31 Ga gallium	32 Ge germanium	33 As arsenic	34 Se selenium	35 Br bromine	36 Kr krypton
37 Rb rubidium	38 Sr strontium	39 Y yttrium	40 Zr zirconium	41 Nb niobium	42 Mo molybdenum	43 Tc technetium	44 Ru ruthenium	45 Rh rhodium	46 Pd palladium	47 Ag silver	48 Cd cadmium	49 In indium	50 Sn tin	51 Sb antimony	52 Te tellurium	53 I iodine	54 Xe xenon
55 Cs cesium	56 Ba^ barium	71 Lu lutetium	72 Hf hafnium	73 Ta tantalum	74 W tungsten	75 Re rhenium	76 Os osmium	77 Ir iridium	78 Pt platinum	79 Au gold	80 Hg mercury	81 Tl thallium	82 Pb lead	83 Bi bismuth	84 Po polonium	85 At astatine	86 Rn radon
87 Fr francium	88 Ra radium	103 Lr lawrencium	104 Rf rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	112 Cn copernicum	113 Nh nihonium	114 Fl flerovium	115 Mc moscovium	116 Lv livermorium	117 Ts tennessine	118 Og oganesson

57 La lanthanum	58 Ce cerium	59 Pr praseodymium	60 Nd neodymium	61 Pm promethium	62 Sm samarium	63 Eu europium	64 Gd gadolinium	65 Tb terbium	66 Dy dysprosium	67 Ho holmium	68 Er erbium	69 Tm thulium	70 Yb ytterbium
89 Ac actinium	90 Th thorium	91 Pa protactinium	92 U uranium	93 Np neptunium	94 Pu plutonium	95 Am americium	96 Cm curium	97 Bk berkelium	98 Cf californium	99 Es einsteinium	100 Fm fermium	101 Md mendelevium	102 No nobelium

* As bauxite, feldspar, alumina and aluminium
^ As baryte
° As coking coal, natural graphite and synthetic graphite
¨ As fluorspar
‾ As phosphate rock and phosphorus
! As silicon metal

Key

Critical Raw Material

Critical Raw Material & Strategic Raw Material

Why do we need this new legislation?

Insufficient amounts of these Critical and Strategic Raw Materials are available from recycling. Presently the EU relies on imports which have been mined and processed elsewhere. For instance, China provides 100% of the EU's Heavy Rare Earth Elements (HREE) requirements, which are essential components for wind turbines. Other important suppliers include Türkiye (99% of the EU's supply of boron, used in fertilisers), Chile (79% of lithium, a key component in batteries), and Brazil (92% of niobium, used in high strength steel and alloys).

Demand for CRMs and SRMs will grow significantly to build the technologies required for climate action and the EU's digital transformation goals, for example lithium demand is projected to increase twelve-fold by 2030 due to the adoption of electric vehicles.

What does the CRMA aim to achieve?

The CRMA sets clear benchmarks for domestic capacities along the strategic raw material supply chain and to diversify EU supply by 2030 in several ways:

EU EXTRACTION

At least **10%** of the EU's annual consumption for extraction

Extraction: the primary extraction of ores, minerals, and plant products from their original source e.g. through mining, quarrying, pumping, or harvesting.

EU RECYCLING

At least **25%** of the EU's annual consumption for recycling

Recycling: any recovery operation by which waste materials are reprocessed into products, materials, or substances whether for their original or other purposes.

EU PROCESSING

At least **40%** of the EU's annual consumption for processing

Processing: means all physical, chemical, and biological processes involved in the transformation of a raw material from ores, minerals, plant products or waste into pure metals, allows, or other economically useable forms.

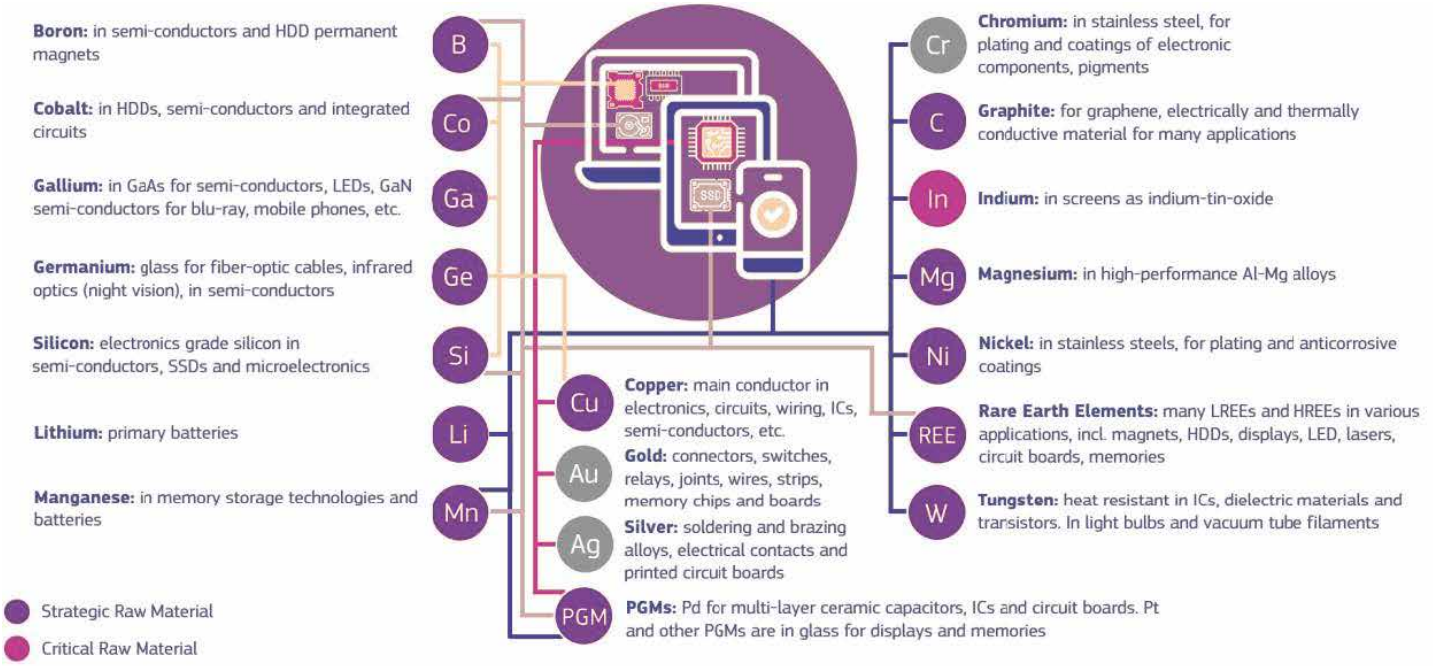
EXTERNAL SOURCES

Not more than **65%** of the EU's annual consumption of **each strategic raw material at any relevant stage of processing from a single third country**

Comsumption: use of a processed material in undertakings i.e. production or manufacturing of products and components.

To achieve these targets Members States are required to identify strategic projects within the EU, and other countries, for streamlined permitting, with defined timeframes for decisions and established mechanisms to improve access to finance. Member States are also required to implement national exploration programmes to increase knowledge of European mineral resources, including those present in extractive waste, such as lead/zinc mine tailings.

Raw materials in everyday life



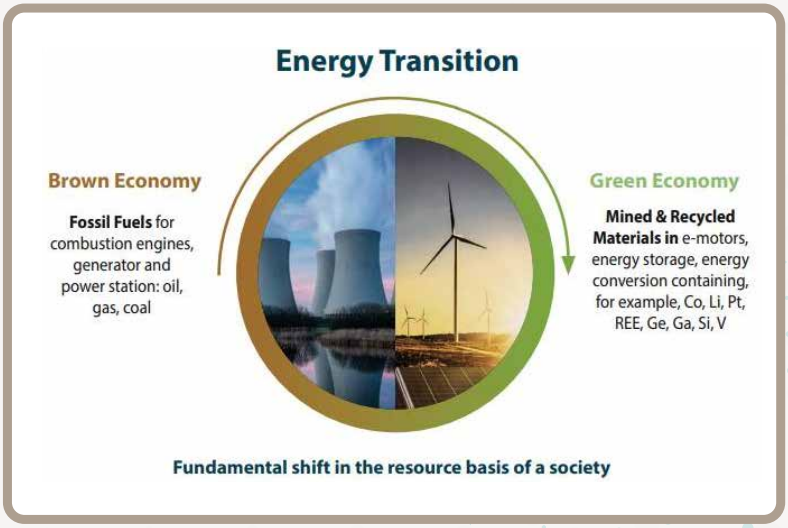
Selection of raw materials used in smartphones, tablets and laptops and their function. Supply chain analysis and material demand forecast in strategic technologies and sectors in the EU – A foresight study, JRC 2023.

What does it mean for Ireland?

Ireland already has many actions of the CRMA in place. These include:

- **Companies** operating to the highest modern standards, particularly environmental and social aspects, from exploration to post-closure
- **Clear exploration and mine licensing system** that has evolved since 1940 – all exploration and mining data recorded is freely available online
- **Regulation by expert authorities**, including planning authorities, Environmental Protection Agency (EPA), Geoscience Regulation Office (GSRO), Health and Safety Authority (HSA)
- **Ireland is one of the most comprehensively mapped countries in the world**, with detailed mapping since 1845 through to modern geochemistry and geophysics collected through the Tellus programme since 2013, all by Geological Survey Ireland (GSI)

This geological data archive means that the foundation already exists for new investigations into many previously overlooked CRM.



Ireland is rare in its CRMA actions, with many of these systems and resources not yet established or readily available in other EU Member States. Some other countries have conflicting responsibilities at federal, state, and local government levels and most have had limited mining experience in the last three decades.

Ireland's role & opportunity

The CRMA will require that Ireland plays its part in mining the metals required to secure decarbonisation and deal with the global climate crisis. This includes:

Opening new mines

To achieve the extraction goals of the CRMA more mines will need to open within the EU. This could see 10 to 15 new mines opened across the Union (depending on size).

New deposits exploration

Ireland had a mining "boom" when three zinc-lead mines were in production (Lisheen, Galmoy, and Tara Mines). During its peak, Ireland supplied almost 40% of Europe's zinc requirements. Tara Mines is a world class deposit, the largest mine in Europe and has been a significant supplier of zinc globally for over 40 years. Ireland continues to have huge potential for zinc deposits (used in utility-scale zinc-air batteries and especially critical for offshore wind turbines) which may contain CRM. Historically, Ireland has been a producer of copper from several mines. There is also exploration potential for new lithium, baryte, antimony and arsenic deposits. Without exploration, the true extent of Ireland's CRM will not be known.

Revisiting closed mines & mine waste facilities

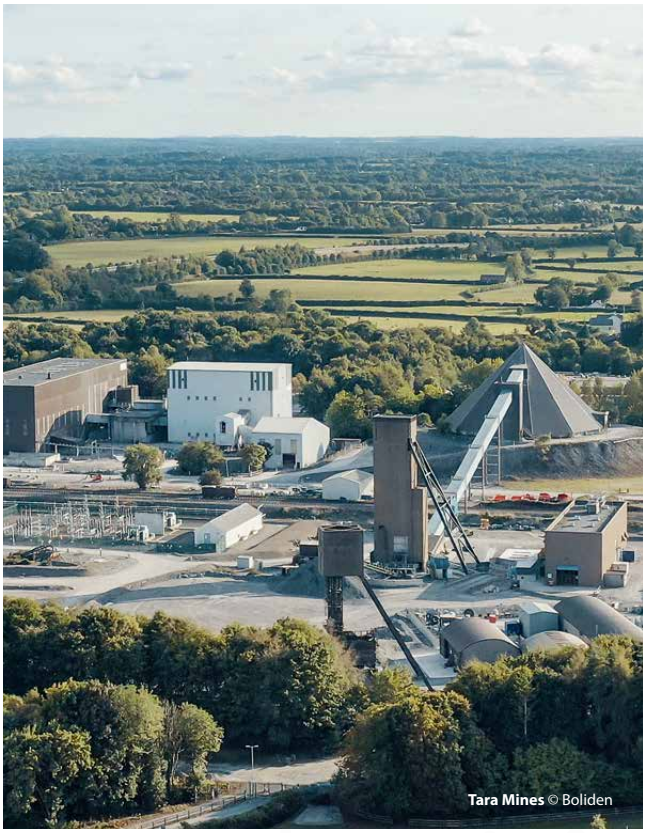
Closed mines and mine waste facilities (tailings storage facilities) need to be revisited for revaluation of CRM as many, notably Rare Earth Elements (REE), did not have industrial uses until recently. New technologies may be needed to unlock these resources. In the case of unrehabilitated mine wastes, reprocessing could both help reach the CRMA targets and provide environmental benefits. Under the CRMA, EU Member States have an obligation to investigate and catalogue all these potential sources.

More local processing

Processing, which occurs after the ore is extracted from the ground, takes place in several facilities in Ireland. The Aughinish Alumina processing plant creates alumina from imported ore and exports it again to be refined into aluminium metal. Aughinish Alumina produces 30% of Europe's alumina. Most mineral processing does not occur in the same country as where the ore is mined. Mineral processing is an energy intensive industry that is more often located closer to markets than mines. If multiple mines of the same type were to open in Ireland, there may be potential for more Irish processing, especially if significant new electricity supply can be secured from offshore wind.

Additional recycling

Ireland can also contribute to the CRMA recycling targets. Many recycling and metal recovery facilities currently operate in Ireland, generally in the form of salvage. Copper is an easily retrievable and recyclable CRM. These facilities could have untapped potential for other CRM such as those from electronics.



Tara Mines © Boliden

What is needed?

To achieve the CRMA targets, EU Member States will need to do more and quicker. For Ireland, this includes:

Streamlined permitting process

Not many new mines are required to meet the targets, but mine permitting is a process that takes years. This is after a decade spent identifying a mineable deposit. If the targets are to be reached by 2030, current projects across the EU need to be accelerated. The CRMA calls for streamlined permitting but this will be challenging as, on the company side the technical and environmental studies for a successful project cannot be rushed, and on the regulator side the sheer volume of assessments slows the process. Both operators and regulators need the support and resources to manage responsible mining.

De-risking resource exploration finance

The CRMA can also help to de-risk and renew investor appetite to finance resource exploration through:

- Facilitating more contact between investors, lenders, and mining companies
- Prioritising new research into the mineralogy and metallurgy of CRM deposits to inform investment decision-making
- Realising CRMA's goal of increasing EU processing capabilities. At present, most mined material is exported for processing, then reimported for use in manufacturing. Local processing would significantly reduce the investment risk for a mining project, while creating domestic economic benefits.

However, these initiatives are all aimed at the *mining* stage when a deposit is already known and has had extensive investigation. While there are some CRM projects at or close to this stage in the EU, it is unlikely that all of them will come into production and more discoveries will need to be made. That stage is *exploration* (or prospecting). This is the highest risk step within the mining timeline and the one currently facing the most challenges worldwide; financing and budgets have collapsed, permits are being delayed, while the administrative burden has risen sharply, all during a time of increasing costs and inflation.

Further collaboration & communication with stakeholders

One of the major stumbling blocks for all stages of exploration, extraction, and processing, are objections and appeals of permits. These can add years to a project, if not complete cancellation. While due process is essential, opposition still arises from incomplete understanding of the environmental standards applicable to modern mining practices or an unwillingness to locate mines in certain localities or communities. Further collaboration and communication with all stakeholders, including local authorities, will be essential for understanding and acceptance of modern mining.

Who will be needed?

Ultimately, the goals of the CRMA cannot be achieved without the underlying lynchpin: trained, professional geoscientists. The many disciplines of geology (or geoscience) are all involved in some way on the path from exploration through mining to post-closure, from economic geologists, to hydrogeologists, to geochemists, to palaeontologists. While Ireland can still help provide the people and expertise needed to reach the CRMA goals much of the geoscientific workforce is set to retire within a decade and there are few professionals to replace them.

Third-level geoscience programmes worldwide (particularly those geared at economic geology) are closing through either a lack of support by universities or insufficient student numbers. Geology, in Ireland as physical geography, has shrunk in second-level education meaning there will be fewer future entrants in the geosciences.

What can be done?

The CRMA provides a pathway for future career opportunities in EU Member States. Ireland will need a greater emphasis on the exciting potential of geology as a career, alongside tangible supports for coursework at second- and third-level institutions to encourage, stimulate and train the next generation of geologists.

A young, diverse inflow of new geoscientists can bring new life to responsible and ethical mining and help bring about a mining renaissance in the EU allowing us all to have a clean, sustainable, green future.

Critical Minerals and Northern Ireland

As part of the UK, the Critical Minerals Strategy published by UK Government will be instrumental in directing the critical minerals agenda in Northern Ireland.

References:

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- UK - UK Critical Minerals Strategy: https://www.gov.uk/government/publications/uk-critical-mineral-strategy