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IMPACT ASSESSMENT REPORT

Accompanying the document

Proposal for a Regulation of the European Parliament and of the Council

establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/1020

{COM(2023) 160 final} - {SEC(2023) 360 final} - {SWD(2023) 160 final} -
{SWD(2023) 162 final}

GLOSSARY

Term or acronym	Meaning or definition
Raw materials	A substance in processed or unprocessed state used as an input for the manufacturing of intermediate or final products, excluding substances predominantly used for the production of food and feed or as fuel for the production of energy;
Critical raw materials (CRM)	Raw Materials defined as critical in the regulation according to the proposed methodology (i.e. supply risks and economic importance);
Strategic raw materials (SRM)	Raw materials defined as strategic according to the criteria established in the impact assessment, e.g. taking account foresight element and strategic applications;
CRM project	Any planned facility or planned extension of an existing facility active in extraction, processing or recycling of critical raw materials;
Exploration	Mineral exploration is the process of searching for any mineralisation under the ground that can be commercially extracted. Exploration activities, such as mapping, will start over a large area and then target smaller and smaller areas;
Extraction	The primary extraction of ores, minerals and plant products from their original source, including from a mineral deposit underground, mineral deposits under water, sea brine and trees;
Metallurgical processing	The concentration of an ore or secondary raw material by physical, chemical and biological processes, the separation, and the refining, including the modification of a material's chemistry for specific valorisation;
Refining	Step (mainly physical or chemical) of the metallurgical process where the impurities (or unwanted elements) are removed from the concentrated metal, metal alloy or metal compound;
Recycling	Any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. Recycling can be "closed loop" or "open loop";
Recovery	Any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy;
Ore	A naturally occurring solid material from which a metal or valuable mineral can be extracted profitably;

Mineral	A solid, naturally occurring inorganic substance which can contain a metal or metal compound of economic importance;
By-product	Subsidiary material from ore in which other materials are dominant. By-products are extracted in processing/refining and not directly mined for;
Substitution	Methods to replace or reduce currently used CRMs in materials and products, including by changes in composition of the product or replacement by other technologies;
Circular Economy	A model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended, their use is optimised, and products and materials are maintained in their highest value function;[1]
UNFC	The United Nations Framework Classification for Resources (UNFC) is a framework that provides countries, companies, financial institutions and other stakeholders a tool for sustainable development of energy and mineral resource endowments;
SDG	Sustainable Development Goals;
Offtake agreement	A long-term contract between a company that manufactures or produce a given resource and a company that needs to buy that resource. It displays the buyer's commitment to purchase a certain amount of the producer's future output.

[1] Source: Circular economy: definition, importance and benefits | News | European Parliament (europa.eu)

1. INTRODUCTION: POLITICAL AND LEGAL CONTEXT

1.1. Political context

Raw materials are indispensable for the EU's industry and stand at the very beginning of each value chain. Amongst the non-energy, non-agricultural raw materials that are assessed by the European Commission, some are defined as critical based on objective criteria including their economic importance and their supply risk. Currently, the global production of CRMs is highly concentrated in few countries in the world, both at extraction and refining stages. The European supply of CRMs is therefore highly dependent on third countries, not always like-minded ones (see section 2.1 What is the problem?). Critical raw materials (CRMs) are often produced and used in relatively small quantities[2] but have special characteristics[3] that make them essential ingredients for products in strategic areas such as renewable energy, digital, aerospace and defence technologies. Well-known examples include the rare earths elements found in the permanent magnets used to manufacture wind turbines motors, lithium used for batteries, and silicon used for semiconductors.

Textbox 1: The EU List of Critical Raw Materials and the concept strategic raw materials

The Commission carries out a criticality assessment at EU level every 3 years, starting in 2011, which showed an increasing number of critical raw materials: 14 in 2011, 20 in 2014, 27 in 2017 (based on a revised methodology) and 30 in 2020. The 2020 list was accompanied by a foresight study on strategic raw materials for strategic value chains 2030-2050. In 2023, the Commission presented the 5th assessment (based on 2016-2020 data for 85 screened raw materials) and developed the second foresight study on strategic raw materials for strategic value chains.

The current CRM methodology covers a wide range of economic sectors and relies on two main criteria:

- Economic importance (EI), based on the value added of corresponding EU manufacturing sectors, corrected by a substitution index; and
- Supply risk (SR), based on supply concentration (at global and EU level, weighted by a governance performance index), corrected by recycling and substitution parameters.

Raw materials exceeding the thresholds set for both two criteria are deemed to be at high risk of supply disruption and at the same time economically important, and therefore defined as critical.

2023 CRMs vs. 2020 CRMs			
antimony	gallium	phosphate rock	vanadium
baryte	germanium	phosphorus	arsenic
bauxite	hafnium	PGM	feldspar
beryllium	HREE	scandium	helium
bismuth	lithium	silicon metal	manganese
borate	LREE	strontium	copper
cobalt	magnesium	tantalum	nickel
coking coal	natural graphite	titanium metal	~~*indium*~~
fluorspar	niobium	tungsten	~~*natural rubber*~~

Legend:
Black: CRMs in 2023 and 2020 ; Red: CRMs in 2023, non-CRMs in 2020 ;
~~*Strike:*~~ Non-CRMs in 2023 that were critical in 2020

[2] All the Metals We Mined in 2021 in One Visualization (visualcapitalist.com)

[3] For example, rare earth elements have special conductive, magnetic and fluorescent properties; lithium is an important component of rechargeable batteries because of its high electrode potential.

It is proposed in the preferred policy option to complement this backward-looking criticality assessment by a forward-looking methodology focused on strategic applications. This would lead to a slightly extended critical raw materials list (including besides the classically-defined critical raw materials also such raw materials that are projected to face significant future supply challenges while being essential to multiple strategic sectors – such as copper, nickel or aluminium) and a shorter list of **strategic raw materials** (including only those raw materials with the highest supply challenges and strategic importance). A set of general measures would apply to the list of critical raw materials while a set of more ambitious measures would apply only to the subset of strategic raw materials.

In light of these applications, critical raw materials are key to enable the European industry to meet the political goals of the EU. The European Green Deal[4], the REPowerEU Communication[5], the Joint Communication on Defence Investment Gaps Analysis and Way Forward[6] and the Digital Strategy[7] have all established objectives or targets to achieve the green and digital transitions and strengthen the EU's resilience and strategic autonomy, which depend on the availability of critical raw materials, while the European Commission has already began the implementation of the action plan set up in the 2020 Communication on Critical Raw Materials (see Annex 8 for additional details and lessons learnt).[8]

In 2022, the European Council's adopted the Versailles Declaration[9], which called to "take further decisive steps towards building our European sovereignty" and toward "reducing our dependencies". It called to secure EU supply of critical raw materials, particularly by building on the strengths of the Single Market. Similarly, the European Parliament called for an EU strategy for critical raw materials in its November 2021 resolution[10]. The Conference on the Future of Europe also recommended for the EU to reduce dependence on other countries for critical raw materials[11]. Against this background, the President of the European Commission announced in her State of the Union speech in 2022[12] a new legislative proposal, the European Critical Raw Materials Act, notably to identify strategic projects all along the value chain and to build up strategic reserves where supply is at risk. The initiative forms part of the Commission Work Programme for the first quarter of 2023[13].

This Impact Assessment supports the Commission's proposal for a Regulation, forming the core of the European Critical Raw Materials Act. This regulatory initiative alone, however, cannot ensure secure and sustainable supplies of CRM for the EU economy. Strengthened efforts to diversify international trade and investment, ensure undistorted international markets, the promotion of human rights, high social and environmental standards in partnerships and cooperation with third countries, as well as increased research and innovation efforts to substitute critical raw materials and minimise the environmental impacts of resource extraction, and work on skills and societal acceptance will also be necessary. These aspects are not expected

[4] COM(2019) 640 final, COMMUNICATION FROM THE COMMISSION, The European Green Deal

[5] COM(2022)230 Communication REPowerEU Plan.

[6] JOIN(2022) 24 final JOINT COMMUNICATION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS on the Defence Investment Gaps Analysis and Way Forward

[7] COM(2022) 4388 final COMMUNICATION TO THE COMMISSION European Commission digital strategy Next generation digital Commission

[8] 172 COM(2020) 474 - Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability

[9] Informal meeting of the Heads of State or Government, Versailles Declaration, 10 and 11 March 2022

[10] REPORT on a European strategy for critical raw materials - (2021/2011(INI))

[11] REPORT ON THE FINAL OUTCOME May 2022, Conference on the Future of Europe (5. Recommendations collected, A stronger economy, social justice, and jobs)

[12] 2022 State of the Union Address by President von der Leyen

[13] COM(2022) 548 final, Commission work programme 2023

to be part of the legislative proposal, but are developed in the accompanying Communication that forms part of the Act.

1.2. Policy context and non-regulatory actions

The European Commission has in place a dedicated strategy since 2008[14], which aims to ensure a fair and sustainable supply of raw materials from global markets, within the EU and through resource efficiency and the recycling of secondary raw materials. This initiative launched the assessment of raw materials' criticality every three years, starting in 2011 (c.f. textbox 1).

In 2020, the Commission presented a dedicated action plan in the Communication on Critical Raw Materials[15] to develop resilient value chains for EU industrial ecosystems; reduce dependency on primary critical raw materials through circular use of resources, sustainable products and innovation; strengthen the environmentally and socially sustainable responsible domestic sourcing and processing of critical raw materials in the European Union; and diversify supply with environmentally and socially sustainable responsible sourcing from third countries, strengthening rules-based open trade in raw materials and removing distortions to international trade.

1.3. Legal context

There is currently no regulatory framework aimed at creating a CRMs sustainable supply chain in Europe and hence increasing the resilience of the CRMs supply chain and reducing the supply risks s. However, a number of EU legal instruments lay down provisions that affect the EU's supply of CRMs. Those instruments relate, among other things, to the conditions and procedures for EU-based CRM projects to obtain a permit, and to the treatment of waste containing CRMs. Similarly, some existing instruments affect the CRM production in third countries and the conditions under which the EU conducts trade in CRM with those third countries. Any efforts to improve the EU's security of supply for CRMs considered in this initiative need to take into account and build on these existing rules and initiatives. These instruments are listed below and Annex 8 explains in detail how they relate to critical raw materials.

Interplay with existing instruments

- Firstly, a range of existing Directives include rules to structure Member States' conditions and procedures for obtaining permits for EU-based projects along the raw material value chain: Strategic Environmental Assessment Directive (SEA)[16]; Environmental Impact Assessment Directive (EIA)[17]; Industrial Emissions Directive (IED)[18]; Habitats and Birds Directives[19]; Water Framework Directive[20]; Environmental Liability Directive[21]
- Secondly, existing EU legislation on waste management includes rules both affecting the operation of EU-based mines regarding the handling of extractive waste and influence the potential to recover and recycle

[14] EUR-Lex - 52008DC0699 - EN - EUR-Lex (europa.eu)

[15] COM(2020) 474 - Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability

[16] Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment

[17] Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment

[18] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions

[19] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

[20] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

[21] Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage

critical raw materials from relevant waste streams: Waste Framework Directive (WFD)[22]; Extractive Waste Directive (EWD)[23]; Waste Electrical and Electronic Equipment Directive (WEEE)[24] ; End-of Life Vehicles Directive (ELV)[25].

- Thirdly, a number of EU and international legal instruments lay down provisions that affect the EU's external supply of CRMs. Those instruments aim to ensure undistorted trade and investment in CRMs with third countries, such as bilateral trade and investment agreements, or to protect EU industries from unfair competition from outside the EU, such as trade defence instruments (anti-dumping or anti-subsidies)[26], and WTO obligations.

Finally, there are EU instruments aimed at improving sustainability of the global industry and materials imported into the EU, some of them of legislative nature such as the Conflict Minerals Regulation27. The EU has an extensive network of bilateral trade and investment agreements28 that cover trade and investment in raw materials through general rules covering all goods and services or dedicated provisions aimed specifically at raw materials. The modern EU trade agreements include Trade and Sustainable Development chapters, highlighting how trade can be an important driver for sustainable growth both in the EU and in partner countries.

- Global Gateway is the EU plan for major investment in infrastructure development around the world. It will be used to deploy both soft and hard infrastructure. As such, Global Gateway will be instrumental to support investments in infrastructure projects relevant for our CRM supply chains, to increase global and EU supply and help diversification. The Global Gateway will be the vehicle to assist partner countries with concrete projects in infrastructure and connectivity, while boosting and leveraging concrete private sector investment projects along the critical raw materials value chain.

Interplay with ongoing initiatives

- The proposed Single Market Emergency Instrument (SMEI) includes in its scope critical raw materials, and its provisions, notably with regards to monitoring and stockpiling, can be activated in the vigilance mode and in the event of a Single Market emergency. Details regarding its interactions with the proposal assessed here are explained in the relevant sections, such as the problem section or section 5.2 and Annex 10.
- The proposed Batteries Regulation and Corporate Sustainability Due Diligence (CSDD) contain measures which when adopted will require companies to put in place human rights and environmental due diligence practices when, inter alia, sourcing critical raw materials from both the Single Market and the international markets.
- The proposed revision of the Industrial Emissions Directive (IED)[29] widens its scope to also cover the extraction and treatment of industrial minerals and metals.

[22] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

[23] Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC

[24] Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE)[24]

[25] Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles

[26] https://policy.trade.ec.europa.eu/enforcement-and-protection/trade-defence_en

[27] Regulation (EU) 2017/821 of the European Parliament and of the Council of 17 May 2017 ... and gold originating from conflict-affected and high-risk areas

[28] https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/negotiations-and-agreements_en

[29] Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) and Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste. COM/2022/156 final/3.

- The Commission's proposal for a Regulation on Forced Labour[30] covers also CRMs, and so does the EU Strategy on Rights of the Child[31].
- The proposed Ecodesign for Sustainable Products Regulation[32] will establish design requirements for products put on the EU market with the aim, inter alia, of extending the lifetime of products, increasing recyclability and recycled content, and making information relevant to circularity and sustainability available along value chains to businesses, consumers and authorities through Digital Product Passports based on digital markers and identifiers, thus contributing to reducing material demand, facilitating recovery of raw materials and increasing transparency and consumer awareness.
- The proposed Regulation on nature restoration33 aims, among others, at covering at least 20% of the EU's land and sea areas by 2030 with nature restoration measures, and eventually extend these to all ecosystems in need of restoration by 2050. The proposed Regulation builds on existing legislation. When adopted, the Regulation should work in synergy with other policy initiatives and legislation.

Regulatory gaps analysis

The CRM Act would be the first piece of EU legislation dedicated to CRMs. No other piece of legislation expressly targets the security of EU supply CRMs by introducing a dedicated monitoring, stockpiling and company risk preparedness system and contributing to the build-up of EU capacities along the value chain. The proposed Single Market Emergency Instrument covers some of these aspects, but most of its provisions only apply once vigilance or emergency mode has been triggered, and thus not address the problem in advance and structurally through a permanent CRM-centred mechanism. Environmental legislation ensures a high level of sustainability of CRM extraction and processing within the EU but is so far not complemented by measures that would encourage European industry to make use of the raw materials potential on EU soil as well as to further develop the processing and recycling stages of the CRM value chain. This initiative is expected to increase the share of such highly sustainable EU production. Waste legislation addresses the risks associated with waste and generally prioritises reuse and recycling, but its provisions do not sufficiently address the challenges specific to CRM recovery (see chapter 2.2.2.5).

Regarding sustainability, the Corporate Sustainability Due Diligence (CSDD) proposal, which covers CRM companies, would oblige companies to address adverse human rights and environmental impacts in their own operations, subsidiaries and value chains. It would apply on a company basis and ensure that adverse human rights and environmental impacts are monitored and addressed. The CSDD however would not apply on a product or material level, i.e. it would not allow buyers of CRMs to see and compare the environmental footprint associated to the product/material they are buying. In the case of climate impacts, for example, a CRM producer may be in full compliance with its legal obligations and have an overall decarbonisation strategy in place, but the CRMs it sells may nevertheless be associated with higher emissions than those produced by a competitor (e.g. due to lower ore grades, a more carbon-intensive energy mix or energy-inefficient production processes). Giving a buyer transparency over this may make him more willing to purchase the more sustainable type of CRM, but the CSDD does not provide for this.

Similarly, in the field of social impacts, the CSDD guarantees that CRM producers selling on the EU market respect the minimum standards imposed by international conventions, such as the prohibition of child and forced labour, but it does not incentivise compliance with higher standards, e.g. such developed by certification bodies (see Driver 3.1) on meaningful involvement of local communities and fair treatment of workers, in the production of a CRM.

In addition, while product-level footprint requirement (such as the carbon footprint included in the proposed Batteries Regulation and potentially under the revised Ecodesign framework) take into account the impact associated with CRM production at the point when they are incorporated into the regulated products, there are many instances where CRMs placed on the market in the EU are not covered: First, when CRMs sold in the

[30] 2022/0269 (COD)
[31] https://op.europa.eu/en/publication-detail/-/publication/bac6e66a-a3d9-11eb-9585-01aa75ed71a1/language-en
[32] Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC. COM/2022/142 final
33 COM(2022) 304 final.

EU are thereafter incorporated into products intended for export; second, CRMs used in applications or products other than the set of regulated products (e.g. even for the "battery raw materials" lithium and cobalt, half of their EU consumption is related to other applications, such as ceramics or steel manufacturing). While the latter may shrink over time with the addition of more Ecodesign measures, these are unlikely to come close to covering all CRM applications in the foreseeable future. Furthermore, the implementation of Ecodesign measures for specific products can benefit from the availability of data on the environmental footprint of the CRMs incorporated in them, such that environmental footprints on both materials and products can work well together.

The Conflict Minerals Regulation addresses specifically four raw materials (tin, tungsten, tantalum and gold), two of which are critical, but its provisions are limited to diligence obligations on importers and smelters of these materials, with the narrow aim of preventing their sourcing from contributing to armed conflict and forced labour. It does not allow for comparison of environmental footprint, and does not include any measures to increase EU capacities along the value chain or improve monitoring for these four raw materials.

2. PROBLEM DEFINITION

A more detailed description of the problem context, problems, and their consequences and drivers is included in Annex 10.

2.1. What is the problem?

The overarching problem this initiative aims to address is the EU's lack of secure access to critical raw materials. Given the central importance of these materials to our green and digital transition, as well as critical sectors such as health and defence, a disruption in the supply of critical raw materials would have significant adverse consequences for the EU's industry, security and the achievement of its political goals.

A key component of this problem is that the EU currently relies almost exclusively on imports for many of these raw materials[34]; more importantly, within these imports, suppliers are highly concentrated[35], and the main suppliers are in many cases exposed to significant environmental, social and governance risks[36](see figure 1). These factors and the economic importance are in fact the main criteria in the EU's criticality assessment (see textbox 1).

In some cases, the supply share of one country is above 90%, for instance China for light rare earths, heavy rare earths, gallium and magnesium; Turkey for Boron.. For around a third of the minerals assessed in the criticality assessment, and half of the critical raw materials, EU supply is more concentrated than global supply (for bauxite, borate or manganese). This concentration expands along the value chain, with the processing stage being even more concentrated than the extraction stage for some materials, such as lithium, magnesium, or germanium. China controls 56% of the global capacity for refined lithium, 60% for refined cobalt, 58% for refined manganese[39]. In addition to the concentration of supply in single countries, some actors have expanded their dominance of the global value chain by gaining control economic activities and assets in third countries, such as China controlling cobalt mines in Congo (Chinese shareholders control two firms in Congo that together account for 13.8% of the world output of cobalt [37] (c.f. further details in Annex 10 – context).

This degree of concentration puts the EU's security of supply at risk, as dominance over CRM supply chains has been used already in the past, through export restriction for instance, to leverage the suppliers' interest

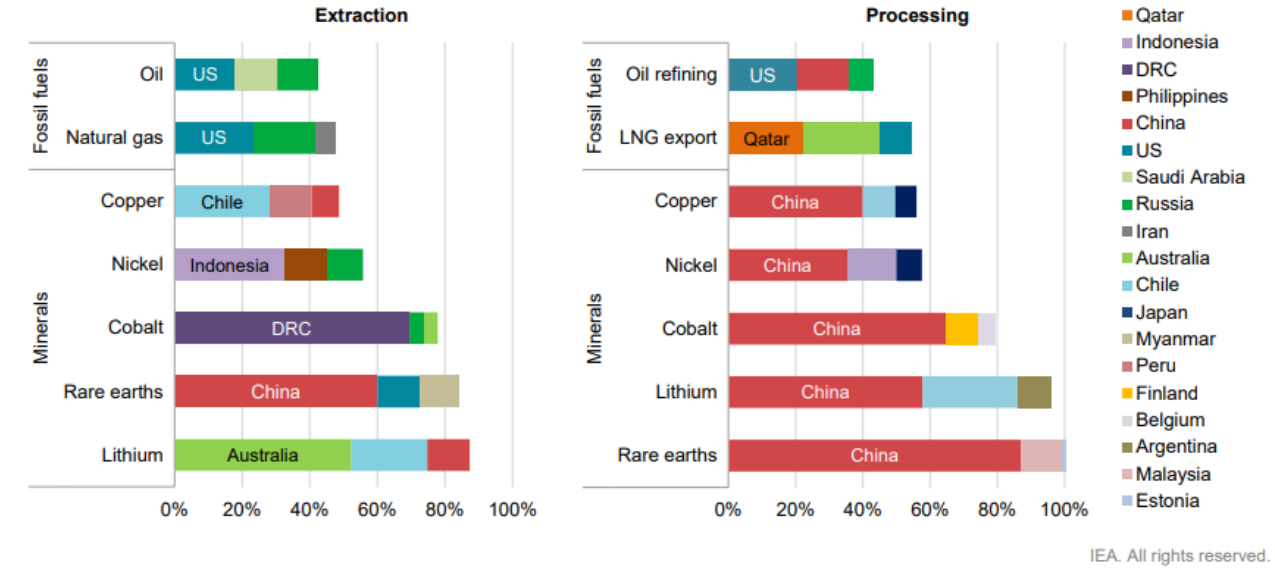
[34] In fact, for 28 out of 87 individual materials or groups assessed in the 202" Study on the EU's list of Critical Raw Materials, the import reliance is 100% at the extraction or processing stage, and above 80% for another 16 materials

[35] The share of the biggest supplier to the EU is 99% for the group of light rare earth elements (China), 100% for the group of heavy rare earth elements (China), 99% for borates (Turkey), 97% for magnesium (China), 79% for lithium (Chile) and 63% for Cobalt (DR Congo), source: Study on the EU's list of Critical Raw Materials (2023): Final Report, European Commission 2023.

[36] See IEA (2021) report on Clean Energy Minerals, page 126-131.

[37] "Who controls the world's minerals needed for green energy?" Luc Leruth (Tbilisi University) and Adnan Mazarei (PIIE), August 9, 2022

over the buyer country's industry (c.f. Annex 10, Consequences of the problem).[38]



Notes: LNG = liquefied natural gas; US = United States. The values for copper processing are for refining operations.
Sources: IEA (2020a); USGS (2021), World Bureau of Metal Statistics (2020); Adamas Intelligence (2020).

Figure 1: Share of top three producing countries in production of selected minerals and fossil fuels (IEA)[39]

This high level of supply concentration today poses a risk in itself, which the EU is seeking to address through global actions to increase the diversification of its industry's supply (see Textbox 2, in section 5.1 on the baseline scenario).

But even leaving supply diversification aside, the global market for CRMs faces significant challenges: The EU will require substantial additional amounts of critical raw materials for meeting the needs of the green and digital transitions, and in light of the increased defence needs in response to Russia's invasion of Ukraine. This will lead to vastly increased EU and global demand, while supply is constrained for several reasons (long project lead times, social resistance to increased extraction, limited circularity potential for key CRMs in the medium-term). At the global level, the International Energy Agency (IEA)'s 2021 Clean Energy Minerals report[40] predicts that total mineral demand[41] will increase by a multiple of between 2 and 4 times between 2020 and 2040,[42] and demand for battery-related materials such as lithium up to 42 times (different scenarios for demand expansion are assessed under textbox 3 in Annex 10.). This rise in demand creates a real risk of supply shortages and increased market volatility over the coming years. As projections point to this future demand/supply gap, the expansion of primary and secondary production in the EU to ensure a higher level of self-reliance appear as an important way of mitigating the problem's potential consequences.

[38] See IEA (2021) report on Clean Energy Minerals, page 126-131.
[39] IEA (2021): Clean Energy Minerals. The Role of Critical Minerals in Clean Energy Transitions – Analysis - IEA
[40] IEA (2021), *The Role of Critical Minerals in Clean Energy Transitions*, IEA, Paris https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions
[41] Including chromium, copper, lithium, nickel, cobalt, manganese, graphite, molybdenum, platinum group metals, zinc and rare earth elements.
[42] Page 46 of IEA (2021): Clean Energy Minerals.

2.1.1. Consequences of the problem

If the EU does not contribute to the required ramping up of CRM production globally by developing European sources, the EU's reliance on highly concentrated imports might continue with the following risks for the EU economy (explained in detail in Annex 10):

- Risk of geopolitical vulnerability
- Risk of adverse environmental and social adverse effects
- Risk of unforeseen disruptions to industrial supply chains
- Risk of high and volatile prices delaying the green transition

Risk of dominant CRM suppliers leveraging market power in downstream industries

PROBLEM TREE

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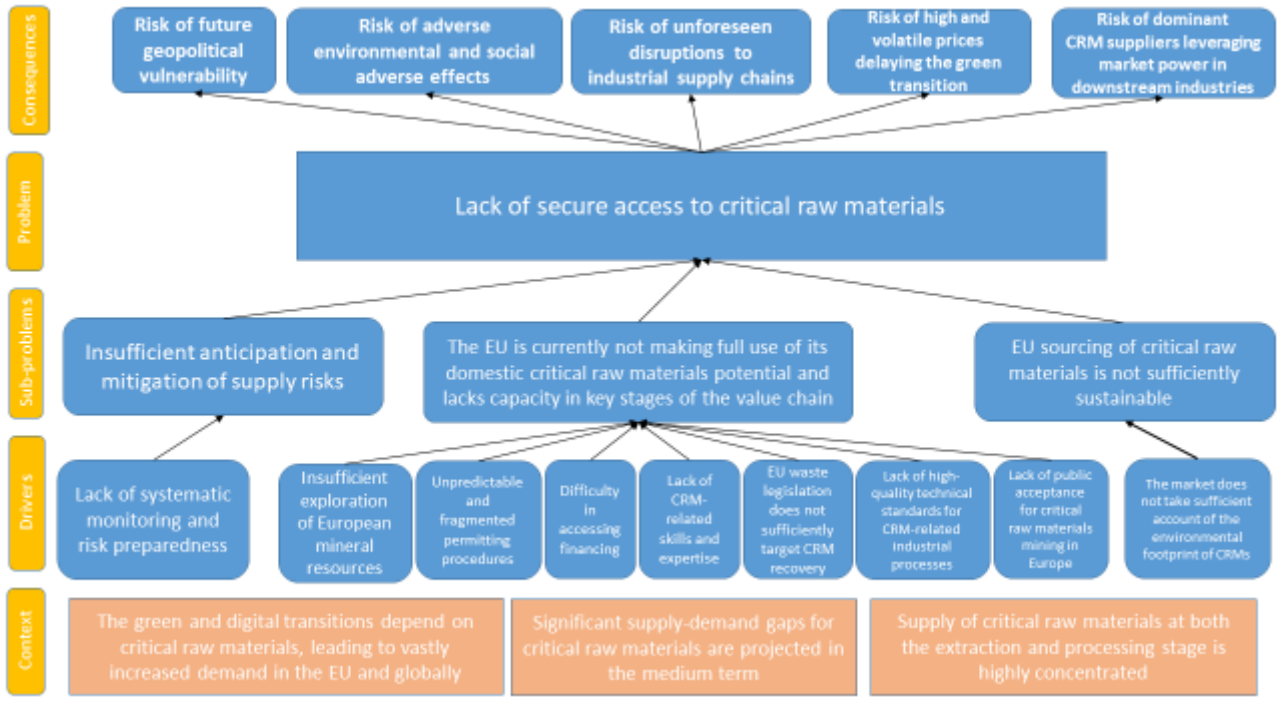

2.2. What are the sub-problems and their drivers?

As stated above, the main problem relates to the overall lack of secure access to CRMs for the EU. In light of ongoing international actions (see textbox 2 in section 5.1), the sub-problems addressed below focus on analysing the main impediments to the development of a competitive European CRM value chain, as well as on risk preparedness of offtakes and the sustainability of CRM sourcing.

2.2.1. Sub-problem 1: Insufficient anticipation and mitigation of supply risks

2.2.1.1. Driver 1.1: Lack of systematic monitoring and risk preparedness

The recent experiences of Covid-19-related supply chain disruptions have created a rising awareness among EU companies of the need to develop risk management tools. Companies in the open public consultation

(OPC) reported having suffered from the price volatility (34%), supply disruptions (29%) and supply shortages (22%) in their supply of CRM in the last 5 years, while only 4% reported not having experienced any supply problems. Their supply of CRMs is deemed as being more at risk than their supply of other inputs by 26% of companies, with only 3% disagreeing[43]. Considering the wider issue of supply chain resilience, there is evidence that companies' inventories increased in response to the disruptions brought about by the Covid-19-related supply chain disruptions and in particular the chips-shortage.[44]A survey conducted by the German Chamber of Industry and Commerce (DIHK) among its member firms in the summer of 2021 finds that 57% of companies across all sectors intend to increase their stockpiling in order to secure their own production capacity. 17% of companies reported the use of recycling and substitution.[45]

However, risk management by companies might not be sufficient to address the growing challenges given the problem's geopolitical dimension and the often complex and opaque value chains for CRM markets, which require a level of sophistication that most companies do not possess. In the OPC, 56% of respondents agree or strongly agree that companies would benefit from public monitoring programmes, with only 3 % of respondents disagreeing.

At Member State level, only two governments have established institutions to monitor critical raw materials supply for their industry: Germany (German Mineral Resources Agency/DERA)[46] and France (French Observatory of Mineral Resources for Industries/OFREMI)[47]. Other Member States have geological agencies and expertise in ministries or advisory bodies but these do not, to the best of the Commission services' knowledge, systematically monitor global markets and the risks affecting domestic raw materials consumers.

At **European level**, the European Commission has developed the criticality assessment (described in textbox 1) to periodically review global production shares, EU imports, recycling rates, applications etc. for a broad set of raw materials and identify those that are the most critical, based on data from the preceding 5 years. The 2020 criticality assessment was accompanied by a 2030/2050 foresight analysis of critical raw materials used in strategic sectors and technologies[48]. These and further studies are contained in the Raw Materials Information System (RMIS).[49] The Commission also maintains several expert groups and networks involving experts, industry, civil society and national authorities to advise on its policymaking and to enable an exchange of information and best practices.

However, none of these frameworks provide operational capabilities to monitor markets in real-time, identify risks in the short- to medium-term future or support companies in their risk management efforts, nor do they establish an operational framework for coordination.[50] In the OPC, 53% of respondents agree or strongly agree that Member State authorities do not have in place sufficient monitoring mechanisms allowing them to assess supply risks and anticipate problems. 58% agree or strongly agree that Member State authorities do not sufficiently cooperate and coordinate in monitoring CRM supply chains.

[43] The other companies did not express an opinion on this question.

[44] Anecdotal: Chip Makers Stockpiled Key Materials Ahead of Russian Invasion of Ukraine - WSJ; Nintendo Appears To Be Stockpiling Raw Materials, Doubles Its 2019 Spending On Supplies | Nintendo Life; Comprehensive: New PMI Comment Tracker dataset reveals key insights into the global supply chain | S&P Global (spglobal.com)

[45] DIHK-Umfrage zu Lieferengpässen und Rohstoffknappheit

[46] BGR - Contact (engl.) (deutsche-rohstoffagentur.de)

[47] Launching of OFREMI: French Observatory of Mineral Resources | BRGM

[48] European Commission, Critical materials for strategic technologies and sectors in the EU - a foresight study, 2020

49 Raw Materials Information System (europa.eu)

50 The Single Market Emergency Instrument partially covers such tasks, but only applies when a significant disruption is expected (vigilance mode) and does not provide expertise on critical raw materials markets. (see Annex 10)

In addition, companies' preparedness is mainly limited to large companies with experience and sophistication in managing CRM supply risks[51]. The costs of disrupted value chains for the wider economy can be massive; the insurer Allianz, for example, estimates that disruptions in the chips value chain in 2020 and 2021 cost EU-based carmakers around EUR 100 billion.[52] This is partly due to upstream producers not taking sufficiently into account the effects the disruptions of their inputs have on firms further down the value chain and therefore prepare for these situations on a level that is socially not optimal. Additionally, complex global supply chains make it harder for companies to spot risks earlier in the value chain, further aggravating the situation[53].

Member States' preparedness to supply disruptions is also uneven. In response to a targeted consultation[54], some reported the development of stockpiling systems to mitigate supply risks, rarely covering CRMs; most did not report any CRM-relevant stockpiles, whether because of confidentiality reasons or because they do not exist. Most Member States who replied to the questionnaire however supported further EU coordination on this matter (DE, EE, FR, PL, PT) to enhance their industry's resilience, given the rising importance of CRM in the economy, albeit the extent of the EU's role differs. At EU level, the proposed SMEI contains a mechanism to build national strategic reserves in the event of a threat/incident with potential to significantly disrupt the supply chain (Single Market emergency). Nonetheless, there is no permanent assessment and stockpile coordination specific to CRMs, which is a policy gap given the need for enhanced preparedness. Indeed, alike regular monitoring, risk assessment and stress tests, mitigation strategies such as stockpiling of CRMs (or diversification of suppliers when feasible) are considered as a way to cope with supply disruptions[55], whose frequency is expected to rise in a context of foreseen supply/demand gaps[56].

2.2.2. Sub-problem 2: The EU is currently not making full use of its domestic critical raw materials potential and lacks capacity in key stages of the value chain

The EU is currently a minor player in terms of critical raw materials production. This is true at both the extraction and the processing stage (see Annex 10 – context). While the quality and accessibility (given high population density and environmental protection areas in the EU) of geological occurrences (see Annex 10 – sub-problem 2) certainly plays a role in explaining the low investment into critical raw materials projects at the extraction stage, the same is not true for the later stages of the value chain: As discussed in textbox 4 of Annex 10, at the processing/refining stage, energy costs are the determining factor for location, while for recycling operations both energy costs and the availability of waste streams play a role. This is particularly evidenced by the case of China, which is dominant in processing for many critical raw materials without being the dominant country at the extraction stage (see figure 1 above).

51 KÖSTER, H., NEUBERT, F. P., DIERKSMEIER, K., ADELMANN, L., LENTGE, H., SCHMIDT, P. (2022): Securing raw material supply: Benchmarking of measures of foreign manufacturing companies and recommendations for action.

52 https://www.allianz.com/en/economic_research/publications/specials_fmo/Europe-automotives.html

53 On academic level, the propagation of supply shocks and costs of supply chain disruptions are studied by Carvalho et al. (2021) with the example of the Great East Japan Earthquake of 2011. They show that complex economic interlinkages between affected areas and non-affected areas aggravate the magnitude of the shock, doubling it. Carvalho et al., Supply Chain Disruptions: Evidence From the Great East Japan Eartquake, in Quarterly Journal of Economics (2021)

54 See Annex 2, Raw Materials Supply Group.

55 IEA (2021), The Role of Critical Minerals in Clean Energy Transitions, IEA, Paris

56 Supply chain challenges: Wind Turbines and magnets" Science for Policy Brief, 1 July 2022, Joint Research Center, European Commission". In "Criticalities in Supply Chains for REPowerEU Plan", JRC132109 Note: The over-proportional increase in demand for rare earth elements stems from the fact that in particular the offshore and large-scale wind turbines contain large amounts of rare earth elements.

2.2.2.1. Driver 2.1: Insufficient exploration of European mineral resources

Exploration is a precondition for any extraction project. As noted in Annex 10, exploration is a high-risk business and therefore structured in stages of increasing cost and certainty on the mineralogical and economical properties of the project.

At global level, exploration spending (public and private) for non-ferrous metals[57] is growing (after a slump in the early 2010s) and was estimated at USD 9.8 billion in 2019, while the share of EU was less than EUR 300 million. Within this sum, three Member States – Finland, Sweden and Spain – accounted for 50% of the total spending.[58] While the EU's exploration budget is increasing, it remains very low compared to other world regions, accounting for about 2% to 3% of global exploration expenditure in 2010-2022 (see Annex 10 – Driver 2.1) while the European continent represents around 7% of the Earth's landmass.

Since mining companies generally focus their exploration budget on a well-defined, small area covered by an exploration permit, public/general exploration is needed at regional level to define areas of mining interests for each specific mineral. Member States' spending for these regional (or, for smaller Member States, national) surveys existed until the end of 1980's and significantly decreased in the 90s onward.[59] In addition, these surveys were focused on materials of economic interest at that time and not on the critical raw materials needed today for the green and digital transition or for resilience and security purposes. Previous regional exploration surveys were also limited to the first few meters of the underground for technological and budgetary reasons. Advances in technological tools for raw material exploration at the end of the 1990s (mainly geophysical methods) have permitted to significantly enhance the knowledge on material resources potential, up to several hundred meters deep. The generalised lack of investments during the past decades on geological exploration by Member States (specifically on the critical raw materials and with the most advanced technology tools) has led to a general lack of knowledge regarding the true potential of critical raw materials in the EU to the present day. This impedes the further exploration by private companies on specific sites of mining interest and further exploitation.

Despite a current scarce mining industry, Europe has a long history of mining industry that resulted in the creation of a large amount of mining tailings[60] across the continent, mostly in closed mines. Since mining companies generally focused on one specific substance only (mostly a base metal), some of these mining tailings have been recently recognised as major potential sources of critical raw materials across the EU.[61] However, to which extent and for which elements the reprocessing of these mining tailings could be an economically viable source of critical raw materials remains mostly unknown due to a lack of proper exploration of mining tailings in the EU. Several Member States map the tailings, for instance the Polish Geological Survey has a dedicated web-tool showing identified sites.[62] The challenge is then to identify the critical raw materials in each of these tailings and develop a technology and business model to extract them. Several pilot projects of reprocessing mining tailings from selected sites to produce critical raw materials are currently underway in the EU (notably under the EIT Raw Materials NEMO project[63]), but delivering the full

[57] A class of metals that includes most CRMs, as well as the precious metals gold, silver etc., and the base metals aluminium, copper, zinc etc.
[58] S&P Global Market Intelligence, 2019
59 Regueiro y González-Barros, Manuel & Espi, Jose. (2019). The returns on mining exploration investments.. BOLETÍN GEOLÓGICO Y MINERO. 130. 161-180. 10.21701/bolgeomin.130.1.010.
60 Tailings are the waste materials left after the target mineral is extracted from ore.
[61] JRC (2019): Recovery of critical and other raw materials from mining waste and landfills; pg. 93-98 of SCRREEN-D3.2-Identification-and-quantification-of-secondary-CRM-resources-in-Europe.pdf
[62] https://cbdgportal.pgi.gov.pl/haldy/
[63] Near-zero-waste recycling of low-grade sulphidic mining waste for critical-metal, mineral and construction raw-material production in a circular economy (h2020-nemo.eu)

potential of this source of critical raw materials would require a proper evaluation of the resources through specific exploration across Member States.

2.2.2.2. Driver 2.2: Unpredictable and fragmented permitting procedures

CRM exploration, mining, processing, refining and recycling, can have significant impacts on the environment and local communities.[64] Therefore, various areas of EU and national legislation set rules related to their planning and operation (an overview of relevant EU law is included in Annex 8) to mitigate the risk of causing significant adverse environmental effects. Compliance with these rules is ensured through the obligation to obtain several permits before starting operations. The costs and time associated with associated procedures and the likelihood of obtaining a permit are key considerations underlying CRM investment decisions. Currently, the unpredictability of the length of national permitting processes and of the criteria for the assessments and documentation required are often reported as barriers to increased investment[65]:

- For raw materials extraction projects, the MINLEX study showed that times to obtain a permit (related to all relevant rules, not only environmental) can vary between procedures from 3 months to 3 years.[66] More problematically, outliers can be found (for CRMs, for example, ongoing cases can be found lasting up to 4 years[67]). One reason for unpredictable timelines is that the procedure for performing the necessary environmental assessments is not consistently implemented. The average duration of the procedure provided for in the EIA Directive (for all projects in scope, including CRM projects), for example, was, according to the most recent data, approximately 11.6 months, but with figures ranging from 5 to 27 months.[68]
- Similarly, differences can be observed in the structure of the procedure, with various levels of authorities (local, regional, and national) involved in this process. The "one-stop shop" concept allows applicants to interact with a single authority and facilitates efficient coordination among authorities. Although EU law already facilitates use of a "one-stop shop", the MINLEX study showed that only some jurisdictions do so and that, without distinguishing per type of mineral, an average of 3 authorities were involved for exploration projects and an average of 4 authorities for extraction projects.[69]
- Environmental assessment procedures are organised differently across Member States also in terms of content. First, the number of different environmental assessments required differs between Member States. Second, there is often a lack of clarity about the scope and level of detail required in the environmental assessment leading to multiple exchanges and new requests between the developer and the competent authorities.
- Stakeholders also point out that responsible authorities sometimes lack sufficient expertise and resources.[70] It should also be noted that, in addition to the permitting procedure as such, judicial appeals can also lead to delays and often cause increased unpredictability.

[64] Mononen, Kivinen, Kotilainen, Leino (2022): Social and environmental impacts of mining activities in the EU. Study requested by the PETI Committee of the European Parliament. Social and environmental impacts of mining activities in the EU (europa.eu)

[65] For example, the length and complexity of permitting procedures was the main reason for the lack of private investment in CRM projects identified by respondents to the OPC. As one company respondent put it: 'Projects along the value chain – such as mining or secondary.

[66] MinPol/European Commission (2017): Legal framework for mineral extraction and permitting procedures for exploration and exploitation in the EU. Final report "Minpol (2017)" in the following.

[67] The Sakatti project in Finland and the Mina do Barroso project in Portugal, see more detail in Annex 10.

[68] GHK (2010), Collection of information and data to support the IA study of the review of the EIA Directive. The average duration of an EIA ranges from 7 months or less (4.75 in Estonia, 5 in Slovakia, 6.5 in Latvia, 7 in Greece) to more than 20 months (21 in Denmark, 27 in Spain). New figures are expected in 2024.

[69] Minpol (2017)

[70] This point was made in the position papers submitted by Junta de Andalucia, Aurubis AG, Vulcan Energy Resources and EIT Raw Materials.

2.2.2.3. Driver 2.3: Difficulty in accessing financing

The rapidly increasing demand for many raw materials needed for the green and digital transition and for strategic sectors relevant for security and resilience translates into massive investment needs, both globally and in Europe. According to estimations by Commission services, the investment needs to ensure the supply of 25% of European demand of the five main raw materials for batteries (lithium, cobalt, nickel, manganese and natural graphite) from domestic sources amount to EUR 7 billion by 2030 and 13.2 billion by 2040.[71] Assuming a share of public spending to realise these projects comparable to the American Battery Materials Initiative, public support of EUR 2.7 billion by 2030 and 4.7 billion by 2040 would be required[72].

Other strategic raw materials are also likely to require large investments in light of the green transition; e.g. copper for electrifying infrastructure, silicon for solar panels, platinum group metals for hydrogen electrolysis. The European Raw Materials Alliance[73] has identified potential investments of EUR 1.7 billion for rare earths extraction, refining and recycling as well as magnet production, which would ensure a supply of 20% of European demand along the value chain by 2030. For other CRM, their potential investment cases amount to EUR 3.1 billion, fulfilling between 20 and 60% of projected EU demand in 2030 for different relevant raw materials.[74]

Several CRM market-specific factors complicate access to (public and private) finance. The volatility of prices for CRMs makes it hard for investors in projects at all stages of the value chain to predict earnings, especially in the medium to long term. Meanwhile, given the long lead times and potential permitting delays (see previous chapter), significant investment decisions have to be taken years before a project starts gaining operational revenue. In addition, global markets for many critical raw materials are small, highly concentrated and opaque[75], increasing the risk premium that needs to be paid compared to other markets. To provide financing, the financial institutions need to possess in-depth knowledge about mining project development and global raw materials markets to be able to assess CRM projects. Maintaining this expertise in-house is difficult considering the small size of the European raw materials sector. While all such factors are not unique to the CRM market and investors routinely deal with such risks (ultimately, high returns on such projects should compensate for the risk taken and the resources invested), their aggregation does make the financing of CRM projects very costly and, given the limited overall size of the EU's mining, processing and refining industries, it can be hard to find any partners willing or able to provide the type of financing required.

Based on discussions Commission services had with various European public and private financial institutions, the following observations can be made on the state of financing for the different stages of the critical raw materials value chain:

- Exploration: Most exploration companies active in Europe are based outside of the EU. Most interviewed private and public financial institutions have not been involved in financing exploration projects and stated that this was due to the high risk involved. The European Bank for Reconstruction and Development (EBRD) is the only notable exception, with a team dedicated to this area and the ability to support such projects. Exploration financing mostly comes in the form of equity or quasi-equity to project companies set up *ad hoc*.

[71] Note that, as explained in Annexes 5 and 12, this refers to the refining and recycling stages for all five raw materials, while the cost of establishing 25% extraction in Europe is only included for lithium. This limitation is due to both the lack of information about extraction project costs and the limited potential for greater extraction in the EU of the other raw materials.
[72] The calculations can be found in the description of the driver in annex 5 and further methodological details in Annex 12
[73] https://eitrawmaterials.eu/wp-content/uploads/2021/09/ERMA-Action-Plan-2021-A-European-Call-for-Action.pdf
[74] Source: Overview of the current state of the investment pipeline provided by ERMA to Commission services (not public).
[75] https://www.ft.com/content/46e5c98e-f9cd-4e88-8cd5-23427522c093: Financial Times: Tesla supplier warns of graphite supply risk in "opaque" market. Syrah Resources says lack of transparency over pricing in China-dominated market poses challenge for financing.

- Extraction: While public institutions have limited capabilities to engage, some private financial organisations have dedicated metals and minerals investment team, usually requiring a large corporation to finance it though their balance sheet. Financing of junior miners is generally considered very risky and the private financial sector is not willing to engage. Furthermore, for mining projects in third countries, the involvement of an Export Credit Agency for risk sharing is key. Financing of investment projects would be usually done on a syndicated basis. Member States started to implement some measures to promote investments in the CRM field in third countries (including extraction)[76].
- Processing/refining: to finance processing/refining projects, a stable and secure supply of critical raw materials would have to be ensured, currently not the case for a number of critical raw materials. Financing of integrated projects (mining + processing/refining) is considered high-risk. Private financial institutions are willing to engage if a large established client with strong credit rating sponsors and finances the project through its balance sheet (corporate finance). The role of energy prices and the price volatility of the relevant critical raw materials has also been mentioned as important in determining the viability of European refining projects.[77]
- Recycling: The interviewed banks have little experience so far on this but generally are willing to engage. One of the main issues for the viability of this type of investment is the steady supply of material for recycling.

Overall, the results from the open public consultation and the targeted consultations of banks show that access to finance is considered a major barrier to investment in specific stages of the critical raw materials value chain in Europe[78]. In this Impact Assessment access to finance can refer both to a framework that allows to best assess the relevant funding and investment vehicles available as well as the provision of actual funds.

In section 5.2, pillar E.2, the Union funds available for CRM are listed. While some projects, especially for such involving recycling and located in an assisted area, should have several possibilities to attract funding, others, such as no less important extraction projects, especially such located in non-assisted areas, are likely to struggle to fill gaps in private financing with public funds.

Additionally, projects may sometimes struggle to identify available funds given difficulties in assessing their eligibility against the several conditions attached. While other countries' funding programmes are either targeted at raw materials (e.g. JOGMEC in Japan, see also Annex 7) or designed in a simple way (e.g. the US Inflation Reduction Act, using tax breaks), the EU has a variety of relevant programmes. This is a problem when, as is currently the case, there is no coordinating capacity to help CRM project developers find the right combination required to realise their projects financially.

CRM projects, especially at the refining and recycling stages, can be very energy-intensive. While it is assumed in this report that the extremely high energy prices seen in 2022 will not last into the medium term and more additions of affordable decarbonised sources to the energy mix will bring prices further down, it is likely that EU energy prices will stay higher than those in other regions. This constitutes a challenge for the CRM Act ambitions of building up additional capacity along the CRM value chain, particularly if prices stay high for long. The CRM Act itself will not be able to address this challenge, but the Commission is working

[76] Examples in this respect are the German UFK programme, which provides a government guarantee for privately financed projects in third countries provided that a long-term off taker agreement exists with a German client; and the French Bpifrance's Strategic Project Insurance, introduced in 2018, which provides an 80% insurance for projects located in France or involving a French business partner.

[77] See also the results of the public consultation.

[78] 51% of respondents to the open public consultation agree or strongly agree that accessing private financing for CRM projects in the EU is difficult and a challenge for the expansion of the EU's critical raw materials capacities; many respondents are neutral on this question; 9 % disagree or strongly disagree. 56% of respondents agree or strongly agree that there is a difficulty to access public funding in the EU; 4 % disagree or strongly disagree. 64% of the 259 respondents to the open public consultation agree or strongly agree that the price volatility or unpredictability poses a challenge to the roll-out of CRM projects in Europe. Some stakeholders make the point that the absence of mining activities in the EU taxonomy would make funding and investment unattractive (see Annex II).

on other files to improve the situation, for example by updating the EU's Temporary Crisis Framework (to become the Temporary Crisis and Transition Framework), (e.g., to offset the higher energy cost compared to its international competitors).

2.2.2.4. Driver 2.4: Lack of CRM-related skills and expertise

The mining sectors employs 3.7 million people worldwide (1.5 million in developed countries, 2.2 million in developing countries). Work force is considered one of the top business risks and opportunities in mining and metals[79]. The limited number of projects in the EU targeting the raw materials value chain has led to a skills shortage, as jobs related to mining (from mining engineers to expert in national administrations) have diminished in the past decades. Mining and metals companies are facing their greatest ever talent shortage following a massive wave of retirements and resignations. The emergence of the EU CRM value chain would create further demand for skilled workers, thereby posing a risk for shortage increase if no action is undertaken. The materials dimension of the battery value chain alone may create up to around 200 000 jobs in 2030 and 0.5 million jobs when in full transition (after 2030).[80]

2.2.2.5. Driver 2.5: EU waste legislation does not sufficiently target critical raw materials recovery

As most critical raw materials are metals, they are in theory highly recyclable. Currently, however, the share of recycled CRMs is very low (see Annex 10). This is due to a combination of factors: most CRMs are used in low concentrations as part of alloys or other mixtures, which make the recovery processes from end-of-life products technically and economically complex and difficult; the total amount of many CRMs used has also not been large in the past, as important markets (e.g. renewables, electric mobility, digital) have been growing at rapid rates in the past, and the materials are often bound in long-lived products (e.g. 20 or more years for a wind turbine); this means that when they are recovered, the so far small quantities often do not justify costly investments into developing targeted recycling processes and building and running industrial-scale operations. As a result, CRMs are currently often disposed of at the end of a product's lifetime, or non-functionally recycled (i.e. recycled in a way that does not make use of the special properties of the raw material). Moreover, current recycling practices and waste legislation often focus, to a large extent, on waste collection and de-pollution, and on overall mass recovery but too little on the recovery of trace metals such as CRMs.

The most important waste streams for CRM recovery (Extractive waste, batteries, electrical and electronic equipment (WEEE), end-of-life vehicles) are covered by dedicated sectoral legislation specifying (e.g. extended producer responsibility, specific treatment requirements, and collection and recovery targets). In addition, the Waste Framework Directive covers all waste streams horizontally (e.g. requiring Member States to draw up waste prevention and waste management plans). Apart from the proposed Batteries Regulation, these legislations do not specifically target the recovery of CRMs.[81]

An area of particular interest for CRMs is extractive waste. Historically most mining operations were targeted at high-volume commodities such as iron and copper. As CRMs commonly co-occur with these carrier metals, extractive waste may contain significant amounts of CRMs[82]. Jointly recovering and valorising base metals, CRMs and aggregates could be economically interesting[83], with the advantage that such operations take place on brownfield sites, lowering risk of environmental impacts and conflicting land-use interests. A barrier however lies in the lack of knowledge concerning CRMs in closed and abandoned mines, as well as the risk and liability assumed by a company re-mining a site with potentially unknown legacy. The Extractive Waste

[79] https://www.ey.com/en_gl/mining-metals/risks-opportunities Top 10 business risks and opportunities for mining and metals in 2023, Ernst and Young.
[80] Fraunhofer-institut für system und innovationsforschung ISI – Job preview study: job effects in the upstram battery value chain.
[81] See Annex 10 for more detail on the current shortcoming in terms of CRMs of existing waste legislation.
[82] JRC (2019): Recovery of critical and other raw materials from mining waste and landfills; pg. 93-98 of SCRREEN-D3.2-Identification-and-quantification-of-secondary-CRM-resources-in-Europe.pdf
[83] JRC (2019): Recovery of critical and other raw materials from mining waste and landfills

Directive currently regulates primarily how to minimise and manage waste generation and it requires Member States to draw up an inventory of closed and abandoned facilities, but it does not provide for incentives or information gathering to promote recovery of CRMs.

In the open public consultation, 66% of respondents agree or strongly agree with the statement that "EU waste legislation does not sufficiently incentivise the recovery and recycling of raw materials".

2.2.2.6. Driver 2.6: Lack of high-quality technical standards for critical raw materials-related industrial processes

The availability of high-quality technical standards is essential to ensure a level playing field in the single market for businesses and to underpin consumer confidence. Standards can help facilitate the creation of a transparent global market for critical raw materials. Currently, European and international standards only partially cover critical raw materials-related industrial processes, including processes involved in their extraction, processing and recycling.

At the level of the relevant European Standardisation Organisation CEN, a number of technical committees exist in charge of the standardisation of metals (aluminium, copper, nickel and steel) but critical raw materials are not covered by the work of these committees. As regards the international aspect, as highlighted in the recent EU Standardisation Strategy, other actors follow a more assertive approach to international standardisation than the EU and are taking the lead to promote their technological solutions.

At the level of the International Standardisation Organisation (ISO), standardisation efforts related to critical raw materials have been mainly instigated by non-EU countries. The Chinese standardisation body has initiated standardisation on rare earths (2015) and lithium (2020) within ISO, covering the whole value chain including upstream extraction and sustainability. On rare earths, the results to date indicate slow progress as concerns the sustainability aspects, and the level of ambition is lower than what is set out in the EU principles for sustainable raw materials.[84]It is to be noted that, since 2021, Standards Australia leads the ISO Strategic Group on Critical Minerals. The mandate of this group was to identify which minerals/metals could be standardised in ISO. [85]

There currently does not exist a common European strategy to ensure that standardisation efforts for critical raw materials sufficiently reflect the sustainability principles underlying EU legislation relevant for the critical raw materials value chain.

Driver 2.7: Lack of public acceptance for critical raw materials mining in Europe

The issues pertaining to permitting of critical raw materials projects are often intertwined with issues of lack of public acceptance. The Public Consultation showed that a lack of, or limited, public acceptance for new critical raw materials projects in EU was often driving away investments in the value chain (64 % of

[84] For REEs, actions focus on the whole value chain including rare earth mining, concentration, extraction, separation and conversion to useful rare earth compounds/materials (including oxides, salts, metals, master alloys, etc.), covering also sustainability of different processes.

[85] Although work is not yet finalised, several minerals or metals have been identified as being of a particularly strategic nature: cobalt, indium, vanadium, graphite, gallium, tungsten. Their mandate was extended by 12 months to summer 2023.

respondents agreeing or strongly agreeing). Licence to operate was reported as a main business risk[868788], other abuses of fundamental labour rights, such as child labour are prevalent[89]. This tarnishes the reputation of mining in Europe as well, where environmental impacts, worker rights and public participation are well-regulated (see discussion of the environmental legislation under Annex 8).

Improvement and better enforcement of environmental legislation, including post-concession management, should address concerns from society. Nevertheless, resistance to projects, particularly for extraction, still exists, driven partially by justified environmental concerns and partially by what has been termed "NIMBYism" – a situation where stakeholders agree on the need for such projects in general but are opposed to the siting due to local interests[90]. The European Federation of Geologists provided a list of the top 10 mining opportunities in the critical raw materials sectors that are stalled/on standstill due to permitting and/or social engagement issues. Such projects relate to the production of lithium, rare earths, nickel, graphite, copper.[91]

2.2.3. Sub-problem 3: EU sourcing of critical raw materials is not sufficiently sustainable

2.2.3.1. Driver 3.1: The market does not take sufficient account of the environmental footprint of critical raw materials

The CRM value chain is associated with a range of environmental impacts. For example, the production of rare earth elements (REEs), used for instance in electric motors and wind turbines, is associated with significant material and energy consumption and generates large amounts of air and water emissions and solid waste.[92] Similarly, the use of platinum group metals in electrolyte membrane fuel cells is the main determinant of the fuel cells' environmental footprint, considering the acidification impacts associated with the extraction of these metals.[93] The production of cobalt and lithium, essential for battery production, is amongst other things associated with significant greenhouse gas emissions.[94] Overall, it was estimated that greenhouse gas emissions associated with overall primary metal and mineral production accounted for approximately 10% of total global energy-related emissions in 2018.[95] Life-cycle analyses of the EU's material consumption and its environmental impacts suggest that it currently takes up a disproportionate share of the safe ecological operating space.[96]

If left unaddressed, the environmental footprint of CRM extraction and processing may cancel out, to an extent, the environmental benefits of their use in green technologies and could mean that decarbonisation comes at the cost of an increase of other detrimental impacts. It is unlikely that the market, left to its own devices, will

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[87] https://www.economist.com/middle-east-and-africa/2022/07/05/how-the-world-depends-on-small-cobalt-miners "Roughly 140,000-200,000 people in the Copperbelt work as artisanal miners. Most earn less than the equivalent of $10 per day, according to the Federal Institute for Geosciences and Natural Resources (bgr), an arm of the German government. That is still a better wage than most get in a country where 73% earn less than $1.90 a day."

[88] https://www.amnesty.org/en/documents/afr62/3183/2016/en/

[89] https://www.ilo.org/manila/publications/WCMS_720743/lang--en/index.htm

[90] See for example: NIMBYism Is Global, And That's A Problem For The Energy Transition (forbes.com); Rare-Earth NIMBY Activists Help China Dominate the Industry (foreignpolicy.com)

[91] European Federation of Geologists https://eurogeologists.eu/wp-content/uploads/2022/10/2022_EFG_List_Top10_Mining_Opportunities.pdf

[92] Navarro, Julio, and Fu Zhao. "Life-cycle assessment of the production of rare-earth elements for energy applications: a review." Frontiers in Energy Research 2 (2014): 45.

[93] Stropnik, Rok, et al. "Critical materials in PEMFC systems and a LCA analysis for the potential reduction of environmental impacts with EoL strategies." Energy Science & Engineering 7.6 (2019): 2519-2539.

94 Gregoir, L., and K. Van Acker. "Metals for clean energy: pathways to solving Europe's raw materials challenge." Eurometaux, KU Leuven (2022).

[95] Azadi et al. (2020). Transparency on greenhouse gas emissions from mining to enable climate change mitigation.

[96] JRC Publications Repository - Consumption and Consumer Footprint: methodology and results (europa.eu) (Note that this study does not separately show the impacts associated with the EU's consumption specifically of critical raw materials).

ensure that the impacts associated with the CRM value chain are properly identified and internalised. Steering the market toward more sustainable CRMs, however, has the potential to drive down impacts given the differences in the environmental footprint of CRMs available to EU buyers. This is evidenced, for example, by the difference in footprints observable between CRMs produced using different production methods[97]. It is also clear that the varying carbon intensity of the energy used in the extraction and refining of CRMs leads to varying environmental footprints[98]. In addition, recycled CRMs have generally a lower environmental footprint than primary materials, given the absence of the extraction phase and the higher purity of inputs (in cases where effective collection and sorting systems exist).

Even though stakeholders, including downstream users, state that they are willing to take into consideration the relative sustainability when procuring materials[99], the market response so far has resulted in the creation of different methods and initiatives, with a varied level of reliability and coverage.[100] The Commission has developed the Product Environmental Footprint (PEF) to provide a common and robust method to measure the footprint of different materials sold on the EU market and distinguish between the environmental impacts of these materials.[101] However, uptake of the PEF method for the assessment of CRM is still limited. In addition, different public and private certification systems with different scopes and coverage are currently available to show the sustainability of raw materials sold on the EU market.[102] Having different overlapping schemes to show sustainability of CRMs can lead to potential confusion and undermine their effectiveness. Without complete information, competition driven by sustainability is diminished to the extent that customers cannot make choices based on sustainability. In that regard, some stakeholders have underlined the need to assess the suitability of different certification schemes.[103] In addition, even where information is available, there is currently nothing preventing users of critical raw materials from procuring the most impactful (and often cheaper) materials. It can reasonably be assumed that, as long as the negative externalities of CRMs are not accounted for, at least some users will continue to be mainly driven by cost considerations, continuing to procure the most polluting CRMs. Sustainability chapters in trade agreements are meant to prevent a 'race to the bottom' and to sustainably trade natural resources, while encouraging trade in raw materials for the climate transition[104]. They are however limited to countries with which the EU has a FTA, and thereby do not cover all CRMs entering the EU market, constraining the EU's ability to incentivise a shift in the global production of CRMs toward more sustainable practices. Other international instruments (c.f. Annex 8) seek to ensure social and environmental due diligence practices for EU companies.

[97] On difference between brine and hard rock based lithium, see "Metals for clean energy'' report (Gregoir and Van Acker).'. On magnesium, see Ehrenberger, Simone. "Carbon Footprint of Magnesium Production and its Use in Transport Applications." (2020). For scandium, see Kaya, Şerif, et al. "Scandium recovery from an ammonium fluoride strip liquor by anti-solvent crystallization." Metals 8.10 (2018): 767. . For titanium, see Pal, Uday B. "A lower carbon footprint process for production of metals from their oxide sources." JOM 60.2 (2008): 43-47.

[98] See e.g. figure in Annex 10, source: "Metals for clean energy'' report (Gregoir and Van Acker)

[99] For example, 186 (72 %) out of 259 respondents to the PC agreed or strongly agreed that CRMs should be accompanied by information on their environmental footprint. Business interest is also driven by changing consumer preferences: based on a recent EU survey (Consumer conditions survey, European Commission, 2021.), the majority of EU consumers being "occasional" consumers of environmentally-friendly products (56%) and more than a quarter paying attention to the environmental impact of all or most goods and services (23%), and 67% EU citizens buy products that are better for the environment even if they cost more.

[100] There are currently 457 voluntary environmental labels worldwide and over a 100 in the EU (Ecolabel index 2020, http://www.ecolabelindex.com/), underpinned by non-comparable methods.

[101] Commission Recommendation of 16.12.2021 on the use of the Environmental Footprint methods to measure and communicate the life cycle environmental performance of products and organisations

[102] See e.g. the overview of different schemes provided in IEA, I. (2021). The role of critical minerals in clean energy transitions. World Energy Outlook Special Report, p. 240.

[103] See for example the Call for Evidence submission of the European Automobile Manufacturers' Association.

[104] Sustainable development in EU trade agreements (europa.eu)

2.3. How likely is the problem to persist?

The main problem identified, the lack of secure and sustainable access to critical raw materials is a forward-looking problem, as demonstrated above, and therefore, likely to persist in the case of no targeted intervention. As discussed in textbox 3 of Annex 10, technological innovation and behaviour patterns have the potential to affect the evolution of demand for critical raw materials. However, most projections show a significant increase for several critical raw materials that outpaces supply currently on-line or planned, thus likely leading to elevated prices, more frequent instances of supply disruption and heightened competition for available resources. These considerations mainly apply to the medium term (2030-2040), where large technological and social innovations are unlikely, and the major sectors driving critical raw materials demand (renewables, electric vehicles) are expected to continue growing. In the longer term, towards 2050, however, technological innovations spurred by scarcity and high prices, as well as the substantial amount of CRM-rich products reaching their end-of-life, are likely to alleviate the pressures while bringing the EU closer to a circular economy for metals (including many CRMs). Of course, new and currently unforeseen challenges could also develop within this longer timeline.

The new CRM production capacities created by third countries may have an effect on global markets, but as explained in Annex 10 – context, the presently known pipeline would not be sufficient to meet the gaps between supply and demand for some critical raw materials. In addition, these new supply sources may be reserved for domestic off-takers or for partners that can provide access to other critical raw materials in exchange. Additionally, acute crisis situations may trigger protectionist reactions, as observed with vaccines and personal protective equipment in the Covid-19 crisis, making agreements and memorandum of understanding for external supply ineffective.

As for the likelihood of the sub-problems and problem drivers to persist, anticipation and risk mitigation efforts by companies and Member States are likely to increase but only the most resourceful will be able to build an effective risk-preparedness system on their own. Smaller companies and Member States are likely to be disadvantaged in a crisis, even if the Single Market Emergency Instrument's provisions would mitigate the unequal impacts to a certain degree. There would be no coherent and systemic provision of information by public authorities to guide and alert companies and governmental bodies alike.

Without any further policy action, the EU is not likely to increase its production capacity along the critical raw materials value chain – in fact, processing/refining capacity in the EU is currently shutting down due to the high energy prices and the recovery is uncertain[105] – except in certain battery-related value chains such as lithium, which are benefiting from strong public support. Private investment and financing along the value chain may increase in response to rising critical raw materials prices, but in the absence of public investment into exploration, de-risking support and streamlined permitting procedures, investments are expected to remain far below what is needed to strengthen the EU's resilience.

Finally, as noted before, circularity will increase over time due to technological advancements and greater availability of waste containing critical raw materials, but for this development to achieve its full potential, accompanying changes to regulation putting a greater focus on CRMs and providing obligations or incentives to recover are required. Similarly, consumer expectations and industry initiatives will certainly increase transparency and sustainability of critical raw materials over time. Without public action, there is a risk of greenwashing and confusion that would be hard to overcome only by private initiative. Given the comparatively small market share of EU companies in the global raw materials value chains, international standards that might be in conflict with EU regulation and values are likely to be dictated by the dominant actors if the EU does not strategically coordinate and engage with international partners.

[105] Position paper by Eurometaux submitted in response to the Call for Evidence.

2.4. Lessons learnt from non-regulatory actions

The 2008 initiative proved to be a useful tool for the EU to begin considering access to critical raw materials as a strategic matter. The three dimensions outlines there have shaped the EU and wider society discussion around critical raw materials dependencies. The EU List of Critical Raw Materials has served as a reference for academia, stakeholders and even international partners. The 2020 Action Plan served to highlight new trends and contexts, such as the link of CRM dependencies with the green and digital transitions, and outline several concrete actions that could be taken without a dedicated regulatory framework. However, it also uncovered its limitations, with many actions having to be taken by other actors. Also, as demonstrated by the continued dependence on third countries and the rising number of raw materials present on the criticality list (from 14 in 2011 to 30 in 2020 and 34 in 2023), the underlying challenge is getting worse. Some limitations of the approach followed so far are noteworthy:

First, even though industrial alliances have identified investment pipelines that concern some CRMs (e.g., on rare earths), the financing tools are scattered around different EU, national and private investment vehicles and are still insufficient to cover the investment gaps (identified in Annex 12). In addition, conversely to renewable energies or Chips manufacturing[106], there is no framework in place to ensure that CRM projects overcome the difficulties encountered by the length or complexity of permitting processes.

Second, the non-regulatory actions have not been sufficient to encourage Member States in developing their knowledge of their geological resources on their territory or their capacity to monitor and prepare for supply disruptions.

Third, even though EU level monitoring through the criticality assessment has become a key framework for the analysis of CRMs, it remains a punctual exercise which does not itself take into account the strategic priorities of EU or national policies, for instance in terms of technologies.

Fourth, initiatives so far have not been able to tackle the increasing needs expressed by the industry and EU citizens to get access to sufficient information regarding the sustainability of CRMs.

3. WHY SHOULD THE EU ACT?

3.1. Legal basis

The initiative intends to improve and ensure the Union's secure and sustainable supply of critical raw materials. Without such efforts, current supply and demand developments are likely to create a serious and structural risk of supply disruptions for a range of critical raw materials.

As CRMs are essential to the functioning of multiple strategic sectors, potential supply disruptions must be addressed in order to preserve a stable functioning of European markets. Therefore, the onset of supply disruptions, and of the associated shortages and prices volatilities, would be likely to trigger efforts at Member States' level to address their consequences (e.g. through stockpiling or export restrictions). Although justified in principle, such efforts have, if left uncoordinated, the potential to distort competition and create intra-EU restrictions to the free movement of goods. By aiming to structurally decrease the likelihood of supply disruptions, therefore, this initiative will contribute to ensuring the well-functioning of the Single Market.

[106] COM(2022) 46 final, Chips Act

In addition, in light of the significant economic impact of potential supply disruptions, it is likely that Member States will, in the absence of EU action, initiate measures to *ex ante* lower the risk of their occurrence.[107] While adequate with a view to addressing deficiencies at a national level, such measures could also lead to an incoherent response, thereby leading to less effective solutions and potentially fragmenting the Single Market or distorting competition. By proposing a coherent Union approach to improving and ensuring the security of supply of critical raw materials, this initiative will help prevent the potential distortion of competition and fragmentation of the Single Market likely to result from such uncoordinated actions and help to preserve a level playing field for businesses within the EU.

To set up a harmonised EU approach to decrease supply risks for critical raw materials, therefore, Article 114 of the Treaty of the Functioning of the European Union (TFEU) is the appropriate legal basis. In addition, regarding the amendments to existing legislation on waste management considered in this impact assessment, they would have to be based on the same legal basis as the legislation to be amended (Article 192 TFEU).

3.2. Subsidiarity: Necessity of EU action

No single Member State alone is capable of effectively addressing the growing critical raw materials supply risks – not least due to lack of geological occurrences in an individual Member State and to the substantial economies of scale in the critical raw materials value chain. The measures included in this initiative would not be as effective if implemented by Member States acting alone, as the problems they address concern the Single Market as a whole. They are not limited to single Member States or to a subset of Member States but to the EU industrial base and the EU-wide value chain of critical raw materials. In addition, approaches at Member States' level only are unlikely to be adequate to serve the needs of closely intertwined supply chains within the internal market.

3.3. Subsidiarity: Added value of EU action

Taking into account that supply chains are widely spread across Europe, EU action is essential to generate economies of scale, propose solutions that fit the scope of the problem and to limit, if not to avoid, the fragmentation of efforts and associated inefficiencies. In line with this logic, the proposed actions focus on areas where there is a demonstrable value added in acting at Union level due to the scale, speed and scope of the efforts needed. For example:

- actions aimed at mobilising investment in critical raw material projects along the value chain could be most effective designed and coordinated at Union level, given the scale of the investments needed and because the resulting capacities should serve the full internal market.
- actions aimed at improving monitoring capacities at Union level will achieve greater effectiveness than if left uncoordinated. Together, Member States and Commission will be better able to anticipate supply disruptions than through a patchwork of national efforts. The framework proposed should allow for a more efficient division of tasks and for the sharing of relevant information to prevent the duplication of efforts.

4. OBJECTIVES: WHAT IS TO BE ACHIEVED?

4.1. General objective

The general objective of the Critical Raw Materials Act is to ensure the EU's secure access to critical raw materials, while incentivising the development of sustainable supply sources. This ultimately contributes to economic growth and high living standards in the EU, prevents disruptions and distress within the European

[107] For example, both Spain and France have announced future actions for ensuring supply of CRMs referring to many of the same fields of action as considered in this initiative, see Hoja de ruta para la gestión sostenible de materias primas minerales (miteco.gob.es) and Strategic metals: BRGM in the forefront of the actions announced by the State | BRGM.

single market and increases the competitiveness of European businesses, without neglecting the EU's role in promoting sustainable development and environmental protection globally.

Given the close link between CRMs and the green and digital transition, as well as the many geopolitical implications of critical raw materials supply, this initiative is indispensable to the achievement of the Commission priorities "A European Green Deal", "A Europe fit for the digital age" and "A stronger Europe in the world".

The initiative is expected to contribute to the achievement of the 2030 Agenda for Sustainable Development and its Sustainable Development Goals (SDGs), in particular SDG #7 Affordable and clean energy, SDG #8 Decent work and economic growth, SDG #9 Industry, innovation and infrastructure, SDG #13 Climate action.[108]

4.2. Specific objectives

The initiative pursues 3 specific objectives (SOs):

- SO1. Increase EU industry's awareness and mitigation of CRM-related risks in the global supply chain
- SO2. Increase the EU CRM value chain's capacity in the internal market, notably by:
    - *Increasing public and private exploration efforts*
    - *Streamlining permitting procedures*
    - *Improving financing conditions for investments along the critical raw materials value chain*
    - *Maximising the recovery of critical raw materials from relevant waste streams*
    - *Promoting high-quality technical standards for critical raw materials-related industrial processes*
- SO3. Reduce the environmental footprint of the EU's CRM consumption

Interaction between the specific objectives and trade-offs

There are many interactions between these specific objectives, both positive (synergies) and negative (trade-offs): Greater awareness of CRM-related risks in industry (SO1) for example is likely to increase companies' willingness to sign off-take agreements with and directly invest into CRM projects in the EU, where the risk of disruption is likely to be smallest, thereby contributing to increased EU capacities along the CRM value chain (SO2). Increasing EU capacities (SO2) in turn is likely to reduce the environmental footprint of the EU's consumption of critical raw materials (SO3) since the EU has a high level of environmental regulation and a relatively low-carbon energy mix. This is especially true for increased EU capacities at the recycling stage, which means a higher share of secondary CRMs, which inherently have a lower energy requirement and lower environmental footprint. Conversely, a reduced environmental footprint (SO3) can be expected to increase societal acceptance for investment into critical raw materials production in the EU (contributing to SO2).

While synergies between the three specific objectives dominate, trade-offs come into play when these are pushed to the extreme: Banning all imports of CRMs from relatively unsustainable sources, for example, would certainly reduce the EU's environmental footprint (SO3) but be very detrimental to its security of supply (the general objective) and to industry's risk mitigation efforts (SO1). Similarly, an exclusive focus on increasing EU capacities along the CRM value chain (SO2), if achieved by lowering environmental standards in the EU, would likely increase the EU's environmental footprint (contrary to SO3). Therefore, a balanced approach has to be pursued, especially with respect to specific objective 3. Such an approach involves balancing the negative impacts associated with any material consumption on the one hand with the clear economic and environmental benefits of that material consumption (e.g. realisation of the green transition). It also involves having a realistic view of the state of sustainability around the world today, while ambitiously charting a path towards solutions that avoid these trade-offs – for example, low-impact mining techniques,

[108] More a more extensive overview of the impact of the critical raw materials value chain on SDGs, see: Raw Materials Information System (europa.eu), How can mining contribute to the Sustainable Development Goals? | Africa Renewal (un.org)

energy-efficient processes and ultimately the circular economy, which can provide the lowest-impact and at the same time most secure raw materials. The measures in place to ensure the development of specific objective 3 should therefore always consider the need for ensuring the main objective of supply security.

5. WHAT ARE THE AVAILABLE POLICY OPTIONS?

5.1. What is the baseline from which options are assessed?

The potential impacts of the policy options are measured against the current dynamic baseline scenario that consists of no additional EU actions, meaning no change to the currently existing or proposed regulatory framework and the wider policy approach on critical raw materials. This notably relates to the implementation of the 2020 Action Plan on Critical Raw Materials.

As noted in section 2.3, "How likely is the problem to persist?", demand for critical raw materials is expected to grow rapidly and outpace supply, thus leading to increased prices and supply risks for critical raw materials needed for the green, digital and resilience ambition of the EU in the medium term (around 2030). However, in the longer term, secondary supply from recycling is forecasted to increase and become a relevant factor for many critical raw materials around 2040 and further increase towards 2050, thus alleviating pressures, as long as its potential is tapped into. Thus, this approximate development of demand and primary and secondary supply over the coming decades should be taken as the baseline. This means that the urgency and potential benefit of this initiative is greatest when considering the medium-term (2030) perspective. However, should also not be taken for granted that the issues would resolve themselves in the long-term, as projections may be assuming precisely that policy action will be taken at some point, For instance, . increase in circularity observed over time may be difficult to attribute to the circularity-related actions proposed, since they would affect the speed and size of the transition towards circularity rather than the direction per se.

Looking more concretely into the problem drivers and associated objectives, the monitoring and risk preparedness framework of the EU and its Member States (Driver 1.1./SO1) would remain unchanged in the baseline option – implying a continuation of current voluntary coordination, public raw materials intelligence agencies only being active in a few countries and no strategic stockpiles for critical raw materials. Meanwhile, private companies may increase their risk anticipation and mitigation efforts but this is likely to be limited to leading large companies with the sufficient resources and the power to impose e.g., diversification conditions on their suppliers. The Single Market Emergency Instrument would be assumed to be in force and thus provide a vigilance and crisis response framework, triggered in case of foreseen (vigilance mode) or actual (emergency mode) disruptions to critical raw materials supply. Stockpiles would be built up during the vigilance mode and released during the emergency mode, and information requests and priority-rated orders could be made to companies producing or possessing stocks of the critical raw materials currently disrupted. However, no efforts would have been made to build up strategic stockpiles before the onset of a crisis, and, given the insufficient capacities along the critical raw materials value chain (see next paragraph), as well as the lack of support for companies to manage critical raw materials supply risks, only very few companies would be able to respond to an information request or priority-rated order.

Investment into the critical raw materials value chain (SO2) would remain limited in the baseline scenario, except in the battery-related value chains where the coordinated effort of the European Battery Alliance to support investments (including through public subsidies and a dedicated regulatory framework – the Battery Regulation) and bring off-takers together with potential producers would continue. Some critical raw materials projects currently in the potential pipeline would advance after securing financing and passing lengthy permitting procedures, but many projects will likely not be realised in the absence of additional policy action. Continued high energy prices could lead to definitive closures of European refining plants, which would affect critical raw materials directly but also could have indirect effects through a loss of metallurgical expertise that can be transferred across raw materials sectors. European downstream industries would largely continue to source from outside the EU and be affected by supply disruptions, relying only on their individual negotiating

power, as well as potential use of trade defence instruments and dispute settlement under WTO or bilateral free trade agreement rules. Overall, import dependence would likely increase.

Regarding circularity, the availability of waste in the baseline scenario would develop as in the "intervention scenario" but no regulatory incentives would be given to focus on the recovery of CRMs. Notably, critical raw materials recovery from extractive waste would be realised in some projects, as is already the case today, but not on a systematic scale, given the lack of information and the risks associated with re-opening a closed site. Overall, the contribution of secondary critical raw materials to satisfying demand would increase, but at a slow pace.

As regards environmental footprint (SO3), increasing sustainability concerns are likely to continue driving the development of private certifications schemes and assessment methods as well as an increasing willingness to procure relatively sustainable CRMs. However, there is a risk that the effectiveness of such efforts would be undermined if methods and certification schemes contradict each other. In the absence of a harmonised approach, customer confidence could be too low to effectively implement those preferences and information could remain incomplete. It should also be noted, that where a product-level footprint exists for a product containing CRMs (as is e.g. the case for larger batteries), there would be an incentive to procure sustainable CRMs for that specific application (to the extent that the relevant products are intended for the EU market). The proposed inclusion of extraction and treatment of industrial minerals and metals the scope of the Industrial Emission Directive would improve the environmental footprint of CRMs produced in the EU. A number of European legislative initiatives in force and under adoption and the implementation of positive agenda in cooperation with third countries to improve the governance of extractive industry would improve the sustainability of local production, imports and foreign investments[109]. However, those measures would not cover all CRMs, the whole value chain or all sustainability issues, and are not all legally binding. Therefore, buyers of CRMs driven solely by price considerations will continue to at least partly procure CRMs with a high environmental footprint. Furthermore, international standards may not adequately reflect EU values in terms of sustainability and circularity and may be ineffective to ensure the EU's policy objectives are achieved.

The problem addressed with this initiative is inherently international in nature because 1) other countries face the same challenges of supply security, and 2) the EU relies substantially on external sources for CRM supply. Therefore, the following considerations need to be taken into account both in the baseline scenario and across the 3 different policy options.

First, the impact of actions by other global actors also has to be considered: Already today, relevant actions by partners and competitors can be observed, as discussed in Annex 7, including financial support for foreign or domestic critical raw materials projects, the conclusion of new partnerships, which are likely to lead to a greater degree of diversification over time at the global level, though it is uncertain to what extent the new capacities would be available to EU actors.

Second, the EU's global actions to diversify its supply chain must also be considered across all options as such efforts aim to reduce the dependencies on concentrated supply sources. Because those actions are ongoing, as described in Textbox 2, and since the path forward follows clear priorities already set out in the 2020 CRM Action Plan and in the EU's 2022 Trade Policy Review, they are considered as being included in each of the policy options presented below. This impact assessment's ability to assess directly their impact is furthermore limited by the fact that such actions are not only EU driven but also depend on the third country's policy (i.e. for the conclusion of a FTA or Strategic Partnership).

Textbox 2: The EU's international actions on raw materials – the baseline also underpinning different options

[109] Those instruments are developed in the Annex 8 "Interplay with other legislation and policies", particularly under the heading "International instruments".

In view of reducing the supply risks from abroad, the EU has been pursuing two main actions: developing partnerships on raw materials value chains with resource rich countries, as announced in the 2020 Action Plan for CRMs adopted in September 2020 (action 9) and negotiating trade agreements to facilitate trade and investment in CRM in third countries.

The partnerships on raw materials value chains with resource rich countries are cooperation instruments of non-binding nature and have a rather holistic approach. Although the ultimate objective of the partnerships is about integration of the raw materials value chains between the partner country and the EU, they are comprehensive, and cover aspects such as research and innovation and leverage of ESG (environmental, social and governance) standards. For the EU the sustainability of supply is as relevant as the security and this model of cooperation covers these two angles, thus creating mutually beneficial partnerships.

The partnerships with developed countries are usually based on three pillars: integration of raw materials value chains – the business-oriented pillar; cooperation on research and in innovation along the raw materials value chains – to develop cutting edge and clean technologies and solutions for the raw materials value chains; and cooperation on ESG standards – that aims at improving sustainability along the raw materials value chains, in its three dimensions. The partnerships with developing countries are based on five pillars: to the three pillars above it adds a pillar on capacity building, training and skills along the raw materials value chains and a pillar on deployment of the necessary hard and soft infrastructure to support projects development.

The partnerships have a roadmap associated, that identifies concrete actions to be developed under each pillar. Some of the actions can be crosscutting. To develop the roadmap, in agreement with the partner country, the EU consults its Member States and the industry, bringing together relevant existing and planned actions, within a true Team Europe approach. The Global Gateway[110] is instrumental in the implementation of the roadmaps. The implementation. The implementation of the roadmaps is monitored and updated as agreed with the partner country.

So far, the EU has established partnerships with Canada (June 2021), Ukraine (July 2021), Kazakhstan (November 2022) and Namibia (November 2022). The EU is currently negotiating partnerships with Norway and Greenland. The EU is also participating in a working group on a raw material supply chain track within the EU-US Trade & Technology Council and is cooperating with like-minded countries under the multilateral and US-initiated Minerals Security Partnership (MSP). Building on the existing initiatives, the EU will also work with like-minded partners to establish a Critical Raw Materials Club to ensure the secure, sustainable and affordable globally supply of raw materials essential for the twin transition[111].

At this stage, it is not possible to assess the benefits of this recent strategy. However, by virtue of example, the partnership with Canada is enabling the development of different investment projects which would in turn benefit both the EU and Canada's CRM value chain. For instance, within the context of the pillar on the "Integration of Canada-EU Raw Materials Value Chains", the current ERMA pipeline includes five advanced projects coordinated by Canadian companies in partnership with their European partners, for a total investment value exceeding EUR 2 billion. Four of these projects deal with exploration and mining of primary resources including critical (e.g. lithium and rare earths) and non-critical materials (molybdenum), while the fifth one focuses on the rare earth permanent magnet value chain. Financing solutions are beings sought for four of these projects. In addition, six other projects in exploration, mining and processing are being evaluated, bringing the total investment potential to over EUR 3.2 billion by 2030. Two of the projects are located in Canada and one in Greenland, and all rely on joint technical expertise, machinery and

[110] The European Commission and the EU High Representative have set out the Global Gateway, a new European strategy to boost smart, clean and secure links in digital, energy and transport sectors and to strengthen health, education and research systems across the world.

[111] COM(2023) 62 final, A Green Deal Industrial Plan for the Net-Zero Age

technologies from both Canada and Europe. The other projects are located in Europe, with one of them sourcing its raw materials also from Africa.

In addition, EU makes use of its trade bilateral agreements to deepen trade and investment links with certain partners. These legally binding agreements provide new export and import opportunities by eliminating tariffs and quotas. Some of the EU's trade agreements also have an Energy and Raw Materials chapter with provisions that aim at facilitating trade and investment in the context of CRM supply chains for example by: ensuring a level playing field for EU and domestic operators and facilitating EU companies to invest, such as when applying for an authorisation for exploration or production; by increasing the legal certainty for operating easily an economic activity by limiting the capacity of third countries to introduce trade barriers such as export restrictions, export taxes, export licenses, import/export monopolies or dual pricing as well as by facilitating customs procedures; by improving the legal environment for protecting intellectual property rights; by ensuring the sustained efforts by our trading partners to implement social and environmental international standards.
The recent trade agreements with Mexico, the United Kingdom, New Zealand and Chile already contain a dedicated Energy and Raw Materials chapter.

5.2. Outline of the policy pillars

On the basis of the mapping of problem drivers (see Section 2.2), different pillars were identified that should form part of an initiative aiming to address all the identified problem drivers by achieving the general and specific objectives detailed in section 4. These generally follow a 1-to-1 correspondence, with the exception of the two horizontal pillars (A and B), which provide the overarching scope and objectives of the initiative. These pillars are implemented by different approaches (which, bundled together, compose the three policy options described in section 5.3 and assessed in section 6. The approaches are described in more detail in annex 5.

TABLE 1. OVERVIEW OF OBJECTIVES, DRIVERS AND PILLARS

Objective	Problem driver	Pillar
[horizontal]	[horizontal]	A. Definition of critical and strategic raw materials
		B. Setting strategic raw materials targets
SO1. Increase EU industry's awareness and mitigation of CRM-related risks in the global supply chain	1.1 Lack of systematic monitoring and risk preparedness	C. Governance • C1. Monitoring and risk assessment • C2. Company risk preparedness • C3. Strategic stocks
SO2. Increase the EU CRM value chain's capacity in the internal market	2.1 Insufficient exploration of European mineral resources	D. Exploration
	2.2 Unpredictable and fragmented permitting procedures	E. Support to the value chain • E1. Permitting procedures • E2. Access to finance
	2.3 Difficulty in accessing financing	
	2.5 EU waste legislation does not sufficiently target CRM recovery	F. Waste legislation

	2.6 Lack of high-quality technical standards for CRM-related industrial processes	G. Standards for the critical raw materials value chain
SO3. Reduce the environmental footprint of the EU's CRM consumption	3.1 The market does not take sufficient account of the environmental footprint of CRMs	H. Environmental footprint of critical raw materials

5.2.1. TABLE 3: OVERVIEW OF POLICY APPROACHES PER PILLAR

Pillars	**Policy approach 1**	**Policy approach 2**	**Policy approach 3**
A. Defining critical and strategic raw materials	Legal definition of critical raw materials [discarded at an early stage]	Legal definition of strategic raw materials [discarded at an early stage]	Legal definition of both critical and strategic raw materials
B. Setting strategic raw materials targets	Developing a framework to set EU-level guiding targets for strategic raw materials regarding capacity	Setting EU-level targets obliging the governance structure to work toward them through Strategic Projects proposals (c.f. pillar E) and performance review(	Setting national targets for strategic raw materials based on national resources and existing capacities [discarded at an early stage]
C. Governance	Tasking expert groups RMSG and EIP on raw materials to carry out tasks on monitoring and risk assessment [discarded at an early stage]	Developing a dedicated EU CRM board supported by a network of national agencies and operational capacity within the Commission	Developing an operational capacity as a separate structure to implement the CRM Act's provisions
C.1 Monitoring and risk assessment		Developing monitoring capacities and risk assessment	Approach 2 + Developing monitoring and risk management capacities
C.2 Strategic stocks		Ensuring EU-level coordination and stock assessment for the stockpiling of strategic raw materials	Approach 2 + Enabling the common purchase of strategic raw materials
C.3 Company risk preparedness		Developing requirements on company diversification and stockpiling	Approach 2 + providing direct support to foster companies' resilience

D. Exploration	Requirement for Member States to report on the mapping and evaluation of the strategic (and critical) mineral resources and extractive waste areas in the EU	National requirement to report on, develop and implement national exploration programmes for strategic (and critical) mineral resources and extractive waste.	Approach 2 +Obligation to report to the governance structure on the land use decisions applicable to known deposits containing strategic raw materials
E. Support to the value chain	Requiring Member States to set up strategies to work towards achieving more stable and secure supply of CRM	Developing Strategic Projects, in Europe and partner countries abroad	Developing Strategic Projects with stronger support, in Europe and partner countries abroad
E.1 Permitting procedures	CRM projects to be considered in spatial planning	Approach 1 + Mandatory measures to make permitting for Strategic Projects more predictable	Approach 2 + Require Member States to dedicate sufficient resources to their permitting
E.2 Access to finance	Encourage the setting up of an Investment Platform for the CRM value chain and leverage finance through existing instruments	Approach 1 + Promote and advise the setting up of a dedicated CRM fund to combine Member State funding with contributions from existing EU funds. It should be able to provide loans and equity to projects in all stages of the CRM value chain, in compliance with State Aid rules. Grants could be considered as well, depending on the types of resources available	Approach 1 + Set up a dedicated CRM Fund with new Commission contribution and Member State contribution, managed by governance structure. It should be able to provide loans, equity and grants to projects in all stages of the CRM value chain, in compliance with State Aid rules
F. Waste legislation	Adoption of a Recommendation and announcements of future CRM circularity actions	Approach 1 + Targeted amendment of the Extractive Waste Directive and certain circularity provisions in the CRM Act	
G. Actions on standards for the critical raw materials value chain	Increase efforts to have EU rules and principles reflected in international standards	Approach 1 + Mandate development of standards and standardisation deliverables regarding relevant industrial processes	Approach 2 + Set essential requirements for regarding relevant industrial processes and mandate development of related harmonised standards [discarded at an early stage]
H. Environmental footprint of critical raw materials	Set minimum requirements for certification schemes for sustainable CRMs	Approach 1 + Require declaration of environmental footprint for CRMs sold in the EU	Approach 2 + Putting in place a mechanism for setting performance classes and maximum thresholds

5.2.2. Pillar A – Defining critical and strategic raw materials

At EU level, the Commission currently performs the criticality assessment (described in detail below) and conducts a foresight exercise on critical raw materials used in strategic sectors and technologies. However, the list of critical raw materials currently does not have legal status and only limited implications.

5.2.2.1. Approach 1: Legal definition of critical raw materials, based on the current criticality assessment methodology and covering the whole EU economy

This approach would consist in defining the scope of the regulation and all its measures based on the current criticality assessment methodology. The methodology covers a wide range of economic sectors and would continue to rely on the criteria:

- economic importance (EI), based on the value added of corresponding EU manufacturing sectors and corrected by a substitution index; and
- supply risk (SR), based on supply concentration (at global and EU level, weighted by a governance performance index) corrected by recycling and substitution parameters.

Raw materials exceeding the thresholds set for both criteria are considered at high risk of supply disruption (based on their supply concentration, weighted with governance indicators) and of high economic importance, and would therefore be defined as critical.

5.2.2.2. Approach 2: Legal definition of only strategic raw materials based on multi-criteria analysis including supply and demand foresight and relevance for strategic applications

Under this approach, a new concept of "strategic raw materials" would be introduced. This concept would take into account better the foresight perspective, and provide a stronger focus on applications considered strategic, such as renewable energy, electric mobility, aerospace and defence, digital or medical technologies. The list of raw materials identified as strategic would be enshrined into law and set a narrow scope for the measures proposed under this initiative. It would be shorter than the current list of critical raw materials and would likely overlap with it, but not fully be a subset as some raw materials that are strategically important and likely to face future supply challenges (e.g. copper, nickel and aluminium) are currently too diversified to pass the supply risk threshold of the criticality assessment.

The methodology to define strategic raw materials would build on the data collected for the criticality assessment but apply also more subjective/qualitative factors, notably relevance for strategic applications and forecasted demand growth. It would be applied to the full set of assessed raw materials, not only the ones currently identified as critical. As this would be a new concept and as important data has yet to be gathered, the exact methodology is not yet defined, but the following is a list of the factors considered for inclusion:

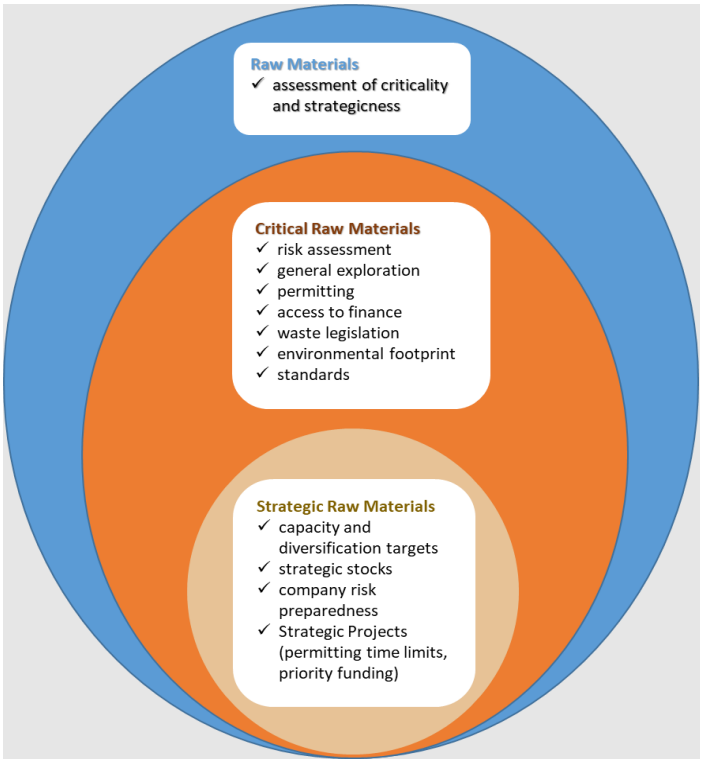
- Relevance for strategic sectors and technologies:
- Future supply and demand forecasts for 2030:
- Production volumes:
- Other potential factors:
    - A governance structure (cf. Pillar C) would monitor a full list of non-energy, non-agricultural raw materials, compiling databases (annually) on current EU production, imports, exports, consumption, recycling etc. for all raw materials.

5.2.2.3. Approach 3: Legal definition of both critical and strategic raw materials, with concentric circles of policy measures' scope

Under this approach, both of the concepts/lists described above would be given legal status. The list of critical raw materials identified based on the above-described criticality assessment would be amended to include all

strategic raw materials identified based on the above-described multi-criteria assessment, such that strategic raw materials would be a subset of critical raw materials. The thus slightly enlarged list of critical raw materials would define the overall scope of the Critical Raw Materials Act

The following figure maps the measures described under other pillars against the set of all screened raw materials, critical raw materials and strategic raw materials:



5.2.3. Pillar B – Setting strategic raw materials targets

5.2.3.1. Approach 1: Developing a framework to set EU-level guiding targets for strategic raw materials regarding capacity

First, this approach would set **headline targets** for the development of EU capacity per strategic raw material by 2030, e.g. the EU is able to meet 30% of its needs for a specific strategic raw material by 2030. Headline targets would be set specifically for strategic raw materials for which the investment needs and potential capacities are more clearly identified, e.g. lithium and rare earths.

Then, to achieve such headline targets, more specific **value chain targets** would be set, where appropriate, for extraction, refining and recycling:

In terms of time horizon, the first value chain targets would be set for 2030, and would have to be announced within one year of entry into force of the regulation. In 2030, following an assessment by the governance structure, new targets would be set for 2040, and similarly for 2050.

When set, the value chain targets would have to take into account:

- Existing EU targets for the deployment of EU renewable energy (Renewable Energy Directive), as it drives the need for green technologies containing strategic raw materials. SRM needs created by defence or digital strategies would also be taken into account.

- Existing recycling targets (recycled content or waste recovery), which could drive the EU's ability to meet EU recycling capacity targets (e.g., in the Batteries regulation
- The geological endowment of Member States and the EU as a whole, as reported in pillar D, for the setting of extraction targets, taking into account the feasibility studies operated by private or public bodies.
- The industrial capacity of Member States and the EU as a whole so as to determine refining/processing and recycling targets.
- The existing and planned projects pipelines, as reported by the relevant industrial alliances as well as by the Member States to the governance structure.
- The expected growth of EU demand for the strategic raw materials on which targets are set.
- The concentration of global supply for the strategic raw material.

5.2.3.2. Approach 2: Setting EU-level targets obliging the governance structure to work toward them through Strategic Projects proposals (cf. pillar E) and performance review

Conversely to approach 1, the targets would be directly set in the Regulation, at different value chain stages. They would be aspirational targets, with a double role:

1) Provide a common objective for public policies and private actors to work toward their achievement;
2) Serve as a criteria for the selection of Strategic Projects, which would have to demonstrate that their future output will serve to develop such targets.

The target levels would be formulated with headline figures, and would ensure that, for each strategic raw material and by 2030,

- Union extraction capacity is able to extract the materials needed to cover at least X % of Union's annual consumption of refined materials, to the extent that the Union's known reserves allow for this;
- Union refining capacity is able to refine at least X % of the Union's annual consumption of refined materials;
- Union recycling capacity is able to produce secondary materials covering at least X % of Union's annual consumption of refined materials;

In addition, compared to approach 1, the Commission would have a formal role in tracking progress towards the targets, based notably on the state of exploration of national resources of critical raw materials; on the advancement of Strategic Projects (cf. Pillar E), and on whether their development is impeded by specific factors, notably permitting bottlenecks, lack of investment, etc.

If it is apparent that EU capacities are not developing sufficiently to meet the EU-wide targets, the Commission would assess the necessity for adopting new measures.

5.2.3.3. Approach 3: Setting national targets in the regulation for strategic raw materials based on national resources and existing capacities

Under this approach, Member States would be imposed country specific targets at different value chain stages for strategic raw materials with a view to decrease the vulnerabilities and to increase the resilience, after the governance structure's initial assessment of their industrial capacity and mineral resources. Those targets would be adopted through delegated act. The Commission would jointly agree, no less than 6 months after the first 2030 review, on a set of measures to unlock the Member State's potential and contribution to achieving the targets.

If, in a subsequent review of the Member State's performance 2 years after the first review, no further progress has been made, the Commission should assess the origin of this lack, notably to determine the origin of it. In

the event where permitting bottlenecks are the concern, the Member State would be compelled to review its permitting procedures and allocate sufficient resources to the public authorities in charge.

5.2.4. Pillar C – Governance structure

This pillar seeks to enable the EU to increase its ability to foresee and mitigate structural supply shocks before they materialise, notably by enabling Member States and companies to build up their resilience through appropriate tools. The scope, depth, speed and efficiency of such tools are inherently linked to the governance structure that would be charged with carrying out the tasks specified in the subsequent (sub)pillars (C.1, C.2, C.3) on monitoring and risk-assessment, strategic stocks and risk preparedness. Therefore, the approaches proposed are bundled together as part of options 1, 2 and 3, and the resources are adapted according to the scope of the tasks proposed.

5.2.4.1. Approach 1: Tasking expert groups RMSG and EIP on raw materials to carry out tasks on monitoring and risk assessment

Under this approach, the Commission would rely on its existing expert groups (RMSG, EIP on RM) to develop relevant tasks on monitoring and risk assessment. The relevant experts would meet at technical level fora focusing discussion and exchanges on structural issues pertaining to the critical raw materials value chain, providing advice to the Commission on different pillars.

5.2.4.2. Approach 2: Developing a dedicated EU CRM board supported by a network of national agencies and operational capacity [within the Commission]

Under this approach, the Commission would propose to set up a EU CRM board composed by representatives of Member States and the Commission. This board would be in charge of building on the existing resources within the Commission and Member States administration to carry out the tasks described in the subsequent pillars (C1, C2, C3). Based on the contributions of the actors below, the board would issue advice to the Commission on particular actions, such as on defining strategic raw materials and setting targets for them on EU supply capacity and EU diversification, as well as on building up strategic stocks, and on proposing Strategic Projects (as per pillar G and K). The board would adopt its rules of procedure at its first meeting and the Commission would provide a common secretariat for the board and the network described below.

For tasks pertaining to the definition of strategic raw materials and their targets, as well as regular market monitoring and forecasting for the selected raw materials, the board would rely on the secretariat with intelligence capacity and a network of national ~~supply~~ agencies established by the regulation. Member States would appoint representatives from the relevant authorities, and their national intelligence or other relevant raw materials agencies. In the event where a Member State would not have a national supply and intelligence agency on critical raw materials or equivalent, it would nominate a representative from the authority in charge of geological or mineral resources. The Member State would also be encouraged to gather the necessary resources for assessing its own territories and developing its expertise in the sector.

Approach 3: Developing an operational capacity as a separate structure to implement the CRM Act's provisions

This approach would consist of creating a full-fledged operational capacity on critical raw materials, that is external to the Commission itself and is set on a permanent basis rather than relying on regular cooperation of Member States and European capacities as provided by the board and network under approach 2.

There are different formats that this operational capacity could take, such as the creation of a dedicated decentralised EU agency on critical raw materials or the creation of a dedicated directorate on critical raw materials in an existing agency.

The operational capacity would ensure the exchange of information, cooperation and coordination with the relevant governance bodies that deal with the vigilance and crisis response for raw materials.

5.2.5. Pillar C.1 Monitoring and risk assessment

5.2.5.1. Approach 2: Developing monitoring capacities and risk assessment

This approach would define precise monitoring tasks that would be carried out by the EU CRM board (i.e. the governance structure set out in approach 2 of Pillar C). The approaches 2 and 3 develop a more comprehensive and permanent framework dedicated to critical and strategic raw materials, ahead of crisis, while taking the instruments proposed in the SMEI into account (c.f., early warning mechanism, in approach 2).

Scope: With the support of the Commission, the board, with the support of the network, would develop a market monitoring capacity related to the critical raw materials industrial value chain, focussing on risks that may disrupt, compromise or negatively affect the supply of critical raw materials.

Means and actions: Through the network, the board would ensure to the best extent possible the coordination of research activities of national agencies on a specific material or value chain and the subsequent knowledge sharing amongst them in order to avoid overlap and gain added value in depth and knowledge. To develop such capacity, there is a parallel need to ensure information sharing from Member States and companies operating in the CRM value chain.

Deliverables:

First, this monitoring would feed into the determination of critical and strategic raw materials, that the Board would propose to the Commission (c.f. Pillar A) and would better inform subsequent policy decisions. It would be used to publish more regular information on monitoring through the publication of regular reports on the state of critical and strategic raw materials supply chain. The Commission would develop and run stress test of strategic raw materials value chain to estimate the likelihood and impacts of a future disruption (model-based, scenario-based, exercises with participating companies).

5.2.5.2. Approach 3: Developing monitoring and risk management capacities

In addition to the monitoring and general risk assessment provided by approach 2, this approach would ensure the development of targeted risk assessment as well as of risk management tools, thereby supporting the resilience of European companies.

Means and actions: Targeted risk assessment would be carried out by the operational capacity (cf. approach 3 of Pillar C) which would:

- **Conduct real time monitoring** of the CRM value chain (screening of news reports, business intelligence, high-frequency customs data),
- **Conduct direct stress tests** on strategic raw materials value chain at a more frequent pace, coordinating with Member States supply agency but with additional capacity to run them itself ;
- **Develop an Early warning mechanism (EWM)**: based on the monitoring, information gathering and stress test, the operational capacity would develop a EWM that indicate that a strategic raw material is at risk of imminent shortage or disruptions.

In addition to the coordination and information sharing tasks mentioned in approach 2, this approach would include **information request** from large companies operating in a strategic raw materials value chain in order to ensure a higher degree of information on the state of supply chains.

5.2.6. Pillar C.3 Companies' risk preparedness

5.2.6.1. Approach 2: Developing requirements on company diversification and stockpiling

Under this approach, specific requirements would be set on companies to ensure their preparedness and resilience. Under those requirements, large companies (>250 staff) which consume strategic raw materials as a primary input for their production would have to comply with at least one of the following obligations:

1) Ensuring a diversified source of suppliers if it relies on strategic raw materials (when the market structure allows);
2) Ensuring a sufficient level of strategic stocks of strategic raw materials equal to 60 days of consumption;

If they cannot ensure and demonstrate their adherence to one of those measures, companies would have to then report to the Member States in which they are established explaining the reasons for their non-compliance.

Those companies would also have to develop an in-depth audit of their supply chain under the form of a stress test, to assess regularly their vulnerability under different supply scenario and the suitability of their risk mitigation strategies.

Member States would be responsible for ensuring the implementation of these obligations.

5.2.6.2. Approach 3: Developing requirements on company diversification and stockpiling while providing direct support to foster companies' resilience

This approach would contain the measures developed in approach 2. In addition, to enable large companies to meet these obligations and to support SMEs in undertaking such efforts (even if SMEs would not face those obligations), this approach provides that the operational capacity advise companies on relevant strategies to enable them to mitigate supply chains risks. This support model could be defined in the legislation laying out the operational capacity's tasks.

Such advisory structure, inspired by the services some national agencies offer to companies, would allow for all EU companies operating across the critical raw materials value chain to benefit from direct advice.

5.2.7. Pillar C.2 Strategic stocks

5.2.7.1. Approach 2: Ensuring EU level coordination and stock assessment for the stockpiling of strategic raw materials

This approach would develop a mechanism to ensure higher coordination of strategic stockpiles amongst EU Member States, following the steps presented below.

1) After the establishment of the list of strategic raw materials, **Member States would be required to report** (with the highest level of confidentially and security) to the Commission on the organisation and on the state of their stockpiles for the strategic raw materials.

2) The Commission **would review the common state** of stockpiles and assess the potential convergences and overall levels of stockpiles across the EU, against a benchmark of what is considered as a safe level of stockpiling.

3) A review of the state of play and implementation of the Commission's recommendation would take place regularly occur to monitor progress. The SMEI framework, including the definition of targets under the mechanism set in the vigilance mode, and the coordinated release under the Single Market emergency phase, could still apply to critical and strategic raw materials in the event of a crisis or threat.

5.2.7.2. Approach 3: Enabling the common purchase of strategic raw materials

In addition to approach, this approach would mean that the operational capacity would foster the development of stockpiles of strategic raw materials. Based on the needs expressed by interested companies, the operational capacity (cf. approach 3 of Pillar C) would purchase through a joint procurement mechanism, appropriate quantities of strategic raw materials.

The interested companies would be financing the purchase of the stockpiles, as they are voluntary, albeit at lower costs given the fact that common purchasing would enable marginal saving. In addition, it would have to be assessed whether any financial instrument developed in pillar E.2 would be able to de-risk companies engaged in stockpiling by contributing to this mechanism.

5.2.8. Pillar D – Exploration efforts in the EU

The approaches developed below cover the early stages of the exploration activities related to mineral resources. They aim to enable further exploration activities by ensuring additional coordination or availability and reliability of data.

5.2.8.1. Approach 1 - Requirement on Member States to report on the mapping and evaluation of the critical raw material resources and extractive waste areas in the EU

With this approach, Member States would have to periodically report on the exploration activities carried by public entities and non-confidential information of exploration activities carried by companies, targeting critical raw materials.

This includes, but not only, existing public exploration programmes of mineral resources, targeting primary deposits (either currently or historically exploited or not) and/or secondary deposits (extractive waste of closed or abandoned facilities). Information on secondary resources should consider the volume, grades, mineralogy, technology feasibility and characteristics of the deposits, when available.

Member States would also have to periodically report, using the UNFC classification system, on results from public and private exploration activities (when available) that have already estimated mineral resources (measured, indicated or inferred) or reserves (proven or probable) according to existing national or international reporting codes.

5.2.8.2. Approach 2 – Requirement on Member States to report on, develop and implement national exploration programmes for critical raw material resources and extractive waste.

Under this approach, Member States would be compelled to implement identified actions, even if the extraction or reprocessing of extractive waste is not part of their industrial or economic strategy. The development of the knowledge produced would then be available for future generations and enable the development of the EU critical raw materials value chain.

- **Develop and implement public exploration programmes**

Member States would have to develop and implement programmes for the public exploration of mineral resources. The public exploration campaign would include geological mapping at a suitable scale, thematic mapping in particular hydrothermal alteration and structural maps, geochemical campaigns of soils, sediments, rocks and extractive waste, aerial geophysical surveys.

- **Reporting on critical raw material resources and extractive waste areas in the EU**

With this approach, Member States would have to periodically report on the exploration activities carried by public entities and non-confidential information of exploration activities carried out by companies, targeting critical raw materials. This includes, but not only, public exploration programmes of mineral resources, targeting primary deposits (either currently or historically exploited or not) and/or secondary deposits (extractive waste of closed or abandoned facilities).

- **Reprocessing existing geochemical and geophysical data sets**

Member States hold substantial repositories of raw geochemical and geophysical data from past public exploration campaigns or acquired in the context of past exploration permits. This data, together with new data acquired through public exploration programmes, could be reprocessed with new and innovative algorithms and processing methodologies. Under this approach, Member States would be compelled to develop and implement adequate policies to reprocess existing and newly acquired geochemical and geophysical data.

- **Developing predictivity maps**

Member States would be compelled to develop and implement adequate policies, such as a dedicated programme, to produce and update predictivity maps for critical raw materials in order to improve the knowledge of the mineral potential present in the EU.

- **Publication of data**

The results of the exploration activities promoted by Member States through the actions presented above, would have to be periodically reported to the governance structure.

Finally, this approach would, alike approach 1, encourage Member States to take due account of the occurrence of mineral resources containing critical raw materials (c.f., pillar A) when taking measures regarding land use that might affect the exploitability of the deposits.

5.2.8.3. Approach 3: Obligation to report to the governance structure on the land use decisions applicable to known deposits containing strategic raw materials

In addition to approach 2, approach 3 would require Member States to inform other EU countries and the Commission through the governance structure of their intention to adopt a land use decision that would affect the potential to exploit of a known mineral deposit containing strategic raw materials, allowing for comments and discussion in the relevant fora.

5.2.9. Pillar E – Support to the value chain

5.2.9.1. Approach 1: Requiring Member States to set up strategies to contribute to a stable and secure supply of CRMs

Under this approach, each Member State would be required to create a strategy outlining the ways and timeline how it can contribute towards achieving a more stable and secure supply of CRM in the EU, by identifying and supporting projects that are important across the CRM value chain. No specific legal notion of strategic projects would be established under this approach.

5.2.9.2. Approach 2: Identify Strategic Projects, in Europe and partner countries abroad

Under this approach, Strategic Projects would be established with legal consequences regarding permitting and access to finance as outlined in pillars E.1 and E.2.

Companies and investors, would be able to submit their proposals to the Commission. To be eligible, projects would have to fulfil general minimum criteria, among them a meaningful contribution to the targets set under Pillar B, positive spill-over effects beyond the Member State where they are located and a positive outlook regarding long-term economic viability. The governance structure might apply more specific criteria per step of the value chain for each raw material mentioned in the list of targets.

a business plan evaluating the financial viability of the project, including an overview about the secured funding and the remaining financing needs and estimated time-to-market.

an assessment of the level of public acceptance of the project and, where relevant, a plan for ensuring it, including actions (additional to what is already required) such as awareness campaigns to educate and inform the public of the importance of CRMs for the green transition and how these CRMs could be obtained in the EU in a responsible way or setting up mitigation and compensation mechanisms to ensure that the project contributes to the general development of the relevant area.

The Commission would then share the application with the Member State where the project is intended to take place and ask for its general approval within one month for the project to receive the status of Strategic Project. Where it refuses, it would have to present its substantiated reasoning to the Commission who could request the Board to discuss these reasons. Where the Member State accepts, the Commission would check the application for the fulfilment of the minimum criteria. In case of many applications, the Commission would be able to prioritise applications for projects active on specific parts of the value chain in order to work towards a balanced representation of projects along all strategic raw materials along the value chain. The Commission would then assess the projects in consultation with the Board. For projects that fulfil the criteria, the decision to assign them the status of Strategic Project, this would be published as a Commission decision.

Projects outside of the EU could also be labelled as Strategic Projects. To be eligible, those projects would also have to fulfil general minimum criteria, among them high environmental and social performance and contribution to the targets laid out in pillar B. They would also need the support of one or more European companies that have committed to purchase at least e.g. 50% of the production of the respective strategic raw materials for e.g. 180 months for use in Europe. The projects should in principle be located in countries with which the EU has concluded a Free Trade Agreement with a chapter on raw materials or a Strategic Partnership. To ensure compliance with ESG criteria, the project would need to show sufficient evidence that it would qualify for a recognised certification scheme, if recognised. Otherwise, the same process would apply. The respective third country would be closely involved to ensure compliance on the ground. The board might also coordinate with the Global Gateway governance, which could help leverage EU Member States funds for projects outside the EU.

5.2.10. Pillar E.1 – Permitting procedures

Raw materials operations in the EU are subject to a comprehensive legislative framework that is meant to minimise a project's adverse environmental impacts and ensure involvement of all relevant stakeholders in the permit-granting process. This framework is an essential achievement, which this initiative should build on. However, the unpredictability of permitting procedures in terms of duration and outcome has been shown to discourage much-needed investment into the European raw materials value chain. Against this background, this section sets out different possible approaches to speeding up permitting processes and making them more predictable.

5.2.10.1. Approach 1: CRM projects to be considered in spatial planning

Intervening in an early phase, well-designed spatial planning has the potential to reduce land use conflicts and point project developers to suitable sites, which in turn is likely to accelerate permit-granting procedures. Analogous to Union legislation on the deployment of renewable energies, therefore, Member States'

competent national authorities at national, regional and local level would be required to take into consideration and provide for the realisation of CRM projects when developing spatial plans.

Given the potential effects on the environment of CRM projects, Member States should, when developing those spatial plans, apply the Strategic Environmental Assessment (SEA) Directive[11].

5.2.10.2. Approach 2: Mandatory measures to make permitting for Strategic Projects more predictable

This approach includes the measures set out in Approach 1.

In order to ensure a secure investment climate for Strategic Projects (see Pillar G) in particular, a general requirement would be set for Member States to ensure that administrative procedures for their approval are streamlined and expedited at the appropriate administrative level.

In order to put such streamlining into practice, Member States would also be required to take the following concrete measures in relation to Strategic Projects:

- allocating the status of the highest national significance possible under national law to Strategic Projects for the purpose of permit granting processes;
- applying a joint procedure combining all relevant assessments for a given project;
- designating a 'one-stop shop', in the form of a competent authority which should be the sole point of contact for project promoters during the entire process
- adhering to specific time limits for different stages of the permit granting procedure;
- allowing documents to be submitted digitally;
- making available a manual of procedures for project developers.

As regards the duration, there would be an overall time-limit set for overall permit granting procedure (covering the period from the date of acceptance of the submitted application file until a comprehensive decision) for Strategic Projects (e.g. 18 months).[112] More specific time limits would also be introduced pertaining to specific steps of the permitting process.

The above-mentioned time limits would be without prejudice to potential delays caused by judicial or non-judicial appeals. However, Member States would be required to, where available under national law, apply urgency procedures for possible litigation related to the permit granting process.

Lastly, this approach would provide direction to Member States on the application of substantial permitting conditions. The nature protection rules that are integral part of the relevant permitting conditions (i.e. the Birds, Habitats and Water Framework Directives) provide that projects considered to be in the overriding public interest can be allowed to go forward even in the case of limited adverse impacts on the environment.

5.2.10.3. Approach 3: Require Member States to dedicate sufficient resources to their permitting

This approach includes the measures set out in Approach 1 and 2.

It would also introduce a requirement on Member States to dedicate sufficient resources to permitting procedures for Strategic Projects. Following the example similar provision in the field of competition and consumer protection law, Member States would, more in particular, be required to ensure that responsible

[112] Similar to the time limit included in the TEN-E Regulation for cross-border energy infrastructure projects (18 months) or the RED II Directive for renewable power plants (24 months).

authorities have a sufficient number of qualified staff and sufficient financial, technical and technological resources necessary for the effective performance of their functions.

5.2.11. Pillar E.2 – Access to finance

5.2.11.1. Approach 1: Encourage setting up of Investment Platform, leveraging finance through existing instruments

Under this approach, no new funding instruments outside the possibilities of the current framework would be established, but the Commission would work towards an extended use of the existing possibilities and to tie them as closely as possible to the Strategic Projects. This would include fostering the setting up of an investment platform under InvestEU, which specifically supports CRM projects. This would require an Implementing Partner that has a valid Guarantee Agreement with the Commission (e.g. the Agreement with the EIB that administers 75% of the Commission's guarantee allows to fund raw materials projects), which enables the EU guarantee and helps attracting additional funding from private and public sources. Under InvestEU a wide variety of financial instruments can be provided, for example loans, equity or hybrid products. An InvestEU Advisory Hub on CRM would be set up to support provide technical assistance and advisory services to project promoters (as well as financial intermediaries), including for the creation of the investment platform. Additionally, the use of other existing funds for domestic use (RRF, Innovation Fund, Cohesion Funds, etc.) should be promoted and fostered for these projects. For CRM projects abroad funds aiming at international spending would be used (NDICI, EFSD+, IPA, etc.).

5.2.11.2. Approach 2: Dedicated CRM Fund with Member State contributions and limited EU contribution from existing sources

In addition to approach 1, the Board, with a dedicated standing sub-group consisting of financial experts from the Member State as well as the Commission, would provide support to Strategic Projects in access to finance. It would point to existing sources that could provide funding, including on level of the Member State, international financial institutions, national promotional banks and the Union.

The support from public sources would be applied to crowd-in private money and increase the leverage. It would focus on filling the remaining gap where the market struggles to finance it due to market failures.
Despite these efforts, significant gaps would persist in the funding landscape. For example, cohesion funding provides only limited opportunities for investment in wealthier regions of the EU, where geological resources for extraction, or energy availability for refining may be better; most other relevant funds are directed either at innovative projects or projects directly contributing to positive environmental and climate impacts (without considering the role of CRMs in enabling clean technology). Importantly, current funding conditions do not address strategic autonomy as a goal (even though the Trade Policy Review and other official strategy papers have endorsed this concept) while investments in areas such as CRMs are essential for this objective. An important project about, for example, rare earth extraction in the north of Sweden would therefore still struggle to attract funding.

Where public support qualifies as State Aid, existing State Aid rules would be respected. The support from public sources would be applied to crowd-in private money and increase the leverage. It would focus on filling the remaining gap where the market struggles to finance it due to market failures. Supported projects would also need to show their long-term economic viability under functioning market conditions, the aim would not be to support that permanently require operational support.

Therefore, the Commission would work with interested Member States to set up a dedicated CRM Fund to further support CRM projects, including Strategic Projects. This Fund would require Member State contributions and a contribution of existing EU sources to leverage this money with private financing[113].

To ensure the European dimension and to get closer to closing the large investment gap as shown in the access to finance part of the problem section, existing European resources would also be used. The necessary mix of different financial instruments would depend on the project's specificities, notably the stage of the value chain (e.g. risk capital, loans). The Fund's purpose would be to support the CRM value chain in Europe and partner countries abroad, in particular Strategic Projects, and to generate a return on investment. The Fund should be able to provide loans and equity to projects along the entire CRM value chain, focussing on Strategic Projects. Grants should also be considered but depend on the type of financial resources and set up of the Fund.

The support from public sources would be applied to crowd-in private money and increase the leverage. It would focus on filling the remaining gap where the market struggles to finance it due to market failures. Supported projects would also need to show their long-term economic viability under functioning market conditions, the aim would not be to support that permanently require operational support.

5.2.11.3. Approach 3: Dedicated CRM Fund with additional Commission contribution and Member State contribution

In addition to approach 1, the Commission would set up a dedicated CRM Fund that combines new EU money with Member State contributions, leveraging private investments to support CRM projects along the value chain in Europe and abroad, prioritising Strategic Projects. It could be managed by the governance structure (i.e. the board or operational capacity, cf. Pillar C). The CRM Fund would be able to provide loans, equity and grants for investment support, in compliance with State aid rules.

This Fund would provide a common European approach to funding CRM projects. With the appropriate endowment, it would be able to provide more and riskier financing, and could also be less bound by profitability considerations and operate more freely (compared to the fund considered under approach 2) to effectively address proven market failures.

5.2.12. Pillar F – Waste legislation

5.2.12.1. Approach 1: Adoption of a Commission Recommendation targeting small consumer electronics and announcements of future CRM circularity actions

- The Commission would adopt (as part of the CRM Act package) a Recommendation on take-back schemes for small consumer electronics, to improve the return of used and waste mobile phones, tablets and laptops, which contain significant amounts of critical raw materials.
- The Communication accompanying the CRM Act would announce that the upcoming (Q2 2023) joint review of the Directive on end-of life vehicles and the Directive on the type-approval of motor vehicles with regard to their reusability, recyclability and recoverability (3R) will include provisions to support recovery of CRMs from end-of-live vehicles and use of recycled CRM content in new vehicles.
- The Communication accompanying the CRM Act would announce (for Q1 2024) upcoming secondary legislation under the current WEEE Directive to amend its Annex VII on selective treatment for materials and components of WEEE to include a list of CRM-rich electrical and

[113] Depending on the design and governance of the upcoming Fund, its support may qualify as State aid, in which case State aid rules will apply.

electronic equipment and components thereof. It would also announce the launch of a preparatory study for the identification of such CRM-rich EEE and components.

- The Communication accompanying the CRM Act would announce an upcoming review of the WEEE Directive, assessing possibilities of introducing information requirements (on CRMs contained in electrical and electronic equipment), design requirements (for dismantlability of CRM-rich components) – in synergy with Ecodesign provisions – and separate collection and recovery targets for a list of CRM-rich electrical and electronic equipment.
- The Communication accompanying the CRM Act would announce actions to introduce EU end-of-waste criteria for the most important waste streams containing CRMs.
- The Communication accompanying the CRM Act would announce (for Q2 2024) a proposal to introduce specific waste codes for Lithium-ion batteries and intermediate waste streams ("black masses") under the European List of Waste.
- The Communication accompanying the CRM Act would announce (for Q2 2023) the launch of an Ecodesign preparatory study on potential product-specific requirements on recycled content and on scarce, environmentally relevant and critical raw materials, which would be followed up by implementing measures. It would also note the possibilities to set relevant requirements for CRM-rich products under the proposed Ecodesign for Sustainable Products Regulation.

These measures would need further analysis in dedicated assessments.

5.2.12.1.1. Approach 2: Targeted amendment of the Extractive Waste Directive and certain circularity provisions in the CRM Act

- The Commission would adopt (as part of the CRM Act package) an amending Directive to the Extractive Waste Directive, to introduce targeted changes aimed at increasing CRM recovery from extractive waste. The two main measures would be to require:
    1. operators of extractive waste sites to perform an economic pre-feasibility study of the potential to recover CRM from the extractive waste generated (as part of the waste management plans under Article 5), and
    2. Member States to create a database of all closed extractive waste sites, search administrative records and perform geochemical sampling to identify quantities and concentrations of CRMs on these sites, and publish such information in order to encourage CRM recovery projects on those closed waste sites.

The CRM Act would include an obligation for Member States to develop national circularity strategies, addressing areas of national competence, such as waste collection and treatment systems, national R&I programmes for CRM recycling technologies and CRM substitution, and to gather data on the most important product and waste streams and stocks containing CRMs on their territory.

5.2.13. Pillar G - Actions on standards for the critical raw materials value chain

5.2.13.1.1. Approach 1: Increase efforts to have EU rules and principles reflected in international standards

This approach would include several actions to leverage this position specifically in relation to critical raw materials, with the aim of ensuring that the principles and values underlying relevant EU legislation are reflected in international technical standards on CRMs, especially standards for ensuring the sustainability of industrial processes involved in the CRM value chain.

This approach would promote a more strategic and coordinated approach to international standardisation activities by helping Member States, EU standardisation bodies and EU industries more effectively coordinate and share resources in support of international standardisation processes.

5.2.13.2. Approach 2: Mandate development of standards regarding relevant industrial processes

In addition to approach 1, this approach would look beyond the EU's contribution to international standardisation efforts by also providing direct support for the development of European standards and standardisation deliverables on the sustainability of CRM-related industrial processes.

Based on the priorities set by the HLF and ERMA working groups, the Commission would request CEN to develop e,g, technical specifications, technical reports, workshop agreements or European standards.

The development of standards following the mandate provided by the Commission to standardisation bodies is likely to take up to three years.

5.2.13.3. Approach 3: Set essential requirements regarding relevant industrial processes and mandate development of related harmonised standards

In addition to approach 1, this approach would include the setting of essential requirements related to the sustainability of CRM-related industrial process, e.g. on the water use and resource efficiency of extraction and recycling processes for lithium. Following a similar approach to the New Legislative Framework, the Commission would issue standardisation mandates for CEN to develop harmonised European standards, providing a presumption of conformity with the requirements to which they are linked.

In addition to operationalising such requirements (allowing responsible economic operators to more easily apply them and competent authorities to more easily enforce them), the creation of harmonised European standards would provide an even stronger basis for European leadership in international standardisation fora.

5.2.14. Pillar H – Environmental footprint of critical raw materials

5.2.14.1. Approach 1: Set minimum requirements for certification schemes for sustainable CRMs

This approach focusses on the reliability of general environmental claims (e.g. 'this lithium was produced using sustainable practices') made by operators selling CRMs on the EU market. The availability of specific qualified information on the environmental footprint is addressed in Approach 2 below

5.2.14.2. Approach 2: Require declaration of the environmental footprint of CRMs sold in the EU

In addition to approach 1, this approach would entail requiring economic operators to declare the environmental footprint of CRMs they sell on the EU market, as a market access requirement. This will help bring about transparency on the environmental footprint of CRMs and help shift the Union market towards lower impact CRMs, regardless of where they are produced.

This requirement would only apply for CRMs for which there are material-specific calculation rules available. Before mandating the rules for the calculation of the environmental footprint of CRMs, a consultation process with industry and Member States seems necessary to fine-tune those rules and clarify how they will be maintained over time. The material-specific calculation rules would therefore be provided by means of implementing acts prioritising CRMs with relatively higher demand and environmental impacts.

Given the wide variety of environmental profiles of the different CRMs, the Commission would be empowered to, when specifying calculation rules, allow the footprint declaration to be limited to one or a subset of impact categories where this is justified based on the environmental profile of the different materials

The calculation rules would be based on the Product Environmental Footprint (PEF) method.[1]

The requirement would in principle not apply to final products containing relevant CRMs. However, where the footprint of CRMs included in product is specifically referenced in any relevant product documentation, it would be required to justify that claim and refer to the declared footprint of the CRMs used.

5.2.14.3. Approach 3: Putting in place a mechanism for setting performance classes and maximum thresholds for environmental footprint

In addition to approach 1 and 2, this approach would consist in introducing a mechanism to set footprint performance classes to further support market differentiation and the setting of maximum footprint thresholds for specific CRMs placed on the EU internal market. Such measures could have adverse effect on the security of supply for CRMs. Therefore, in light of this risk and in order to avoid any negative effect on supply security, the following measures would be gradual, progressive and evidence-driven. Indeed, for each maximum footprint threshold, there should be dedicated assessments conducted.

This approach would contain the following gradual steps: First, as there is not yet sufficiently detailed statistical information on the relative footprints of CRMs, the Commission would gather such information through the declarations proposed in approach 2 through secondary legislation. Second, once sufficient market knowledge is acquired through step 1, relevant CRMs would be categorized in an A-G scale based on their footprint. Third, a threshold would be identified, which would correspond to correspond to the limit values of the lower or lowest classes in the performance class scale.

The introduction of maximum thresholds the third step would only be possible when accompanied by a proportionate and dedicated assessment, which would take into account the relative distribution of the footprint values for the relevant CRMs placed on the Union market, the extent of progress in the reduction those footprints as a result of the information requirement referred to in approach 2, and the effective and potential contribution of a threshold to the Union's environmental and climate objectives. In addition, this assessment would take close account of the potential effects of thresholds on EU imports of the relevant CRMs, ensuring that the level of the thresholds is set so as to prevent potential bottlenecks for EU supply of CRMs.

This approach would steer relevant economic operators to reduce the environmental footprint associated with their CRMs and would ban from the market those materials with the relative highest footprint. Economic operators should be given sufficient time to adjust their production facilities.

As explained, this measure would need further analysis in dedicated assessment.

Interaction of approach 2 and 3 with other initiatives: The measures outlined in approaches 2 and 3 related to the environmental footprint of CRMs are in full coherence with existing initiatives related to the life-cycle impacts of products and materials, and would help contribute to achieving similar environmental aims.

Batteries Regulation: the recently adopted batteries regulation contains similar measures, focusing on the carbon footprint of larger batteries placed on the EU market, i.e. combining information requirements with potential thresholds to be set gradually. Such batteries include several critical raw materials, including lithium and cobalt, and the footprint of such materials would be included in a battery's overall footprint. Footprint requirements on critical raw materials contained in batteries add value for several reasons. Firstly, they would apply also to CRMs sold on the EU market for other applications than battery manufacturing.[114] Secondly, a material-level footprint would also cover the EU market for battery materials used to produce batteries intended for export (to which the Battery Regulation does not apply). Lastly, the availability of footprint

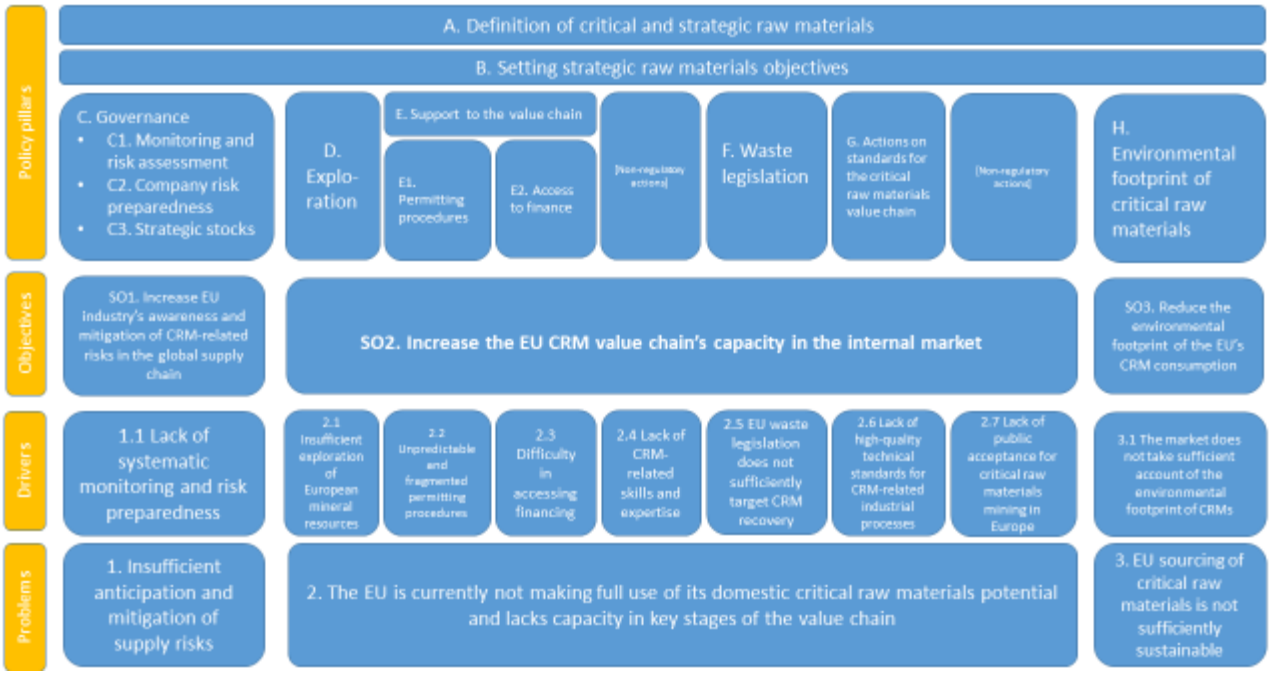
[114] Globally, 56% of lithium is used for rechargeable batteries, other primary uses are within the glass- and ceramics industry and for lubricating greases. Similarly, 49% of cobalt is used for rechargeable batteries. Other uses of cobalt are in superalloys and composite materials for e.g. turbine engines and cutting tools. See https://ecodesignbatteries.eu/sites/ecodesignbatteries.eu/files/attachments/EDbatteryFollowupWP4finalpreprint.pdf

information will be beneficial for battery manufacturers that need to calculate the footprint of their batteries intended to be placed on the EU market. Both sets of calculation rules are intended to be based on the PEF method and it should be ensured that they are complementary.

Ecodesign for Sustainable Products Regulation (ESPR): the proposed revision of the current ecodesign directive is intended to widen its scope beyond energy-related product to allow the setting of wide range of requirements on a broad range of products, in order to improve their environmental sustainability, and provides for the introduction of a Digital Product Passport. Although the product parameters to be regulated (either by information or performance requirements) should be determined at product-specific level, the possible parameters include the carbon and environmental footprint of products. However, it is important to note that the ESPR is proposed to focus only on final products (e.g. fridges) and intermediate products (e.g. steel). As such, it does not allow to set footprint requirements for CRMs. Where the ESPR imposes a footprint requirement on a product containing CRMs for which a footprint requirement also applies, the material-level footprint information can feed into the product level footprint calculation.

Corporate Sustainability Due Diligence Directive (CSDD): The CCSD applies only to companies of certain size, including those active in the raw materials sector, and requires companies and their directors to, *inter alia* set up due diligence processes that should include identification and prevention actual or potential adverse human rights and environmental impacts in the company's own operations, its subsidiaries and its value chains. This initiative may not lead to the availability of complete product-level footprint information as the scope of environmental impacts to be taken into account is determined by a list of relevant international treaties, and does not encompass all PEF impact categories. However, where relevant, the calculation of a material-level footprint could contribute to the effective implementation of a due diligence policy.

Carbon Border Adjustment Mechanism (CBAM): The recently adopted CBAM is intended to address greenhouse gas emissions embedded in certain carbon intensive imported goods, in order to prevent the risk of carbon leakage. CBAM was designed to function in parallel with the EU's Emissions Trading System (EU ETS), to mirror and complement its functioning for imported goods. Given this specific aim, CBAM will not lead to making the footprint of all relevant goods placed on the EU transparent nor will there be any thresholds for embedded emissions. In addition to this fundamental difference, it should be noted that the current scope of the CBAM does not include an CRMs and that the CBAM only focusses on a single PEF impact category (climate change).



5.3. Description of the policy options

The approaches for each pillar were used to define realistic policy options, which represent combinations of different approaches.

In order to avoid an unmanageable multiplicity of options, measures were combined into the three distinct options that represent different levels of political ambition. The combination of measures has been designed to ensure adequacy between the scope of the tasks established and the level of resources required to perform them. The tasks defined in monitoring, stockpiling or companies' risk preparedness pillars, for example, are intrinsically linked to the governance structure's ability to deliver them, and are therefore more ambitious under option 3 which foresees the creation of an external operational capacity to perform them. This is meant to avoid the risk of under-implementation of the measures presented.

For some of the pillars, the choice of the preferred policy approach is straightforward considering the stakeholders' feedback, proportionality and subsidiarity of measures. In such cases, some of the approaches are not included in any of the options, and annex 5 explains for each of them why they were discarded at an early stage. For others, in particular for far-reaching measures, the views of different stakeholders including Member States and businesses differ, hence the different approaches for these blocks have been included in the different policy options.

For the reasons provided in the Section 5.1, the measures presented below mainly focus on European value chain; global value chain of critical raw materials remain nonetheless covered by dispositions on monitoring or on environmental footprint.

The overview of the composition of the policy options resulting from the analysis in section 5.2 is presented in the table below. These three policy options will be analysed in detail in section 6.

TABLE 2. OVERVIEW OF POLICY OPTIONS			
Pillars	**Policy option 1**	**Policy option 2**	**Policy option 3**
A. Defining critical and strategic raw materials	*Approach 3:* Legal definition of both critical and strategic raw materials		

B. Setting strategic raw materials targets	*Approach 1:* Developing a framework to set EU-level guiding targets for strategic raw materials regarding capacity	*Approach 2:* Setting EU-level targets obliging the governance structure to work toward them through Strategic Projects proposals (c.f. pillar G) and performance review	
C. Governance	*Approach 2:* Developing a dedicated EU CRM board supported by a network of national agencies and operational capacity within the Commission		*Approach 3:* Developing an operational capacity as a separate structure to implement the CRM Act's provisions
C.1 Monitoring and risk assessment	*Approach 2:* Developing monitoring capacities and risk assessment		*Approach 3:* *Approach 2* + Developing monitoring and risk management capacities
C.2 Strategic stocks	*Approach 2:* Ensuring EU level coordination and stock assessment for the stockpiling of strategic raw materials		*Approach 3:* *Approach 2* + Enabling the common purchase of strategic raw materials
C.3 Company risk preparedness	*Approach 2:* Developing requirements on company diversification and stockpiling		*Approach 3:* *Approach 2* + providing direct support to foster companies' resilience
D. Exploration efforts in the EU	*Approach 1:* Requirement for Member States to report on the mapping and evaluation of the strategic (and critical) mineral resources and extractive waste areas in the EU	*Approach 2:* Requirement for Member States to report on, develop and implement public exploration programmes for strategic (and critical) mineral resources and extractive waste.	
E. Support to the value chain	*Approach 1:* Requiring Member States to set up strategies to work towards achieving more stable and secure supply of CRM	*Approach 2:* Strategic Projects, in Europe and in third countries	
E.1 Permitting procedures	*Approach 1:* CRM projects to be considered in spatial planning	*Approach 2:* *Approach 1* + Mandatory measures to make permitting for Strategic Projects more predictable	*Approach 3:* *Approach 2* + Require Member States to dedicate additional sufficient staff to their permitting handling
E.2 Access to finance	*Approach 1:* Encourage the setting up of an Investment Platform for the CRM value chain and leverage finance through existing instruments	*Approach 2:* *Approach 1* + Promote and advise the setting up of a dedicated CRM fund to combine Member State funding with contributions from existing EU funds, in compliance with State Aid	*Approach 3:* *Approach 1* + Set up a dedicated CRM Fund with new Commission contribution and Member State contribution, managed by governance structure, in compliance with State Aid

		rules. It should be able to provide loans and equity to projects in all stages of the CRM value chain. Grants could be considered as well, depending on the types of resources available.	rules. It should be able to provide loans, equity and grants to projects in all stages of the CRM value chain.
F. Waste legislation	*Approach 1* Adoption of a Commission Recommendation targeting small consumer electronics and announcements of future CRM circularity actions	*Approach 2:* *Approach 1* + Targeted amendment of the Extractive Waste Directive and certain circularity provisions in the CRM Act	
G. Actions on standards for the critical raw materials value chain	*Approach 1:* Increase efforts to have EU rules and principles reflected in international standards	*Approach 2:* *Approach 1* + Mandate development of standards and standardisation deliverables regarding relevant industrial processes	
H. Environmental footprint of critical raw materials	*Approach 2:* Set minimum requirements for certification schemes for sustainable CRMs + Require declaration of environmental footprint for CRM sold in the EU	*Approach 3:* *Approach 2* + Putting in place a mechanism for setting performance classes and maximum thresholds (through delegated acts)	

5.4. Aspects of the main problem tackled through actions outside the scope of this impact assessment

The pillars and approaches identified above are not per se sufficient to tackle the overall problem described in section 2. They are constrained to the options and measures that can be best tackled through direct regulatory actions, and that mainly focus on domestic dimensions, notably the reinforcement of the European value chain, its resilience to supply disruptions and the sustainability of its supply. Other actions are necessary to contribute to the main objective, notably on external diversification; skills and research and innovation. In all cases, actions are already ongoing, but should be further strengthened in the context of the Critical Raw Materials Act in order to

- **Ensure the diversification of EU supply**

Another key action to directly target the lack of supply security remains the pursuit of a diversification strategy, as engaged with Strategic Partnerships since the 2020 Critical Raw Materials Action Plan or through Free Trade Agreements (c.f. Section 5.1). The Communication attached to the Critical Raw Materials Act will contain new initiatives that aim to address this matter directly. (c.f. Section 5.1).

- **Develop adequate skills to support the CRM value chain**

Ongoing actions are contributing to developing the right skill sets for the CRM value chain to develop in the EU, responding to the identified problem driver 2.4. For instance, the EU-funded research project "Intermin"[115]

[115] https://interminproject.org/, co-funded under Horizon 2020 from 2018 to 2021.

identified, in particular for the mining sector, a shift towards higher cognitive and complex problem-solving skills, the need to re-skill and up-skill the workforce, the need to support mobility and rotation, the need to attract talents from other sectors and the need to increase collaboration with universities. It also underlined the need for social skills in the sector, for instance skills related to mining rehabilitation and waste management[116].The Communication will include other actions to tackle this issue, while in parallel promoting the development of relevant skills in the public sector.

- **Strengthen EU efforts in research and innovation**

Ongoing actions are supporting research and innovation efforts to ensure the deployment of adequate technologies, such as more sustainable exploration, mining, processing, refining, recycling opportunities or substitution development, responding to the identified problem driver 2.5.

For instance, under the 2021-2024 Work Programmes of Horizon Europe, calls for proposals on Raw Materials are placed under Cluster 4 (Digital, Industry and Space). In total, the Commission has devoted around EUR 550 million for raw materials R&I in exploration, extraction, processing, refining, recycling, substitution, Earth Observation and policy support actions in this period. Initial R&I results are expected in 2026 when first projects will finish their work. Their further uptake to a more developed Technology Readiness Levels or implementation by the industry will be a necessary activity at that stage.

The uptake of results is an issue for projects originating from H2020, where around EUR 600 million was devoted to around 70 technology projects in raw materials. For instance, a rare earths separation technology has been positively tested in certain sites and now requires ore input from full scale extraction activity. However, this can only happen when the mining site obtains necessary permits to start extraction activity. Thus, the regulatory measures to strengthen the EU's CRM value chain will also allow to validate such research and innovation actions.

Regarding substitution, following the magnesium shortage in 2021, the EU funded a project to substitute magnesium in aluminium alloys for light weight mobility applications. The results are expected in 2024, three years after the shortage on the market. A more forward-looking approach to substitution, covering also a broader set of raw materials and applications, could be a priority for future R&I projects.

The Communication will announce actions to strengthen the EU's leadership in the support for R&I projects on raw materials, notably by improving the coordination and coherence between regional, national and EU funding for critical raw materials R&I.

- **Address the lack of public acceptance**

The measures on R&I and skills (presented above), as well as on the environmental footprint of CRMs and circularity of CRMs (see policy pillars and options in the next chapters) will contribute to reducing the environmental impacts associated with the CRM value chain. This, combined with more proactive communication by companies and policymakers on the high level of environmental protection in the EU, can contribute to addressing the lack of public acceptance for CRM projects in the EU identified as problem driver 2.7. Similarly, the development of strategic raw materials targets clearly linking the availability of CRM to the EU's green and digital transition objectives, the selection of Strategic Projects, and the general discussion around the measures taken under this initiative should contribute to raising awareness on the important role of CRM in our economy and society.

[116] https://interminproject.org/wp-content/uploads/The-skills-needed-in-the-mining-sector-in-the-21st-century.pdf

6. WHAT ARE THE IMPACTS OF THE POLICY OPTIONS?[117]

The impacts of the different policy options are assessed below based on the results of the open public consultation, internal analysis and external studies. Only the relevant types of impacts affecting each pillar are assessed. Overall, the initiative is not expected to have an impact on fundamental rights. It is also considered that all measures that include or imply information sharing or reporting should be implemented in line with the principle of digital by default.

Stakeholders overall call for additional EU support in the area of critical raw materials. 59% of the 259 respondents to the public consultation (OPC) agree or strongly agree that industry is not able to tackle critical raw materials sourcing challenges on the global market without further EU policy intervention, and 72% agree or strongly agree that EU policies are currently insufficient to effectively manage supply chain disruptions, shortages and prices hikes.

6.1. POLICY OPTION 1

6.1.1.Economic Impacts

6.1.1.1. Impact on companies

Under option 1, companies would benefit from incremental support to develop the EU value chain and ensure their resilience, as analysed below.

There would be two **lists of raw materials** (Pillar A), one of critical and one of strategic raw materials, each based on a transparent methodology, and each defining the scope of different measures under the following pillars (see Annex 9). Most stakeholders support complementing the current critical raw materials list with a list of strategic raw materials to provide focus for actions under this initiative. 70% of all OPC respondents said it would be useful to guide investment decisions of companies and financial institutions and that it should be used to target public support at EU and national level.

Companies would benefit from the alignment of EU support toward strategic raw materials through the dedicated EU supply capacity **targets** (Pillar B. Those targets, albeit aspirational under this option, would also focus and guide investors' decisions. 73% of respondents in the public consultation agreed or strongly agreed that setting EU objectives for increasing domestic production capacity along different stages of the value chain (exploration, extraction, refining, recycling) to guide national and European efforts in relation to the materials on the strategic list would be helpful.

Option 1 would enable the development of **monitoring capacities and risk assessment ahead of crisis** (Pillar C.1), based on a network of Member States agencies and internal capacity in the Commission. Stakeholders indicated strong support for enhanced cooperation between national authorities or agencies in charge of critical raw materials (data exchange, common monitoring, etc.): 82 % of respondents agreed or strongly agreed that such measures would support the EU CRM value chain. Stakeholders also converged on focusing the scope of the monitoring on projects evolution, demand and supply developments, and trade flows (further details in annex 2).

Limited administrative cost is associated with the reporting obligations for large companies operating in the critical raw materials value chain: it is estimated at EUR 49.000 in total for all 64 companies concerned to report twice a year to the governance structure (see calculations in Annex 4). The monitoring tools developed above would directly benefit companies by enabling cost saving measures on their own monitoring system, thereby lowering or offsetting the costs created by information requests. Overall, companies of all sizes would

[117] Note: It is advisable to read the detailed description of policy approaches in section 5.2 and for more details in annex 5 in order to understand better the exact measures being assessed in the following.

directly benefit from the regular publication of up-to-date information on supply risks that would enable them to tailor their mitigation strategies, as indicated by 70% of respondents in the public consultation.

This option's measures on **strategic stockpiling** (Pillar C.2) relate to the coordination of national stockpiles for strategic raw materials, which would not have a direct impact on companies. This option is the most supported by stakeholders, with 41% preferring an EU level guidance on voluntary stocks at national level. Member States showed overall support for this coordination in the response to an RMSG survey on stockpiling, and the European Parliament also called on the Commission in its 2021 report to encourage "Member States to carry out strategic stockpiling as part of a coordinated approach". Conversely, "mandatory stockpiling" was the least supported option in the open public consultation with only 14% of respondents in favour (7% for companies).

Coordination would bring additional benefits by incentivising Member States to strengthen their strategic stocks, adding an extra-layer of security for the companies whose value chain comprise strategic raw materials. It would also respect subsidiarity with regard to the building or maintenance of stockpiles up to Member States without adding additional targets. This coordination amongst national stockpiles ahead of any crisis would also ensure a better crisis preparedness in the event of activation of any vigilance or crisis response framework mechanism which can cover raw materials (including strategic raw materials), whether it is a horizontal instrument like the SMEI or sectoral one like Chips Act. A coordinated EU approach to the stockpiling of strategic raw materials also appears as a key element ahead of the new orientations on critical minerals and materials of the International Energy Agency (IEA)[118], of which 20 EU Member States are members. The launch of an "IEA voluntary critical minerals security program" that comprises stockpiling would benefit from a coordinated EU participation.

To ensure **companies' risk preparedness** (Pillar C.3), this option would ensure that companies using SRM invest in their resilience and take into account the real costs of SRM production, through actions on diversification, stockpiling or other mitigation strategies, notably the conduct of stress test to assess the vulnerability of their supply chains. It would also ensure companies using SRMs to support the emergence of an EU value chain and achieve diversification of their supply by purchasing, when available, from European sources. The direct adjustment costs for all the companies affected (large companies using SRM in strategic sector) in the Single Market would be EUR 1 million per year (see Annex 4).

Regarding **exploration** (pillar D), stakeholders (e.g. EuroGeosurveys, the association of geological surveys of Europe) indicated their support for availability and EU level harmonisation of geological data in line with United Nations Framework Classification for Resources (UNFC) and the INSPIRE directive.[119] This would have positive effects for companies along the value chain, as it would foster additional investment in the extraction stage.

The requirement for Member States to set up strategies to **support the value chain** (pillar E) and contribute to the overall European targets would raise awareness on the risks related to CRM supply and prompt the consideration of policy levers available in Member States (e.g. mining laws, investment support). If well-crafted and implemented, these strategies also help companies implement relevant projects and reduce their supply dependencies.

Regarding **permitting** (pillar E.1), this option is expected to have a positive effect on companies by decreasing the cost and duration of completing permitting procedures. The structural integration of CRM projects into spatial plans combined with the application of the SEA Directive to those plans is expected to decrease the costs of individual permitting procedures for companies. The SEA Directive provides for an overall and cumulative assessment of the environmental impacts of planned activities. As such, it would provide a

[118] 2022 IEA Ministerial Communiqué - News - IEA

[119] See EuroGeosurveys position paper submitted in response to the Call for Evidence.

framework for the easier identification of areas suitable for CRM projects or of less harmful alternatives for associated activities and infrastructure at an early planning stage. It would also provide an information basis for subsequent more specific environmental assessment performed by project developers. The extent of the cost decrease (including administrative costs) is difficult to quantify, as it is highly case-specific depending on the extent to which project developers make use of spatial plans and the related information.

The setting up of an InvestEU platform and stronger use of existing financing instruments to improve **access to finance** (Pillar E.2) would lead to a more effective use of resources to support the EU CRM value chain. In particular, domestic projects could be supported through a dedicated InvestEU platform and projects in third countries could benefit from greater use of EU external financing instruments. This option would create benefits for companies operating in the CRM value chain due to improved access to finance and for companies further downstream due to increased accessibility of CRMs. Given the magnitude of the investment needs and the possibilities of InvestEU platforms, a total size of EUR 1 billion would represent an ambitious, though feasible, target for the InvestEU platform120. Compared to the investment needs outlined above, this would equal to 14% of the investment needs in battery raw materials for a domestic production share of 25% by 2030, excluding the riskiest undertakings requiring grants, Hence, that would contribute to making Europe's supply more secure, but not by much. This option would not result in additional cost for companies and enjoys broad support with stakeholders: 73% of 259 respondents support targeting existing EU funds to finance CRM projects of particular strategic relevance.

On **waste legislation** (Pillar F), this option would provide only non-binding measures (a Commission Recommendation) and announcements for future actions (outside of the scope of this Impact Assessment). If the Commission Recommendation on take-back schemes for small consumer electronics is effective, it could lead to an increase of the currently very low collection rate of such waste products and thus create economic opportunities for the recovery of CRMs by recycling companies.

Regarding **standards** (Pillar G), increasing efforts to have EU rules and principles reflected in international standards would facilitate increased transparency and sustainability of CRMs placed on the EU market. In addition, it is expected to help ensure that relevant international standards reflect or do not conflict with EU rules, thereby preventing a potential burden for EU and global companies active on the global market.

Regarding **environmental footprint** (Pillar H)[121], this option would generate additional cost for companies selling CRMs in the EU. First, all companies that choose to make general claims would have to make use of certification schemes, the one-off adjustment cost is estimated to be in the range of EUR 3.75 – 10 million for those companies (see Annex 4). In addition, for materials for which calculation rules are available, operators would be required to declare the environmental footprint. This is estimated to create a one-off administrative cost of EUR 14.55 million for all companies selling those CRMs (see Annex 4). Companies procuring CRMs would also benefit from easier access to quality information on the sustainability of CRMs.

Taken together, the measures considered under PO1 would help boost investment in the EU CRM value chain. By facilitating access to finance, making exploration easier, taking account of CRM projects in spatial planning, and making the environmental footprint of CRMs transparent, PO1 would make it easier for companies to build a business case for new EU-based CRM projects.

6.1.1.2. Impact on SMEs

The InvestEU guarantee (Pillar E.2) contains a specific window for supporting SMEs, which the Commission would work towards using as well. As junior miners (most often SMEs) and exploration projects often struggle to attract adequate funding, the use of this window would be particularly beneficial for SMEs.

[120] The InvestEU platform of the Chips Fund, based on the already existing budgetary guarantee, totals EUR 1.5 billion.

[121] See Annex 4 on methodology for assumptions.

SMEs would also particularly benefit from the enhanced availability of monitoring and information regarding the supply chains of critical and strategic raw materials, as they generally do not have the resources to invest into their own monitoring and risk preparedness systems. Out of the 81 companies/business organisations which answered the OPC, 32 are SMEs, and 44% agreed that they would benefit from public monitoring to inform them about risks of supply chains disruption (6% disagreed, the rest being neutral or with no opinion). 59% of SMEs agree that an EU-wide governance capacity with monitoring tasks could help strengthen the value chain resilience. Only a slight majority of SMEs agreed that companies lack sufficient information on supply risks to take preventive measures (28% agree and 22% disagree), but 72% support measures that would enable them to benefit from such information. Finally, similar to the results for all companies, only 3% of SMEs favoured mandatory strategic stocks while 43% supported EU-level guidance on strategic stockpiling.

6.1.1.3. Impact on competitiveness

By strengthening EU **companies' preparedness** in case of supply disruptions, this option would increase their competitiveness compared to other actors not benefiting from such support.

The creation of an InvestEU platform would improve **financing** conditions for some projects and thus improve the competitiveness of the companies operating them. This would lead to slightly higher and more stable availability of critical and strategic raw materials and would therefore increase the cost- and international competitiveness of the European downstream users of those materials marginally.

Having EU rules reflected in global **standards** would also help EU companies' competitiveness. The size of these effects is however likely to be minor under this option.

Regarding **environmental footprint** (Pillar G), this option would have a positive impact on the competitiveness of companies that sell or produce CRMs in a more sustainable manner. The companies' benefits would depend on the impact categories the footprint focusses on. It could for example include refiners that use decarbonised energy to lower emissions or mining companies applying less invasive methods of extraction. Those companies would be able to display their credentials to potential buyers without unreliable certification schemes or footprint information creating potential confusion. Companies with low sustainability would evidently lose relative competitiveness under this option (though to a limited extent as purchases of low-performing or uncertified CRMs would not be prohibited), but thanks to the introduction of a clear and reliable methodology, they would have a clearer view of how to improve their sustainability performance to increase their competitiveness in the future. On the negative side, to the extent that the cost of footprint calculations is reflected in the price of CRMs, this measure could have a negative effect on the competitiveness of downstream sectors using those CRMs compared to third country companies able to source CRMs without this cost increase. Quantifying the economic impact of this measure on CRM prices has not been feasible since no methodology is available to estimate the effect in isolation from other cost drivers. More analysis is needed and any introduction of maximum carbon thresholds via secondary legislation will be subject to a proportionate and dedicated impact assessment. Assessments carried out for platinum can be used to get an indication of the potential cost increase. With the full cost of footprint calculations (for all companies) estimated at 0.07% of the European market value (see Annex 4), it potentially translates into an equivalent price increase for EU downstream users in case the full price increase is passed on.

In light of such costs, there is the possible risk that third country operators will divert their exports of CRMs to other jurisdictions without the requirement to declare the environmental footprint in order to avoid the costs associated with calculating this footprint (potentially partially cancelling out the benefits of improved supply security). However, whether this risk materialises will be highly case-specific and will depend on the extent to which other jurisdictions will introduce footprint-related measures, the relative importance of selling on the EU market for an exporting company and on whether the additional costs of a footprint declaration would outweigh the costs of diverting exports.

6.1.1.4. Impact on competition

Given the limited ambition of most actions included in this option, and the absence of a selective procedure to identify strategically important projects benefiting from privileged permitting procedures and access to special funding, it is not expected to have significant impacts on competition. All information and support provided under the monitoring and company risk preparedness pillars would be open to all companies without discrimination.

6.1.1.5. Impact on international trade

Large EU companies using CRM would have to ensure a higher level of supply diversification, to the extent possible (**pillar C.3)**. Such efforts would help support the EU's engagement in the world, as EU companies would become drivers in the quest for new supply sources.

On standards (Pillar G), the drive for further EU coordination and actions in the international standards setting bodies would contribute to increasing the quality and availability of standards, contributing to the development of more sustainable global CRM value chain at the global level.

Regarding **environmental footprint** (Pillar H), this option would mean that companies importing CRMs into the EU would also need to comply with the recognised schemes for making general environmental claims and to declare the footprint of their materials. This would make the sustainability of all CRMs on the EU market, including those of third country origin, more transparent and allow the relative footprint of materials to become an object of competition on the EU market. This additional transparency on the supply's sustainability may lead to a demand-led drive from the European downstream users for more sustainable CRMs, benefiting (in a relatively mild manner) third countries that produce CRMs more sustainably while hurting those that produce less sustainably. The costs for companies operating in the EU market, whether European or from third countries, would be the same.

6.1.1.6. Impact on Member States (public authorities)

In total, PO1 would require at least 4 to 7 FTEs (full time equivalent[122]) per Member State that would be split by (see for more detail Annex 11):

- 2 FTEs per year for participation to the governance structure;
- 1/4 FTE per year for the coordination of strategic stocks;
- 1/2 FTE per year for the coordination of data on exploration activities;
- 1 to 3 FTEs per year to design and implement strategies supporting the CRM value chain;
- Additional FTEs (not quantified) to enforce environmental footprint obligations.

A measure of particular relevance to Member States is stockpiling. In this respect, option 1, which includes EU-level coordination and information exchange regarding national stockpiles is favoured by public authorities over the alternatives: 46% of public authorities responding to the open public consultation assessed as appropriate EU-level guidance on voluntary storage to be organised at national level, while EU-level coordinated mandatory storage was widely rejected by public authorities. EU-level coordination and information exchange would diminish overlapping measures and enable additional efficiencies gains across EU Member States, thus leading to cost savings, which are however not directly quantifiable.

[122] A full-time equivalent, sometimes abbreviated as FTE, is a unit to measure employed persons or students in a way that makes them comparable although they may work or study a different number of hours per week. Glossary: Full-time equivalent (FTE) - Statistics Explained (europa.eu)

6.1.1.7. Impact on the Commission (budgetary implications)

In total, PO1 would require around 27 FTEs for the Commission, that would be split by (see for more detail Annex 11):

- 2 FTEs for ensuring the secretariat of the governance structure, in addition to EUR 75.000 per year of organisational costs.
- 17 FTEs for implementing monitoring, data gathering and risks assessment tasks, based on similar tasks performed by existing units in the Commission), which can be split as:
  - 10 FTEs for market monitoring;
  - 1 FTE for the management of studies and contracts;
  - 1 FTE for the building of a data set on projects;
  - 5 FTEs for the coordination of information from Member States.
- 3 FTEs for the coordination of national stockpiles information and the development of guidance when possible.
- 1 FTE to coordinate the submission of national exploration activities.
- 3 FTEs for assessing the suitability of environmental footprint, developing calculation methods and monitor the application of the measures.
- 1 FTE to enforce actions on standardisation.

6.1.2.Social Impacts

On **waste legislation** (Pillar F), this option would improve the collection of mobile phones, tablets and laptops, which tend to be the most prominent CRM-containing products in people's lives. Besides the increased recovery of CRMs, this action would increase convenience for consumers and increase awareness of the relevance of CRMs for citizens' everyday lives.

Regarding **environmental footprint** (Pillar H), depending on the strategy to be followed by CRM producers, this approach may alter the relative balance of manufacturing jobs between different regions of the EU, as companies seek production sites that allow them to achieve lower footprints. However, this advantage may be offset to some extent by the possibility to purchase green energy certificates, depending on whether such possibility will be permitted by the calculation rules.

6.1.3.Environmental Impacts

Regarding **permitting** (Pillar E.1), the measures are expected to have a positive impact on the environment. Structural integration of CRM projects in spatial plans and the application of the SEA Directive to those plans would benefit the environment by allowing authorities and project developers to have a better view of the overall and cumulative impacts of potential projects. It will help developers to identify suitable sites as well as the least impactful alternatives. This can provide the framework for the identification of areas suitable for CRM projects, but also less harmful alternatives for associated activities and infrastructure at an early planning state which subsequently decrease the risk of future conflicts between competing uses.

On **waste legislation** (Pillar F), this option would likely increase the recovery of critical raw materials from small consumer electronics. By reducing the need for primary raw materials by enhancing the use of secondary raw materials, the overall environmental impacts of CRM decreases.

Regarding **standards** (Pillar G), increasing efforts to make international standards reflect EU rules and principles has the potential to decrease the environmental impact of CRM production globally. The impacts of projects taking place in jurisdictions with a less comprehensive environmental framework than the EU might be lowered, to the extent that those standards are applied.

Regarding **environmental footprint** (Pillar H), this option would have positive impacts by allowing EU buyers to more effectively reduce the environmental footprint of their consumption. By ensuring that general sustainability claims are based on trustworthy and comprehensive certification schemes and by ensuring CRMs are accompanied by a footprint based on transparent, reliable and comparable methods (based on the EU Product Environmental Footprint[123]), sustainable purchasing decisions will more likely lead to a real reduction in negative environmental impacts. The environmental benefits of this measure would depend on the extent to which buyers drive their consumption decisions based on the information provided.

Overall, this option is expected to cause **no significant harm** as it does not promote projects that can affect the environment; it only provides tools that can improve the value chain marginally, without lowering any environmental *acquis.* The provisions on exploration only relate to the sharing of information. This option can conversely have a positive effect on the environment as described in the paragraph above.

6.2. POLICY OPTION 2

6.2.1. Economic Impacts

6.2.1.1. Impact on companies

The coverage of the measures, based on a **list of critical and strategic raw materials** (Pillar A), remains the same as under option 1.

Regarding **targets** (Pillar B) directly set in the regulation, this option would provide greater security for companies, which would be able to set goals on long-term investment plans. They are likely to affect the behaviours of companies operating along the CRM value chain, to the extent that they would be clear criteria for the selection of Strategic Projects. Therefore, companies that would like to develop a project benefiting from the Strategic Project status would be incentivised to focus, to the extent possible, on the strategic raw materials as they are covered by the targets. In terms of the overall volume of such investments required to achieve the targets, the analysis of investment needs (cf. driver 2.3/Annex 10) estimates that for example investments of EUR 1.7 billion along the rare earths value chain would be required to achieve an EU target of supplying 20% of its own needs by 2030, and that investments of EUR 7 billion would be required to supply 25% of the EU's battery raw materials needs by 2030. While different regulatory and non-regulatory measures would be required to unlock these investments, the setting of targets would provide the overarching political mechanism to identify which changes are necessary and coordinate action to follow-through on them.

The costs and benefits of the **governance structure** (Pillar C) and of the sub-pillars on **monitoring, stockpiling and company risk preparedness** (Pillar C.1, C.2 and C.3) are the same as in option 1.

On **exploration** (Pillar D), this option would benefit companies operating in the early stages of the critical raw materials value chain by providing access to the relevant mineral data, thereby de-risking investment into targeted exploration. By ensuring that Member States develop actions in exploration, this option is likely to enable further investment and decrease costs. Mining companies active in targeted exploration would benefit from the regional exploration data (geophysical and geochemical) acquired by Member States and reuse it for their benefit, representing a range of several thousands to tens of thousands of euros savings (depending on the size of the exploration permit).[124] Overall, stakeholders' responses to the call for evidence support those measures. For example, the Swedish (SGU) and Finnish (GTK) geological surveys and the association of the geological surveys of Europe (EuroGeosurveys), as well as several private actors, supported promoting an efficient and harmonised delivery of Member States' exploration and mining data. In the public consultation,

[123] Commission Recommendation of 16.12.2021 on the use of the Environmental Footprint methods to measure and communicate the life cycle environmental performance of products and organisations.

[124] Order-of-magnitude estimation based on expert knowledge within the Commission services.

78% of 259 respondents agreed or strongly agreed with the idea of strengthening exploration and documentation of critical raw materials in secondary deposits and waste streams.

This option would introduce the concept of **Strategic Projects** (Pillar E). This would result in stronger support for the CRM value chain in the EU and in third countries and with that a more secure availability of CRM for downstream user in the EU. By ensuring that these projects are realised, this option would concretely contribute to achieving the targets for EU capacities along the value chain (extraction, refining, recycling). Under this option, projects are selected for support on the basis of their potential contribution to the EU targets. Assuming that this requires, on average, a capacity increase of 20 percentage points across value chain stages, it is estimated that up to 120-180 Strategic Projects (or 12 SPs per strategic raw material, assuming a list of 12-15 strategic raw material), divided evenly per value chain stages (extraction, refining, recycling), would receive support between entry into force of the Regulation and 2030 (or 24-36 per year, see more details in Annex 4). This would benefit the companies implementing the project, their off-takers and the wider ecosystem downstream benefiting from more secure supply of critical raw materials. The estimated investment needs for battery raw materials of EUR 7 billion by 2030 and EUR 13.2 billion by 2040, and the overall market size of batteries in the EU (estimated at EUR 250 billion already by 2025)[125] indicate the possible magnitude to which Strategic Projects would contribute. Using the estimates above on the size of the InvestEU platform, there would still be EUR 6 billion left to bridge the needs for the battery raw materials value chain, for example by a European fund consisting of Member States' contributions. And this would not yet include investments in rare earths and other strategic raw materials that are fundamental for other clean technologies necessary for the green transition such as renewable energy equipment. The majority of the respondents in the Public Consultation agree that identifying Strategic Projects would be beneficial for financial and permitting decisions. 86% out of 259 respondents agree or strongly agree that identifying Strategic Projects across the critical raw materials value chain with strong environmental and social performance contributes to reducing EU dependencies. 71 % out of 259 respondents agree or strongly agree that strategic projects and partnerships outside of the EU should also benefit from de-risking if they comply with social and environmental standards and can contribute to secure EU supply.

Regarding **permitting** (Pillar E.1), this option is expected to have the effects described under option 1, as well as additional positive effects on companies developing Strategic Projects by streamlining their permitting procedures across Member States. [126] A mandatory integration of procedures and assessments reduces the administrative burden for developers compared to an approach where the assessment and permitting responsibilities are allocated to several separate entities (e.g. reduced environmental assessment costs as a single assessment report would be prepared). Cost savings will be particularly significant in Member States where such procedures are not yet in place and for certain types of projects, e.g. projects related to industrial activities (i.e. also subject to the IED) and projects with significant impacts on biodiversity. Mandatory scoping for Strategic Projects is expected to have no net effect on the burden for project developers. Although there are extra costs involved for procedures in Member States where scoping is not mandatory, those costs are likely to be offset by time savings during the drafting of the EIA report, as the analysis of irrelevant information would be avoided. Lastly, the possibility to submit documents digitally and to consult a manual of procedures for Strategic Projects would likely further reduce burden for project developers and contribute to the implementation of the digital by default principle.

[125] Building a European battery industry - European Battery Alliance (eba250.com)

[126] The assessment below is based on the assessment of similar measures in the impact assessment accompanying the 2012 proposal for revision of the EIA Directive - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012SC0355&from=EN#page=38&zoom=100,27,726

This approach is also expected to reduce the average length of permitting procedures, as regards new Strategic Projects, by one-third (33.33%). This is based on the experience of the TEN-E Regulation[127], which includes very similar provisions on permitting, which managed to decrease the average duration of permitting procedures (including the pre-application stage) for trans-European electricity infrastructure projects from more than 6 years in some Member States to 4 years.[128]This measure benefits from a strong level of stakeholder support: 73 % of 259 respondents agree or strongly agree Strategic Projects benefit from streamlined and quicker permitting procedures.

Increasing the speed and predictability of permitting, notably by considering them as of public interest, is also expected to contribute to de-risking this early step and make investments in Strategic Projects more likely. Pre-bankable projects, before the obtainment of a permit, often struggle to obtain funding due to the high uncertainty involved. The measures outlined in this option would provide a clearer picture for economic operators of permitting timelines and procedures for Strategic Projects. In addition, setting the proposed minimum requirements for national permitting procedures for Strategic Projects would increase harmonisation between Member States and contribute to improving the functioning and efficiency of the single market, as developers and business in general would benefit from a more level playing field and less distorted market conditions.

A **fund at European level** (Pillar E.2) with contributions from interested Member States on top of a contribution from existing EU funds would strongly support the development of European CRM projects, benefitting businesses. The benefit to companies would depend on the size of the fund, which is not clear at this stage and depends on Member States' willingness to contribute. Compared to funds set up individually by Member States, for example via their promotional banks, this option would deliver the clear advantage of taking the whole European value chain into account.

As analysed in driver 2.3, the investment required for the refining and recycling of 25% of the EU's needs for battery raw materials plus the extraction of the lithium needed would amount to EUR 7 billion by 2030 and EUR 13.2 billion for 2040. Full self-sufficiency would require EUR 27.9 billion and EUR 52.2 billion, respectively. Other CRMs are likely to require large investments as well to gain a certain level of self-sufficiency along the value chain. Targeting existing EU funds to finance CRM projects as well as increasing financial support from national and promotional banks receives strong support from stakeholders[129].

On **waste legislation** (Pillar F), in addition to the effects described under option 1, this option would introduce an increased focus on CRMs within the waste management plans of extractive waste site operators, including obliging them to assess the feasibility of CRM recovery from the generated waste. This would create only very limited administrative costs, since a pre-feasibility study is a very simple assessment, and the underlying data on mineral concentrations is already available from the feasibility studies performed by extractive waste site operators for other purposes. The benefits would also accrue to these companies, as they would be the first to perform the CRM recovery operations when the pre-feasibility study indicates potential to do so profitably –

[127] Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure, amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013

[128] See Support to the evaluation of Regulation (EU) No 347/2013 on guidelines for trans-European energy infrastructure - Publications Office of the EU (europa.eu), p. 69.

[129] In the public consultation, 73% of respondents agree or strongly agree that "targeting existing EU funds that have the possibility to finance critical raw materials projects of particular strategic relevance identified under the future legislation" would facilitate access to finance for CRM projects. 71% would like "Increased financial support from national and European promotional banks for critical raw materials projects" and 68% are positive about "a dedicated financial platform to de-risk critical raw materials projects by blending private, national and EU funding". In the position papers submitted, several stakeholders suggest financial de-risking to take place through guarantees or contracts for difference (Deutsche Bank AG, Ragn-Sells and European Geothermal Energy Council in response to the Call for Evidence.), and they express their wish for simpler and more automatic mechanisms to qualify for public support (Norsk Hydro ASA in response to the Call for Evidence).

insofar the obligation is designed to be complied with at a minimal cost and intended primarily to put a focus on this aspect for companies' own potential benefit.

The recycling capacity targets to be achieved by the EU are not binding but general objectives guiding the selection of Strategic Projects. Insofar, they would not affect companies directly, except to the extent that companies propose Strategic Projects in the recycling stage, in which case they could benefit from the permitting and financing benefits described above.

The measures on **standards** (Pillar G) under this option would, in addition to the impacts of option 1, have a positive impact on companies, including SMEs, in that they help ensure a level-playing field in the single market for businesses and underpin consumer confidence. Promoting the development of technical standards on relevant industrial processes would increase transparency and sustainability of CRMs over time.

Regarding **environmental footprint** (Pillar H): on top of the economic impact described for option 1, the introduction of minimum thresholds may induce additional costs for economic operators, as certain processes need to be adapted and electricity supply needs to be reconsidered, in order to reduce relevant footprints. Depending on the stringency of the proposed thresholds, manufacturing processes for CRMs farthest from best-in-class might need substantial investments. However, those costs would be calculated in a dedicated impact assessment, as explained in section 5.2, pillar H, given that the threshold would be introduced by secondary legislation.

The administrative impact is expected to be fairly similar to the one described under option 1. Market access would become conditional on the declaration demonstrating that certain thresholds have been attained, but the effort for the declaration itself would remain the same. If performance classes are introduced, the third-party verification costs may slightly increase, as the number of data points to be verified would be higher in order to increase precision.

Taken together, the actions proposed under this option would lead to a generally larger availability of CRMs in the economy as well as increased security of supply. All these effects would benefit downstream users of CRMs as well as firms even further down the value chain and even consumers. The larger supply would help to bring down world market prices leading to greater competitiveness of the green and digital technologies in the scope of this proposal. Especially in times of tight global supply chains, these measures would produce tangible benefits by protecting the European economy to a larger degree from shortage of crucial inputs.

6.2.1.2. Impact on SMEs

On **exploration** (Pillar D), as suggested by stakeholders (e.g., European Federation of Geologists[130]), this approach would bring positive benefits to SMEs by providing additional data that could de-risk their activities: though SMEs are the main actors operating in this early stage of the value chain, they have less resources and capacities to undertake risk-heavy exploration operations.

SMEs would benefit from the **monitoring** (Pillar C.1) and **access to finance** (Pillar E.2) dimensions as explained in PO1 In addition, SMEs would also benefit from the increased funding opportunities offered by the fund. In the public consultation, SMEs are adamant about the difficulty to access private financing for CRM projects (62% agreeing; 0% disagreeing) and to access public funding (80% agreeing; 3% disagreeing). For them the lack of support from public financial institutions (34%) and the higher production cost in the EU (31%) are among the main reasons for the difficulties in accessing private finance. The effects on SMEs are assessed in more detail in Annex 6.

[130] See their position paper submitted in response to the Call for Evidence.

6.2.1.3. Impact on competitiveness

The availability of additional data and mapping of EU mineral resources as provided per P**illar D** would also support the competitiveness of the value chain; equipped by additional information, companies would benefit from a de-risking at the early exploration stages that would then trickle down along the value chain.

In general, the designation of Strategic Projects (pillar E) with streamlined **permitting** and improved **access to finance**, would lead to increased production of SRMs in Europe and like-minded third countries and therefore to greater supply security for European downstream manufacturers. This concerns both the companies directly procuring the SRMs, such as those producing permanent magnets or batteries, as well as those further down the value chain, such as producers of wind turbines. This should give those companies a competitive advantage over competitors in other world regions with less supply security and allow to catch-up to regions were this is already the case. Especially, the competitiveness of SMEs in those sectors would benefit as they tend to be less likely to be able to weather supply chain disruptions for key inputs on their own. More Strategic Projects would also lead to more production of strategic raw materials in general. This higher supply would lead ceteris paribus to lower prices for key inputs for downstream producers and boost their cost competitiveness vis-à-vis producers using less SRMs as input.

Regarding **environmental footprint** (Pillar G), this option would, in addition to option 1, create a framework for setting thresholds for the environmental footprint. Such measures would increase the competitiveness of relatively sustainable CRMs. On the negative side, for downstream users, in addition to option 1, producers (e.g. such using renewable energy in their operations) no longer able to buy certain CRMs, would also reduce access to CRMs for downstream users in cases where most production is subject to low performing and potentially cheaper CRMs to which third country companies might still have access All such impacts would be taken into account in the assessments for preparing the delegated acts introducing any concrete, and this effect could be increased in case the share of such materials that would otherwise be exported to the EU would be diverted to third country markets, potentially decreasing prices for third country downstream users be jeopardised by such thresholds. However, as this discussion refers to delegated acts to be developed and properly assessed ex-ante in the future, it is beyond the scope of this IA.

On the negative side, environmental footprint requirements might prevent downstream users from acquiring the cheapest (but environmentally damaging) products containing critical raw materials. This could harm their competitiveness in the short run vis-à-vis competitors from jurisdictions where such rules do not apply. Therefore, it is important that all such impacts would be taken into account in the assessments for preparing the delegated acts introducing such thresholds and the impacts would be carefully weighed against each other. Taking that into account, the competitive position of European downstream producers would not weaken significantly.

As explained in problem section 2.3, high energy prices threaten the competitiveness of energy-intensive activities in Europe, including extraction, refining and recycling of critical raw materials. While the CRM Act itself will not be able to address this challenge, the Commission is working on other files to improve the situation, for example by updating the EU's Temporary Crisis (and Transition) Framework e.g. to offset the higher energy cost compared to its international competitors.

While the high energy prices over the course of 2022 present a case of market failure, there is a risk that the energy prices in the EU continue to be higher than in other regions of the world which impacts the competitiveness of the energy intensive CRM value chain. While the CRM Act aims to make the production of energy in the EU in general cheaper in the future, it does not provide for measures to tackle these challenges in the short term. Here, other EU initiatives like the revision of the Temporary Crisis Framework (soon to be Temporary Crisis and Transition Framework) or the Carbon Border Adjustment Mechanism should provide or allow for the provision of support to those projects. For the unlikely case of, for example, significantly higher energy prices threatening competitiveness in Europe even in the long run, this structure would create

the risk that some projects might be supported operationally in the long term, despite all safeguards. In that case, however, not only the CRM value chain but also the entire European energy-intensive industry might be in danger of disappearing.

6.2.1.4. Impact on competition

The special status granted to Strategic Projects (Pillar E) with respect to permitting and, to a limited extent, funding included in this option means that benefits would be awarded selectively. However, a transparent process based on clear criteria and the involvement of the Commission along Member States in the projects' selection would ensure that the beneficiaries are those where the benefits to the entire Single Market are greatest.

The pooling of Member State contributions with existing EU resources into one European fund (Pillar E.2) ensures a stronger focus on benefits to the entire Single Market dimension than if some of them would simply set up such a fund on their own; however, Member States with a greater financial capacity would likely be able to fund a greater number of projects of their choice. Here, the relative magnitude of the EU contribution determines how much the European dimension can be taken into account. State Aid rules would continue apply and thus minimise the risk of such distortions.

6.2.1.5. Impact on international trade

The positive benefits of **targets** (Pillar B) for the EU supply diversification are the same ones as for option 1 as the mechanism for setting the targets and reviewing MS performance only applies to the targets for EU supply capacity. The impact of EU supply capacity **targets** (Pillar B) and of the development of the EU value chain on international trade and on third countries would be limited; while the EU would increase the relative share of its own production in its consumption, the rise in demand for CRM would still allow all international actors to export them.

Overall, policy and regulatory measures aiming to increase sustainable primary and secondary production will both benefit the EU market and the global availability of CRMs, hence mitigating supply risks.

On **environmental footprint** (pillar H), the information-gathering obligations are likely to lead firms in third countries to replicate these calculations at minimal additional cost for CRMs sold elsewhere, such that the European information requirements could have global impacts and set an industry standard. While this transparency is not likely to change the market and international trade in CRMs immediately, it should incentivise private companies to ensure more environmentally sustainable raw material supply. This, with the set of other measures, should lead to a gradual demand-driven shift towards more sustainable forms of production – e.g. using renewable energy for on-site operations, instituting closed-loop water recycling, or committing to rehabilitation post-closure – to set own production apart from competitors. This shift to more sustainable forms of production, to the extent it occurs, would take place not only in the EU but also in third countries catering to the EU market. This would benefit local populations and the environment in those third countries.

Once sufficient data will be collected and while ensuring that security of supply would not be jeopardised, thresholds could be set based on an ex-ante proper impact assessment. Placing CRMs on the EU market would be possible for the best performing materials where thresholds are set. In comparison with policy option 1, this would have commensurately greater positive and negative (depending on a country's relative performance) impacts on third countries. Since a dedicated assessment will be made at material-specific level before introducing a possible threshold, unintended consequences (notably on availability/security of supply of CRMs) should be prevented. Any such measure would also be compatible with applicable trade rules and international agreements, such as the WTO and the GATT rules. Indeed, requirements would apply in a proportionate manner both to European producers and to importers and would therefore not be discriminatory

as they would target products wherever they may come from, whether produced in the EU or in third countries. The precise impacts on third countries, or precisely on the economic operators active in them, would be heterogeneous and depend on their capabilities for production along the CRM value chain, their commitment to high but at least improving ESG standards, and their current position in the market. Especially trade relations with countries with high environmental standards and underused potential for CRM production would benefit whereas currently large suppliers are likely to lose relative market share. Given the dramatic increase in the demand projections for several CRMs, this would likely not lead to a decrease in trade volumes in absolute terms.

It should also be noted in this context that potentially decreasing demand for relatively unsustainable CRMs (enabled by the greater transparency on environmental footprint) need not affect any third country negatively, as not the country of origin of the CRMs but their environmental footprint are targeted. Third countries with overall low environmental performance today could invest into improving this performance and thereby benefit from the measure.

6.2.1.6. Impact on Member States (public authorities)

In total, PO2 would require at least 4 FTEs per Member State, that would be split by (see for more detail Annex 11):

- 1/4 FTE per year for reporting on the state of CRM projects on their territories;
- 2 FTEs per year for participation to the governance structure;
- 1/4 FTE per year for the coordination of strategic stocks;
- 1/4 FTE to contribute to the development of EU-targets and report on them.
- Additional FTEs (not quantified) to enforce environmental footprint obligations.
- 1 FTE per year to develop and implement national circularity strategies.

Additional 25 FTEs are required for the development of exploration programmes, which would be a one-off cost[131]. In addition, costs can be expected to finance obligations on exploration, as the option would for all Member States combined a one-off cost of EUR 82 million for aerial geophysical survey and EUR 80 million for geochemistry mapping survey to cover the EU. The costs of provisions on permitting for Strategic Projects are assessed to be minimum and avoid duplications in the procedures.

Similarly, 3-4 FTEs per Member State would be required to implement new obligations under the Extractive Waste Directive (one-off costs).

However, in addition to coordination and information exchange with regards to monitoring, or the coordination of stockpiles, this option would also provide Member States with a strategic and coherent framework to support the CRM value chain, with positive effects on their supply chain's solidity and their industry's resilience.

Further details of PO2's impacts on Member States are available in Annex 11.

6.2.1.7. Impact on the Commission (budgetary implications)

In total, PO2 would require around 31 FTEs for the Commission, that would be split by (see for more detail Annex 11):

- 2 FTEs for ensuring the secretariat of the governance structure, in addition to EUR 75.000 per year of organisational costs.

131 It is to be noted that the FTE costs for exploration programmes and exploration costs described above are dependent upon a Member State's size, its geological endowment and existing administrative and research capacities.

- 17 FTEs for implementing monitoring, data gathering and risks assessment tasks, based on similar tasks performed by existing units in the Commission), which can be split as:
    - 10 FTEs for market monitoring;
    - 1 FTE for the management of studies and contracts;
    - 1 FTE for the building of a data set on projects
    - 5 FTEs for the coordination of information from Member States
- 3 FTEs for the coordination of national stockpiles information and the development of guidance when possible;
- 2 FTEs to coordinate the submission of national exploration activities;
- 1 FTE to support the board in the selection of Strategic Projects;
- 3 FTEs for assessing the suitability of environmental footprint, developing calculation methods and monitor the application of the measures;
- 2 FTEs to enforce actions on standardisation and prepare standardisation requests.
- 1 FTE to ensure the enforcement of Member States obligation under the Extractive Waste Directive.

The additional costs of policy option 2 for the Commission are detailed in Annex 11.

6.2.2. Social Impacts

Strategic Projects (Pillar E) would create economic value and jobs locally. It is not feasible at this stage to assess the number of jobs created and their repartition but the generally lower economic development in former mining regions (discussed in option 1), which could be revitalised especially through re-mining projects suggests that such projects could contribute to generating new opportunities and increasing cohesion. These investments would create jobs in areas with high unemployment rates and bring needed resources that then will spur further economic activity locally whilst harnessing and upgrading the existing skills of the labour force in the area. Low estimate point at 3 840 potential direct job per year for the development of the Strategic Projects, and eventually to above 100 000 direct and indirect jobs if over 100 Strategic Projects are selected to meet EU targets during the implementation of the Regulation. (c.f. Annex 4).For partner countries, this would include capacity building going beyond the extraction phase where feasible.

On **waste legislation** (Pillar F), this option would likely lead to greater societal awareness by engaging Member State governments to develop strategies to recover critical raw materials from all waste streams economy-wide.

6.2.3. Environmental Impacts

The Climate law requires that an assessment is concluded to determine the initiative's coherence with the climate neutrality objective by 2050. It is to be noted that the main underlying motivation for securing CRM supply under the CRM Act is the fact that the world's reliance on fossil fuels heavily contributes to climate change and that the shift to replace these drivers with more sustainable sources of energy production is therefore of great importance. Critical raw materials are crucial inputs for the strategic technologies needed to make the green transition happen, such as wind turbines, solar panels and batteries. By securing a greater supply security for Europe and more availability in general, this option is consistent with the climate-neutrality objective of the Climate law as it would contribute to a better investment climate for the European clean technology sector and therefore to the higher availability and deployment of renewables. This would help in the fight against climate change and would contribute to substantial environmental benefits. This issue also has a global dimension: increasing global supply of critical raw materials would make renewables more competitive on world markets and contribute also outside of Europe to the fight against climate change.

On **exploration** (Pillar D), the impact of this policy option on the environment are minimal as the measures proposed do not include the drilling phase of exploration but rather relate to studies, coordination of information and targeted assessment.

Regarding **permitting** (Pillar E.1), the measures considered focus on improving procedures, and are without prejudice to the substantial conditions set out in relevant national and EU legislation (the considerations linked to public interest are dealt with below in the context of the "Do no significant harm" principle). In addition, some measures in particular are expected to have a positive impact on the environment (in addition to the impacts of option 1)[132]:

- A mandatory scoping procedure would help clarify the environmental issues to be covered in the assessment report, e.g. the most important impacts, preferred methodologies, and relevant information sources, thereby likely increasing the quality of the resulting report and help provide robust evidence for the final decision in Member States where it is not yet mandatory.
- The creation of a one-stop shop and streamlining of different assessments is likely to have a positive impact on the environment, as it enables a more comprehensive information base for decision-making.

On **waste legislation** (Pillar F), this option would go substantially further than option 1 in amending waste legislation and requiring Member States to develop strategies to increase recovery of critical raw materials. In the absence of an elaborate economic model, it cannot be assessed how impactful these changes will be quantitatively, but the focus many stakeholders, including NGOs,[133] put on creating an open database of extractive waste sites and establishing recycling targets for critical raw materials, indicates that these are generally considered effective measures that could make a difference. As explained in the problem section under driver 2.6, increased recovery of critical raw materials, and thus reduced demand for primary critical raw materials production, can significantly reduce environmental impacts. Since the new mine operator would be responsible for closure and after-closure management of the new operation, re-mining of abandoned waste sites would provide a solution to ensure their rehabilitation, which has significant benefits for biodiversity.[134]

On **environmental footprint** (Pillar G), this option would have, compared to option 1, additional positive impacts, as companies (especially relatively unsustainable companies) would be confronted with the risk of their CRMs not being allowed in the Union market if thresholds are not attained, and would therefore reduce production, thus lowering environmental impacts.

Regarding **standards** (Pillar H), this option would, in addition to option 1, also provide European standards and standardisation deliverables on relevant industrial process. These would be available to EU companies and further help them implement sustainable practices and increase transparency.

Overall, since no environmental legislation is weakened and the streamlining of permitting procedures is targeted towards reducing administrative delays and increasing the resources dedicated to ensuring a proper assessment of projects along the CRM value chain, **no significant harm** (DNSH) to the environment is expected under this option. Indeed, Strategic Projects would have to comply with all relevant nature protection legislation, including environmental assessment requirements, although different assessment would be required to be bundled.

The signalling that Strategic Projects may be of overriding public interest does not go beyond the current environmental legislative framework; it does not bypass the necessity for a case-by-case assessment or for meeting the conditions set out in the relevant Directives.

As the technical guidelines on DNSH provide, conducting an environmental impact assessment does not automatically entail that no significant harm is done, but it constitutes a "strong indication for the absence of significant harm for a number of the relevant environmental objectives". In addition, as the measures presented

[132] The assessment below is based on the assessment of similar measures in the impact assessment accompanying the 2012 proposal for revision of the EIA Directive – see footnote 93.
[133] See joint position paper submitted by Friends of the Earth Europe, European Environmental Bureau, Power Shift and the Centre for Research on Multinational Corporations (SOMO) in response to the call for evidence.
[134] https://www.cbd.int/development/doc/Minining-and-Biodiversity.pdf

aim to secure the CRM needed notably to ensure greater electrification (due to their presence in energy storage or renewable energy technologies), they also contribute to the environmental objective of climate change mitigation as part of the DNSH evaluation. Also, while extraction activities can affect the habitat or water conditions surrounding the operations, measures pertaining to the environmental footprint of CRM would incentivise the adoption of the best available levels of environmental performance in the sector, hence contributing to mitigate potential environmental harm. In addition, the development of Strategic Projects inside the EU would ensure a lesser reliance on supply from third countries, hereby ensuring that the additional capacities are developed in compliance with EU environmental *acquis*, and reducing environmental impacts in third countries. Lastly, environmental impacts would also be reduced due to measures promoting greater use of secondary raw materials, greater transparency on the environmental footprint of critical raw materials and more ambitious sustainability standards.

6.3. POLICY OPTION 3

6.3.1. Economic Impacts

6.3.1.1. Impact on companies

On **the list of critical and strategic raw materials** (pillar A) and **setting strategic raw materials targets** (pillar B), this option has the same impact as option 2.

On the **governance** aspects (pillar C), industrial actors or business associations favour the creation of a dedicated agency, such as the operational capacity (Euromines, EIT Raw Materials[135]), as they argue it would help in the development of CRM projects and provide relevant expertise to the EU institutions and industry.

Indeed, this operational capacity would enable the development of **stronger monitoring and risk management capacities** (pillar C.1), notably by developing tools such as early warnings of imminent vulnerability of a supply chain, which 63 % of 259 respondents supported, or periodic supply chain stress testing of selected CRMs (52 % of respondents agreed that it would allow to better anticipate supply chain disruptions, with only 7% disagreeing). The costs here are the same as for options 1 and 2 as they only concern large companies.

On **strategic stocks** (pillar C.2), the operational would enable companies to buy strategic stocks at better prices (due to joint purchase), resulting in cost savings. Since it is not a purchasing obligation but an incentive based on companies expressed needs, no costs on companies are quantified for this option. Stakeholders are supportive of avoiding centralized storage and favour a decentralized approach[136] that does not add burden for companies: mandatory stocks are the least favoured option among stakeholders when asked about the organisation of strategic stocks (14 %). Given the high financial burden induced by stocks, companies would welcome stronger EU support.

On **company risk preparedness** (pillar C.3), the operational capacity would provide for direct support to enable risk mitigation strategies. Large companies comprising a strategic raw material in their value chain would have to bear additional costs given the obligations to adopt at least one mitigation strategy (explained in annex 4). Given that this measure is not prescriptive on the exact nature of the strategy to adopt, it is not possible to assess its costs directly. Stakeholders were generally opposed to the addition of new requirements on companies, such as mandatory stockpiling, if those were not met with corresponding incentives. Some large

[135] See respective position papers submitted in response to the call for evidence.
[136] This point was notably made in the position papers submitted by the German automotive (VDA) and defence (BDSV) industry associations submitted in response to the call for evidence.

companies are also already adopting these mitigation strategies depending on which ones they consider as the most efficient137.

On **exploration** (pillar D), the positive benefits of this option are the same as for option 2.

The impact related to the **selection of Strategic Projects** (pillar E) is the same for companies.

Regarding **permitting** (pillar E.1), this option has the same impact as under option 2. This approach would also provide additional certainty to developers and related investors that Strategic Projects' applications will be effectively handled by national authorities.

Regarding **access to finance** (pillar E.2), a CRM Fund set up with additional European money (see section 5.2) would enable to bring enough resources to link the Fund closely to the concept of Strategic Projects. This would increase incentives to apply for the Fund and for Member States to make efforts that projects on their territory are included. The European involvement should also ensure that not only the selection of Strategic Projects is performed by a governance structure ensuring that the common European interest is pursued, but also that these Strategic Projects are supported financially in a manner proportionate to their importance to the whole of the EU. This way it can be best ensured that the cross-border value chains and the needs of the entire European economy are adequately affected, rather than the risk of some Member States trying to mostly pursue their own interests. This fund is also very likely to be larger than the fund explained in option 2, so a higher degree of supply stability is possible. This fund would also be better suited to distribute funding via grants to support the CRM value chain even more effectively, in line with State Aid rules, where a particular strategic European interest exists.

68 % of 259 respondents agree or strongly agree that a dedicated financial platform to de-risk critical raw materials projects that meet certain requirements (e.g., high environmental and social standards, while contributing to EU supply) by blending private, national and EU funding would be useful.

On **waste legislation** (pillar F) and **environmental footprint** (pillar H) and this option has the same impact as option 2.

For **standards** (pillar G), this option would have the same impact as option 1 and 2 combined.

The actions proposed under this option would ensure an even larger availability of CRMs generating even larger benefits for downstream users and the wider economy. Key green and digital technologies would become more competitive and the resilience in crises of global supply chain tensions increased.

6.3.1.2. Impact on SMEs

SMEs would particularly benefit from the measures developed on **monitoring, risk management, strategic stocks and the company risk preparedness** (pillar C.1, C.2 and C.3). Indeed, conversely to larger companies, SMEs that are active in a sector where strategic raw materials are required are less likely to already have in place contingency measures. They would benefit from the early warning mechanisms or the stress tests**,** as well as from the ability to jointly purchase stocks of strategic raw materials and from the consulting on their risk preparedness proposed by the **operational capacity**. This would directly strengthen their resilience ahead of any supply shock, thereby avoiding them to suffer the mitigation costs of a crisis. In the public consultation, a slight majority agreed that companies generally don't have contingency plans to deal with supply disruptions (37% agreement vs. 22% disagreement)

[137] KÖSTER, H., NEUBERT, F. P., DIERKSMEIER, K., ADELMANN, L., LENTGE, H., SCHMIDT, P. (2022): Securing raw material supply: Benchmarking of measures of foreign manufacturing companies and recommendations for action.

6.3.1.3. Impact on competitiveness

The more ambitious measures in pillar E with a European CRM Fund including new funding would contribute even more than option 2 to increasing the cost- and international competitiveness of European downstream producers as well as the international competitiveness and capacity to innovate for firms along the CRM value chain. These benefits would apply especially to SMEs due to their generally more difficult access to finance as well as vulnerability to supply disruptions. The considerations regarding energy prices discussed in option 2 apply here as well.

On **exploration** and **environmental footprint** (pillars D and H), this option would have the same impact as option 2. However, this option would further foster the competitiveness of EU industries by providing them with strong **monitoring** resources (pillar C.1) while supporting their eventual purchase of strategic raw materials **stockpiles** (pillar C.2) and their risk mitigation strategies (pillar C.3), making them more resistant to supply shocks and shortages.

6.3.1.4. Impact on competition

The same impacts as discussed under option 2 would apply, but a **CRM Fund** (pillar E.2) with a stronger EU role (backed by its financial contribution) would better ensure a level playing field in the Union.

6.3.1.5. Impact on international trade

Qualitatively, the same impacts as discussed under PO2 would apply, though to a stronger degree due to increased funding and support for Strategic Projects that improve EU supply security.

6.3.1.6. Impact on Member States (public authorities)

Under this option, the direct cost induced on Member States would remain the same as for option 2 (32 to 33 FTEs, plus cost induced by exploration programmes). Indirect costs would however be higher as they would directly relate to the contribution of Member States to the EU budget so as to allow the financing of an EU operational capacity on CRMs. Assuming that the resource obligation for national authorities would translate into the allocation of 0.5 FTE per Strategic Projects, this option would entail a recurrent cost of 12-18 FTEs in total for all Member States (assuming a number of 24-36 SPs per year, see Annex 4). However, this cost would differ between Member States depending on the amount of SPs taking place on their territory and their current staffing.

6.3.1.7. Impact on the Commission (budgetary implications)

The impacts on the Commission of this operational capacity ensuring the governance and the implementation of tasks (pillars C, C.1, C.2, C.3, with also a role in D and E) are more significant than for the other 2 options as it would require the creation of a full-fledged external operational capacity with significant staff. For the first year of establishment, the staffing implication would be limited to a seconded Head of Unit and 20 FTEs (or equivalents). In this phase, the operational capacity would draw on the expertise available in the Commission services. At operating speed, the operational capacity, whether an agency or a department in another agency, would have around 100 FTEs, shared amongst 4 units of 25 FTEs: Member States coordination, Intelligence and monitoring, Risk assessment and preventive measures, and Stockpiling coordination, with posts transferred from the relevant DGs or post creation; and with the possibility to hire seconded national experts with relevant expertise in risk assessment, project management and stockpiling. All the staff costs related to sub-pillars C.1, C.2 and C.3 are accounted for in this assessment.

In addition, the budgetary costs related to the capacity's administration (recruitment of new staff, rental of premises - unless the host country or existing agency would provide for it -, furniture and IT costs) would represent EUR 25 to 27 million[138].

In addition to the creation of this operational capacity, this option would require 4 FTEs (1 FTEs for ensuring the implementation under the extractive waste directive; 3 FTEs for assessing the suitability of environmental footprint, developing calculation methods and monitor the application of the measures; and 2 FTEs to enforce actions on standardisation and prepare requests).

As under option 2, the management of the **CRM Fund** (pillar E.2) would need to be paid by keeping a share of the funds under management. The funds to be invested would need to come from the existing Commission budget or additional funding sources. The EU contribution in this option would require new EU resources. In the description of driver 2.3 in the problem section, the needs for public support to the permanent magnet value chain and to the refining, recycling and (partially) mining of battery raw materials are estimated to be at EUR 2.7 billion by 2030 and EUR 4.7 billion by 2040.The actual needs are likely to be much higher, given the many other important CRM use cases.

6.3.2. Social Impacts

Through stronger support for **Strategic Projects**, this option would also create greater economic and social opportunity in the regions in which they are located. Since overriding public interest does not change rules on community involvement, this option should not lead to greater adverse impacts.

6.3.3. Environmental Impacts

This option would be contributing even more to the overall goals codified in the European Climate Law, compared to option 2 (c.f. section 6.2.3 for additional details).

Regarding **permitting** (pillar E.1), this option has the same impact as under option 2.However, the increased roll out of Strategic Projects to boost the production of CRMs, including CRMs essential for technologies enabling the energy transition, will facilitate the transition to climate neutral economy, and thereby further contribute to the development of the climate law's objectives.. Moreover, it is likely to be the case that if a project cannot be implemented in the EU, a similar amount of CRMs will need to be produced elsewhere including potentially in jurisdiction with no or lower environmental standards.

Regarding **environmental footprint** (pillar G), this option has the same impact as option 2. For **standards** (pillar H), this option would have the same impact as option 1 and 2 combined. Overall, **no significant harm** to the environment is expected under this option. Indeed, substantial requirements of permitting and corresponding legislation are not changed, so the analysis of option 2 remains valid; however, additional resources provided by Member States in the permitting process for Strategic Projects are likely to ensure a higher degree of scrutiny regarding the respect of environmental legislation.

7. HOW DO THE OPTIONS COMPARE?

Effectiveness: PO3 is likely to be most effective in meeting the objective of increasing EU industry's awareness and mitigation of CRM-related risks (SO1) given the added value of an external operational capacity, its additional resources and increased range of tasks, notably on monitoring, strategic stocks, risks preparedness and fund management. The governance structure proposed in PO1 and PO2 would however also

[138] The costs are adapted to 2022 prices and use as a baseline the EUR 22 to 24 million estimated in the European Labour Authority's impact assessment from 2018 for the creation of an agency of a similar size - (SWD(2018)68)

support the objective by providing enhanced stockpiling coordination, additional monitoring and further incentives for companies' risk mitigation strategies.

PO2 and PO3 are likely to be most effective in meeting the objective of supporting the EU CRM value chain (SO2). To increase exploration efforts in the EU, PO2 and PO3 present a more effective mechanism to foster national exploration and mapping, compared to PO1, which rather focuses on coordination and data exchange. To streamline permitting procedures and improve access to finance, PO2 and PO3 introduce the concept of Strategic Projects, which would entail privileged treatment in permitting and support in access to finance, while PO1 only contains general and likely less effective measures. With respect to increasing investment, PO3 is expected to be the most effective, as it would provide additional financial resources, but PO2 already provides a framework for SP selection and streamlined permitting, which is the necessary first step and likely the maximum achievable given the set level of resources available. Of course, the final outcome and effectiveness of the measures on finance will depend predominantly on the amount of funding made available, but this cannot be assessed at this point in time. In supporting circularity, the Recommendation and announcements of future actions under PO1 are less effective than the regulatory measures proposed in PO2 and PO3. All options also provide for effective tools to meet the need for standards for CRM-related industrial processes, although PO2 and PO3 enable stronger standards-development and better ensure their availability and suitability for EU companies compared to PO1.

On SO3, all options make the environmental footprint of CRMs transparent for buyers and help shift the market towards more sustainable CRMs. However, information requirements alone are not expected as such to lead to the behavioural change needed to reduce footprints in line with Union objectives, which is better achieved by PO2 and PO3 as these allow for the setting of thresholds to address the most polluting CRMs.

It is to be noted that all options also convey a time dimension. On standards, PO2 and PO3 are likely to take longer to fulfil the actions added on top of PO; on environmental footprint, measures allowing for the display of information of the CRM's environmental footprint will require the development of a dedicated methodology and the establishment of performance classes, which will require resources over time.

Efficiency: PO3 is more costly than PO1 and PO2 to meet the objective SO1 as they do not require the creation and financing of an external capacity but only the reinforcement of internal capacity and the creation of a dedicated board overseeing a network.

Regarding SO2, on exploration, PO2 and PO3 provide for a comprehensive approach that is however most costly than PO1. Regarding permitting, the PO2 is deemed more efficient than PO1 as, despite requiring limited additional resources from Member States, it has much greater benefits for project developers in terms of investment certainty. PO3 could be more effective, but would increase the pressure on national resources, thus reducing its efficiency. For circularity, PO2 and PO3 introduce light obligations on Member States and companies, which promise a significant additional benefit in terms of potential CRM recovery, which makes them very efficient actions. On standards, PO2 and PO3 would require more efforts from the Commission and relevant standardisation bodies than PO1, but with a higher likelihood of enabling the development of standards supporting the industry's competitiveness and the development of sustainable techniques, which makes them very efficient.

Regarding environmental footprint (SO3), PO2 and PO3 are considered more efficient as they allow for the setting of thresholds to address the most polluting CRMs, in as long as they do not negatively impact security of supply, i.e. do not create substantial cost. Here, not only domestic costs but also impact on trade are taken into account.

Proportionality/subsidiarity: Regarding targets, PO2 and PO3 go beyond PO1 in instituting additional review of the targets process, which makes them more demanding but still proportionate. When it comes to objective SO1, PO1 and PO2 provide necessary margin of manoeuvre to Member States and companies and focus on coordination and incentives, while PO3 imposes stronger requirements on companies.

Regarding objective SO2, requirements on exploration and on permitting in PO2 and PO3 remain proportionate to meet the objective, but impose further obligations on Member States. PO3, however, would to some extent limit Member States' discretion regarding permit-granting and the application of nature protection legislation, as well as their staffing decisions. For investment, all options are proportional as they are dependent upon the prior mobilisation of resources tailored to the needs of the value chain stages. Regarding circularity, PO1 only provides voluntary guidance to Member Statas whereas PO2 and PO3 in addition impose requirements to develop strategies and provide information on Member States and companies, but leaving them broad room in terms of follow-up and implementation.

On measures pertaining to environmental footprint (SO3) and standards on CRM industrial processes (part of SO2), all options are considered to be proportionate and respect subsidiarity principles, given that requirements and standards are adapted to the entire single market.

Coherence assessment:

In terms of overall coherence, the options are in line with the different European strategies and regulatory framework. They are all seeking to reinforce the Union's ability to meet EU Green Deal objectives and enable the deployment of clean energy as prescribed by the climate law, while respecting the "Do no significant harm" principle; the only difference across options here relates to their degree of ability to achieve the main objective. PO2 and PO3 also include amending EU waste legislation to ensure its coherence with the need to reinforce the EU's secondary supply of CRMs. In addition, the gaps analysis of this assessment demonstrates that on matters such as the sustainability of CRM, there is no EU instrument aiming at achieving this objective in a similar way with a similar scope (for CRMs placed on EU market), although complementarity with the batteries regulation or the ESPR have been considered. Matters related to monitoring or strategic stocks are designed so as to complement rather than overlap with any dispositions of the Single Market Emergency Instrument. In addition, this initiative is complementary to other initiatives announced under the Green Deal Industrial Plan[139], such as the Net Zero Industry Act, which will aim to develop the industrial manufacturing of key technologies for the green transition. Overall, the options are built in such a way so as to ensure conformity with international obligations and to contribute to the UN SDGs.

In terms of internal coherence, the options are built in such a way that actions undertaken to meet one specific objective should not come at the expense of another specific objective. As discussed in chapter 4, security of supply and sustainability may have opposing effects if one is pushed to the extreme. This is why the elaborations on pillar H (environmental footprint measures) describe (notably in section 5.2) how, prior to the introduction of any threshold limiting market access for less clean producer, a dedicated assessment will have to be conducted to ensure the absence of risks to EU supply security, hence ensuring that coherence is taken into account. However, the information requirements contained on option 1 for pillar H ensure a slightly higher coherence than options 2 and 3, meaning that a trade-off has to be made around this pillar regarding the different specific objectives.

	Effectiveness in meeting objectives			**Efficiency**	**Proportionality/ subsidiarity**	**Coherence**
	SO1	**SO2**	**SO3**			
Option 1	++	+	+	+	++	++
Option 2	++	++	++	++	+	+

[139] COM(2023) 62 final, A Green Deal Industrial Plan for the Net-Zero Age

Option 3	+++	+++	++	+	-	+

Legend: +- no / neutral impact; + minor positive impact; ++ positive impact; +++ significant positive impact; - minor negative impact; -- negative impact; --- significant negative impact

In order to reflect the different components of the specific objective 2, the effectiveness of each option has been assessed for each of the pillars that compose it:

Specific Objective 2: effectiveness of meeting the objectives for the different components					
	Exploration	**Permitting**	**Access to finance**	**Circularity**	**Standards**
Option 1	+	+	+	+	+
Option 2	++	++	++	+++	++
Option 3	++	+++	+++	+++	++

For **companies,** all options would result in positive impacts as they all allow for stronger support to the value chain than the baseline scenario, which would not only benefit companies operating directly in the CRM value chain but also downstream companies and the wider economy. The impacts of the options would have positive spill-overs on the security of supply of both primary and secondary critical raw materials, particularly of strategic raw materials, which would secure the deployment of green technologies or technologies needed in health, defence or digital industries. Though it allows for stronger support to the CRM value chain, PO2 and PO3 also require additional contributions from companies (information request and stress tests to conduct on large companies for PO2 and PO3, additional requirements on environmental footprint for PO2 and PO3) The public consultation shows that companies would support stronger actions developed in PO2 and PO3, however, given the additional benefits that such actions would allow. **Member States** have expressed stronger support for the set of measures developed under PO2, whether it is in terms of governance, monitoring or coordination of stockpiling, but also on strategic projects and circularity. They would however face additional costs in PO2 and PO3, since it provides for more stringent obligations and additional resources to implement the proposed measures. **Civil society** would benefit rather from PO2 and PO3 that best ensure the availability of the critical and secondary raw materials that are necessary to deploy green technologies, while ensuring a higher level of transparency on the sustainability of CRMs. They would also enjoy the benefits from the greater availability security of jobs both along the CRM value chain and downstream sectors.

8. PREFERRED OPTION

Following the analysis of the impacts of each policy option, as well as their ability to meet the general and specific objectives in the most effective and efficient manner while respecting proportionality, coherence and subsidiarity, this impact assessment considers that PO2 would be the preferred option.

First, PO2 is the option whose measures receive most support from stakeholders and Member States, as it adds only limited additional burden while also being proportionate.

Second, while it would require some resources and efforts from different stakeholders, the overall costs and impacts of PO2 are significantly smaller compared to PO3, while still being sufficiently efficient in tackling the problem drivers (which are not as effectively addressed in PO1).

Third, and most importantly, PO2 manages to effectively meet the general and specific objectives, also for the different components of SO2. It brings clear added value to the functioning of the Single Market and has positive economic impacts for CRM producers and downstream sectors by ensuring industrial resilience and enabling the development of EU CRM value chain. Its social impacts on jobs and cohesion of EU regions are also positive. Its positive environmental impacts are enabled by the measures on circularity, environmental footprint of CRMs, and the support to technical standardisation. It has to be noted that PO3 is assessed as more effective to meet the objectives given the additional resources and support that an operational capacity would entail, notably on permitting and on access to finance, as demonstrated by table above. However, the current budgetary context does not allow for the creation of such an entity at the time, despite support for a more ambitious governance option notified by some stakeholders. At the time of drafting, PO2 is therefore more efficient to meet the objectives and form the best performing package when considering the benefits in terms of effectiveness, efficiency and subsidiarity. No alternative combination of policy options would have allowed to effectively meet the specific objectives.

Proposing PO3 without ensuring the required of financial and human resources would lead to significant delays in implementation and undermine the delivery of some tasks.

Finally, while this impact assessment presents a coherent and effective approach to tackle the identified problems, political arbitration on some of the measures may remain affected by parallel on-going policy developments. The overall outcome of the initiative will depend to a large extent on whether Member States and other EU initiatives make funding available to support the Strategic Projects.

8.1. The economic and environmental model for the EU CRM value chain

As discussed in chapter 4, the main objective of the CRM Act is to ensure the EU's secure supply of CRMs, while incentivising the further development of sustainable supply sources. The main tool for this is strengthening the EU's capacity along the CRM value chain (specifically targeted by SO2). Under the preferred option, such value chain would be enabled in different ways both regulatory and through factors outside of this initiative (e.g. measures to tackle high energy costs, stronger use of the trade policy toolbox, increased investment in skills and R&I).

A key aspect of the long-term economic viability of the EU CRM value chain is political commitment: By setting targets (pillar B), investors receive assurance that measures (regulatory and financial) will be taken to guarantee the viability of their investments. More concretely regarding the measures in this initiative, the monitoring and risk preparedness actions (pillar C) would create demand from governments and companies to purchase secure CRMs, which will likely benefit most projects located in the EU.

The permitting provisions (pillar E1) are likely the most direct factor reducing costs and thereby making CRM projects in the EU more viable, and depending on the availability of financial resources, the access to finance actions will compensate for the remaining cost gap (pillar E2). Various actions announced under the circularity/waste pillar (F) would provide incentives specifically for projects at the recycling stage. Economic footprint measures (pillar H) should also increase the willingness of customers to pay for sustainable CRMs, where EU CRM projects likely have a frontrunner position due to the high level of regulation in the EU.

In this way, the pillars work together to address different barriers to the economic viability of an EU CRM value chain. The economic model for the EU CRM value chain can thus be described as one that relies not on satisfying demand from the cheapest sources, but on a joint effort by public and private actors to secure the existence of a fully developed EU CRM value chain even at higher costs. To some extent, these higher costs can be borne by downstream industries, who – in response to the experience of recent supply chain disruptions, and to increasing customer sustainability demands – should increasingly be willing to pay a premium for secure and sustainable CRM supplies. EU CRM producers in turn will likely have a head start in catering to this demand, by virtue of being subject to strong environmental regulation, and the existence of the interconnected European internal market that guarantees supply security. However, it should not be ignored

that a gap may persist between downstream industry's willingness to pay and the higher cost of CRM production in the EU. This is where public support – by the EU by Member States, in line with State Aid rules – comes in. While financial resources are not made available in this initiative itself, the framework created by it can dock into existing or future funds where a financing gap to realise the targets of this initiative is identified. Over time, the need for such support should decline, as the increasing availability of secondary raw materials and reduced energy costs due to renewable energy sources should reduce the role that energy costs and geological occurrences (weak points in the EU's current position on CRM markets) play while increasing the importance of Europe' leadership in recycling. These measures and developments should ensure the long-term economic viability of the CRM value chain in Europe, which is crucial for the security of supply of downstream users.

8.2. REFIT (simplification and improved efficiency)

The changes to existing legislation that this initiative would provide are limited to waste legislation (pillar F, laid out in detail in section 5.2). The measures are designed to consist in targeted amendments to existing provisions, thus not presenting significant choices in the context of the overall regulation and not requiring extensive analysis or stakeholder consultation. As they clearly relate to critical raw materials and, considering the growing importance of secondary supply, are an essential part of the solution to the problem this initiative revolves around, it is considered appropriate to assess them as part of this Impact Assessment and to consider them outside of the scope of REFIT.

8.3. Application of the 'one in, one out' approach

The initiative is in the scope of the "one in, one out" approach.

The administrative costs for businesses that would result directly with this initiative are very limited and relate to:

- ongoing costs:
    - reporting obligations of a small number of large companies operating in the CRM value chain, estimated at EUR 49.000 in total for all 64 companies concerned to report twice a year to the governance structure (see calculations in Annex 4). while reporting would remain voluntary for other companies. The costs induced are likely to be offset for the same companies, which would benefit, under certain conditions (e.g., having their projects labelled as strategic) from efficiency gained from the streamlining of permitting obligations.
    - reporting for large companies using Strategic raw materials (manufacturing) (on stress tests) -estimated at EUR 38.000 pear year
    - reporting available information on critical raw materials content of waste streams and composition of the waste EUR 700 000 for existing mining sites
- One-off costs to declare the environmental footprint. This is estimated to create a one-off administrative cost of EUR 14.55 million for all companies selling those CRMs.

No reductions of administrative costs for companies have been identified.

The adjustment costs for businesses resulting from this initiative consist of:

- Additional requirements on conducting a risk assessment under the form of a stress test for large companies in strategic sectors using strategic raw materials, estimated at EUR 1 million per year in the EU Costs related to certification of general sustainability claims and to the studies required for underlying environmental footprint. This one-off adjustment cost is estimated to be in the range of EUR 3.75 – 10 million for companies (see Annex 4).

The initiative does not foresee any cost applicable to citizens.

9. HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

The Commission will carry out an evaluation of the effectiveness, efficiency, coherence, proportionality and subsidiarity of this legislative initiative and present a report on the main findings to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions four to six years after the date of application of the legislative act. The Commission may propose report how to improve the CRM Act.

This review mechanism is similar to the review mechanisms included with the Commission proposal for a Regulation establishing a Single Market Emergency Instrument and repealing Council Regulation (EC) 2679/98140 as well as with the Commission proposal for a Regulation of the European Parliament and of the Council establishing a framework of measures for strengthening Europe's semiconductor ecosystem (Chips Act)[141].

The Commission and Member States will regularly monitor the application of the legal acts, in particular the effectiveness of the measures to monitor structural supply challenges if critical raw materials faced by the EU industry.

In addition, the achievement of EU supply capacity targets, as explained in pillar B (section 5.2) would be used to monitor the success of the initiative. The success of this initiative would be measured in terms of greater security of supply (which is not per se measurable but relevant aspects, such as the share of EU production and of global supply concentration can be measured, as they are already in the criticality assessment), the scale (in terms of financial volume) and speed (in terms of permitting delays) of investments in the EU CRM value chain within the EU. The contribution of secondary CRMs is also an important indicator of success, as is the distribution between high and low environmental performance scores, gathered through the environmental footprint measures. Through increased domestic production and circularity, as well as through constructive interaction with external CRM producers – aided by the incentives provided by the environmental footprint system – the EU's supply of CRMs would also be more sustainable.

Concretely, the following indicators to determine the initiative's success could be developed as follows:

Specific objective	Indicator	Unit of measurement	Data source	Frequency of measurement	Baseline	Target	Data quality rating
1	Diversification level of companies	% Size of supply coming from only one source	Companies survey	Every 3 years (adapt with report)	Defined per company	Reduction of companies' supply concentration	Low
2	Extraction/refining and recycling capacity (3 distinct indicators)	% compared to EU consumption of refined material	Criticality assessment	Defined in criticality assessment (every 3 years)	2023 criticality assessment provides the baseline for each material	Increase of EU capacity along the value chain	High

[140] COM(2022)459

[141] COM(2022)46 final.

2	Number of Strategic Projects in EU	[number]	Commission	Yearly report to Board	0	Increase for the number of projects in the different value chain stages	High
2	Number of Strategic Projects in third countries	[number]	Commission	Yearly report to Board	0	Increase of Strategic Projects to ensure diversification	High
2	Average permitting time for Strategic Projects	Length in months	Member State	Report to the board every three years	NA (no Strategic Project now)	Reduction of process length toward the timescale prescribed	High
2	Existence of national/regional programmes for exploration of strategic and CRM resources in MS	Number of programmes in each MS	Report by each Member State	Yearly	Review of existing national/regional programmes in MS one year after the CRM Act entered to force.	Each MS should have an updated national/regional programme I	High
2	Recycling input rates	% End of life recycling input rate	Criticality assessment based on material system analysis	Defined in criticality assessment	2023 criticality assessment provides the baseline for each material	Increase	High
3	Environmental footprint of CRMs	(Depends on indicator chosen, e.g. carbon footprint in gCO2-eq./kg of material)	Commission	Every three years (after entry into force of calculation rules for information requirements)	Depends on the indicator and the material in question	Depends on indicator	High

ANNEX 1: PROCEDURAL INFORMATION

1. Lead DG, D*e*cide Planning/CWP references

The European Critical Raw Materials Act is part of the 2023 CWP under the Commission's priority 'A Europe fit for the digital age'. The lead DG for this initiative is the DG for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW). The Directorate in charge is Directorate I –Ecosystems IV: Mobility & energy intensive industries. The initiative is encoded in Decide Planning with the reference PLAN/2022/1733.

2. Organisation and timing

The Secretariat-General set up the Inter-service Steering Group to assist in preparing the initiative in Q3 2022. There have been four ISSG meetings. The last ISSG consultation took place on 13 December 2022. A written consultation on the revised IA, following the RSB's negative opinion, was conducted from 31 January to 2 February 2023. A positive opinion with reservations was issued by the RSB on 16 February 2023.

The Call for Evidence and Public Consultation for this initiative were published on 30 September 2022 and was open to feedback from all stakeholders for a period of eight weeks, until 25 November 2022. The timing for adoption of the new act by the Commission is Q1 2023.

3. Consultation of the RSB

A meeting with the RSB took place on 18 January 2022. The RSB issued a negative opinion on 20 January 2022, following which this Impact Assessment was revised as follows:

RSB Recommendations	**Revisions introduced**
The report should provide more clarity on the policy context, the lessons learned from past actions and the planned interaction with parallel measures, including in the sustainability, external, development, trade and research policy areas. The report should be more specific on the regulatory gap to be tackled, particularly in the sustainability area. The impact of environmental legislation and public attitudes on EU CRM production should be also covered when presenting the problem drivers.	The report further expands on the context and past actions, with more detailed discussion of the 2008 raw materials initiative and the 2020 Action Plan, and the lessons learnt (Annex 8). Textbox 2 in chapter 5 provides an overview of the EU's international actions on critical raw materials, and chapter 2.1 provides more details on the international dimension of the problem, which are central to the problem and previously only figured in Annex 10. The international dimension is considered as a baseline scenario, but since these actions are continuous and are in place whichever policy options is chosen, they are also further assessed in the relevant impact sections (impact on international trade) in chapter 6. More generally, the non-regulatory dimensions have been integrated throughout the document, including by adding the lack of skills and the lack of public acceptance as drivers in chapter 2, and by listing trade, R&I and skills as aspects of the main problem

	tackled through the overall initiative (new chapter 5.4). We have expanded the detailed discussion of interactions with existing and proposed legislation in Annex 8 and synthesised the most relevant interactions in a section on "regulatory gaps analysis" under chapter 1.2, with a special focus on sustainability legislation, notably CSDD.
The report should present a clear and consistent set of general and specific objectives and a timeline (or major milestones) by which these should be achieved. Specific objectives should be formulated in a way that they do not pre-empt the choice of policy options. Trade-offs (and any resulting prioritisation) as well as synergies between objectives, such as security of supply, EU industry competitiveness, EU's decarbonisation efforts and environmental and sustainability impacts should be explained clearly. The report should also be clearer on the envisaged economic and environmental model for the EU CRM ecosystem and value chain (e.g. improved autonomy of CRM extraction and refining in Europe, mainstreaming of circular economy models, more reliable and sustainable sourcing from third countries, increased use of alternative solutions). On this basis, it should explain what success would look like and how it would be measured.	The objectives were rearranged (section 4). The general objective of the Critical Raw Materials Act is to ensure the EU's secure access to critical raw materials, while incentivising the development of sustainable supply sources. This ultimately contributes to economic growth and high living standards in the EU, prevents disruptions and distress within the European single market and increases the competitiveness of European businesses, while not neglecting the EU's role in promoting sustainable development and environmental protection globally. The specific objectives have been rephrased and condensed into three specific objectives that do not prejudge the solutions proposed: SO1. Increase EU industry's awareness and mitigation of CRM-related risks in the global supply chain SO2. Increase the EU CRM value chain's capacity in the internal market SO3. Reduce the environmental footprint of the EU's CRM consumption Potential trade-offs are explained upfront in chapter 4.2 on specific objectives. The report further elaborates on how success of the initiative could be monitored, notably by the number of Strategic Projects and the achievement of the value chain targets (pillar B) (chapter 9). The envisaged economic and environmental model for the EU CRM value chain was further detailed in a new chapter 8.1, which also comments on its long-term economic viability.
The measures considered under the policy options need to be presented in a clearer way. Measures which will be subject to analysis in later initiatives (such as certain waste measures and environmental footprint thresholds) can be referenced and would not need to be analysed in depth in this report. The report should provide greater clarity on the nature, types of targets, the supporting analysis required and the envisaged target setting	In section 5.2, the report developed further the details of the different measures composing the policy options, following additional reflections in the drafting of the legal text and consideration for the subsidiarity of the measures, notably for: - Targets (headline value chains target for extraction, refining and recycling instead of a complex target setting process);

process. The concept of strategic projects should be developed in more concrete terms. The report should clarify the streamlining of permitting processes related to strategic projects and how these would respect the subsidiarity principle. Diversification measures would need further precision on issues such as offtake agreements, private and public stockpiling. The role of the sustainability footprint and how it would work inside and outside the EU should be more thoroughly explained.	- Strategic Projects (more agile selection of projects rather than a list-based approach and possibility for Member States to object to a project being granted strategic status; clarification of the main criteria for selection, including EU added value and long-term viability); - Permitting (clarification of the requirements that would apply to Member States for Strategic Projects' permitting, at different stages of the process; clarification of how subsidiarity is ensured, i.e. by allowing Member States to object to a project being granted strategic status); - Diversification measures (providing clearer requirements on a limited set of companies, while providing them with the possibility to explain why compliance is not possible); - Stockpiling measures (the different obligations that apply to private or public stockpiling are further elaborated) - Circularity and waste measures (further explanation of which measures would come in the Act itself and which would come at a later stage, and some changes to the measures included, reflecting the evolving discussions in legal drafting); - The details pertaining to the functioning of environmental footprint have also been further explained (the measure does not ban all relatively unsustainable CRMs but, as a first step, creates transparency allowing customers to choose how they value sustainability in comparison to other aspects such as price and availability, and only in a second step, provides the possibility to impose thresholds, based on a dedicated IA, that could exclude the most unsustainable CRMs from the EU market. This second step would only apply after sufficient information is gathered at the transparency stage, and only where significant disruptions to the EU

	industry's green and digital transition or other key industrial assets can be excluded.)
The report should be clearer on the investment necessary to deliver on the objectives and the envisaged funding structure. It should clarify the role of and financial support to strategic projects, the envisaged mix of national and EU level funding and the role of State aid. It should explain how the long-term economic viability of high investment measures and strategic projects will be ensured.	Estimates regarding the investment necessary to deliver on the objectives were included in Annex 10 (Driver 2.3 Difficulty in accessing finance) and Annex 12 (Estimation of investment needs). These have now been better linked to the main text and complemented by some estimates of a suitable size of an InvestEU platform, notably in sections 6.1.1.1 and 6.2.1.1 on impact on companies. The option on access to finance is now further explained: the preferred option relates to the development of a framework that allows to best assess the relevant funding and investment vehicles available for a dedicated Strategic Project (chapter 6). It is also specified whether the measures relate to investment support or to the long-term operations of the Strategic Projects. The report discusses high energy prices in chapter 2, under Driver 2.3 "Lack of access to finance" and in section 6.2.1.3 on impacts.
The report should better assess impacts of options on third countries and trade, including compliance with international and WTO standards. It should further assess the potential economic benefits and be clearer on the overall impacts of EU industry competitiveness (including for SMEs) as well as the EU based CRM ecosystem. The overall compliance with the 'do no significant harm' principle should be further developed, as well as explaining the role of the measures for the EU's overarching green transition strategies.	The assessment of impacts has been strengthened to the extent feasible. Quantitative information has been added to further explain the benefits of the options, notably on Strategic Projects' job creation potential (see Annex 3 and Annex 4) Throughout chapter 6, additional information on cost- and international competitiveness, including for SMEs, has been added in the assessment of impacts. The effects of high energy prices have also been discussed (Chapter 2, subproblem 2). In addition, the report further assesses the impact on third countries and trade (WTO compliance, notably in Section 6 under the different policy options impact on international trade) as well as on competitiveness. Further details were added on the contribution of the options towards the goals set out in the European Climate Law and on their compliance with the "do no significant harm" principle, notably by explaining which criteria could be affected by the measures, also taking into account compliance with environmental acquis (see Environmental Impact for the different options.)

The comparison of options should include the coherence dimension. This should allow for a reflection of the main trade-offs as indicated above and overall consistency with existing and parallel measures. The effectiveness comparison should be based on a revised set of specific objectives. The preferred package of measures should be further justified. 3 The report should also clarify the overall net impacts on main parameters. Costs and benefits should be quantified to the extent possible and the table in annex 3 further elaborated, including on the One In: One Out requirements	The report further explains that the combination of approaches into options are shaped not only based on the degree of ambition and stakeholders' feedback, but also on the available set of resources to implement each option's provisions (Chapter 5.3 Description of the policy options) The report comprises a new coherence dimension that allows to better detail the comparison of options and show the trade-offs, both between the options and across EU policies (chapter 7). It is also better explained why policy option 2 is the preferred package. The overall net impacts were adapted with the addition of new qualitative benefits, notably in its effect on the one in one out requirements (c.f. Annexes 3 and 4) Additional costs were added to reflect the changes of one of the pillars (C.3), by calculating the number of companies affected by risk assessment obligation (stress test) (c.f. Annexes 3 and 4; and 6.1.1.1 impact on companies) The comparison of costs and benefits was expanded in the Chapter 8.2, Application of the 'one in, one out' approach was explained in section 8.2 and in Annex 3.

Further to this resubmission, the Impact Assessment received a positive opinion from the RSB on 16 February 2022, with comments, which were addressed as follows:

RSB Recommendations	**Revisions introduced**
The report should provide a more coherent description of the overall policy context and include for example the Global Gateway. It should better explain the link and coherence with the flanking measures envisaged in parallel to this initiative, such as on research and trade. The link between this initiative and the battery regulation should also be clarified, since similar mechanisms apply and certain CRMs are covered also by the battery act with a risk of redundancy. Strategic partnerships, which are not specified as a policy option in the intervention logic, should not be assessed in the impacts section but clearly explained as flanking measures and in the context section and included in the baseline scenario.	The Global Gateway was mentioned in the interplay with existing instrument of section 1.3 The overall policy context was ed by adding a section 1.2 on the policy context and previous nonregulatory actions taken in the area of critical raw materials. The link and coherence with the parallel measures on research and trade was further explained in section 5.4, underlining that ongoing work was already under way regarding skills, research and innovation or trade, but that the accompanying communication would further propose measures to reinforce those aspects, which were identified in the problem section.

Lessons learnt should be activated for the purpose of the policy context and problem definition.	The link with the battery regulation was further evidenced by integrating the description of the environmental footprint pillar in the main text, as it contains a paragraph explaining the link between the coherence between the two approaches. The parts on the impact Strategic Partnerships of were conscribed to the section 5.1 on the baseline scenario. Lessons learnt were included in the main text. In section 2.4, after having explained the likelihood of the problem persisting.
The report should better explain to what extent the problem of sustainable sourcing of CRMs linked with the main problem of lack of secure access to CRMs for the EU	A sentence was added in section 4.2 at the end of the specific objectives to specify that measures to ensure higher sustainability of CRM production should always consider the need to ensure supply security in parallel.
The content of the options and functioning of the key measures should be better presented in the main report. While the overview of policy options gives a broad idea of the available policy choices, these need also to be explained in a clear, but concise manner in the option definition section with corresponding references to the detailed description currently contained only in an annex. The report should explain what is behind each measure presented under each option (e.g. strategic projects, access to finance , etc), how they are intended to function and what they are expected to deliver. Policy measures which will require further analysis (certain waste measures and thresholds for the environmental footprint) should be clearly indicated in the preferred option section.	The content of the options was introduced in the main report, in section 5 It was specified that for some pillars, such as on environmental footprint and circularity measures, additional analysis would be required (in section 5).
(4) The report envisages financial support as a permanent feature of EU CRM value chains. It should explain how this long term framework for economic operators will ensure that public funding is used fully in line with principles applying to EU funding and State aid and sound economic incentives continue to apply. It should assess potential risks relating to permanent funding structures and specify under which conditions financial support could be granted.	Section 5.2 and annex 5 explain in the approaches which envisage financial support that such support should only be granted in case of market failures and where projects show long-term viability, in line with existing state aid rules. This should prevent the establishment of permanently supported projects under normal conditions. The unlikely case of sound projects requiring permanent support, for example due to permanently significantly higher energy costs, is assessed in the part on competitiveness for option 2.

(5) The report should clarify by when the envisaged technical standards for critical raw materials value chain could be realistically expected to be available, what the related uncertainty is and how this has been reflected in the impact analysis. (from entry into force)	The average time to develop dedicated standards was included in the corresponding options in section 5.
(6) The report should provide a more granular comparison of the effectiveness of options in terms of achieving the specific objective to increase the EU CRM value chain's capacity. This objective is very broad in terms of relevant measures that could contribute to it and thus requires a set of more specific criteria based on their difference in delivery on effectiveness which could be measured. On this basis the report should better justify the choice of the preferred option, including by explaining whether alternative combinations of option packages of measures (other than the three presented) have been assessed.	The specific objective 2 on supporting the EU value chain was further completed by its different components (section 4.2). To that end, the effectiveness of options was also further analysed in a granular way with the addition of a dedicated table in section 7, and this reasoning was included in the preferred option's section, notably underlining that no other combination of options would have performed better.

Evidence, sources and quality

Evidence and data that were used in this Impact Assessment included:

A. Academic studies and literature on the effect of previous crises on critical raw materials, as well as existing position papers and other documents drawn up by relevant stakeholders;
B. Newspaper articles and press materials. The references are cited in the main text of the report as appropriate.
C. Internal studies of Commission services, and notably of the Joint Research Centre.

The Impact Assessment further relies on the information received from consultation activities as detailed in the synopsis report contained in Annex 2 of this Impact Assessment

ANNEX 2: STAKEHOLDER CONSULTATION (SYNOPSIS REPORT)

In the context of the Impact Assessment on the European Critical Raw Materials Act, various consultation activities were conducted between September and November 2022. The purpose of the consultation was to collect evidence and views from a broad range of stakeholders, giving them an opportunity to provide relevant data and information on the problems and potential solutions to secure the supply of critical raw materials in the EU. While attempting to reach the widest possible range of stakeholders, the results of the consultation activities represent only the opinions of the respondents. This Annex presents the results of the consultation activities carried out.

The consultation activities included:

- A call for evidence published for feedback from the 30th of September to the 25th of November 2022,
- A public consultation published in the "Have your say" portal containing multiple choice and open questions covering regulatory and non-regulatory measures, running in parallel with the call for evidence.
- Questionnaires on "Permitting in the EU Member States" and on "Stockpiling of raw materials in the EU Member States" shared on the 28th of October with the Raw Materials Supply Group (RMSG).

Concerning the call for evidence and the public consultation, both were open to the public. The consultation process through the RSMG group targeted Member States, stakeholders and experts.

1. Overview of the participants

For all stakeholder activities, the main stakeholder groups addressed were:

- National authorities responsible for the survey, exploration and overall management of raw materials and mineral resources;
- Non-Governmental Organisations representing civil society;
- Associations representing industry, businesses and professionals;
- Businesses, including Small and Medium-sized Enterprises (SMEs);
- Social partners;
- Academic experts on non-energy extractive industries, research community;
- EU citizens.

For the call for evidence, 310 answers were received coming mainly from companies and business associations (144), followed by EU citizens (54), NGOs (49), Academia and others (39), public authorities (12), environmental organisations (5), trade unions (3) and non-EU citizens (2). There were responses from stakeholders from 19 Members States and 12 non-EU countries. In addition, 190 policy papers were submitted. Most responses came from Belgium, Germany and Spain. Among non-EU countries, Norway accounts for the largest number of responses. Most of the contributions presented a favourable attitude towards the upcoming act and welcomed the European Commission's initiative.

For the open public consultation, 263 answers were received coming mainly from business associations/companies/business organizations (164), followed by non-governmental organisations, EU citizens, public authorities and other stakeholders. 49 stakeholders attached a policy paper to their answers. The majority of respondents represent a large (250 or more employees) organization (81 out of 259 respondents; 31 %). 12 % (32 out of 259) of the respondents are from medium-sized organizations (50 to 249 employees), 20 % (53 out of 259) are from small organizations (10 to 49 employees) and 26 % (67 out of 259) are from micro-enterprises (1 to 9 employees).

Regarding the questionnaires on permitting procedures and stockpiling policies sent to the members of the Raw Materials Supply Group, input from 9 Member States, 2 non-Member States and 4 business associations was received.

2. Replies to the Call for Evidence for an Impact Assessment on the European Critical Raw Materials Act

The Commission consulted stakeholders to provide evidence for the impact assessment on the European Critical Raw Materials Act via the have-your-say portal. This consultation was open to the public. A total of 310 responses were received, and 115 policy papers were submitted.

Stakeholders were requested to give their views on the problems and initial solutions via regulatory and non-regulatory measures identified by the European Commission. The regulatory dimension was built around four main pillars as follows:

- Pillar 1. Defining priorities and objectives for EU actions,
- Pillar 2. Improving the EU's monitoring, risk management and governance in the field of CRM,
- Pillar 3. Strengthening the EU's critical raw materials value chain (mining, refining, processing, recycling) in a global context,
- Pillar 4. Ensuring a sustainable level playing field across the Single Market.

In addition, the following non-regulatory measures were also presented:

- Strengthening the EU external actions,
- Accelerating research and innovation,
- Enabling the development of skills needed for the critical raw materials value chain.

General priorities

A vast majority welcome the initiative and support the need to secure the supply of raw materials for the digital and green transition through a new regulation. A small number of stakeholders, mainly from the aggregates industry, pointed out their preference for the legal instrument to be a Directive, in order to better adapt the upcoming Act to Member States' specificities.

Overall, stakeholders acknowledge the necessity for the EU to overcome the challenge of critical raw materials dependency by diversifying the supply chain and increasing EU capacities while ensuring both the competitiveness of EU industry and supply chain sustainability. For almost every business, barriers to the development of CRM projects in Europe, such as the lack of available funding and complex and long permitting processes, are the main concern. NGOs and citizens most frequently mentioned the absence of measures targeting the demand side of CRM consumption and the need to ensure high environmental and social standards as well as transparent governance processes. A small group of EU citizens' responses also showed their opposition to the current regulation. In addition, national authorities and experts' groups focussed on the need to enhance EU geological data and improve monitoring and governance capacities, with differing positions on the need for a network of national agencies or a transnational EU agency.

Many respondents mentioned the need for consistency with other EU legislation, showing awareness of the interconnections between critical raw materials and EU energy, corporate governance, human rights and environmental, health and products regulation such as the Water Framework Directive (WFD), the Environmental Impact Assessment Directive (EIA), the Habitats Directive, the EU Industrial Emissions Directive, the Waste Electrical and Electronic Equipment (WEEE), the Extractive Waste Directive (EWD), the Waste Shipment regulation, the End of Life Vehicles Directive (ELV), the Registration, Evaluation, Authorisation and Restriction of Chemicals directive (REACH), the Renewable Energy Directive (RED), the Batteries Regulation, the proposal for a Directive on Corporate Sustainability Due Diligence (CSDD), the

Supply Chain Sourcing Obligations Act, article 191 of the Treaty on the Functioning of the European Union, the Packaging and Packaging Waste Directive, the Trans-European Energy Infrastructure (TEN-E) Regulation, the Ecodesign Directive, the proposal for an Ecodesign for Sustainable Products Regulation, and the proposal for a Regulation on Prohibiting products made with forced labour on the Union market.

Regulatory Measures

Pillar 1. Defining priorities and objectives for EU actions.

Stakeholders support a sound, data-based and transparent definition of critical raw materials. Stakeholders call to ensure that the list of raw materials is flexible and easily reviewed over time to be able to answer quickly and efficiently in times of crisis. In addition, most stakeholders suggest to broaden the scope of the list, calling to anticipate the future needs of the digital and green transition as well as strategic dependencies in other sectors such as defence or health. In this context, a reassessment of the methodology to define criticality is suggested, with proposals varying across stakeholders. Also, most of the feedback from businesses underlines new materials to be considered under the scope of criticality with copper, aluminium and nickel commonly repeated.

Only few respondents address EU objectives to increase domestic production. Among those that do, setting a 2030 EU target on critical raw materials is suggested to send a strong signal to Member States and European industries and work towards more strategic autonomy.

Pillar 2. Improving EU's monitoring, risk management and governance in the field of CRM

Stakeholders acknowledge the lack of unified governance and up-to-date data on raw materials across the EU. A general call is made for strengthening and improving the coordination and monitoring capacities in Europe. Most research institutions support harmonising reporting on the basis of the United Nations Framework Classification for Resources. National authorities and sectoral associations mostly agree with granting monitoring tasks to geological agencies across Europe and implementing a coordinated network, with partial alignment on the need for a governance body. Several companies and associations suggest the creation of an independent EU agency that would help develop projects in the EU as well as providing expertise to European institutions and companies.

On stockpiling, respondents' views are cautious, with national authorities raising questions about administrative feasibility and additional costs for Member States while businesses stress adverse impacts on prices and administrative burdens.

Civil society supports collection and open access to data, while most companies mention additional administrative burden and believe that building a common European database should include provisions ensuring that sensitive information is not disclosed.

Pillar 3. Strengthening the EU's critical raw materials value chain

Stakeholders, and businesses in particular, emphasize a lack of funding incentives, as well as delays, uncertainties and complexities in the permitting procedures as major barriers to project development. It is considered a priority to streamline permitting procedures. On the financing side, several businesses suggest the inclusion of mining in the EU sustainable finance taxonomy, financial support via State aid under the Guidelines on State aid for climate, environmental protection and energy or the creation of Important Projects of Common European Interest for critical raw materials, the creation of a dedicated EU fund and the use of financial instruments such as EIB and EBRD loans and public guarantees. The received feedback shows that strategic projects are welcome as long as they do not impact negatively on prospective non-strategic mining projects.

The majority of civil society and NGOs think that priority should be given to secondary raw materials value chains to build a raw materials circular economy. On the specific actions aiming at promoting the extractive industry, civil society showed environmental and social concerns, calling to secure 'no-go zones' for extractive activities at EU level and ensure public participation and the respect of ESG standards for strategic projects.

Pillar 4. Ensuring a sustainable level playing field across the Single Market

Stakeholders generally agree that measures tackling waste and circularity need to be improved, especially when addressing recycling and recovery of end-of-life products. Responses show that economic feasibility combined with a lack of technological maturity are considered major obstacles. The feedback shows commitment from all stakeholders, with several calls for binding targets on recycling and material recovery from waste, as well as on better eco-design requirements. In particular, industrial associations operating in the recycling, batteries and renewable energy sectors call for paying closer attention to waste streams with forecasted growth, such as end-of-life vehicles or waste of electrical and electronic equipment. In addition, many respondents express their concern about waste leakage to third countries, which hinders access to waste resources and decreases industries' competitiveness.

Finally, many stakeholders call for ambitious, transparent and harmonised ESG standards to ensure the respect of responsible mining principles and European competitiveness. Overall, stakeholders support the enforcement of existing standards such as the Initiative for Responsible Mining Assurance in the upcoming act.

Accelerating research and innovation & skills

Feedback underlines a real need for research and innovation across the whole supply chain of critical raw materials. Stakeholders' priorities vary across groups with civil society calling to prioritize investments on secondary raw materials and substitution technologies while businesses want to tackle technological challenges in their respective industrial sectors, and national authorities and expert groups focus on new technologies and knowledge gaps, with national authorities focusing on exploration activities. Respondents call for new R&I programmes and additional competitive grants for ongoing EU research programmes.

In addition, a small group provided feedback on the need to re-skill and up-skill European workers ahead of the latest innovations and expected increasing demand in the raw materials sector.

3. Public Consultation

Overview

The public consultation questionnaire includes questions on general challenges regarding raw materials but also on specific issues ranging from EU policies to monitoring and permitting processes on mining to circularity.

General Challenges

A vast majority believes that EU possibilities to source CRM (primary, secondary, refining, processing) are currently underexploited or insufficient.

Most respondents either agree or strongly agree with statements that refer to underexploited opportunities of critical raw materials (CRM) within the EU. 170 (66 %) respondents out of 259 agree or strongly agree that the potential to extract CRM from primary sources within the EU is currently underexploited. More respondents (218 out of 259 respondents; 84 %) agree or strongly agree that the re-use and recycling opportunities within the EU are currently underexploited and only 2 respondents disagree or strongly disagree with the statement.

Further answers received on the following statements regarding the underexploited opportunities for CRM sourcing within the EU:

- 186 (72 %) out of 259 respondents agree or strongly agree that EU's processing and refining capacities for CRM are currently underexploited.
- 167 (64 %) out of 259 respondents agree or strongly agree that the potential to diversify the EU's external supply of critical raw materials is currently underexploited.
- 109 (42 %) out of 259 respondents agree or strongly agree that the potential to substitute critical raw materials is currently underexploited in the EU. Almost the same number of participants (110) responded without stating an opinion (e.g., neutral, no opinion).
- 138 (53 %) out of 259 respondents agree or strongly agree that the potential to increase efficiency of critical raw materials use is currently underexploited in the EU.
- 154 (59 %) out of 259 respondents agree or strongly agree that the industry is not able to tackle critical raw materials sourcing challenges on the global market without further EU policy intervention.
- 194 (75 %) out of 259 respondents agree or strongly agree that current EU policies on critical raw materials are insufficient to effectively manage supply chain disruptions, shortages and price hikes.

Current EU policies

The respondents overall agree that current EU policy actions contribute to secure the EU's supply of CRM. The following actions are supported:

- Establishing and updating the critical raw materials list - 169 (65 %) out of 259 respondents agree or strongly agree
- Developing the European Raw Materials Alliance – 161 (62 %) out of 259 respondents agree or strongly agree
- Concluding strategic partnerships with resource rich third countries – 149 (58 %) out of 259 respondents agree or strongly agree
- Developing a transparent and stable trade framework for facilitating trade in raw materials, including through free trade agreements with resource rich third countries – 150 (58 %) out of 259 respondents agree or strongly agree
- Funding research and innovation on resource efficiency, recycling and substitution of critical raw materials through Horizon Europe – 184 (71 %) out of 259 respondents agree or strongly agree
- Developing and coordinating knowledge through research projects, such as the raw materials information system – 179 (69 %) out of 259 respondents agree or strongly agree

Lack of investment into the EU supply chain

The topic of financing receives similar answers as most respondents see difficulties with financing and funding. The fear of reputational damage seems to be less important than the lack of public acceptance for new CRM projects:

- Difficulty to access private financing for critical raw materials projects – 133 (51 %) out of 259 respondents agree or strongly agree; 23 (9 %) disagree or strongly disagree
- Difficulty to access public funding in the EU for critical raw materials projects – 145 (56 %) out of 259 respondents agree or strongly agree; 10 (4 %) disagree or strongly disagree
- Lack of technical standards for processes along the critical raw materials value chain – 73 (28 %) out of 259 respondents agree or strongly agree; 56 (22 %) disagree or strongly disagree; 130 (50 %) express no opinion
- Fear of reputational damage for companies – 87 (34 %) out of 259 respondents agree or strongly agree; 22 (8 %) disagree or strongly disagree; 150 (58%) express no opinion

- Lack of or limited public acceptance for new critical raw materials projects in EU – 165 (64 %) out of 259 respondents agree or strongly agree; 22 (8 %) disagree or strongly disagree
- Unfair competition from third countries – 158 (61 %) out of 259 respondents agree or strongly agree; 19 (7 %) disagree or strongly disagree
- Price volatility and unpredictability – 165 (64 %) out of 259 respondents agree or strongly agree; 14 (5 %) disagree or strongly disagree
- Lack of skilled workforce to design and operate critical raw materials projects – 133 (51 %) out of 259 respondents agree or strongly agree; 28 (11 %) disagree or strongly disagree
- Lack of available technologies to carry out critical raw materials projects in line with the required environmental standards – 91 (35 %) out of 259 respondents agree or strongly agree; 72 (28 %) disagree or strongly disagree

The main problem about the difficulty to access private funding is the length and complexity of the permitting process (for exploration and extraction). Further explanation was given for some stakeholders, this relates to the fact that the absence of mining activities from the EU taxonomy makes funding and investment unattractive.

Permitting emerges as a major bottleneck in the open public consultation among stakeholders. Permitting processes are perceived as *"lengthy, complex and can be easily derailed at several stages"*[1]. Hence, stakeholders call for acceleration of these processes, "while ensuring a coherent level of sustainability performance"[2]. At the same time, there is a call for transparency and guidance[3] in permitting processes, for instance in form of a common platform created by the EU, where member states could exchange experience and knowledge linked to permitting processes[4].

- **Definition of critical raw materials**

On the definition of critical raw materials, stakeholders either propose new elements that should be added to the list of critical raw materials, such as sylvinite, sulphur[5], phosphate rock[6] and potassium[7], or stress the general need for a better and clearer methods of criticality assessments. Several stakeholders also underline the need to take future demand into account[8] as well as propose a review of the materials currently understood as "fundamental/strategic/essential/priority or other"[9].

Implementing a list with strategic raw materials would be beneficial for future decisions according to the respondents. A specific list of raw materials of strategic importance for the EU (and thus deserving priority attention) would:

- guide investment decisions of companies and financial institutions – 182 (70 %) out of 259 respondents agree or strongly agree
- target public support at EU and national level – 182 (70 %) out of 259 respondents agree or strongly agree
- Setting EU objectives for increasing domestic production capacity along different stages of the value chain (exploration, extraction, refining, recycling) to guide national and European efforts (i.e. in relation to the materials on the list) - 188 (73 %) out of 259 respondents agree or strongly agree

- **Setting critical raw materials objectives**

The list of raw materials of strategic importance for the EU can also be used to set EU objectives for increasing domestic production capacity along different stages of the value chain: 188 (73 %) out of 259 respondents agree or strongly agree with the statement.

- **Monitoring and risk assessment (and governance)**

On **monitoring**, the answers are highly distributed. On the question of whether companies would benefit from public monitoring programmes, 146 (56 %) out of 259 respondents agree or strongly agree. Only 8 (3 %) respondents disagree or strongly disagree on that matter. The answers on the question if companies lack sufficient information on supply risks for them to take preventive measures were distributed quite evenly: 29 % agree or strongly agree, 25 % disagree or strongly disagree, 24 % are neutral and 22 % express no opinion. The answers on the matter if companies generally do not have in place contingency plans to deal with supply disruptions are more distributed as well: 34 % agree or strongly agree, 23 % disagree or strongly disagree 21 % are neutral and 22 % express no opinion. However, regarding the competences of the member states, the answers are quite clear again:

A. Member State authorities do not have in place sufficient monitoring mechanisms allowing them to assess supply risks and anticipate problems – 138 (53 %) out of 259 respondents agree or strongly agree
B. Member State authorities do not sufficiently cooperate and coordinate in monitoring critical raw materials supply chains – 150 (58 %) out of 259 respondents agree or strongly agree

More cooperation between national authorities and EU-wide governance would also be beneficial for the EU's value chain of CRM according to the respondents:

- Enhanced cooperation between national authorities or agencies in charge of critical raw materials (data exchange, common monitoring, etc.) - 213 (82 %) out of 259 respondents agree or strongly agree
- A dedicated EU-wide governance capacity tasked with monitoring actions and strengthening the EU value chain – 177 (68 %) out of 259 respondents agree or strongly agree
- Better access for companies to monitoring information at EU or at national level to enable them to identify vulnerabilities in their supply chains – 182 (70 %) out of 259 respondents agree or strongly agree

Regarding the subjects of monitoring, the respondents assess that CRM projects in the EU and supply and demand developments are the most important aspects to monitor while price developments are the least important ones:

- Prices of critical raw materials – 125 (48 %) out of 259 respondents agree or strongly agree, 116 (45 %) out of 259 respondents expressed a neutral or no opinion
- Demand developments at national, European and global levels – 197 (76 %) out of 259 respondents agree or strongly agree
- Supply developments of critical raw materials (including forecasting) - 195 (75 %) out of 259 respondents agree or strongly agree
- Trade flows of critical raw materials – 192 (74 %) out of 259 respondents agree or strongly agree
- Progress of important critical raw materials projects in the EU – 204 (79 %) out of 259 respondents agree or strongly agree

Many respondents would welcome an early warning system by public authorities; stress testing supply disruptions is also seen positively, albeit slightly bit more reserved:

- Early warnings by public authorities of imminent vulnerability of a supply chain – 162 (63 %) out of 259 respondents agree or strongly agree
- Periodic supply chain stress testing of selected critical raw materials at EU level to better anticipate supply chain disruptions – 134 (52 %) out of 259 respondents agree or strongly agree, 107 (41 %) out of 259 respondents expressed a neutral or no opinion

Several stakeholders agree that *"while monitoring of prices and market fundamentals is important, monitoring must be accompanied with forecasting of future supply needs and capacities."*[10] At the same time, there are opinions that the public authorities and member states should conduct monitoring by themselves and communicate any potential disruptions in supply or anticipated issues to the concerned companies[11]. From the social point of view, stakeholders believe that monitoring and control should be implemented along the life cycle of the mines as well as several years after their closure in order to be credible[12]. The data and its quality are considered highly important, and companies call for implementation of mechanisms that would allow access to reliable information from resource-rich countries[13]. Inputs from EU citizens also uncover a need for close monitoring of the amount of critical raw materials used as well as how much of these had been recycled[14]. Finally, suggestions for monitoring include gaining a better overview of the public perception of exploration activities in general but also in relation to specific projects[15].

- **Strategic stocks**

Even though strategic stocks are generally welcome by the respondents, some answers were more reserved:

- Provisions to increase strategic stocks of critical raw materials at EU, national or industry level – 129 (50 %) out of 259 respondents agree or strongly agree, while 15 disagree or strongly disagree (10%)
- 105 (41 %) out of 259 respondents expressed a neutral or no opinion

Regarding the organisation of strategic stocks, most respondents would prefer an EU level guidance on voluntary stocks at national level (41 %). Mandatory stocks are the least favourable options among the respondents (14 %). Only 9 (11 %) out of 81 business associations and company/business organisations that answered the question have a strategic stock.

Coordination of stockpiling at an EU level is favoured as it is viewed as costly, and support from the EU is thus welcomed[16]. For instance, companies from the PV industry perceive stockpiling as a major financial burden in an already competitive industry environment[17]. Coordination is called for also in order to prevent supply shocks and mitigate geopolitical risks[18]. Any discriminatory practices are strongly discouraged, which is where management on an EU level could step in to ensure equal conditions and treatment among the member states[19]. Strategic stockpiling is thus often supported, but in a way in which it would not pose too great an administrative and financial burden for companies[20]. However, there are also opinions favouring strategic stockpiling being initiated at the national level on the basis of national security, while keeping the stockpiling on a voluntary basis[21].

- **Company risk preparedness**

Business associations and company organisations also stated that within the last five years 'strong volatility in prices' was the biggest problem in relation with critical raw materials supply (35 %). Other problems are supply disruptions (27 %) or supply shortages (23 %).

- **Exploration efforts in the EU**

As regards to exploration efforts in the EU, the public consultation shows a range of different opinions among stakeholders. Overall, respondents point out the untapped potential of the European bedrock, with gaps in the availability of up-to-date and relevant geological data. Stakeholders highlight deficient national funding for exploration projects and an urgent need to speed up investments on modern and efficient technologies. While non-governmental organisations call for environmental protection and community consultation, several business associations and companies call for financial or additional support from the EU to promote local exploration activities. The environmental and social concerns include a need for increased engagement with local communities, workers and other stakeholders in exploration and production processes[22].

At the same time, many stakeholders stress the need for exploration and mining projects not to be carried out in sensitive or particularly sensitive endangered habitats[23], and for NO-GO zones to be established[24].

On the other hand, businesses but also some EU citizens point on the need to educate the public *"on the urgent need for local exploration and sourcing of critical raw materials, the environmental advantages of sourcing these materials in the EU's highly regulated jurisdictions as opposed to loosely monitored third countries"*[25]. Increased action to counter misinformation and disinformation on the exploration and mining industries is called for, along with financial support and a clearer overview of available funding to be provided by the EU in the field of exploration[26]. Also, according to some stakeholders, *"deposits which are easy to access become depleted, and so exploration needs to be deeper and in more remote locations"*[27].

- **Support to the value chain**

The majority of the respondents agree that identifying strategic projects would be beneficial for financial and permitting decisions. 184 (71 %) out of 259 respondents agree or strongly agree that strategic projects and partnerships outside of the EU should also benefit from de-risking if they comply with social and environmental standards and can contribute to secure EU supply. Furthermore, identifying strategic projects could be beneficial for the EU's industry according to the answers received.

- Identifying Strategic Projects across the critical raw materials value chain with strong environmental and social performance and contributing to reducing EU dependencies – 223 (86%) out of 259 respondents agree or strongly agree
- Ensuring that these Strategic Projects benefit from easier access to public and private finance – 193 (75 %) out of 259 respondents agree or strongly agree

    - *Permitting procedures*
- Ensuring that these Strategic Projects benefit from streamlined and quicker permitting procedures – 190 (73 %) out of 259 respondents agree or strongly agree

Among the received answers, Spain and Sweden were mentioned the most in context of difficult permitting procedures. However, many respondents sent the exact same answer: 'National permitting requirements are complicated to navigate, but they are fit for purpose for national or regional needs and should remain national competence'

    - *Access to finance*
- Regarding policy options in order to facilitate access to finances for CRM projects the following answers were received:
- Public support to bring together downstream users and project promoters to facilitate the conclusion of long-term supply contracts and offtake agreements – 143 (55 %) out of 259 respondents agree or strongly agree
- Target existing EU funds that have the possibility to finance critical raw materials projects of particular strategic relevance identified under the future legislation – 185 (73 %) out of 259 respondents agree or strongly agree
- Increased financial support from national and European promotional banks for critical raw materials projects – 183 (71 %) out of 259 respondents agree or strongly agree
- A dedicated financial platform to de-risk critical raw materials projects that meet certain requirements (e.g., high environmental and social standards, while contributing to EU supply) by blending private, national and EU funding – 175 (68 %) out of 259 respondents agree or strongly agree
- Explore opportunities offered by the existing State aid rules for critical raw materials projects, such as Important Projects of Common European Interest, State aid Framework for research, development and innovation, Regional Aid Guidelines, Guidelines on State aid for Climate, Environmental

protection and Energy or relevant State aid General Block Exemption Regulation provisions – 168 (65 %) out of 259 respondents agree or strongly agree

- Support a level playing field to promote transparency and good governance with partner countries, aiming to gather sustainable and responsible investments and partnerships in the sector – 203 (78 %) out of 259 respondents agree or strongly agree

Multiple stakeholders agree that *"mining and quarrying extraction projects are highly capital intensive and, in some instances, would require priority financing from EU and national tools"*[28]. They believe that EIB and EBRD should be more active in de-risking priority projects and in financing projects related to primary raw materials[29]. There are also requests of funds or tax rebates for companies that make an active effort to apply a circular approach in the design of their products with the aim of reducing the consumption of critical raw materials or replace some of them with non-critical ones[30]. At the same time, incentivising individuals and businesses financially is highly supported, along with a more transparent pricing mechanism and a liquid market for the content of purchased products[31]. Businesses also believe that *"market incentive and deterrent programs will encourage private investment in critical minerals projects"*[32]. Responses also reflect the current energy crisis, causing high energy costs and posing a vital issue for the industries. Consequently, stakeholders ask for a higher financial support as *"new investments need certainty that low carbon energy sources will be available and affordable in Europe"*[33]. Financial de-risking is suggested to take place via different public guarantees such as contracts for difference, public indemnities, green investment funding leveraged through the Sustainable Finance Taxonomy, but also the European Sovereignty Fund as a source of a sustainable pan-European financial de-risking scheme[34]. In general, more clarity on public funding opportunities is desired[35].

- **Targeted revisions of waste legislation**

Most respondents agree that the legislative situation within the EU should be improved in order to promote and incentivize secondary resources and circularity:

- EU product legislation does not sufficiently incentivize the use of secondary raw materials in products – 152 (59 %) out of 259 respondents agree or strongly agree
- EU waste legislation does not sufficiently incentivise the recovery and recycling of raw materials – 171 (66 %) out of 259 respondents agree or strongly agree

Regarding the challenges of shipping waste containing CRM, the following responses were received:

- Shipments of waste containing critical raw materials between Member States are difficult, which limits possibilities for viable recycling projects – 136 (53 %) out of 259 respondents agree or strongly agree, 11 (4 %) out of 259 respondents disagree or strongly disagree
- Export of waste containing critical raw materials increases the shortage of critical raw materials in the EU and limits potential for circularity – 156 (60 %) out of 259 respondents agree or strongly agree

Most respondents would also welcome targets for waste operators and other requirements regarding sustainability, circularity and recycling. Overall, the responses are positive or neutral, with only few people disagreeing or strongly disagreeing with the statements.

Regarding the development of targets for waste operators, the following responses were received:

- there should be targets for the recycling efficiency of critical raw materials from different waste streams (electronics, vehicles, etc.) - 142 (55 %) out of 259 respondents agree or strongly agree
- there should be targets for the material recovery of critical raw materials from different waste streams (electronics, vehicles, mining waste etc.) - 164 (63 %) out of 259 respondents agree or strongly agree

Regarding recycling, the following answers were received:

- Requiring Member State to design waste management plans including specific measures to promote the recovery of critical raw materials, from historical mining waste – 176 (68 %) out of 259 respondents agree or strongly agree
- Setting design requirements for products containing critical raw materials to increase their ease of dismantling and recycling – 173 (67 %) out of 259 respondents agree or strongly agree
- Setting minimum content of recycled critical raw materials in relevant products – 115 (44 %) out of 259 respondents agree or strongly agree, 82 (32 %) out of 259 respondents expressed a neutral or no opinion
- Setting design requirements for products containing critical raw materials to increase the length of product life – 129 (50 %) out of 259 respondents agree or strongly agree
- Strengthening support for EU research and innovation funding on recycling and material recovery technologies for critical raw materials – 226 (87 %) out of 259 respondents agree or strongly agree
- Strengthening exploration and documentation of critical raw materials in secondary deposits and waste streams – 201 (78 %) out of 259 respondents agree or strongly agree

There is a call for waste management on both the European and member states level. While on the level of member states, some stakeholders call for *"waste management plans with specific measures to promote the recovery of critical raw materials from historical mining waste, mandatory reporting, and setting clear binding targets for waste operators handling critical raw materials from different waste streams"*[36], others propose an introduction of recycling obligations and fixed recycling targets applicable both within the EU and internationally[37]. Some major bottlenecks connected to waste management have been identified, such as transport of waste between different member states, which is considered to be a complex process leading to an administrative overburden, but also the collection and treatment of waste, where harmonised procedures are supposedly lacking[38]. The potential to identify critical raw materials from mining waste is also considered important and underexploited[39], together with assistance to utilise products that would otherwise be waste[40]. Efforts to boost the recovery and recycling rate of the resource flows are called for, along with the mining waste valorisation, which should include consistent mapping of former mining waste and assessing legislative bottlenecks[41].

- **Actions on standards for the CRM value chain**

Majority of stakeholders agree on the need for mining in the EU to be done with commitment to, and enforcement of, high environmental and social standards[42] and, in general, for harmonised and consistent application of environmental and social standards across all member states and regions of the EU[43]. Multiple stakeholders agree that: *"a lack of technical standards is not the challenge, but rather the quality of the standards and their transparency and enforcement. The EU, Member States and companies should embrace new legislation and update and enforce existing EU legislation to ensure high social and environmental standards"*[44]. Production in Europe is perceived as more sustainable, both with respect to social and environmental standards, but stakeholders underline the need for investments to reach the desired volumes[45]. In addition, standards for recycling processes such as dismantling are also called for as binding minimum standards would ensure high-quality recyclate in the recycling and related value chain processes [46]. Some stakeholders also support companies to engage in standardization as, in their opinion, uniform standards increase efficiency and contribute to greater security and trust[47].

- **Sustainability of critical raw materials**

To ensure that critical raw materials meet European sustainability standards, respondents agree or strongly agree that CRM should be accompanied with information on the environmental footprint of producing those materials (186 (72 %) out of 259 respondents) and on the ethical sourcing of those materials (180 (70 %) out of 259 respondents).

A majority of stakeholders are committed to comply with the environmental and social protection rules in a strict way. Their goals include an improvement of sustainability in mining projects, as well as a social acceptance of the mining industry, value sharing, transparency and cooperation with the local society in the process[48]. They often perceive the improvement of the sustainability performance of European raw materials value chains as a vital part of their strategies[49]. As mentioned above, recycling efforts form a significant part of the sustainability goals of stakeholders, including proposals of EU wide campaigns on the importance of recycling raw materials[50]. Many stakeholders also call for assurance that projects follow the due diligence requirements set out under the EU Corporate Sustainability Due Diligence Directive (CSDD)[51]. An overall call for exploring technologies which are linked to decarbonisation efforts and require less resources is very much present[52]. Stakeholders express the need for a better guidance from the EU when it comes to available sustainable substitutes, as one of them claims that *"the policies set forth would need to define an EU-based recycling management strategy and ensure to the maximum that the raw materials recycled at end of life remain in the EU and can feed into the EU production processes again"*[53].

- **Skills along the CRM value chain**

On skills, many respondents suggest an exchange programme with countries that have the knowledge of mining and refining certain CRM (e.g. battery-grade lithium) in order to slowly build up knowledge within the EU. Another suggestion is to facilitate the visa and working permits for non-EU citizens as the current process is apparently complex. An often-mentioned aspect is about increasing the knowledge about raw materials within the society, especially young people in order to attract the next generation to the industry of mining and metallurgy. Many respondents suggest more funding towards re-skilling programmes as well.

The respondents were also asked to specify what policy measures would have the highest impact on their organization. Many respondents claim that a faster and easier permitting process and a better access to funding/financing would positively impact them the most. Different objectives (set incentives, stop waste exports, strengthen recycling capacities, mandatory recycling targets, etc.) were also mentioned in order to support circularity and recycling. A company called BE1 Geoconsulting AB also mentioned concerns about the critical raw materials list manipulating the market and thus having a negative impact.

- **EU external action**

Majority of respondents agree (39%) or strongly agree (13%) that the EU lacks a strategy for increasing the diversification of the EU industry supplies from third countries. The feedback to the question on whether potential to extract critical raw materials from primary sources in third countries is currently underexploited was non-conclusive, as 23% of respondents agree (9% strongly agree), but 19% were neutral and 19% did not know/no opinion and 15% disagree (7% strongly disagree). The problem seems to be more pronounced in global refining and processing capacities, where 34% agree and 14% strongly agree that global processing and refining capacities for critical raw materials are currently insufficient. More exchanges and cooperation between Third Countries and the EU/Member States authorities on critical raw materials (data exchange, common monitoring, etc) are needed, as 39% agree and 15% strongly agree that they are not sufficient.

When asked about the underlying reasons for supply chains disturbances and supply constraints of raw materials, respondents identified the following: increased geopolitical tensions (73% of all replies), volatile trading conditions (44%), untransparent market mechanisms (36%), insufficient global production (35%) and market manipulation (35%).

In terms of policy suggestions, 45% of respondents agree and 26% strongly agree, that the EU should strengthen the ongoing strategic partnerships on critical raw materials and conclude additional ones with resource rich third countries. Some stakeholders indicated that the EU should focus on new partnerships with regions that can deliver supply in the short terms (next 5+ years). 38% agree and 35% strongly agree that such

partnerships should rely on clearly established pillars, such as integration of raw materials value chains, research and innovation cooperation and alignment on environmental, social, and governance (ESG) criteria and standards. 48% agree and 22% strongly agree that partnerships on raw materials value chains with developing countries need to include a pillar for capacity building, skills and training and one for deploying infrastructure.

34% agree and 25% strongly agree that the EU should diversify its global supply through its free trade agreements and trade relations. Many respondents were asking for faster ratification of existing trade agreements (Mexico, Chile, Mercosur, New Zealand), speedy conclusion of ongoing trade negotiations (Australia, India and Indonesia). It is also important to work together with likeminded partners and initiatives, such as MSP were mentioned as good examples. Many respondents emphasised the importance of free trade agreements and strong chapters on raw materials. Since 2015, the EU proposes a dedicated chapter on Energy and Raw materials in all its negotiations and such chapters are being negotiated currently with Australia, India and Indonesia (finalised with Chile), however the EU would have to quickly conclude/start to apply those agreements and communicate more and better on these chapters, as only 14% agree and 5% strongly agree that these provisions (on investments, licensing and standardization) have the necessary disciplines to unlock the potential in opening access and encouraging investment in raw material, while 37% of respondents did not know/ had no opinion.

Majority of respondents (36–49%) did not know/had no opinion on trade barriers, but from the ones that agreed or strongly agreed, export taxes (25% agree and 8% strongly agree) and export monopolies/qualified exporters lists (28% agree and 9% strongly agree) were selected as having the most trade distortive effects on EU business.

In addition, a limited number of stakeholders were calling for strong trade defence instruments to tackle unfair trade practises, as well as emphasis on Economic, Social and corporate Governance (ESG) standards when sourcing raw materials abroad. Some stakeholders underlined the need for special attention to EU circular economy.

3. Questionnaires on "Permitting in the EU Member States" and on "Stockpiling of raw materials in the EU Member States" shared on the 28th of October with the Raw Materials Supply Group (RMSG)

Permitting in the EU Member States

Stakeholders offered several concrete proposals and avenues that could enrich the policies adopted in the CRM Act. In terms of permitting, some were of the opinion that *"there is no need for special treatments in terms of permitting of certain selected projects, but the emphasis should rather be on encouraging each Member State to make general adjustments in the national permitting processes to make them more predictable, streamlined and efficient"*[54]. They also shed light on how the current permitting processes work in different member states, often relying on approvals and permits provided by the municipal authorities. Some stakeholders report to be "often frustrated" by the administrative processes, governmental approvals and environmental permits/authorisation processes[55]. Also, permitting processes in Member States are perceived to be disparate as they depend on the different national legislation and the Member States internal structures[56]. As mentioned in one of the responses, *"EU legislation and in particular the transposition and case-by-case interpretation when it comes to mining projects should be equipped with guidance to address contradicting objectives and inconsistencies that could form an obstacle to permitting to ensure predictability and efficiency"*[57]. Although not directly linked to the details of permitting processes, some Member States stress that the general opinion of the civil society is negative towards mining activities and operations, which affects mining regulations that

are being adopted, or at least their public perception[58]. Thus, there is a call for creation of conditions for the development of communication programmes in order to increase social mining acceptance[59].

Stockpiling of raw materials in the EU Member States

There is a call for a better definition of what stockpiling means and whether it refers to produced raw materials or also strategic reserves still to be mined[60]. At the same time, there are doubts concerning the financial aspects of stockpiling, whether in relation to investors and the assurance that they would not lose income due to stockpiling, or related to the whole structure of stockpiling managed at the EU level and the implications relevant for the Member States[61]. As in the case of permitting, stakeholders including Member States provided an insight into how stockpiling is organised locally, also informing that some of them currently do not have any stockpiling systems established[62]. In some cases, stockpiling (in general, not necessarily for metals and minerals) is under supervision of a government body or an agency[63]. Stakeholders also provided either concrete lists of raw materials that should in their opinion be stockpiled or labeled all critical raw materials as necessary to be stockpiled at the EU level[64]. Some Member States support the idea of stockpiling being managed by a dedicated EU body[65].

ANNEX 3: WHO IS AFFECTED AND HOW?

Practical implications of the initiative

Businesses

As detailed above, businesses would be subjected to limited information requirements, notably contributing to the monitoring capacity (only for large companies operating in CRM value chain) and providing information on the critical raw materials content of EEE put onto the market (as a new category within the existing reporting of EEE producers) and of extractive waste generated (only for operators of currently operating extractive waste sites). Other measures comprised in the preferred option only include rules for how claims on sustainability and environmental footprint more specifically should be made, thus imposing higher costs on companies when they choose to make such claims, but in doing this also increases the trust of customers, which would ultimately benefit businesses (especially the most sustainable ones).

In terms of benefits, the measures proposed would improve substantially the information basis for companies to manage their critical raw materials supply risks, and therefore likely save costs and improve businesses' competitiveness in case of a disruption. Additional benefits to companies, notably a consulting capacity for critical raw materials risks and the possibility to join a common purchasing infrastructure, would only occur under option 3, as they rely on the existence of a well-equipped operational capacity.

Also, the proposed measures would streamline permitting, put in place a Fund to de-risk investments, and thus reduce significantly the project development cost of projects along the value chain – creating economic opportunities that businesses can benefit from.

In addition, companies further down the value chain, operating in sectors such as renewable energy, digital industries, defence and aerospace or health, would also benefit from the availability of the materials used in the technologies they rely on.

Citizens

Citizens are not directly affected by most of the proposed measures, with the exception being on recycling and sustainability. For the former, they would be incentivised through take-back schemes for small electronics, and potential other measures proposed in Member States' CRM recovery strategies, to contribute to collection and thus an improved recycling value chain; for the former, they would benefit from better information on the sustainability of critical raw materials included in their products, and through their consumer choices, could drive change towards more sustainability. Indirectly, they would benefit from the added supply security enabling the development of ecosystems, notably for renewable energy but also for other ecosystems that are at the backbone of our economy.

Member States

Member States will play an important role in the implementation of this initiative. Under the preferred option, they will be part of the governance structure, take part in the assessment and selection of Strategic Projects, and contribute to the development of a stronger monitoring capacity, while taking part in the EU level coordination of stockpiling. They would have to develop incentives for companies to diversify their supply or stockpile of strategic raw materials. In addition, they would be required to invest resources into exploration and develop strategies to recover critical raw materials from waste.

Commission

Under the preferred option, the Commission will have to develop a number of implementing rules and coordinate and support the governance structure, with notably higher capacity in monitoring, stockpiling

coordination, etc. As a results, this impact assessment provides an estimate of how many resources would be needed for the development of the governance structure, responsible for monitoring critical raw materials market and coordinating strategic stocks, data on exploration and the monitoring of Strategic Projects. How such resources would be allocated is left to subsequent decisions made by the Commission.

Summary of costs and benefits

I. Overview of Benefits (total for all provisions) – Preferred Option		
Description	***Amount***	***Comments***
Direct benefits		
Monitoring/ strategic stocks, companies' risk preparedness	Not quantifiable: but access to information and preparedness solutions.	Those measures would enable the companies to be more prepared ahead of any supply challenge that might occur in the CRM value chain and to better resist to them. It relates to the cost of not acting, which is very high if and when a supply disruption materialises.
Exploration	Negligeable: <10 k€ that can be saved.	The main benefit of exploration at national level is to put in evidence metal anomalies that will encourage local exploration by mining operators and will trickle down to support further investment down the value chain.
Strategic Projects	This assessment considers that at least 3840 direct jobs (lowest estimate) could be created per year through the development of Strategic Projects.	
Access to finance	Not quantifiable, but benefits generated by improved access to finance for producers along CRM value chain.	De-risking of financial investment would also enable the uptakes by further private investment sources as well. The overall benefits of this pillar will however be directly dependent on the size of the funds that can be made available.
Permitting provisions	Not quantifiable but benefits generated by time-gains, investment stability, etc. Permitting delays can put the whole operations of a company on pause for years depending on the waiting time. In extreme cases, the company is dissolved before the permit issuance due to its inability to sustain the costs of waiting.	Benefits of streamlined permitting notably for companies developing a Strategic Projects
Provisions on circularity: recycling and waste	Framework for MS to work on circularity, notably on collection, public procurement and R&I, which should increase circularity,	

	with all its environmental and security benefits; the amended Extractive Waste Directive would provide important access to information on CRM recovery potential from extractive waste sites, which should encourage the opening of new "re-mining" projects	
Provisions on standards	Standards to guide processes of activities along the CRM value chain. Such standards would develop the competitiveness of the EU CRM industry by supporting the development of more efficient and sustainable processes.	
Provisions on environmental footprint	The competitiveness of companies that sell or produce CRM with in a more sustainable way would increase by comparative advantage. These benefits would trickle down the value chain: downstream users will be able to use information on the sustainability of the CRM they purchase to make green claims about their products that contain them. Customers will directly benefit from this increased competition fostered by the sustainability of the products.	
Indirect benefits		
Monitoring/stockpiling/companies preparedness	Contribution to the stability of the value chain of critical and strategic raw materials	Contribution to the stability of the value chain of critical and strategic raw materials
Support to the value chain	Indirect benefits of providing security of supply for the ecosystems that rely on technologies of which strategic raw materials are a part of, needed for green and digital transitions as well as resilience. These positive effects would then trickle further down the entire economy.	These measures would contribute to achieving the EU Green Deal objectives, amongst other objectives of the digital transition or of resilience.
Administrative cost savings related to the 'one in, one out' approach*		
(direct/indirect)	Permitting streamlining for Strategic Projects will substantially reduce the administrative burden on companies benefiting from those measures.	It is not possible to quantify these benefits, as they differ from MS to MS and company to company.

	Monitoring measures (e.g. with the creation of a monitoring dashboard, available digitally to all companies) will lower's companies administrative costs of gathering data, including in interaction with public authorities, and building their own monitoring systems without a common basic information offer from the public system set up under pillar C.	No clear monetary equivalent, but certainly an important cost saving for companies.
	The creation of a publicly and digitally accessible database of closed extractive waste sites, including valuable information from permitting files and geochemical campaigns, will allow companies interested in recovering CRMs from these sites, to directly access this information instead of having to correspond with authorities with uncertainty surrounding access to confidential information etc.	The monetary equivalent of these benefits is not possible to quantify without knowing the amount of information that MS will include and the number of companies interested in such operations, but it can be considered a significant reduction in administrative burden.

*(1) Estimates are gross values relative to the baseline for the preferred option as a whole (i.e. the impact of individual actions/obligations of the preferred option are aggregated together); (2) Please indicate which stakeholder group is the main recipient of the benefit in the comment section;(3) For reductions in regulatory costs, please describe details as to how the saving arises (e.g. reductions in adjustment costs, administrative costs, regulatory charges, enforcement costs, etc.;); (4) Cost savings related to the 'one in, one out' approach are detailed in Tool #58 and #59 of the 'better regulation' toolbox. * if relevant*

II. Overview of costs – Preferred option							
		Businesses		**Administrations** (Member States)		**For the Commission**	
		One-off	**Recurrent**	**One-off**	**Recurrent**	**One-off**	**Recurrent**
Set of measures in policy option 2	Direct adjustment costs	EUR 3.75 – 10 million for certification related to general sustainability claims	EUR 1 million per year in the EU for conducting risk assessment (stress test) for companies using strategic raw materials in the manufacturing of strategic technologies	- exploration: 10 FTE for aerial geophysics (already operative in some MS) ; 10 FTE for geochemical survey (also already operative in some MS) ; Data reprocessing and predictivity maps: 1 unit of 5 FTE. (Some MS already have those capacity, notably for geochemical survey) - 182,4 Million EUR to cover the whole EU for exploration (dependent upon MS existing	- 1/4 FTE per year for reporting on the state of CRM projects on their territories; - 2 FTEs per year for participation to the governance structure; - 1/4 FTE per year for the coordination of strategic stocks; - 1/4 FTE to contribute to the development of EU-targets and report on them; - 1 FTE per Member State to develop and implement the national circularity strategy (recurrent costs);		Around 31 FTEs for the Commission, that would be split by: - 2 FTEs for ensuring the secretariat of the governance structure, in addition to EUR 75.000 per year of organisational costs. - 17 FTEs for implementing monitoring, data gathering and risks assessment tasks, based on similar tasks performed by existing units in the Commission), which can be split as: o 10 FTEs for market monitoring; o 1 FTE for the management of studies and contracts; o 1 FTE for the building of a data set on projects o 5 FTEs for the coordination of information from Member States - 3 FTEs for the coordination of national stockpiles information and the development of guidance when possible; - 2 FTEs to coordinate the submission of national exploration activities; - 1 FTE to support the board in the selection of Strategic Projects; - 3 FTEs for assessing the suitability of environmental footprint, developing calculation methods and monitor the

				capacity and surface covered) - 3-4 FTE per MS to create the database of closed and abandoned waste sites and fill it with data from permitting files and geochemical campaigns	- Additional FTEs (not quantified) to enforce environmental footprint obligations.		application of the measures; - 2 FTEs to enforce actions on standardisation and prepare standardisation requests. - 1 FTE to ensure the enforcement of Member States obligation under the Extractive Waste Directive. - 3 FTEs to develop the methodology and run the data-collection exercise underlying the national recycling targets.
	Direct administrative costs	EUR 700 000 for existing mining sites of reporting available information on critical raw materials content of waste streams and composition of the waste 14.55 million for studies underlying environmental footprint claims (total figures for all companies expected to make	Administrative cost of reporting for large companies operating along the strategic raw materials value chain [up to EUR 49.000 for the whole EU if the information is not already available]		2 FTE per MS (reporting) - 1/4 FTE per MS on the transmission of information on strategic stockpiles - 1/4 FTE for the reporting of the Commission on the development of incentives for companies' resilience - 1/2 FTE for the classification and		

		claims)	Administrative costs of reporting for large companies using Strategic raw materials (on stress tests) – EUR 38.000 pear year		reporting to the Commission of obligations under exploration		
	Direct regulatory fees and charges						
	Direct enforcement costs						- 1 FTE to increase enforcement of Member State obligations under the Extractive Waste Directive
	Indirect costs						
Costs related to the 'one in, one out' approach							
Total	Direct adjustment costs	EUR 3.75 – 10 million for certification	EUR 1 million				
	Indirect adjustment costs						
	Administrative costs (for offsetting)	EUR 15,25 million	EUR 87.000 per year				

III. Overview of relevant Sustainable Development Goals – Preferred Option(s) (to adapt, this is an example)		
Relevant SDG	**Expected progress towards the Goal**	**Comments**
SDG #7 Affordable and clean energy, SDG #13 Climate action	Enable the development of clean energy that relies on critical raw materials (such as wind turbines, batteries and electronic motors, etc), thereby reducing the impact on climate. It will also contribute to incentivising higher sustainability of CRM production through environmental footprint.	
SDG #8 Decent work and economic growth	The support for the CRM value chain is expected to leverage positive impacts on employment, reskilling and upskilling, particularly in former and current industrial regions. This will also have positive impacts over the whole value chain.	
SDG #9 Industry, innovation and infrastructure	The proposal is expected to strengthen industrial resilience, whether by better preparing companies or by directly increasing the availability of supply of CRM that the industry needs.	

ANNEX 4: ANALYTICAL METHODS

The analysis contained in this Impact Assessment builds on data collected from desk research (academic studies, economic reports, media items, existing impact assessment reports such as for the SMEI proposal), input from stakeholder outreach activities and Commission officials' expert knowledge. Information has been analysed against the main problems identified for the purpose of this initiative, the problem drivers as well as stakeholder positions. Whenever possible, the Impact Assessment provides a quantitative analysis of benefits and costs relating to the main economic and social impacts. The cost/benefit analysis, however, is not fully comprehensive due to significant data gaps. The evidence base of the report is limited due to the short time available to request information beyond questions identified early on in the call for evidence and the public consultation, and the lack of a supporting study. The views of stakeholders are transparently reflected in the Impact Assessment. It should be noted that the aim of this assessment is to provide ranges of the magnitude of potential impacts generated by each policy option, rather than exact monetisation.

Impacts section

Pillar C

Cost of governance

The cost for running the **governance structure** (pillar C)**,** and particularly the board, are assessed based on the standard budget for a meeting for a meeting with 27 MS experts of EUR 15 000, as developed in the SMEI impact assessment. The cost for the governance structure to develop monitoring capacities (pillar C.1) are assessed in comparison with the size of HERA.2 Intelligence Gathering, Analysis and Innovation Unit, which performs similar tasks as the one proposed in option 2.

Cost of information requirements

The costs for the reporting obligations on companies (**monitoring,** pillar C.1) over 250 employees is based on day spent by one employee per company, twice a year; the number of companies concerned is assessed based on the number of companies active in the EU in the extractive sector for the mining of metal, and non-ferrous metal ores, as well as the manufacturing of weapons and ammunition (given the high CRM content of their productions) which equals to around 64 companies in 2020 in the EU. The total cost of information requirement is assessed based on the reported cost of a manager (OIOO tariffs – EU average of 47,78e/hour for ISCO 1) in a company operating in the sector. It is assumed, based on internal analysis that the time spent on reporting is of an average of 1 day. Based on the administrative burden calculator, is of EUR 764*64 companies= EUR 48 896 for a reporting twice per year for all concerned companies in the EU (rounded up at EUR 49 000).

Cost of company risk preparedness

The costs induced on companies for their risk preparedness do not consider obligations linked to building of strategic stocks or of diversification, given that companies retain the possibility of explaining why they are not able to comply with the obligation.

The costs therefore concern the conduct of a stress test to ensure the resilience of their value chains, for those who use strategic raw materials as an input for the manufacturing of technologies in key sectors (hence excluding the extractive industry but includes the processing industry). The NACE costs concern for this assessment are:

- 24.41 - Precious metals production
- 24.42 - Aluminium production
- 24.44 - Copper production
- 24.45 - Other non-ferrous metal production
- 26.11 - Manufacture of electronic components
- 27.11 - Manufacture of electric motors, generators and transformers
- 27.12 - Manufacture of electricity distribution and control apparatus
- 27.20 - Manufacture of batteries and accumulators
- 28.11 - Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
- 30.30 - Manufacture of air and spacecraft and related machinery
- 30.40 - Manufacture of military fighting vehicles

Eurostat simulation then provides for around 193 companies corresponding to those NACE code (up to one decimal place) with above 250 employees in 2021 in the EU (Statistics | Eurostat (europa.eu))

If those companies do not use any of the strategic raw materials in their consumption, they would be exempted from any obligation under those pillars.

Adjustment costs for companies to operate a similar risk management system could amount to EUR 5/000 for large companies (according to the CCSD impact assessment142) Based on that, we could take the following assumptions for the whole single market: EUR 5.000 X 193 = EUR 965.000 per year in the EU (rounded up at EUR 1 million).

Administrative costs for companies to report on such a risk management system to their Member States every 2 years would be the following: 193 x 8 hours of work x 47.8 (average hourly wage for senior officials and managers) = EUR 75.347 every two years, EUR 37.673 per year in the EU (rounded up at EUR 38.000).

Pillar D

Cost for exploration obligations

The figures developed as regards the costs induced on Member States by the **exploration obligations** rely on the inside analysis of the Commission based on the assessment of costs of ongoing projects (in the EU or world bank projects) which were expanded to cover the EU as a whole.

Pillar E

For the assessment impacts related to the **support to the value chain** (pillar G), the following assumptions were made:

Number of Strategic Projects (SPs)

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The number of SPs used for the assessment of impacts was based on estimation of the number of strategic materials for which projects are needed, the targets for the different value chain stages included under Pillar B, and the average contribution of a project to meeting those targets:

- Based on current information on projected supply-demand gaps and the needs of strategic sectors, the number of strategic raw materials (SRM) is, from now until 2030, estimated to be within the 10-15 range;

- Pillar B provides that the Board will propose to the Commission EU capacity targets (expressed percentage of EU needs covered by EU capacities) per SRM and stage of the value chain. For this calculation, it is assumed that those targets will have a 2030 horizon and will on average require a capacity increase of 20 percentage points (given the targets of 10% for extraction and recycling capacity, the target;

- To estimate the average contribution of SPs to this increase, we took lithium as a proxy.[143] The expected annual capacity of lithium extraction projects can be up to 20,000 tonnes lithium carbonate equivalent (LCE), which represents roughly 5% of EU needs in 2030. Oftentimes, an extraction project is linked to a single refining project. From a permitting point of view these are then viewed as two distinct projects. Based on this, it is assumed that a single SP will on average contribute 5 percentage point in terms of capacity.

Based on these estimations, it is therefore assumed that per material we need 4 projects per step of the value chain to realise a 20 percentage points increase. Taking into account three steps of the value chain (i.e. extraction (including mineral processing), refining and recycling), this equal 12 projects per material). The overall amount of SPs is estimated at 120-180 (or 24-36 per year, if the proposal enters into force in 2025).

Benefits of Strategic Projects

Based on planned or currently existing facilities in the EU (Spain, Finland, Sweden) and equivalent economies worldwide (i.e., US - Bureau of Labor Statistics), it is expected that:

-Each strategic project in extraction will bring individually 200 new jobs with an employment multiplier of 4.7 for indirect jobs (supplier jobs and induced jobs).

-Each strategic project in refining will bring 180 new jobs with an employment multiplier of 4.8 for indirect jobs.

-Each strategic project in recycling will bring 100 jobs with an employment multiplier of 4.8 for indirect jobs

The overall impact of strategic projects on employment would be ranging from 110 000 to 165 000 direct and indirect jobs.

For direct jobs, the lower estimate that is proposed is: 24 projects per year (see above) X (200+180+100)/3 = 3 840 potential direct job per year – assuming the projects would not have happened without dedicated support. However, it is worth noting that these projects might help to

[143] Lithium is one of the materials with highest expected demand increases in absolute and relative terms, and levels of contribution of single projects can be assumed to be relatively and safely taking as a proxy.

secure or develop a significant number of employments in the downstream industry. The last Raw Material Scoreboard of the European Commission (2020) indicates the mining and quarrying industry in the EU represents 280 000 employments (for a 4,8 B€ added value) but help to support 2 million employments and EUR 120 billion of added value in the relevant raw manufacturing sector.

Pillar H

For the costs of the measures related to **the environmental footprint** (pillar H) the following assumptions were made:

Number of relevant environmental profiles

For the number of CRMs with separate environmental profiles ('types') potentially sold on the EU market, we made assumptions based on the example of the global market for lithium. It is assumed that all types are potentially sold in the EU. There are currently less than 20 active mining operations for lithium.[144] Given the sharp increase in demand for lithium and ongoing exploration, the amount of active mines is expected to increase at least 5-fold toward 2030 to roughly 100 active operations (also including new recycling operations).[145] Given that primary lithium originating from a specific operation is usually going to the same refinery (often attached to the site) and that there are generally less refineries than active mines, it can be assumed that there as many relevant types as there are mining operations.

In the absence of detailed information per materials, this number is taken as a proxy for other CRMs such as REEs and PGMs with strategic applications (both of which currently have a lower amount of operations than lithium), for which the number of operations is also expected to grow sharply from a low base. Assuming that the Commission will, towards 2030, develop 10 sets of calculation rules (through implementing act) for different CRMs (NB: a single CRM might require different calculation rules for different sub-categories e.g. neodymium is a sub-category of REE), this means that there would be roughly 1000 relevant profiles.

Cost of using a recognised certification scheme

There is no statistical info available for the amount of environmental claims made in a B2B context. For the share of companies making B2B claims for CRMs, we therefore developed an assumption starting from a survey with SMEs that included environmental information provided in a B2B context[146]. Among the SMEs responding to the survey (600), 20% declared to communicate on environmental performance in a B2B context. Assuming that the share of large companies communicating in a B2B context is higher, we assume that 25% of such companies will make environmental claims. Taking a conservative approach, it is assumed all of these claims include also general claims. Based on the number of relevant profiles, this translates into 250 relevant claims.

Based on the only currently available price example[147], certification for the mining stage is expected to be a one-off cost of between EUR 10.000 and 30.000, depending on the size of the operation. For some of the CRMs that are placed on the market with a general claim, there will have been other steps involved, for example processing or refining. Considering that many more

[144] Mineral Commodity Summaries 2022 - Lithium (usgs.gov), U.S. Geological Survey, Mineral Commodity Summaries, January 2022.
[145] See e.g. Almost 400 new mines needed to meet future EV battery demand, data finds - TechInformed for a more conservative.
[146] *Assessment of different communication vehicles for providing Environmental Footprint information*, London School of Economics for DG Environment, 2018.
[147] See IRMA Certification Fee Policy_May2021 (responsiblemining.net).

potential impacts and a larger land area is associated with mining, the additional cost of additional value chain stages in the certification is assumed to be 50% compared to only considering mining. The cost is therefore assumed at between EUR 15.000 and 40.000. It is conservatively assumed that all CRMs for which general claims are made are processed materials. The cost associated would therefore be in the range of EUR 3.75 – 10 million.

Cost of conducting a PEF study based on harmonised calculation rules

The harmonised calculation rules to be provided would resemble closely the function of PEF Category Rules (PEFCR) and the cost can thus be assumed to be the same at the cost of conducting a PEF study based on a PEFCR[148]. Considering the assumptions above regarding the amount of active operation and integration of refining, it is assumed that most companies will a single or several PEF studies, and potential economies of scale are not taken into account.

Expert cost: consultants / experts are charging on average EUR 15.000 for a single PEF study. This cost is identical whether the company uses in-house expertise or a contractor. If the life cycle model of the applicable representative product (RP) is available in a simple-to-use software, this halves costs, as there is no need to adjust the otherwise available RP model in a generic life cycle assessment (LCA). This results in more efficient data input and less need for senior expertise.

Flanking measures such as making availability of simplified calculation tools can reduce the cost for a single study in line with the license cost (known license costs in the range of EUR 1.500 – 2.000, unless the tools would be used as part of an external expert support contract and then be factored in substantially cheaper, as the license would be used by the expert for many studies per year – see more below). Taking a conservative approach, we assume a tool is not available.

When assessing related expert costs, we consider that license fees are paid per user and for a year (EUR 5.000 one-time cost); and the number of studies that the expert can do in a year using that license, with an expert cost of €1,000/man-day. The cost per use is on average EUR 50 per study. This results in overall study expert cost of **EUR 7.550** (€15.000*50%+€50).

Data collection costs (both in-house and secondary data from data suppliers) are estimated based on the expected effort of data collection. This is estimated to take approximately 5 person-days, i.e. EUR 5.000 for a single PEF study. The costs for collection of data might be further cut down through an automatic collection system; we have however no available data in this regard. Furthermore, the expertise might vary depending on the data to be gathered. We are using a conservative estimate, which might be over-estimated.

Based on information from several consultants, the cost of supplier-specific datasets or datasets for missing materials is on average EUR 5.000 per dataset. As to the secondary EF datasets, these are assumed to be free of charge (same as currently and under all sub-options). The data collection costs are therefore estimated to EUR **5,000** per study.

Verification costs for a single-product PEF can be estimated at approximately **€2,000,** based on input from practitioners.

The total cost for conducting a PEF study based on a PEFCR for a single CRM type is therefore estimated to **EUR 14,550** (€7.550+€5.000+€2.000).

The cost associated would therefore be **EUR 14.55 million** (1000 *14.550).

[148] The text is closely based on DG ENV analysis and assumption in the context of the green claims initiative.

Relative burden on footprint cost for platinum[149]

The EU demand for platinum is 64 tonnes compared to world production of 178 tonnes (roughly 36%). As the global market value of this production is 5.8 billion, the EU market value is estimated at 0.36 x 5.8 billion, I.e. roughly EUR 2.1 billion.

As the cost for 10 CRMs was estimated above at 14.55 million, the assumed percentage of the footprint cost is 2.1 billion / 1.45 million, equalling roughly 0.07%.

ANNEX 5: OVERVIEW OF POLICY APPROACHES

9.1.1. Pillar A – Defining critical and strategic raw materials

At EU level, the Commission currently performs the criticality assessment (described in detail below) and conducts a foresight exercise on critical raw materials used in strategic sectors and technologies. These exercises and the data provided serve to raise awareness for raw materials supply risks among companies, the research community and the wider public, and the list of critical raw materials is used in the Commission's policymaking process, notably to prioritise support to research and innovation under Horizon Europe and to direct international engagement, including in the negotiation of free trade agreements. However, the list of critical raw materials currently does not have legal status and only limited implications. The foresight exercise meanwhile is currently limited to projecting demand for critical raw materials in strategic sectors and does not allow to identify which raw materials may become critical in the future or otherwise pose risks not reflected in the backward-looking criticality assessment; it also currently does not have any legal or policy implications.

9.1.1.1. Approach 1: Legal definition of critical raw materials, based on the current criticality assessment methodology and covering the whole EU economy

This approach would consist in defining the scope of the regulation and all its measures based on the current criticality assessment methodology. The methodology covers a wide range of economic sectors and would continue to rely on the criteria:

- economic importance (EI), based on the value added of corresponding EU manufacturing sectors and corrected by a substitution index; and
- supply risk (SR), based on supply concentration (at global and EU level, weighted by a governance performance index) corrected by recycling and substitution parameters.

Raw materials exceeding the thresholds set for both criteria are considered at high risk of supply disruption (based on their supply concentration, weighted with governance indicators) and of high economic importance, and would therefore be defined as critical.

The data would continue to be provided by an established process within the European Commission (GROW, JRC), using historical and stakeholder-validated data (from the last 5 available years) from official statistics and data providers. The criticality assessment has served as a basis for the EU List of critical raw materials updated every 3 years since 2011.

[149] Figures taken from the Commission factsheet on criticality for the 2020 CRM list, p. 415.

In the past, the lists' relevance has proven to be valid for the following 3-5 years and has been a useful tool for directing investment across the EU, raising awareness of strategic dependencies in industry, informing the EU trade policy and focusing international partners on our needs, but also in development of the EU legislation. The assessment vastly improved the Commission's intelligence on a wide range of raw materials and informed general and professional public.

The Commission has performed the 5th criticality assessment for the EU on 87 screened raw materials. Compared to the list of 30 CRMs in 2020, the 2023 list qualifies 34 CRMs as critical, moving above the threshold: Arsenic, Feldspar, Helium, Manganese, Copper and Nickel while natural rubber and indium move out of the list. From the new screened materials, none of them have been considered critical. Approach 2: Legal definition of only strategic raw materials based on multi-criteria analysis including supply and demand foresight and relevance for strategic applications.

*9.1.1.2. **Approach 2:** Legal definition of only strategic raw materials based on multi-criteria analysis including supply and demand foresight and relevance for strategic applications*

Under this approach, a new concept of "strategic raw materials" would be introduced. This concept would take into account better the foresight perspective, and provide a stronger focus on applications considered strategics, such as renewable energy, electric mobility, aerospace and defence, digital or medical technologies. The list of raw materials identified as strategic would be enshrined into law and set a narrow scope for the measures proposed under this initiative. It would be shorter than the current list of critical raw materials and would likely overlap with it, but not fully be a subset as some raw materials that are strategically important and likely to face future supply challenges are currently too diversified to pass the supply risk threshold of the criticality assessment.

The methodology to define strategic raw materials would build on the data collected for the criticality assessment but apply also more subjective/qualitative factors, notably relevance for strategic applications and forecasted demand growth. It would be applied to the full set of assessed raw materials, not only the ones currently identified as critical. As this would be a new concept and as important data has yet to be gathered, the exact methodology is not yet defined, but the following is a list of the factors considered for inclusion:

- Relevance for strategic sectors and technologies:
    - The strategic sectors and technologies would be renewable energies and e-mobility (lithium batteries, hydrogen electrolysers, fuel cells, electric motors, wind energy, photovoltaics) as well as aerospace and defence, digital and medical technologies.
    - The joint foresight report of JRC and GROW (in preparation) on "Supply chain and future demands analysis of strategic technologies and sectors in the EU" should serve as the base for identifying the raw materials for the selected technologies.
    - Proposed indicator: count of high relevance of each raw material to selected technologies, e.g. 9 for Copper, 2 for PGMs (platinum and iridium), according to preliminary calculations.
- Future supply and demand forecasts for 2030:
    - Global Demand 2030/2020: ratio between the forecasted future global demand (2030) and current reported demand (2020), from various sources.
    - Global Demand-Supply Gap 2030 (in tonnes): difference between the forecasted future global demand (2030) and future supply (2030) , from various sources.

- Future EU demand (2030): based on the joint foresight report of JRC and GROW (in preparation) on "Supply chain and future demands analysis of strategic technologies and sectors in the EU".

- Production volumes:
  - Rationale: Given the widely different market sizes of critical raw materials production, ramping up production to meet rising demand is more challenging for larger-volume raw materials, where e.g. increasing supply by 10% requires several mega-mines to be opened, whereas increasing demand for smaller-volume materials can be satisfied by just one medium-sized mine, or even just by introducing an additional processing step on an existing site in the case of by-products contained in carrier raw materials (e.g. gallium as a by-product of aluminium production). A logarithmic measure would be used to capture the variation in orders of magnitude.
- Other potential factors:
  - Supply risk (SR) parameter from the current criticality methodology
  - Import Reliance (IR) parameter from the current criticality methodology
  - Form of production: main product/co-product/by-product. By-products face higher supply risks than main products or co-products, for example if the main material production stops (Aluminium/Gallium, Copper/Cobalt) or the price of the by-product does not justify an expensive separation (Indium or Germanium from Zinc, Rare earths from Iron ore).
  - Reserves: economically extractable geological resources in tonnes. Main source is USGS, but data is not available for all minerals and metals.

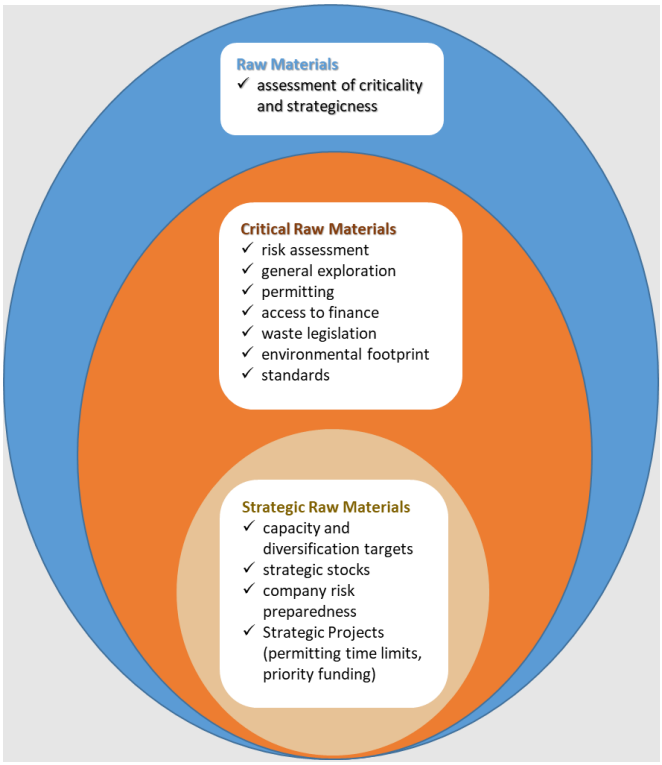
- A governance structure (cf. Pillar C) would monitor a full list of non-energy, non-agricultural raw materials, compiling databases (annually) on current EU production, imports, exports, consumption, recycling etc. for all raw materials. It would also identify which applications are (or will be) dependent on the availability of the raw materials. It would conduct foresight at different time horizons on EU and global demand and supply of all RMs (taking into account different technological scenarios and material efficiency/substitution possibilities, e.g. by assigning probability weights to the scenarios; for supply, taking into account current production and announced new projects). This would be coordinated closely with/via the EC's RMIS, as part of the EC's operational capacity. The gathered information would be made available to the Advisory Group of the Single Market Emergency Instrument.

It is expected that following this methodology, approximatively between. 10-15 strategic raw materials would be identified.

9.1.1.3. Approach 3: Legal definition of both critical and strategic raw materials, with concentric circles of policy measures' scope

Under this approach, both of the concepts/lists described above would be given legal status. The list of critical raw materials identified based on the above-described criticality assessment would be amended to include all strategic raw materials identified based on the above-described multi-criteria assessment, such that strategic raw materials would be a subset of critical raw materials. The thus slightly enlarged list of critical raw materials would define the overall scope of the Critical Raw Materials Act, providing for actions related to monitoring, exploration, recycling or carbon footprint, while the most costly or ambitious measures (such as stockpiling coordination and streamlined permitting and priority funding access) would only apply to the shorter list of strategic raw materials. The figure below shows this visually and Annex 9 provides a detailed overview of the scope for each pillar.

The following figure maps the measures described under other pillars against the set of all screened raw materials, critical raw materials and strategic raw materials:



To operationalise this approach, the following would apply:

- The proposal should include an empowerment for the Commission to adopt delegated acts regularly updating the list of critical and strategic raw materials, specifying the frequency of such an update (e.g. every 3 or 5 years[150], with the possibility of an ad hoc update when deemed necessary);
- The methodology to be used by the Commission when updating the list of critical and strategic raw materials should be specified in the legal proposal, as well as the potential revision of the methodology.
- A governance structure [see pillar C] would monitor a full list of mineral and metal raw materials, compiling databases (annually) on current EU production, imports, exports, consumption, recycling etc. for all raw materials. It would also identify which applications are (or will be) dependent on the availability of the raw materials. It would conduct foresight at different time horizons on EU and global demand and supply of all RMs (taking into account different technological scenarios and material efficiency/substitution possibilities, e.g. by assigning probability weights to the scenarios; for supply, taking into account current production and announced new projects). This would be coordinated closely with/via the EC's RMIS, as part of the EC's operational capacity.
- A first list of critical and strategic raw materials should be included in an Annex to the legal proposal.

Discarded approaches: Approach 1 is discarded at an early stage, as it would not provide sufficient focus for more ambitious measures (e.g. strategic stocks, streamlined permitting and

[150] Note: The European Parliament, in its November 2021 Resolution on "A European strategy for critical raw materials" asked for 2 years, but this would decrease stability of the list for investors. DG GROW experience shows that 3-5 years would be optimal.

financing support for Strategic Projects) and thus apply them too broadly. Also, the critical raw materials list would continue not to include such important raw materials as copper, nickel or aluminium that do not pass the supply risk threshold in the backward-looking criticality assessment but are essential for the green transition and face significant supply challenges (see chapters 2.1.1.1 and 2.1.1.2).

Approach 2, namely limiting the scope of the entire initiative to a new, shorter of strategic raw materials, is discarded at an early stage, as it would mean that no legal status would be given to the list of critical raw materials and as such not even "lighter" measures such as an early-warning system, targeted exploration or recycling targets could apply to the non-strategic critical materials, despite their identified supply risk and overall economic importance. Introducing a new concept with legal consequences while maintaining a non-regulatory criticality assessment would also likely overshadow the latter and could thus undermine the credibility of the criticality exercise developed over the last 10 years, and exclude non-strategic but economically important sectors (e.g. construction, chemicals, manufacturing).

9.1.2. Pillar B – Setting strategic raw materials targets

9.1.2.1. Approach 1: Developing a framework to set EU-level guiding targets for strategic raw materials regarding capacity

First, this approach would set **headline targets** for the development of EU capacity per strategic raw material by 2030, e.g. the EU is able to meet 30% of its needs for a specific strategic raw material by 2030. Headline targets would be set specifically for strategic raw materials for which the investment needs and potential capacities are more clearly identified, e.g. lithium and rare earths.

Then, to achieve such headline targets, more specific **value chain targets** would be set, where appropriate, for the following stages of the value chain:

- Extraction, e.g.: by 2030, at least X% of EU demand for primary raw materials should come from European sources, comprising Overseas countries and territories of EU Member States and EEA countries.
- Refining, e.g.: by 2030, at least X% of EU demand for processed materials should be covered by European sources.
- Recycling, e.g.: by 2030 and by 2050, the EU should cover at least X% of its total demand through its own secondary production.

In terms of time horizon, the first value chain targets would be set for 2030, and would have to be announced within one year of entry into force of the regulation. In 2030, following an assessment by the governance structure, new targets would be set for 2040, and similarly for 2050.

When set, the value chain targets would have to take into account:

- Existing EU targets for the deployment of EU renewable energy (Renewable Energy Directive), as it drives the need for green technologies containing strategic raw materials. SRM needs created by defence or digital strategies would also be taken into account.
- Existing recycling targets (recycled content or waste recovery), which could drive the EU's ability to meet EU recycling capacity targets (e.g., in the Batteries regulation

- The geological endowment of Member States and the EU as a whole, as reported in pillar D, for the setting of extraction targets, taking into account the feasibility studies operated by private or public bodies.
- The industrial capacity of Member States and the EU as a whole so as to determine refining/processing and recycling targets.
- The existing and planned projects pipelines, as reported by the relevant industrial alliances as well as by the Member States to the governance structure.
- The expected growth of EU demand for the strategic raw materials on which targets are set.
- The concentration of global supply for the strategic raw material.

Though the exact level of targets to be defined would be adopted by the process described below, it is useful to estimate preliminary size of such targets for the purpose of this impact assessment. Examples of target levels could include:

- As a headline figures, the European Raw Materials Alliance has identified a pipeline of projects that would ensure 20% of EU demand in rare earth permanent magnets by 2030;
- Other investment cases from ERMA assess the possibility of reaching 20 to 60% of EU sourcing for some materials;
- Other stakeholders assess that:
  - For raw materials likely to become strategic, 50% of EU sourcing is achievable for the refining stage, and 25% for the extraction stage, with the exception of some materials (depending on geological endowment), based on the data provided by some studies[151;]
  - Higher targets (up to 75% of EU sourcing) could be achieved for the recycling of materials by 2030 provided the materials are already well integrated in the recycling and industrial capacity loops;
- For battery raw materials, the investment needs of the existing projects pipeline could cover 20% of EU demand with EU sourcing by 2030, and attain higher level by 2040/2050. Some stakeholders foresee possible targets based on the existing pipeline, e.g. for processed lithium, 50 to 60% of EU needs could be covered by 2030.

The mechanism to set target would be the following: the governance structure would propose to the Commission value chain targets for all strategic raw materials, 1 year after entry into force of the regulation, based on the first reporting of Member States to the governance of their 1) mineral resources (pillar F) and 2) project potential in their territory along the value chain (Pillar G) and 3) project potential in third countries, with the help of ERMA and EBA. The Commission would take note of the proposals from the governance structure, which would hold a strategic meeting on how to ensure the application of these targets, notably in the selection of Strategic Projects in or outside the EU. When a new strategic raw material is identified, the governance structure would meet to define its target.

9.1.2.2. Approach 2: Setting EU-level targets obliging the governance structure to work toward them through Strategic Projects proposals (cf. pillar E) and performance review

Conversely to approach 1, the targets would be directly set in the Regulation, at different value chain stages. They would be aspirational targets, with a double role:

[151] KU Leuven, Metals for Clean Energy - Pathways to solving Europe's raw materials challenge, 2021

1) Provide a common objective for public policies and private actors to work toward their achievement;
2) Serve as a criteria for the selection of Strategic Projects, which would have to demonstrate that their future output will serve to develop such targets.

The target levels would be formulated with headline figures, and would ensure that, for each strategic raw material and by 2030,

- Union extraction capacity is able to extract the materials needed to cover at least X % of Union's annual consumption of refined materials, to the extent that the Union's known reserves allow for this;
- Union refining capacity is able to refine at least X % of the Union's annual consumption of refined materials;
- Union recycling capacity is able to produce secondary materials covering at least X % of Union's annual consumption of refined materials;

The level of such targets is coherent with the estimate of stakeholders and with the potential projects pipeline. Targets for extraction would need to take into account the geological resources available and the economic feasibility of extraction. When setting those targets, it is worth noting that they refer to EU annual consumption in 2030, which is set to increase for most materials concerned, thereby requiring additional EU efforts for meeting them.

In addition, compared to approach 1, the Commission would have a formal role in tracking progress towards the targets, based notably on the state of exploration of national resources of critical raw materials; on the advancement of Strategic Projects (cf. Pillar E), and on whether their development is impeded by specific factors, notably permitting bottlenecks, lack of investment, etc.

If it is apparent that EU capacities are not developing sufficiently to meet the EU-wide targets, the Commission would assess the necessity for adopting new measures.

9.1.2.3. Approach 3: Setting national targets in the regulation for strategic raw materials based on national resources and existing capacities

Under this approach, Member States would be imposed country specific targets at different value chain stages for strategic raw materials with a view to decrease the vulnerabilities and to increase the resilience, after the governance structure's initial assessment of their industrial capacity and mineral resources. Those targets would be adopted through delegated act. The Commission would jointly agree, no less than 6 months after the first 2030 review, on a set of measures to unlock the Member State's potential and contribution to achieving the targets.

If, in a subsequent review of the Member State's performance 2 years after the first review, no further progress has been made, the Commission should assess the origin of this lack, notably to determine the origin of it. In the event where permitting bottlenecks are the concern, the Member State would be compelled to review its permitting procedures and allocate sufficient resources to the public authorities in charge.

Discarded approach: Approach 3 is discarded early as it is perceived as too intrusive for Member States, which remain the responsible authority for their mineral resources. This approach would therefore not respect necessary standards of subsidiarity. In addition, Member States do not have the same level of same mineral resources and of industrial capacity. While national targets would have to take into account such differences, they would also place an uneven burden on some Member States compared to others.

9.1.3. Pillar C – Governance structure

This pillar seeks to enable the EU to increase its ability to foresee and mitigate structural supply shocks before they materialise, notably by enabling Member States and companies to build up their resilience through appropriate tools. The scope, depth, speed and efficiency of such tools are inherently linked to the governance structure that would be charged with carrying out the tasks specified in the subsequent (sub)pillars (C.1, C.2, C.3) on monitoring and risk-assessment, strategic stocks and risk preparedness. Therefore, the approaches proposed are bundled together as part of options 1, 2 and 3, and the resources are adapted according to the scope of the tasks proposed.

9.1.3.1. Approach 1: Tasking expert groups RMSG and EIP on raw materials to carry out tasks on monitoring and risk assessment

Under this approach, the Commission would rely on its existing expert groups (RMSG, EIP on RM) to develop relevant tasks on monitoring and risk assessment. The relevant experts would meet at technical level fora focusing discussion and exchanges on structural issues pertaining to the critical raw materials value chain, providing advice to the Commission on different pillars, e.g., on the definition of critical and strategic raw materials, on the establishment of dedicated targets, on the state of supply chains of critical raw materials, on strategies that companies could develop to mitigate supply risks and on strategies that Member States could adopt with regards to strategic stockpiling. Such exchanges would support the Commission in its work on critical raw materials act and the gathered information would also be made available to the governance structures of vigilance and crisis management mechanisms dealing with raw materials..

9.1.3.2. Approach 2: Developing a dedicated EU CRM board supported by a network of national agencies and operational capacity [within the Commission]

Under this approach, the Commission would propose to set up a EU CRM board composed by representatives of Member States and the Commission. This board would be in charge of building on the existing resources within the Commission and Member States administration to carry out the tasks described in the subsequent pillars (C1, C2, C3). Based on the contributions of the actors below, the board would issue advice to the Commission on particular actions, such as on defining strategic raw materials and setting targets for them on EU supply capacity and EU diversification, as well as on building up strategic stocks, and on proposing Strategic Projects (as per pillar G and K). The board would adopt its rules of procedure at its first meeting and the Commission would provide a common secretariat for the board and the network described below.

For tasks pertaining to the definition of strategic raw materials and their targets, as well as regular market monitoring and forecasting for the selected raw materials, the board would rely on the secretariat with intelligence capacity and a network of national agencies established by the regulation. Member States would appoint representatives from the relevant authorities, and their national intelligence or other relevant raw materials agencies. In the event where a Member State would not have a national supply and intelligence agency on critical raw materials or equivalent, it would nominate a representative from the authority in charge of geological or mineral resources. The Member State would also be encouraged to gather the necessary resources for assessing its own territories and developing its expertise in the sector.

For those tasks, the board would also be able to consult relevant expert groups, such as the EIP on RM or the RMSG, to ensure that civil society, industrial stakeholders, including SMEs, and NGOs are heard in the relevant discussions. For the tasks pertaining to the building of strategic stocks and corresponding obligations, the board would have to convene Member States' authorities or

agencies in charge of emergency and stocks, which are different from the supply and intelligence agencies mentioned above.

For tasks pertaining to the selection of Strategic Projects and to the definition of strategic raw materials and their targets, the board would also be able to consult industrial alliances for raw materials (ERMA) or batteries (EBA), which would notably contribute to the identification of investment needs or potential Strategic Projects alongside Member States, as well as the different geological surveys and the relevant permitting authorities. Tasks linked to raw materials value chains knowledge would interact with the EC's RMIS.

The board would also be able to invite to dedicated meetings third parties from EEA countries, neighbourhood countries or countries having a Strategic Partnership on raw materials or an FTA with a chapter on raw materials; or relevant international organisations. In such case, the meeting would be dedicated to the assessment of a Strategic Project in a third country and how to best support it; or any other matter related to the international dimension of diversification and of the critical and strategic raw materials value chain, notably in cooperation with the Global Gateway governance. The board would also ensure the exchange of information, cooperation and coordination with the relevant governance bodies that deal with the vigilance and crisis response for raw materials. To support the operative tasks described above and in the subsequent sub-pillar, the board would still rely on the expertise of the European Commission, whose resources would be adapted to the scope and depth of such tasks.

9.1.3.3. Approach 3: Developing an operational capacity as a separate structure to implement the CRM Act's provisions

This approach would consist of creating a full-fledged operational capacity on critical raw materials, that is external to the Commission itself and is set on a permanent basis rather than relying on regular cooperation of Member States and European capacities as provided by the board and network under approach 2.

There are different formats that this operational capacity could take, such as the creation of a dedicated decentralised EU agency on critical raw materials or the creation of a dedicated directorate on critical raw materials in an existing agency. These different formats are however not analysed separately in detail as it is assessed that the costs and efficiency would only marginally differ from one to another (as demonstrated by the impact assessment relative to the creation of a European Labour Authority[152].

Alike the board defined in approach 2, this operational capacity would be able to rely on the expertise of existing expert groups, industrial alliances, Member States representatives and agencies, etc., but it would be able to carry out the tasks determined above independently, though in coordination so as to avoid overlaps.

The operational capacity would ensure the exchange of information, cooperation and coordination with the relevant governance bodies that deal with the vigilance and crisis response for raw materials.

The tasks that the operational capacity would carry out are spelled out in subsequent pillars but would also include the definition of strategic and critical raw materials and corresponding targets, the development of monitoring, risks assessment and stockpiling capacities as well as the selection

[152] Impact assessment report - SWD(2018)68 p56, table 4

of strategic projects. Although the tasks are similar to those proposed for the board (approach 2), they would here be wider in scope and depth.

Discarded approach: Approach 1 is discarded, as in comparison with the two approaches developed afterward, it does not provide for substantial additional benefits and does not allow to tackle the problem drivers. Indeed, the format of expert groups favour the development of an inclusive discussion, with a wide set of stakeholders, but does not allow for the development of an operational capacity capable of carrying out the tasks. Consequently, adding new tasks to the existing expert groups would not differ substantially from the baseline scenario. It is therefore proposed that only the approaches 2 and 3 of the subsequent pillars (C1, C2, C3) are analysed, considering the need to align the scope of the tasks with the resources provided by the governance structure. This is why no approach 1 is mentioned for these pillars.

9.1.4. Pillar C.1 Monitoring and risk assessment

9.1.4.1. Approach 2: Developing monitoring capacities and risk assessment

This approach would define precise monitoring tasks that would be carried out by the EU CRM board (i.e. the governance structure set out in approach 2 of Pillar C). The approaches 2 and 3 develop a more comprehensive and permanent framework dedicated to critical and strategic raw materials, ahead of crisis, while taking the instruments proposed in the SMEI into account (c.f., early warning mechanism, in approach 2).

Scope: With the support of the Commission, the board, with the support of the network, would develop a **market monitoring capacity** related to the critical raw materials industrial value chain, focussing on risks that may disrupt, compromise or negatively affect the supply of critical raw materials. This work would contain an element of foresight and a focus on strategic applications of the materials monitored. The scope of such work would comprise both the state of supply chains within the internal market and in the global value chain, taking due considerations of the evolution of trade flows as well. It would also ensure a regular annual intake of information to ensure coordination across Member States with regards to different stages of the CRM value chain.

Such EU-wide capacity is supported by stakeholders, with 177 (68 %) out of 259 respondents agreeing or strongly agreeing that a dedicated EU-wide governance capacity tasked with monitoring actions would benefit the EU CRM value chain.

Means and actions: Through the network, the board would ensure to the best extent possible the **coordination** of research activities of national agencies on a specific material or value chain and the subsequent knowledge sharing amongst them in order to avoid overlap and gain added value in depth and knowledge. To develop such capacity, there is a parallel need to ensure **information sharing** from Member States and companies operating in the CRM value chain.

First, Member States would have an obligation to report at least annually to the governance structure on the following topics:

- The state of exploration, extraction, processing and recycling projects in the UNFC format (NB: such reporting is also partially accounted for in pillar D on exploration; the costs for such reporting are therefore not accounted for under this pillar).
- A risk assessment of their domestic CRM value chain as reported by their own analysis and by surveying large companies operating in their country in such value chain, for which the burden would be limited to a minimum;

Second, companies operating in a critical raw materials value chain or smaller companies would be surveyed on a voluntary basis by the Commission through external support. All information gathered would have to be treated in full confidentiality and with appropriate level of security, as established by the governance structure, and should be aggregated in order not to display sensitive commercial information or information affecting security and public order.

Deliverables:

- First, this monitoring would feed into the determination of critical and strategic raw materials, that the Board would propose to the Commission (c.f. Pillar A) and would better inform subsequent policy decisions.

Second, this monitoring capacity would be used to publish more regular information on monitoring through the publication of regular reports on the state of critical and strategic raw materials supply chain (a monitoring dashboard), with the main risks outlined to companies so that they can best adapt their resilience strategies. Such work could also be useful to support the screening of foreign direct investment: the assessment of whether an acquisition is problematic or not becomes more apparent after a relevant mapping of the value chain.

Third, to the extent possible in terms of resources, the Commission would develop and run**stress test of strategic raw materials value chain** to estimate the likelihood and impacts of a future disruption (model-based, scenario-based, exercises with participating companies). Such stress test would be developed based on the following stages: select the strategic raw materials for study, estimate risks per different scenario, incorporate supply and demand forecasts and potential gaps, determine materials necessary for finished goods / services, apply market responses to shortage or shock, analyse shortfall risk to the strategic sectors and the whole economy, identify mitigation options and assess their feasibility to prioritize them. To ensure that the stress tests can cover at least each strategic raw materials every three year, the Commission would ensure that the coordination of joint or complementary research by existing national agencies in the network. The results of those stress tests would be commonly published and made publicly available, for instance on the monitoring dashboard, to ensure that it benefits economic operators.

Under this approach, no dedicated CRM early warning mechanism would be developed, since the mechanism developed in the proposed SMEI (Article 8) could cover critical or strategic raw materials in the contingency planning framework. The mechanism allows for the notification of a Member State to the Commission of any incidents that significantly disrupt or have the potential to significantly disrupt the functioning of the Single Market and its supply chains (significant incidents). The information and intelligence gathered under this approach would however feed in the governance structure and Member States, which could then be used for this SMEI's *Ad hoc alerts for early warning.* With due consideration for the SMEI mechanism, this approach would still have to ensure that the different actors in place (Commission, CRM Board, Member States, governance bodies of SMEI, CHIPS Act or HERA) are informed whenever the monitoring provisions would lead to the assessment of a potential risk to the EU supply.

9.1.4.2. Approach 3: Developing monitoring and risk management capacities

In addition to the monitoring and general risk assessment provided by approach 2, this approach would ensure the development of targeted risk assessment as well as of risk management tools, thereby supporting the resilience of European companies.

Means and actions: Targeted risk assessment would be carried out by the operational capacity (cf. approach 3 of Pillar C) which would:

- **Conduct real time monitoring** of the CRM value chain (screening of news reports, business intelligence, high-frequency customs data), using those data to determine the monitoring dashboard described above.
- **Conduct direct stress tests** on strategic raw materials value chain at a more frequent pace, coordinating with Member States supply agency but with additional capacity to run them itself ;
- **Develop an Early warning mechanism (EWM)**: based on the monitoring, information gathering and stress test, the operational capacity would develop a EWM that indicate that

a strategic raw material is at risk of imminent shortage or disruptions. The definition of this mechanism should be adopted by the Commission on the advice of the operating structure within 6 months of entry into force of the regulation, and could be modified as necessary. If triggered, Member States would be informed as well as large companies that are users of SRMs; EWD results wouldhave to be made public for companies, including SMEs, to benefit from it.

- Provide direct advice to the EU industry on supply risks and sourcing of raw materials, and facilitate interactions between the raw materials suppliers and the EU end users.

In addition to the coordination and information sharing tasks mentioned in approach 2, this approach would include **information request** from large companies operating in a strategic raw materials value chain in order to ensure a higher degree of information on the state of supply chains.

9.1.5. Pillar C.3 Companies' risk preparedness

9.1.5.1. Approach 2: Developing requirements on company diversification and stockpiling

Under this approach, specific requirements would be set on companies to ensure their preparedness and resilience. Under those requirements, large companies (>250 staff) which consume strategic raw materials as a primary input for their production would have to comply with at least one of the following obligations:

1) Ensuring a diversified source of suppliers if it relies on strategic raw materials (when the market structure allows);

This should comprise a diversification both in terms of suppliers but also in terms of third countries on which the concerned EU economic operators could be dependent on for their supply. Indeed, if supply is fully concentrated in a single country but on different suppliers, it would still be at risk in the event of some form of supply risks. For instance, the energy curtailment in China that affected the country's magnesium producers simultaneously, putting EU users at risk of overall supply cut. It is certain that this diversification would have to take due account of the availability and affordability of other supply sources.

2) Ensuring a sufficient level of strategic stocks of strategic raw materials equal to 60 days of consumption;

If they cannot ensure and demonstrate their adherence to one of those measures, companies would have to then report to the Member States in which they are established explaining the reasons for their non-compliance.

Those companies would also have to develop an in-depth audit of their supply chain under the form of a stress test, to assess regularly their vulnerability under different supply scenario and the suitability of their risk mitigation strategies.

Member States would be responsible for ensuring the implementation of these obligations.

9.1.5.2. Approach 3: Developing requirements on company diversification and stockpiling while providing direct support to foster companies' resilience

This approach would contain the measures developed in approach 2. In addition, to enable large companies to meet these obligations and to support SMEs in undertaking such efforts (even if SMEs would not face those obligations), this approach provides that the operational capacity advise

companies on relevant strategies to enable them to mitigate supply chains risks. This support model could be defined in the legislation laying out the operational capacity's tasks.

Such advisory structure, inspired by the services some national agencies offer to companies, would allow for all EU companies operating across the critical raw materials value chain to benefit from direct advise.

9.1.6. Pillar C.2 Strategic stocks

9.1.6.1. Approach 2: Ensuring EU level coordination and stock assessment for the stockpiling of strategic raw materials

This approach would develop a mechanism to ensure higher coordination of strategic stockpiles amongst EU Member States, following the steps presented below.

1) After the establishment of the list of strategic raw materials, **Member States would be required to report** (with the highest level of confidentially and security) to the Commission on the organisation and on the state of their stockpiles for the strategic raw materials. Such reporting would include the strategic raw materials that are stockpiled, the stock levels compared to their industry's demands, and the planned allocation of stockpiles in the event of a shortage.

2) The Commission, with the support of the board (cf. approach 2 of Pillar C)**, would review the common state** of stockpiles and assess the potential convergences and overall levels of stockpiles across the EU, against a benchmark of what is considered as a safe level of stockpiling Where possible and relevant, the Commission would propose targeted recommendations for the Member States to reinforce its resilience on those matters.

3) A review of the state of play and implementation of the Commission's recommendation would take place regularly occur to monitor progress. The SMEI framework, including the definition of targets under the mechanism set in the vigilance mode, and the coordinated release under the Single Market emergency phase, could still apply to critical and strategic raw materials in the event of a crisis or threat; but the objective of approaches 2 and 3 is to act ahead of crisis or threat of crisis, as usually those situations are characterized by high market prices.

9.1.6.2. Approach 3: Enabling the common purchase of strategic raw materials

In addition to approach, this approach would mean that the operational capacity would foster the development of stockpiles of strategic raw materials. Based on the needs expressed by interested companies, the operational capacity (cf. approach 3 of Pillar C) would purchase through a joint procurement mechanism, appropriate quantities of strategic raw materials.

The interested companies would be financing the purchase of the stockpiles, as they are voluntary, albeit at lower costs given the fact that common purchasing would enable marginal saving. In addition, it would have to be assessed whether any financial instrument developed in pillar E.2 would be able to de-risk companies engaged in stockpiling by contributing to this mechanism.

9.1.7. Pillar D – Exploration efforts in the EU

The approaches developed below cover the early stages of the exploration activities related to mineral resources. They aim to enable further exploration activities by ensuring additional coordination or availability and reliability of data. They do not contain provisions to promote feasibility studies that occur later in the exploration process and are usually carried out by economic operators (e.g., junior miners), nor do they contain measures that would allow Member States to override any environmental legislation. However, they also include national reporting of potential

critical raw materials projects according to the United Nations Framework Classification (UNFC) for Mineral and Anthropogenic Resources in Europe. Further support to private explorations projects would rather occur within the context of Strategic Projects (approaches 2 and 3 of pillar E).

9.1.7.1. Approach 1 - Requirement on Member States to report on the mapping and evaluation of the critical raw material resources and extractive waste areas in the EU

With this approach, Member States would have to periodically report on the exploration activities carried by public entities and non-confidential information of exploration activities carried by companies, targeting critical raw materials.

This includes, but not only, existing public exploration programmes of mineral resources, targeting primary deposits (either currently or historically exploited or not) and/or secondary deposits (extractive waste of closed or abandoned facilities). Information on secondary resources should consider the volume, grades, mineralogy, technology feasibility and characteristics of the deposits, when available. The governance structure (cf. Pillar C) would have to ensure regular meetings to discuss progress of these exploration activities.

Member States would also have to periodically report, using the UNFC classification system, on results from public and private exploration activities (when available) that have already estimated mineral resources (measured, indicated or inferred) or reserves (proven or probable) according to existing national or international reporting codes.

On this basis, Member States would have to periodically report to the governance structure the state of knowledge of their critical raw materials resources, under UNFC framework when applicable, and aligned with INSPIRE.

Member States would also be encouraged to:

- Develop and implement public exploration programmes of their mineral resources contributing to the knowledge base of EU mineral resources with a focus, but not only, on critical raw materials;
- Reprocess existing geochemical and geophysical data with new and more accurate and robust algorithms;
- Develop new mineralisation models for critical raw materials;
- Develop predictability maps for critical raw materials and update them on a regular basis;
- Exchange good practices to include critical raw materials in land use policies and land use plans;
- Identify suitable areas for exploration of critical raw materials.

In addition, this approach would also encourage Member States to take due account of the occurrence of mineral resources containing critical raw materials (c.f., pillar A) when taking measures regarded to land use that might affect the exploitability of the deposits, for instance by granting it a statute of public interest, by including it in land use planning, as an information layer, or by ensuring that statutory change in land use determination from non-mining to mining can be implemented in a streamlined and time-considerable manner.

9.1.7.2. Approach 2 – Requirement on Member States to report on, develop and implement national exploration programmes for critical raw material resources and extractive waste.

Under this approach, Member States would be compelled to implement identified actions, even if the extraction or reprocessing of extractive waste is not part of their industrial or economic strategy. The development of the knowledge produced would then be available for future generations and enable the development of the EU critical raw materials value chain.

All actions under this approach would have to be revised on a regular basis in order to target the updated critical and strategic raw materials lists.

- **Develop and implement public exploration programmes**

Member States would have to develop and implement programmes for the public exploration of mineral resources. Programmes must be aligned with the list of critical raw materials but could include more raw materials based on MS specifics objectives.

The public exploration campaign would include geological mapping at a suitable scale, thematic mapping in particular hydrothermal alteration and structural maps, geochemical campaigns of soils, sediments, rocks and extractive waste, aerial geophysical surveys.

It is worth noting that these surveys would not only useful for mineral exploration but also for improving spatial land use and planning, e.g., groundwater knowledge, natural hazards mitigation or mapping natural geochemical background (a key information when dealing with environmental pollution and polluted soils).

The use of earth observation data, in particular hyperspectral and multispectral data could be included as part of the exploration programmes.

The exploration programmes would be designed with the aim of targeting undiscovered deep land deposits but also unexplored shallow deposits of critical raw materials.

The exploration programmes would include the development of new mineralisation models of critical raw materials from the most relevant mineral systems in Europe.

The acquisition and processing of the new data, and the development of new mineral models, could lead to the identification of anomalies and ultimately the discovery of new deposits, to be confirmed by feasibility studies conducted by mining operators.

The results of the implementation of the programmes would be used to estimate the potential of the EU in mineral deposits and to attract investments in private exploration.

Member States would report to the board every year on the status of those exploration programmes.

- **Reporting on critical raw material resources and extractive waste areas in the EU**

With this approach, Member States would have to periodically report on the exploration activities carried by public entities and non-confidential information of exploration activities carried out by companies, targeting critical raw materials. This includes, but not only, public exploration programmes of mineral resources, targeting primary deposits (either currently or historically exploited or not) and/or secondary deposits (extractive waste of closed or abandoned facilities). Information on secondary resources should consider the volume, grades, mineralogy, technology feasibility and characteristics of the deposits, when available.

The governance structure (defined by pillar C) would have to ensure regular meetings to discuss progress of exploration activities in the Member States.

Member States would also have to periodically (yearly) report, using the UNFC classification system, on results from public and private exploration activities (when available) that have already estimated mineral resources (measured, indicated or inferred) or reserves (proven or probable) according to existing national or international reporting codes.

Member States would not have to use the UNFC to report results on early-stage exploration projects that include identification of mineral occurrences or areas with mineral potential.

- **Reprocessing existing geochemical and geophysical data sets**

Member States, in particular Geological Surveys and mining authorities, hold substantial repositories of raw geochemical and geophysical data from past public exploration campaigns or acquired in the context of past exploration permits. This data, together with new data acquired through public exploration programmes, could be reprocessed with new and innovative algorithms and processing methodologies.

Under this approach, Member States would be compelled to develop and implement adequate policies, such as a dedicated a programme, to reprocess existing and newly acquired geochemical and geophysical data, with the aim of defining geochemical and geophysical anomalies, that could lead to discovery of new ore bodies of critical raw materials.

- **Developing predictivity maps**

Member States would be compelled to develop and implement adequate policies, such as a dedicated programme, to produce and update predictivity maps for critical raw materials in order to improve the knowledge of the mineral potential present in the EU.

Predictivity maps are a powerful tool to indicate potential areas containing deposits yet undiscovered. Within one year of entry into force of the regulation, the governance body would define a standardised way to report this mineral assessment. These geological and mineral results would be reported to the governance structure to inform the definition of potential targets for extraction.

- **Publication of data**

The results of the exploration activities promoted by Member States through the actions presented above, would have to be periodically reported to the governance structure by using a predefined template (specifications), following UNFC when applicable, and/or aligned with INSPIRE Directive. This would foster the creation of pan-European data sets or maps as called by stakeholders (e.g. EuroGeosurveys)

After a joint assessment, and in due consultation with the data owners, such data would be made available to economic operators with a guaranteed equal access in view of promoting later stages of economic activities in the value chain, such as feasibility studies.

Finally, this approach would, alike approach 1, encourage Member States to take due account of the occurrence of mineral resources containing critical raw materials (c.f., pillar A) when taking measures regarding land use that might affect the exploitability of the deposits.

9.1.7.3. Approach 3: Obligation to report to the governance structure on the land use decisions applicable to known deposits containing strategic raw materials

In addition to approach 2, approach 3 would require Member States to inform other EU countries and the Commission through the governance structure of their intention to adopt a land use decision that would affect the potential to exploit of a known mineral deposit containing strategic raw materials, allowing for comments and discussion in the relevant fora. This measure would ensure that information on upcoming activities over these deposits are provided to the governance structure if such activities have the potential to affect other actions provided in the CRM act, such as the determination of targets based on an assessment of resources and deposits in Member States. This obligation for Member States to report would be done to the network or the operational capacity (depending on whether option 2 or 3 are chosen).

Discarded approach: It is suggested to discard approach 3 at an early stage. This approach was deemed as not respecting the proportionality principle, given that other reasons of strategic nature or environmental preservations might require the use of the land, despite the presence of a mineral resource of strategic importance, and that it would add unnecessary burden on Member States for the reporting. It is also not in line with subsidiarity principle to the extent that Member States, or local governments, are the most appropriate authorities to judge the relevance of a particular land and its use.

9.1.8. Pillar E – Support to the value chain

9.1.8.1. Approach 1: Requiring Member States to set up strategies to contribute to a stable and secure supply of CRMs

Under this approach, each Member State would be required to create a strategy outlining the ways and timeline how it can contribute towards achieving a more stable and secure supply of CRM in the EU, by identifying and supporting projects that are important across the CRM value chain. These strategies would have to be submitted to the Commission 6 months after entry into force of the legislation. The Commission would then analyse them jointly, evaluate the cumulative impact and based on this give specific recommendations to each Member State 12 months after entry into force.

No specific legal notion of strategic projects would be established under this approach.

9.1.8.2. Approach 2: Identify Strategic Projects, in Europe and partner countries abroad

Under this approach, Strategic Projects would be established with legal consequences regarding permitting and access to finance as outlined in pillars E.1 and E.2.

Companies and investors, would be able to submit their proposals to the Commission. To be eligible, projects would have to fulfil general minimum criteria, among them a meaningful contribution to the targets set under Pillar B, positive spill-over effects beyond the Member State where they are located and a positive outlook regarding long-term economic viability. The governance structure might apply more specific criteria per step of the value chain for each raw material mentioned in the list of targets. To this end, the project promoter's application should include, among other things:

- an assessment of their projects with regard to their contribution to reaching the targets and the applicable criteria;
- a business plan evaluating the financial viability of the project, including an overview about the secured funding and the remaining financing needs and estimated time-to-market.
- an assessment of the level of public acceptance of the project and, where relevant, a plan for ensuring it, including actions (additional to what is already required) such as awareness campaigns to educate and inform the public of the importance of CRMs for the green transition and how these CRMs could be obtained in the EU in a responsible way or setting up mitigation and compensation mechanisms to ensure that the project contributes to the general development of the relevant area.

The Commission would then share the application with the Member State where the project is intended to take place and ask for its general approval within one month for the project to receive the status of Strategic Project. Where it refuses, it would have to present its substantiated reasoning to the Commission who could request the Board to discuss these reasons. Where the Member State accepts, the Commission would check the application for the fulfilment of the minimum criteria. In case of many applications, the Commission would be able to prioritise applications for projects active on specific parts of the value chain in order to work towards a balanced representation of projects along all strategic raw materials along the value chain. The Commission would then assess the projects in consultation with the Board. For projects that fulfil the criteria, the decision to assign them the status of Strategic Project, this would be published as a Commission decision.

Projects outside of the EU could also be labelled as Strategic Projects. To be eligible, those projects would also have to fulfil general minimum criteria, among them high environmental and social performance and contribution to the targets laid out in pillar B. They would also need the support of one or more European companies that have committed to purchase at least e.g. 50% of the production of the respective strategic raw materials for e.g. 180 months for use in Europe. The projects should in principle be located in countries with which the EU has concluded a Free Trade Agreement with a chapter on raw materials or a Strategic Partnership. To ensure compliance with ESG criteria, the project would need to show sufficient evidence that it would qualify for a recognised certification scheme, if recognised. Otherwise, the same process would apply. The respective third country would be closely involved to ensure compliance on the ground. The board might also coordinate with the Global Gateway governance, which could help leverage EU Member States funds for projects outside the EU.

The number and nature of Strategic Projects to be designated would depend on the needs of the European economy, the current level of production as well of supply security per material and step of the value chain, as well as European production potential, next to individual characteristics of projects such as environmental performance Projects of all sizes could become Strategic Projects if they sufficiently help to address gaps in the European CRM value chain. To effectively ensure security of supply, the selection of projects would take into account an analysis of the gaps per material and step of the value chain. Due to its increasing importance over time, recycling projects would be expected to make up an increasing share of Strategic Projects over time. The potential number of projects to be assigned depends also on the size of the available projects. An estimation is made on their number in Annex 4 in order to best assess their potential impacts.

9.1.9. Pillar E.1 – Permitting procedures

Raw materials operations in the EU are subject to a comprehensive legislative framework that is meant to minimise a project's adverse environmental impacts and ensure involvement of all relevant stakeholders in the permit-granting process. This framework is an essential achievement,

which this initiative should build on. However, the unpredictability of permitting procedures in terms of duration and outcome has been shown to discourage much-needed investment into the European raw materials value chain. Against this background, this section sets out different possible approaches to speeding up permitting processes and making them more predictable.

9.1.9.1. Approach 1: CRM projects to be considered in spatial planning

Intervening in an early phase, well-designed spatial planning has the potential to reduce land use conflicts and point project developers to suitable sites, which in turn is likely to accelerate permit-granting procedures. Analogous to Union legislation on the deployment of renewable energies, therefore, Member States' competent national authorities at national, regional and local level would be required to take into consideration and provide for the realisation of CRM projects when developing spatial plans.

Given the potential effects on the environment of CRM projects, Member States should, when developing those spatial plans, apply the Strategic Environmental Assessment (SEA) Directive[11].

Undertaking the SEA procedure encourages a more integrated and efficient approach to spatial planning and early in the project development phase. For example, applying the SEA procedure allows relevant national authorities to plan for the development of CRM projects while factoring in the environmental obligations and identifying the cumulative environmental impacts at an early stage. The outcomes in turn provide a basis for the subsequent project development and permitting procedures. This also translates into fewer conflicts at the individual project level, both in substance and in terms of public acceptance.

9.1.9.2. Approach 2: Mandatory measures to make permitting for Strategic Projects more predictable

This approach includes the measures set out in Approach 1.

In order to ensure a secure investment climate for Strategic Projects (see Pillar G) in particular, a general requirement would be set for Member States to ensure that administrative procedures for their approval are streamlined and expedited at the appropriate administrative level.

In order to put such streamlining into practice, Member States would also be required to take the following concrete measures in relation to Strategic Projects:

- allocating the status of the highest national significance possible under national law to Strategic Projects for the purpose of permit granting processes;
- applying a joint procedure combining all relevant assessments (i.e. those required by the EIA, Habitats, Birds, Water Framework, Seveso and Industrial Emissions Directives) for a given project;
- designating a 'one-stop shop', in the form of a competent authority which should be the sole point of contact for project promoters during the entire process leading to a comprehensive decision for a given project and should coordinate the submission of all relevant documents and information;
- adhering to specific time limits for different stages of the permit granting procedure;
- allowing documents to be submitted digitally;
- making available a manual of procedures for project developers.

In addition, to ensure procedures are more predictable, the scope and the level of detail of information's for the EIA report needed to apply for the relevant permits would have to be clear

from the outset. In order to do so, this approach would make the scoping opinion preceding the submission of an EIA report mandatory for Strategic Projects.

As regards the duration, there would be an overall time-limit set for overall permit granting procedure (covering the period from the date of acceptance of the submitted application file until a comprehensive decision) for Strategic Projects (e.g. 18 months).[153] The following more specific time limits would also be introduced pertaining to specific steps of the permitting process, including:

- period between the request for a scoping opinion for environmental assessment report and the response – *1 month*
- conclusion of the environmental impact assessment (which is bundled with the assessments relevant to the applicable nature protection directives) of a given project - *3 months (with possible 3-month extension)*
- public consultation on the environmental impact assessment report – *2 months*

The time-limits would be shortened for procedures related to exploration, which by its nature has a smaller scope and impacts.

The above-mentioned time limits would be without prejudice to potential delays caused by judicial or non-judicial appeals. However, Member States would be required to, where available under national law, apply urgency procedures for possible litigation related to the permit granting process.

Lastly, this approach would provide direction to Member States on the application of substantial permitting conditions. The nature protection rules that are integral part of the relevant permitting conditions (i.e. the Birds, Habitats and Water Framework Directives) provide that projects considered to be in the overriding public interest can be allowed to go forward even in the case of limited adverse impacts on the environment. Under this approach Member States also would be required to consider Strategic Projects, at least for refining and recycling, as being of public interest for the purposes of that assessment, considering their contribution to the Union's supply security and the green and digital transitions. In addition, the proposal would clearly emphasize that Member States may, when performing their case-by-case assessments to weigh potential environmental concerns with a Strategic Project's public interest, consider a Strategic Project to be of overriding public interest if all the conditions set out in the relevant Directives are fulfilled.

The obligations displayed in this approach take account of the subsidiarity principle by ensuring that Member States may refuse the development of a Strategic Project on their territory in the selection process leading up to them.

9.1.9.3. Approach 3: Require Member States to dedicate sufficient resources to their permitting

This approach includes the measures set out in Approach 1 and 2.

It would also introduce a requirement on Member States to dedicate sufficient resources to permitting procedures for Strategic Projects. Following the example similar provision in the field of competition and consumer protection law, Member States would, more in particular, be required to ensure that responsible authorities have a sufficient number of qualified staff and sufficient

[153] Similar to the time limit included in the TEN-E Regulation for cross-border energy infrastructure projects (18 months) or the RED II Directive for renewable power plants (24 months).

financial, technical and technological resources necessary for the effective performance of their functions.

9.1.10. Pillar E.2 – Access to finance

9.1.10.1. Approach 1: Encourage setting up of Investment Platform, leveraging finance through existing instruments

Under this approach, no new funding instruments outside the possibilities of the current framework would be established, but the Commission would work towards an extended use of the existing possibilities and to tie them as closely as possible to the Strategic Projects. This would include fostering the setting up of an investment platform under InvestEU, which specifically supports CRM projects. This would require an Implementing Partner that has a valid Guarantee Agreement with the Commission (e.g. the Agreement with the EIB that administers 75% of the Commission's guarantee allows to fund raw materials projects), which enables the EU guarantee and helps attracting additional funding from private and public sources. Under InvestEU a wide variety of financial instruments can be provided, for example loans, equity or hybrid products. An InvestEU Advisory Hub on CRM would be set up to support provide technical assistance and advisory services to project promoters (as well as financial intermediaries), including for the creation of the investment platform. Additionally, the use of other existing funds for domestic use (RRF, Innovation Fund, Cohesion Funds, etc.) should be promoted and fostered for these projects. For CRM projects abroad funds aiming at international spending would be used (NDICI, EFSD+, IPA, etc.).

9.1.10.2. Approach 2: Dedicated CRM Fund with Member State contributions and limited EU contribution from existing sources

In addition to approach 1, the Board, with a dedicated standing sub-group consisting of financial experts from the Member State as well as the Commission, would provide support to Strategic Projects in access to finance. It would point to existing sources that could provide funding, including on level of the Member State, international financial institutions, national promotional banks and the Union. Possible sources for support on European and Member State level could be:

- The use of the Recovery and Resilience Fund (RRF) by the Member States to contribute to the needed investments.
- In addition, funds could be used more within existing programmes such as Horizon Europe and/or the Innovation Fund to actions supporting investments in the CRMs field.
- One such example is Horizon Europe which enables funding of pilot demonstrators for industrial application of technologies via proposals for projects.
- The Innovation Fund focuses on highly innovative technologies and big flagship projects within Europe that can bring significant emission reductions. It is about sharing the risk with project promoters to help with the demonstration of first-of-a-kind highly innovative projects. In 2022, a project for battery recycling received a grant of EUR 68 million[154]. The fund could focus even more on CRM projects in the future.
- Regional Development & Cohesion Funds: Under priority 2 – a greener, low carbon transitioning towards a net zero carbon economy – funds could be allocated for raw materials, for example for projects focusing on refining/processing/recycling. The Just Transition Fund could also be used more as has been demonstrated with a grant of

[154] https://climate.ec.europa.eu/system/files/2022-12/if_pf_2022_relieve_en.pdf

EUR 18.7 million to a rare earth magnet manufacturing facility in Estonia[155]. These funds, unlike most other sources of public funding, also allow to finance projects in earlier parts of the CRM value chain, that do not rely on innovative technology.

- Explore providing counter-guarantees to national export credit agencies (ECAs) where such ECAs are involved in the financing of strategic projects in third countries with European off takers and European project promoters;
- The NDICI (and, in particular, EFSD+ guarantee facility and blending facility) and IPA (Instrument for Pre-accession Assistance) funds could be used to support projects in their coverage area (i.e. in third countries) within the existing sectoral windows (e.g. energy or sustainability). Special sectoral windows could be opened for funding CRMs. but this would require additional resources for EFSD+, especially if dedicated guarantee programmes tailored to CRM are envisaged.
- Existing EU funding schemes with loans, equity or grants in the area of energy could be extended to cover also raw materials production for energy applications. They would form a coherent component of such programmes, reflecting the value chain approach. EU added value, in terms of jobs, growth and resilience potential, may be part of the criteria considered when assessing the project proposals.

For the external aspects it is crucial to work with the European Investment Bank and Development Finance Institutions to engage in the raw materials value chain in partner countries. Engagement in the financial and investment ecosystem have so far dominated, but are not sufficient to gauge the full potential. It may also be relevant to leverage existing programmes with other multilateral development banks (MDBs) such as the World Bank Group (including the International Finance Corporation (IFC) and Multilateral Investment Guarantee Agencies (MIGA)), the Inter-American Development Bank (IDB), the EBRD, which have a long standing experience in this domain. As the IFC has submitted a broad proposal to EFSD+, it may be worth exploring including CRM support, i.e. pending resources availability under EFSD+.

Despite these efforts, significant gaps would persist in the funding landscape. For example, cohesion funding provides only limited opportunities for investment in wealthier regions of the EU, where geological resources for extraction, or energy availability for refining may be better; most other relevant funds are directed either at innovative projects or projects directly contributing to positive environmental and climate impacts (without considering the role of CRMs in enabling clean technology). Importantly, current funding conditions do not address strategic autonomy as a goal (even though the Trade Policy Review and other official strategy papers have endorsed this concept) while investments in areas such as CRMs are essential for this objective. An important project about, for example, rare earth extraction in the north of Sweden would therefore still struggle to attract funding.

Therefore, the Commission would work with interested Member States to set up a dedicated CRM Fund to further support CRM projects, including Strategic Projects. This Fund would require Member State contributions and a contribution of existing EU sources to leverage this money with private financing[156].

To ensure the European dimension and to get closer to closing the large investment gap as shown in the access to finance part of the problem section, existing European resources would also be used. The necessary mix of different financial instruments would depend on the project's

[155] https://www.neomaterials.com/neo-performance-materials-to-receive-first-ever-grant-under-europes-just-transition-fund-for-neos-planned-sintered-rare-earth-magnet-manufacturing-plant-in-estonia/

[156] Depending on the design and governance of the upcoming Fund, its support may qualify as State aid, in which case State aid rules will apply.

specificities, notably the stage of the value chain (e.g. risk capital, loans). The Fund's purpose would be to support the CRM value chain in Europe and partner countries abroad, in particular Strategic Projects, and to generate a return on investment. The Fund should be able to provide loans and equity to projects along the entire CRM value chain, focussing on Strategic Projects. Grants should also be considered but depend on the type of financial resources and set up of the Fund.

Where public support qualifies as State Aid, existing State Aid rule would be respected. The support from public sources would be applied to crowd-in private money and increase the leverage. It would focus on filling the remaining gap where the market struggles to finance it due to market failures. Supported projects would also need to show their long-term economic viability under functioning market conditions, the aim would not be to support that permanently require operational support.

9.1.10.3. Approach 3: Dedicated CRM Fund with additional Commission contribution and Member State contribution

In addition to approach 1, the Commission would set up a dedicated CRM Fund that combines new EU money with Member State contributions, leveraging private investments to support CRM projects along the value chain in Europe and abroad, prioritising Strategic Projects. It could be managed by the governance structure (i.e. the board or operational capacity, cf. Pillar C). The CRM Fund would be able to provide loans, equity and grants for investment support, in compliance with State aid rules.

This Fund would provide a common European approach to funding CRM projects. With the appropriate endowment, it would be able to provide more and riskier financing, and could also be less bound by profitability considerations and operate more freely (compared to the fund considered under approach 2) to effectively address proven market failures.

9.1.11. Pillar F – Waste legislation

9.1.11.1. Approach 1: Adoption of a Commission Recommendation targeting small consumer electronics and announcements of future CRM circularity actions

- The Commission would adopt (as part of the CRM Act package) a Recommendation on take-back schemes for small consumer electronics, to improve the return of used and waste mobile phones, tablets and laptops, which contain significant amounts of critical raw materials.
- The Communication accompanying the CRM Act would announce that the upcoming (Q2 2023) joint review of the Directive on end-of life vehicles and the Directive on the type-approval of motor vehicles with regard to their reusability, recyclability and recoverability (3R) will include provisions to support recovery of CRMs from end-of-live vehicles and use of recycled CRM content in new vehicles.
- The Communication accompanying the CRM Act would announce (for Q1 2024) upcoming secondary legislation under the current WEEE Directive to amend its Annex VII on selective treatment for materials and components of WEEE to include a list of CRM-rich electrical and electronic equipment and components thereof. It would also announce the launch of a preparatory study for the identification of such CRM-rich EEE and components.

- The Communication accompanying the CRM Act would announce an upcoming review of the WEEE Directive, assessing possibilities of introducing information requirements (on CRMs contained in electrical and electronic equipment), design requirements (for dismantlability of CRM-rich components) – in synergy with Ecodesign provisions – and separate collection and recovery targets for a list of CRM-rich electrical and electronic equipment.
- The Communication accompanying the CRM Act would announce actions to introduce EU end-of-waste criteria for the most important waste streams containing CRMs, notably (based on a JRC scoping exercise[157]): red mud / bauxite residue; phosphorus recovered or produced from waste water treatment and sewage sludge; rubber recovered/recycled from end-of-life tyres; ferro-alloys and silicon slags; and certain categories of waste electrical and electronic equipment that are currently not prepared for re-use.
- The Communication accompanying the CRM Act would announce (for Q2 2024) a proposal to introduce specific waste codes for Lithium-ion batteries and intermediate waste streams ("black masses") under the European List of Waste.
- The Communication accompanying the CRM Act would announce (for Q2 2023) the launch of an Ecodesign preparatory study on potential product-specific requirements on recycled content and on scarce, environmentally relevant and critical raw materials, which would be followed up by implementing measures. It would also note the possibilities to set relevant requirements for CRM-rich products under the proposed Ecodesign for Sustainable Products Regulation.

9.1.11.1.1. Approach 2: Targeted amendment of the Extractive Waste Directive and certain circularity provisions in the CRM Act

- The Commission would adopt (as part of the CRM Act package) an amending Directive to the Extractive Waste Directive, to introduce targeted changes aimed at increasing CRM recovery from extractive waste. The two main measures would be to require:
    1. operators of extractive waste sites to perform an economic pre-feasibility study of the potential to recover CRM from the extractive waste generated (as part of the waste management plans under Article 5), and
    2. Member States to create a database of all closed extractive waste sites, search administrative records and perform geochemical sampling to identify quantities and concentrations of CRMs on these sites, and publish such information in order to encourage CRM recovery projects on those closed waste sites.

The CRM Act would include an obligation for Member States to develop national circularity strategies, addressing areas of national competence, such as waste collection and treatment systems, national R&I programmes for CRM recycling technologies and CRM substitution, and to gather data on the most important product and waste streams and stocks containing CRMs on their territory.

9.1.12. Pillar G - Actions on standards for the critical raw materials value chain

9.1.12.1.1. Approach 1: Increase efforts to have EU rules and principles reflected in international standards

The European Union has had a strong global footprint in international standardisation and European experts and national standardisation bodies are important contributors to the work of ISO. This approach would include several actions to leverage this position specifically in relation to critical raw materials, with the aim of ensuring that the principles and values underlying relevant

[157] JRC Publications Repository - Scoping possible further EU-wide end-of-waste and by-product criteria (europa.eu))

EU legislation are reflected in international technical standards on CRMs, especially standards for ensuring the sustainability of industrial processes involved in the CRM value chain.

This approach would promote a more strategic and coordinated approach to international standardisation activities by helping Member States, EU standardisation bodies and EU industries more effectively coordinate and share resources in support of international standardisation processes.

Following the overall approach set out in the Standardisation Strategy, the Commission would in particular:

- Ensure that the High-Level Forum (HLF), announced in the Standardisation Strategy, includes a specific work stream on CRMs. The HLF will bring together representatives of Member States, European Standardisation Organisations and National Standardisation Bodies, industry, civil society and academia to set priorities, advise on future standardisation needs, and coordinate effective representation of European interests in international standardisation fora.
- Monitor the effective implementation of existing commitments on standardisation in EU trade agreements and use such trade agreements to cooperate on standardisation with like-minded partners and coordinate positions in relevant international technical committees;
- Promote international cooperation on standardisation and EU standards with the Neighbourhood, Development and International Cooperation Instrument – Global Europe (NDICI-GE) and Horizon Europe, also with a view to support stakeholder participation in international standardisation (SMEs, civil society, academics);
- Fund relevant projects in the field of standardisation in selected African countries as part of its development cooperation policy and the Global Gateway. The EU will promote the development of a standardisation infrastructure reflecting the EU principles and values in partner countries with accession perspectives/closer integration with the EU's internal market, starting in the EU's Neighbourhoods.

9.1.12.2. Approach 2: Mandate development of standards regarding relevant industrial processes

In addition to approach 1, this approach would look beyond the EU's contribution to international standardisation efforts by also providing direct support for the development of European standards and standardisation deliverables on the sustainability of CRM-related industrial processes.

Based on the priorities set by the HLF and ERMA working groups, the Commission would request CEN to develop e,g, technical specifications, technical reports, workshop agreements or European standards. The Annual Union Work Programme on Standardisation would thus clearly reflect the growing importance of CRMs. This work would be supported according to the existing rules on financing of European standardisation.

The resulting technical standards will provide solid and coordinated basis for EU participation in international standardisation efforts, and where necessary provide a clear counter-narrative to standardisation efforts by industry or countries with lower environmental standards.

The development of standards following the mandate provided by the Commission to standardisation bodies is likely to take up to three years.

9.1.12.3. Approach 3: Set essential requirements regarding relevant industrial processes and mandate development of related harmonised standards

In addition to approach 1, this approach would include the setting of essential requirements related to the sustainability of CRM-related industrial process, e.g. on the water use and resource efficiency of extraction and recycling processes for lithium. Following a similar approach to the New Legislative Framework, the Commission would issue standardisation mandates for CEN to develop harmonised European standards, providing a presumption of conformity with the requirements to which they are linked.

In addition to operationalising such requirements (allowing responsible economic operators to more easily apply them and competent authorities to more easily enforce them), the creation of harmonised European standards would provide an even stronger basis for European leadership in international standardisation fora.

Discarded approach: Approach 3 was discarded at an early stage. Although this approach would effectively contribute to the objective of having high quality standards available, it would also entail the setting of additional requirements on the EU CRM value chain. In addition, there is a risk that such requirement would overlap or be incoherent with the rules to be developed under the recently proposed revision of the Industrial Emissions Directive, where it is proposed to bring the relevant industrial processes under its scope. As such, approach 3 would risk creating additional barriers to the EU's supply of CRMs, and thereby has the potential to undermine the attainment of the other objectives, including to strengthen the EU value chain for CRMs.

9.1.13. Pillar H – Environmental footprint of critical raw materials

9.1.13.1. Approach 1: Set minimum requirements for certification schemes for sustainable CRMs

This approach focusses on the reliability of general environmental claims (e.g. 'this lithium was produced using sustainable practices') made by operators selling CRMs on the EU market. The availability of specific qualified information on the environmental footprint is addressed in Approach 2 below.

This approach would include setting set of common requirements for voluntary certification158 schemes at EU level related to the sustainability of CRMs. This would be coupled with an empowerment for the Commission to establish which certification schemes meet those common requirements through implementing act. The common requirements to be set should ensure that recognised certification schemes are based on transparent criteria covering all relevant sustainability aspects and are awarded based on reliable and third-party verified information.

In order to prevent unreliable general environmental claims, sellers of CRMs on the EU would only be allowed to make such claims about the sustainability of their materials (e.g. 'this lithium was mined and refined sustainably') based on recognised certification schemes. It would not be allowed to make reference to non-recognised certification schemes.

[158] 'Certification' in this context refers to the voluntary process of providing an operator with an attestation of a status or level of achievement regarding the sustainability of their operations. This is different from the 'declaration' referred to in approach 2, which refers to the making available of specific quantified information on the environmental impacts linked to CRMs placed on the market based on pre-set calculation rules.

9.1.13.2. Approach 2: Require declaration of the environmental footprint of CRMs sold in the EU

In addition to approach 1, this approach would entail requiring economic operators to declare the environmental footprint of CRMs they sell on the EU market, as a market access requirement. This will help bring about transparency on the environmental footprint of CRMs and help shift the Union market towards lower impact CRMs, regardless of where they are produced. It may also enable other policies at Union and national level, such as incentives or green public procurement criteria, fostering the use of CRMs with lower environmental impacts.

This requirement would only apply for CRMs for which there are material-specific calculation rules available. Before mandating the rules for the calculation of the environmental footprint of CRMs, a consultation process with industry and Member States seems necessary to fine-tune those rules and clarify how they will be maintained over time. The material-specific calculation rules would therefore be provided by means of implementing acts prioritising CRMs with relatively higher demand and environmental impacts.

Given the wide variety of environmental profiles of the different CRMs, the Commission would be empowered to, when specifying calculation rules, allow the footprint declaration to be limited to one or a subset of impact categories where this is justified based on the environmental profile of the different materials. For example, the impact category global warming potential or carbon footprint is a significant category for many CRMs (e.g. REEs and lithium) and is an important factor given that CRMs are central to the manufacturing of technologies needed for decarbonisation and could thus be made the focus of specific declarations. In addition, it would allow Member States to set incentives based on the different footprints of CRMs, including potentially in public procurement.

The calculation rules would be based on the Product Environmental Footprint (PEF) method.[1] The PEF method was developed by the Commission to ensure reliable and comparable life-cycle assessment information. As such, it would be ensured that CRM buyers intending to buy relatively more sustainable materials will find reliable information in the market and are enabled to make effective purchasing decisions. A proper enforcement of the regulatory proposal will most likely require putting in place a third-party verification system rather than relying on self-declarations, so that a fair and verifiable mechanism is established. The use of a common calculation tool and harmonised secondary datasets159 could also contribute to this aim.

The requirement would in principle not apply to final products containing relevant CRMs. However, where the footprint of CRMs included in product is specifically referenced in any relevant product documentation, it would be required to justify that claim and refer to the declared footprint of the CRMs used.

9.1.13.3. Approach 3: Putting in place a mechanism for setting performance classes and maximum thresholds for environmental footprint

In addition to approach 1 and 2, this approach would consist in introducing a mechanism to set footprint performance classes to further support market differentiation and the setting of maximum footprint thresholds for specific CRMs placed on the EU internal market. Such measures could have adverse effect on the security of supply for CRMs. Therefore, in light of this risk and in order to avoid any negative effect on supply security, the following measures would be gradual,

[159] The calculation of environmental footprints would require a mix of secondary and company-specific data. For example, for carbon footprints, the calculation rules could allow factoring in information on supplier-specific electricity mixes, which may improve the footprint results compared to the ones obtained with the use of default country residual grid mixes.

progressive and evidence-driven. Indeed, for each maximum footprint threshold, there should be dedicated assessments conducted.

This approach would contain the following gradual steps:

First, as there is not yet sufficiently detailed statistical information on the relative footprints of CRMs, the Commission would gather such information through the declarations proposed in approach 2 through secondary legislation

Second, once sufficient market knowledge is acquired through step 1, relevant CRMs would be categorized in an A-G scale based on their footprint.

Third, a threshold would be identified, which would correspond to correspond to the limit values of the lower or lowest classes in the performance class scale.

The introduction of maximum thresholds the third step would only be possible when accompanied by a proportionate and dedicated assessment, which would take into account the relative distribution of the footprint values for the relevant CRMs placed on the Union market, the extent of progress in the reduction those footprints as a result of the information requirement referred to in approach 2, and the effective and potential contribution of a threshold to the Union's environmental and climate objectives. In addition, this assessment would take close account of the potential effects of thresholds on EU imports of the relevant CRMs, ensuring that the level of the thresholds is set so as to prevent potential bottlenecks for EU supply of CRMs.

This approach would steer relevant economic operators to reduce the environmental footprint associated with their CRMs and would ban from the market those materials with the relative highest footprint. Economic operators should be given sufficient time to adjust their production facilities.

Discarded approach: Approach 1 was discarded at an early stage. Although this approach would help make general claims about the sustainability of CRMs more reliable, it would not affect quantitative claims for which conflicting methods could continue to proliferate. In light of the large support for increasing the availability of reliable environmental footprint information expressed in the OPC, it is expected that this approach alone would therefore not be able to count on sufficient support of stakeholders. In addition, it is expected that without clear quantified information on important impact categories, relying only on increasing the reliability of general claims, it will not be possible to effectively achieve the Union climate and environmental objectives.

ANNEX 6: SME TEST

32 SMEs answered to the public consultation survey, mainly operating in the exploration or extraction of critical raw materials (10 and 11 respectively – often combining both activities), while 14 reporting being active in the use of CRM for manufacturing, 9 in recovery and recycling, 7 in research, etc.

They reported having experienced problems in relation of their supply of critical raw materials, such as shortage or disruption, for most of those which answered.

The initiative is considered as relevant for SMEs.

Step 1/4: Identification of affected businesses

All businesses and SMEs should feel the positive effects of a more stable supply of critical raw materials. Particularly affected by the legislative initiative are businesses and SMEs in sectors along the CRM value chain and those who directly use them as inputs.

The former group includes, for example, junior miners, firms engaged in exploration or in the nascent industry of CRM recycling, that are often SMEs. For them, the easier access to funding as well streamlined permitting provisions are expected to bring large benefits.

For downstream users, the increased availability of their inputs as well as lower risk of severe disruptions is especially beneficial for SMEs as they tend to struggle more with acquiring such goods in a crisis situation.

Step 2/4: Consultation of SME Stakeholders

Of 81 businesses that replied to the Open Public Consultation 32 are SMEs.

Of the policy papers received many explicitly mentioned SMEs calling for financial support due to their particular vulnerabilities. It is also mentioned that it is instrumental for the competitiveness of micro and SMEs to secure reliable sourcing of the input materials needed for the green transition at a competitive price. Social and environmental concerns should be balanced with economic and security interests.

Step 3/4: Assessment of the impact on SMEs

For policy option 2, SMEs would benefit from the enhanced availability of monitoring and information regarding the supply chains of critical and strategic raw materials. Indeed, they usually are less informed about the supply chains risks. In the public consultation, 40% of SMEs agree that companies would benefit from public monitoring programmes with only 6% disagreeing. 44% of SMEs agreed that they would benefit from public monitoring to inform them about risks of supply chains disruption (6% disagreed, the rest being neutral of with no opinion). To this end, 59% of them agree that an EU-wide governance capacity with monitoring tasks could help strengthen the value chain resilience. A slight majority of them agreed that companies lack sufficient information on supply risks to take preventive measures. (28% against 22%), although 72% support measures that would enable them to benefit from such information.

On governance, the board would regularly convene with stakeholder groups, among them some groups explicitly representing SMEs. This would ensure that they could express their opinion.

SMEs are also adamant about the difficulty to access private financing for CRM projects (62% agreeing; 0% disagreeing) and to access public funding (80% agreeing; 3% disagreeing). They converge in saying that the length and complexity of permitting processes are the main reasons for the difficulties in accessing private finance (47%), followed by the lack of support from public financial institutions (34%) and the higher production cost in the EU (31%). For them the funding opportunities are therefore particular valuable. Additionally, the InvestEU guarantee (pillar E.2) contains a specific window for supporting SMEs. Especially, junior miners and exploration projects often struggle to attract adequate funding and using this window would therefore be particularly beneficial for SMEs.

The proposed approach on exploration (pillar D), as suggested by stakeholders (e.g., European Federation of Geologists), would bring positive benefits to SMEs as they are the main actors operating in this early stage of the value chain have less resources and capacities to undertake risk-heavy exploration operations.

A lot of these benefits to SMEs also apply under the other policy options. In option 3 SMEs would additionally benefit a lot from early warning mechanisms of supply chain disruptions provided by the operational capacity. Larger companies are more likely to able to shoulder these tasks on their own than SMEs.

Step 4/4: Minimising negative impacts on SMEs

Although most of the measures discussed in this Impact Assessment have positive impact on SMEs, there are some that could affect them negatively. Therefore, specific exemptions for SMEs are foreseen, such as one from reporting obligations.

Actions of other global actors and organisations

In consideration of the projected supply-demand imbalance and rising concerns with supply security amidst geopolitical tensions, other countries have acted to ensure their supply of CRMs for the future. The following overview includes both countries in a similar situation as the EU such as manufacturing-heavy but CRM-import-reliant Japan, South Korea or the UK but also major mining and refining players such minerals-rich Australia and Canada.

The UK adopted its Critical Minerals Strategy in July 2022[160] which includes three main axes: a) enhancing domestic production; b) collaboration with international partners: using G7, IAE, MSP, and bilateral paths; supporting UK companies abroad including with export finance; c) Enhancing international markets, by promoting the City of London as a hub for responsible mining and trading. The UK established its Critical Minerals Intelligence Centre in July 2022[161], which will provide ongoing intelligence on the supply of and demand for critical minerals. The centre is to be run by the British Geological Survey.

In Japan, a country with a large manufacturing sector and few domestic CRM resources, a dedicated governmental structure on critical raw materials (JOGMEC) is in charge of monitoring, stockpiling (sufficient to meet 60 to 180 days' demand) and investing. It supports exploration and technological development by Japanese companies through equity capital and liability guarantees. Its JOGMEC's mandate was recently expanded to "functions of equity investments for domestic processing and smelting of rare metals". In addition, the Economic Security Promotion Act aims to ensure stable supplies of critical items.

In South Korea, the State-owned Korea Resources Corporation runs a stockpile storage system for rare metals. A dedicated plan to stabilise resources supply in 2021 has developed in 2021 a dedicated plan to stabilise resources supply notably by increasing the stockpile of minerals to 100 days of consumption[162]. The country also has an early warning system in place to monitor 20 key raw materials.

In 2022, the US also adopted the Inflation Reduction Act (IRA), aiming to put the US on a path to around 40% percent emissions reduction by 2030. Numerous financial support programmes in the IRA have domestic or regional content provisions. These include the sourcing, processing and recycling of many critical raw materials. With the American Battery Materials Initiative, USD 2.8 billion in public money will be disbursed to support projects in different stage of the battery value chain, of which USD 1.6 billion are earmarked for projects to separate and process battery raw materials. Critical minerals-related funding is also available under the Infrastructure Investment and Jobs Act.

Australia published in 2022 a Critical Minerals Strategy, which is coordinated by the Critical Minerals Office (founded in 2020). The Office supports research and development, promotes

[160]https://www.gov.uk/government/publications/uk-critical-mineral-strategy/resilience-for-the-future-the-uks-critical-minerals-strategy

[161] UK's first Critical Minerals Intelligence Centre to help build a more resilient economy - GOV.UK (www.gov.uk)

[162] The Ministry of Trade, Industry, and Energy announced on December 28 the Ministry's work report for 2022, titled "Building Korea into an Industrial Power, Overcoming & Rising Together"
http://english.motie.go.kr/common/download.do?fid=bbs&bbs_cd_n=2&bbs_seq_n=903&file_seq_n=1

investment, facilitates strategically important critical minerals projects and improves access to information[163].

On 9 December 2022, Canada released its new Critical Minerals Strategy focusing on the entire value chain of Canada's listed 31 critical minerals and backed by a CAD 5.3 billion (about EUR 3.6 billion) budget allocation. The strategy also aims to accelerate regulatory and permitting processes by enhancing coordination between the federal and the provincial levels. Moreover, the Investment Canada Act subjects foreign investments to review for national security concerns and critical mineral investments receive "enhanced scrutiny." The new guidance states that investments by State-owned enterprises in critical minerals will only be approved on "an exceptional basis" and will apply to investments of any size.

China fully dominates global production of several critical raw materials at different stages of the value chain (e.g., Magnesium, rare earth elements[164]), has consolidated economic activity in China in some of these sectors (e.g. in December 2021, three of the six Chinese state entities producing rare earth merged to create of a State-owner enterprise named China Rare Earth Group Co, which holds nearly 40% of China's rare earth production), and also abroad: in the democratic Republic of Congo, which accounts for half of the world's cobalt reserves, China now controls 70% of the country's cobalt production with 15 out of 19 cobalt mine owned or financed by China (as of 2020). In central Asia, China makes use of its Belt and Road Initiative (BRI) to develop strong ties with mineral corporations[165]. China has made use of export control mechanism for CRMs: for instance, it reduced its export quota of rare earths (to the United States) in 2010, and since January 2022, all rare earth elements are covered by Chinese export control measures. China has also been engaged in economic stockpiling of CRM[166].

At multilateral level, during the G7 2022 Summit in Germany, G7 Leaders agreed to '*promoting market circularity and support diversification by exploring investment in alternative resources, processing capabilities, sustainable practices, and new technologies*'[167].

The 2022 Ministerial Communiqué of the International Energy Agency (IEA) recognised the growing importance of critical minerals and materials to clean energy transitions and agreed to establish a new Working Party on Critical Minerals ("CMWP"). The aim of the Working Party is to provide a forum for IEA member countries to co-operate on critical minerals policy, technology and security.

[163] Critical Minerals Office | Department of Industry, Science and Resources

[164] SWD(2022) 41 final

[165] America's Critical Strategic Vulnerability: Rare Earth Elements - Foreign Policy Research Institute (fpri.org)

[166] Situation and Policies of China's Rare Earth Industry (www.gov.cn)

[167] See the Background for a full quote.

ANNEX 8: INTERPLAY WITH OTHER LEGISLATION AND POLICIES

Environmental legislation

- The Strategic Environmental Assessment Directive (SEA)[168] provides a set of procedural rules to integrate environmental considerations into their preparation, adoption and implementation of public plans and programmes by national authorities, including for land-use. For example, national authorities have to examine reasonable alternatives and take account effects on the environment including biodiversity, soil, water, air, etc.
- The Environmental Impact Assessment Directive (EIA)[169] requires Member States to make projects likely to have significant effects on the environment, because of their nature, size or location, subject to consent and an assessment by a competent national authority (i.e. a permit). To get a permit, the EIA Directive requires e.g. the preparation of an environmental impact assessment report and the carrying out of consultation of the authorities, the public and other Member States affected by the project. Under the EIA Directive a depending on their likely significant impact on the environment, certain projects are subject to a mandatory assessment while for others a determination by a competent authority is required to decide if the project shall be subject to an assessment. In practice, most raw materials related projects, including exploration, extraction, processing and recycling, are subject to the EIA procedure.
- The Industrial Emissions Directive (IED)[170] in turn governs the operation of raw materials related projects. It provides for the integrated prevention and control of pollution originating from relevant installations. Although the current IED only applies to industrial facilities processing raw materials, the recently proposed revision of the IED would widen the scope to also include the extraction and treatment of industrial minerals and metals. The IED requires Member States to make the operation of an installation subject to obtaining a permit containing conditions set in accordance with the principles and provisions of the IED. The permit conditions should take into account the environmental performance of an installation, including emissions to air, water and soil. In that regard, the permit should include emission limit values.
- The Habitats and Birds Directives[171] require Member States to prevent significant negative effects on protected species and habitats in Natura 2000 sites. To that end, raw materials related projects that are likely to have a significant effect on such a site, must be subject to an appropriate assessment. The competent national authorities can, based on the assessment, agree to the project it is does not adversely affect the integrity of the site concerned. In exceptional cases, developments that could have an adverse effect on a protected site can still go ahead under certain conditions and where the procedural safeguards foreseen by the two Directives are respected. The EIA Directive provides for mandatory integration of this assessment with the EIA procedure.
- The Water Framework Directive[172] provides that the deterioration of the ecological status of a body of water is only allowed where justified by overriding public interests or societal benefits, where no feasible environmental alternatives exist, and where mitigation

[168] Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment
[169] Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment
[170] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions
[171] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds
[172] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

measures are taken. In light of this requirement, projects potentially affecting bodies of water, including raw materials projects, need to be subject to assessment and permitting procedures (which may be integrated with the EIA procedure set out above).

- The Environmental Liability Directive[173] establishes the obligation for responsible operators, including of raw materials projects, to prevent and, where necessary, remedy environmental damage. It defines environmental damage as damage to protected species and natural habitats, damage to water and damage to soil.
- The Seveso-III-Directive[174] aims at the prevention of major accidents involving dangerous substances. However, as accidents may nevertheless occur, it also aims at limiting the consequences of such accidents not only for human health but also for the environment. The Directive covers establishments where dangerous substances may be present (e.g. during processing or storage) in quantities exceeding certain threshold, which could include CRM projects. Among other things, operators of such establishments are obliged to take all necessary measures to prevent major accidents and to limit their consequences for human health and the environment.
- The above directives also have important links with each other, allowing for or requiring the bundling of assessment required under each. For example, pursuant to Art. 11 (2) of the SEA Directive, Member States may provide for coordinated or joint procedures, fulfilling the requirements of the relevant EU legislation. Likewise, Art. 13 (4) of the Seveso Directive, gives the possibility Member States to provide for coordinated or joint procedures in order to fulfil the requirements about the land use planning in the sense of that directive. The amendment of the EIA Directive (Directive 2014/52/EU) continued the set path for streamlining of the environmental assessments at project level. Under Art. 2(3) of the EIA Directive[175], the one-stop shop approach for assessments deriving from the EIA and the Habitats and Birds Directives[176] is required (with a margin of discretion for Member States). For the other Directives (such as the Water Framework Directive[177] or the Industrial Emissions Directive[178]), it is left up to Member States to decide whether to opt for the one-stop shop or not. To facilitate the transposition in this part of the amended

[173] Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage

[174] Directive 2012/18/EU Directive 2012/18/EU of the European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances.

[175] Article 2(3) states that Member States shall, where appropriate, ensure that coordinated and/or joint procedures fulfilling the requirements of the EIAD and the Habitats and Birds Directives are provided for

[176] For the Habitats and Birds Directives, several guidance documents have been developed such as the 'Revised methodological guidance on Article 6(3) and (4) of the Habitats Directive', on appropriate assessment of plans and projects on the Natura 2000 sites (EN.pdf (europa.eu)). These guidelines together with sectoral guidelines on wind energy (wind_farms_en.pdf (europa.eu)), energy transmission (guidance_on_energy_transmission_infrastructure_and_eu_nature_legislation_en.pdf (europa.eu)) and hydropower (hydro_final_june_2018_en.pdf (europa.eu)) provide many practical examples for how project approval can be facilitated, among others, by strategic (spatial) planning, use of solid environmental data and suitable mitigation measures without compromising nature protection needs.

[177] For the Water Framework Directive, guidance has been developed on the procedure to be applied for new developments possibly affecting water status. This guidance also highlights the need or advantages of coordinated assessment with assessments under the EIA Directive, where applicable (Guidance Document No. 36 established in the framework of the Common Implementation Strategy under the Water Framework Directive, on Exemptions to the Environmental Objectives according to Article 4(7))

[178] Article 5(2) of the IED obliges Member States to take measures that ensure a coordination of the permitting process when more than one permit/competent authority or more than one operator is involved in the procedure.

Directive, the Commission issued a guidance on the streamlining of the environmental assessments[179].

Waste and circularity legislation

- The Waste Framework Directive (WFD)[180] targets waste in general and obliges Member States to take measures to prevent waste generation, targeting notably products containing critical raw materials (e.g. by instructing Member States to prevent that those materials become waste). The Directive provides that Member States shall establish waste management plans, which are required include, where appropriate, existing major disposal and recovery installations, including any special arrangements for waste containing significant amounts of critical raw materials. In addition, Member States are bound since 2018 to establish waste prevention programmes to define waste prevention measures for products containing critical raw materials. The Waste Framework Directive is complemented by several pieces of sectorial legislation containing obligations for Member States on how to manage specific waste streams, including waste streams containing CRMs.
- The Extractive Waste Directive (EWD)[181] requires any operator responsible for managing extractive waste (i.e. the waste generated by mining operations) to obtain a permit. To do so, the operator has to draw up and submit to the national authorities a waste management plan covering the minimisation, treatment, recovery and disposal of extractive waste. The permit will only be granted if the waste management plan meets the EWD's provisions, which include specific requirements for the prevention of water status deterioration, air and soil pollution, and if the national authorities are convinced that the relevant operator has the means to carry out the commitments laid down in the plan. Moreover, it sets rules for the closure and after closure procedures. The EWD also aims to promote the recovery of extractive waste by means of recycling, reusing or reclaiming such waste, and required that plans to this effect should be included in the waste management plans.
- The Waste Electrical and Electronic Equipment Directive (WEEE)[182] governs the collection and treatment of devices such as computers, fridges and mobile phones at the end of their life. The WEEE Directive lays down rules to, as a first priority, prevent electrical and electronic equipment from becoming waste and, in addition, to promote the re-use, recycling and other forms of recovery of such waste so as to contribute to the efficient use of resources and the retrieval of secondary raw materials including CRMs. To that end, the WEEE Directive sets general treatment requirements and contains general collection targets increasing over time and applicable to all relevant waste equipment combined, as well as recovery targets for each one of the categories of WEEE set out in that Directive (Annex V), that also increase over time.
- The End-of Life Vehicles Directive (ELV)[183] includes rules for the prevention, collection and treatment of waste vehicles and sets targets for the re-use and recycling as well as reuse and recovery of components from such vehicles. The ELV also contains obligations for

[179] Commission notice — Commission guidance document on streamlining environmental assessments conducted under Article 2(3) of the Environmental Impact Assessment Directive (Directive 2011/92/EU of the European Parliament and of the Council, as amended by Directive 2014/52/EU) (europa.eu)

[180] Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

[181] Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC

[182] Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE)

[183] Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles

the provision of information by producers on components and materials used in vehicles, in order to facilitate their identification for reuse and recovery.

Lastly, the European Green Deal sets the goal to protect better human health and the environment as part of an ambitious approach towards a toxic free environment. Substance risk classification and control measures under REACH and the Classification, Labelling and Packaging Regulation[184] serve to ensure the safety of chemicals and products containing chemicals in the EU, highly relevant for base metals and CRM. One recent example is the updated classification of cobalt metal according to EU CLP Regulation (2020), to include carcinogenicity category 1B – presumed human carcinogen (proven in animals), mutagenicity category 2 – suspected of causing genetic defects, and reproductive toxicity category 1B presumed human reproductive toxicant

International instruments

- Critical Raw Material Partnerships taking the form of Memorandum of Understandings (MoUs) have been concluded with Canada, Ukraine, Namibia and Kazakhstan.
- Trade defence instruments[185], such as anti-dumping or anti-subsidy duties, are ways of protecting European production against international trade distortions.
- The objective of the EU's Foreign Direct Investment (FDI) regulation[186]is to make sure that the EU is better equipped to identify, assess and mitigate potential risks for security or public order from FDIs. Foreign investments in the CRM value chain may have security implications.
- WTO obligations cover aspects such as export restrictions in raw materials, subsidies, dumping, trade in services, etc.
- The EU has introduced a comprehensive mix of voluntary and mandatory actions to promote Corporate Social Responsibility / Responsible Business Conduct (CSR/RBC) and implement the UN Guiding Principles on Business and Human Rights (UNGPs) and the UN 2030 Agenda for Sustainable Development.
- The Conflict Minerals Regulation[187], for instance, requires importers of tin, tantalum, tungsten and gold (3TG) to establish and implement due diligence policies in relation to potential environmental and human rights including labour rights impacts along their value chain. Of these, tantalum and tungsten are currently considered critical. This initiative does not include due diligence requirements.
- As an accompanying measure to the EU Conflict Minerals Regulation, the EPRM (European Partnership for Responsible Minerals) targets both upstream and downstream actors of the 3TGs supply chains. At downstream level, it wants to assist EU importers in ensuring that the minerals used in their supply chain are not contributing to financing armed groups, conflict, terrorism, or other violations of human rights. At upstream level, it aims at supporting particularly Artisanal and Small-Scale Miners in sourcing countries to conform to internationally accepted labour and social standards and other basic human rights principles. The EPRM is a multi-stakeholder partnership where Civil Society Organisations, Industry and Governments come together to find mutually beneficial solutions.

[184] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures

[185] https://policy.trade.ec.europa.eu/enforcement-and-protection/trade-defence_en

[186] Regulation (EU) 2019/452 of the European Parliament and of the Council of 19 March 2019 establishing a framework for the screening of foreign direct investments into the Union (OJ L 79 I , 21.3.2019, p. 1).

[187] Regulation (EU) 2017/821 of the European Parliament and of the Council of 17 May 2017 laying down supply chain due diligence obligations for Union importers of tin, tantalum and tungsten, their ores, and gold originating from conflict-affected and high-risk areas

- At bilateral level, all recently concluded trade and investment agreements have an ambitious Trade and Sustainable Development (TSD) chapter. They aim to ensure that that economic growth goes together with the protection of human rights, decent work, the climate and the environment. Those chapters refer to international agreements and standards, and establish a close cooperation amongst others in the field of corporate social responsibility and accountability. The Commission has recently published a Communication setting out how to further enhance the contribution of trade agreements to sustainable development. Some recently concluded Energy and Raw Materials (ERM) chapters of EU Free Trade Agreements contain specific sustainability provisions.
- At the multilateral and plurilateral levels, the EU recognises the importance of and promotes use of internationally agreed standards so as to ensure predictability for businesses. In particular RBC action is included in all TSD chapters via reference to international standards.

Other regulatory interplay

- The Council Regulation 2022/2372 "on a framework of measures for ensuring the supply of crisis-relevant medical countermeasures in the event of public health emergency at Union level" provides for the activation of a mechanism that includes measures such as monitoring, stockpiling or public procurement. Its scope covers "crisis-relevant raw materials", which may include critical raw materials such as bismouth or titanium, which can be used for medical applications and pharmaceuticals.[188]
- In REPowerEU[189], the Commission proposed to increase to 45% the target for the amount of renewable energy in the EU's energy consumption by 2030 in the Renewable Energy Directive.[190]

Interplay with ongoing instruments

- The proposed Single Market Emergency Instrument (SMEI) provides for a set of framework measures for anticipating, mitigating and responding to significant impacts of crises on the functioning of the Single Market. It aims at safeguarding the free movement of goods, services, workers and persons and ensuring the availability of crisis-relevant goods and services during Single Market emergencies. It includes a general vigilance and crisis response mechanism for dealing with unexpected supply disruptions that threaten to severely affect the functioning of the Single Market in the next six months or severely disrupt the functioning of the Single Market, where the supply chains are indispensable for the maintenance of vital societal interests. It is activated for responding to such a threat or emergency once the relevant criteria are fulfilled. If defined through the appropriate procedures as "goods of strategic importance" or as "crisis-relevant goods and services", critical raw materials may be covered by the instrument's set of measures.
- The Chips Act addresses shortages of semiconductors, proposing both short- and long-term measures to reinforce the Union's competitiveness, resilience and innovation capacity; ensure a security of supply; coordinate the monitoring of the semiconductor value chain and respond to disruptions of their supply. The crisis toolbox proposed in the Chips Act may apply to raw materials as well (e.g. in the event a crisis is triggered, common purchasing could take place for raw materials required by semiconductor manufacturing companies).
- The proposed Batteries Regulation and Corporate Sustainability Due Diligence (CSDD) contain measures requiring companies to put in place social and environmental due diligence practices when, *inter alia*, sourcing critical raw materials from both the Single

[188] COUNCIL REGULATION (EU) 2022/2372. of 24 October 2022

[189] (COM/2022/230 final)

[190] Renewable Energy Directive 2018/2001/EU

Market and (especially) the international markets. CSDD is the first proposal of its kind that introduces horizontal due diligence requirements for larger companies in all sectors to identify, prevent, bring to an end, and account for negative human rights and environmental impacts in their own operations, subsidiaries and their value chains. It helps companies understand their value chains and ensure the sourcing is sustainable while contributing to its diversification where necessary. Termination of the business relationship is required when, despite appropriate engagement measures, resolving abuses has no reasonable prospect. The proposed Batteries Regulation, being product-specific, addresses pressing sustainability concerns that are particularly salient as regards the specific product concerned. Both initiatives refer to, *inter alia*, international conventions related to human rights, workers' rights and the environment.

- The recently proposed revision of the Industrial Emissions Directive (IED) [191] widens the scope of the IED to also include the extraction and treatment of industrial minerals and metals. This aims to create a transparent and inclusive permitting process that will accompany the expansion of these activities and allow public authorities to address concerns from the public.
- The Forced Labour proposal, including forced child labour, would complement this approach by banning products produces with force labour from EU market[192]. Producers of critical raw materials are within the scope of the proposal.
- The EU Strategy on Rights of the Child[193] contains commitments to making supply chains of EU companies free of child labour, there is an intersection between critical raw materials supply chains and increased risk of labour abuses, particularly child labour e.g. in artisanal mining settings.
- Ecodesign legislation, including the Ecodesign Directive[194] and the proposal for an Ecodesign for Sustainable Products regulation[195], aims inter alia at extending the lifetime of products, thus contributing to reducing the demand for raw materials, especially critical raw materials in e.g. electronics, batteries etc. In the Ecodesign workplan for 2022-24[196], a horizontal measure on circularity of energy-related products, in particular recycled content, durability, and the use of scarce, environmentally relevant and critical raw materials, is planned.
- The proposal for a CBAM Regulation[197] aims to prevent the risk of carbon leakage for selected energy-intensive sectors by subjecting the import of certain products from third countries to a levy linked to the carbon price paid under the EU ETS. The CBAM will initially cover five industrial sectors: iron and steel, cement, fertilisers, aluminium, and electricity. The Commission has selected these sectors because of their risk of carbon leakage, the magnitude of their carbon emissions, and for administrative feasibility. The proposal does not cover raw materials processing directly. However, current negotiations are considering the possibility to include some precursors materials, meaning basic materials that are used as key inputs in the production of some of the CBAM goods and contribute significantly to the embedded emissions of the latter. Precursors under considerations are the following: coke, iron ore agglomerates, dolime, magnesia, lime, some ferro-alloys and alumina. Their inclusion would be conditional on the relevance of their emissions to the goods that use them and on their tradability. If these precursors are

[191] Directive 2010/75/EU
[192] 2022/0269 (COD)
[193] https://op.europa.eu/en/publication-detail/-/publication/bac6e66a-a3d9-11eb-9585-01aa75ed71a1/language-en
[194] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products
[195] Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC. COM/2022/142 final
[196] EUR-Lex - 52022XC0504(01) - EN - EUR-Lex (europa.eu)
[197] Proposal for a Regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism. COM/2021/564 final

eventually included in the CBAM scope, their imports into the EU will be subject to the CBAM levy.

- The Non-Financial Reporting Directive (NFRD) requires certain large companies to disclose information on the way they operate and manage social and environmental challenges. This helps investors, civil society organisations, consumers, policy makers and other stakeholders to evaluate the non-financial performance of large companies and encourages these companies to develop a responsible approach to business. The Commission's proposal for a Corporate Sustainability Reporting Directive (CSRD) extends the scope of the NFRD and envisages the adoption of EU sustainability reporting standards.

Non-regulatory actions on Critical Raw Materials

To ensure a secure and sustainable supply of critical raw materials, the European Commission has in place a dedicated strategy since 2008[198], which aims to ensure a fair and sustainable supply of raw materials from global markets, within the EU and through resource efficiency and the recycling of secondary raw materials. This initiative also launched the assessment of raw materials' criticality every three years, starting in 2011. Such assessment has helped identify the increasing number of raw materials that are critical due to their economic importance and the supply risk they face.

In line with the European Green Deal's ambition of decoupling the EU's economic growth from resource use, the Commission launched a new Circular Economy Action Plan for a cleaner and more competitive Europe.[199] The new Action Plan builds on the measures adopted by the Commission since 2015, which have contributed to setting the framework conditions, including relevant policies and legislation, for moving towards a circular economy. One of the Plan's goals is to create a well-functioning EU market for high-quality secondary raw materials by proposing several actions that should prevent a mismatch between supply and demand of secondary raw materials and ensure a smooth expansion of the dedicated recycling sector in the EU. By using and consuming in a more circular way, it is possible to not only substantially reduce the impacts of human economic activities on the environment, but also achieve the EU's objective of doubling circular material use rate by 2030.[200]

Considering this assessment and the aforementioned political objectives, the Commission presented a dedicated action plan in the 2020 Communication on Critical Raw Materials[201] to develop resilient value chains for EU industrial ecosystems; reduce dependency on primary critical raw materials through circular use of resources, sustainable products and innovation; strengthen the environmentally and socially sustainable responsible domestic sourcing and processing of critical raw materials in the European Union; and diversify supply with environmentally and socially sustainable responsible sourcing from third countries, strengthening rules-based open trade in raw materials and removing distortions to international trade.

In parallel, the Industrial Strategy Update of 2021 initiated a better mapping of where strategic dependencies lie, their potential development and their effects on the EU's vulnerabilities. It launched two stages of in-depth reviews that provided further analysis on the origins of strategic

198 EUR-Lex - 52008DC0699 - EN - EUR-Lex (europa.eu)

199 Communication A new Circular Economy Action Plan For a cleaner and more competitive Europe COM(2020)98 (europa.eu)

200 COM(2020) 98, p. 2.

201 COM(2020) 474 - Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability

dependencies, notably addressing critical raw materials[202] overall before focusing on rare earth elements and magnesium[203]. These reviews also point to the actions and strategies adopted by third countries to secure their access to these resources in a context of growing competition for resources. The Industrial strategy also highlighted the need for supporting the financing of a green recovery and in that context initiatives such as the Directive on corporate sustainability due diligence which helps companies understand their value chains and ensure the sourcing is sustainable while contributing to its diversification where necessary.

Partnerships are one of the actions contributing to security and diversification of supply of raw materials, by mitigating the risks posed by structural external dependencies and concentration of supply. The partnerships are structured around three main pillars: raw materials value chains integration, between the EU and the partner country, the investment and business-oriented pillar; alignment on environmental, social and governance standards, the sustainability and accountability pillar; and cooperation on research and innovation along the raw materials value chain. In the case of developing countries partnerships on raw materials value chains have two additional pillars, with a focus on capacity building, training and skills along the value chain and deployment of infrastructure, in particular renewable energy infrastructure. The partnerships have a roadmap or action plan associated, identifying concrete actions of cooperation under each one of the pillars and the timeframe for implementation, in full alignment with the Team Europe approach. These partnerships are the political umbrella that aggregates existing cooperation actions and new actions at member state and EU levels, mobilizing funding instruments and investment, key investment entities as EIB, EBRD and the national investment banks. The EU industrial alliances also play a key role in the context of the partnerships.

Until now the EU has established bilateral partnerships with Canada (2021), Ukraine (2021), Kazakhstan (2022) and Namibia (2022). The EU will continue to implement this action, establishing partnerships with more resource-rich countries, including Norway, Greenland, Chile and Australia. Further partnerships are considered with countries in the EU neighbourhood, in Africa and Latin America.

The EU is also part of a multilateral partnership – the Minerals Security Partnership (MSP), a US led initiative, launched in spring 2022, aiming to catalysing investment from key partners and the private sector for strategic mining, processing, and recycling opportunities that adhere to the highest environmental, social, and governance (ESG) standards. Under MSP, the partners share information on critical raw material developments in third countries, identify investment opportunities and co-invest in mining, refining and recycling projects covering essential minerals for the clean energy transition such as: lithium, cobalt, nickel, graphite, rare earths, manganese and copper.

In 2020, the Commission announced the creation of the European Raw Materials Alliance (ERMA) as part of its Action Plan on Critical Raw Materials. The aim of the Alliance, which brings together industry, research and technology organisations, civil society, investors and public authorities, is to increase the resilience of critical raw materials value chains, further develop industrial capacities

[202] Chapter 5.1 of SWD(2021) 352, Strategic Dependencies and Capacities (check)

[203] Commission Staff Working Document: EU strategic dependencies and capacities: second stage of in-depth reviews (SWD(2022) 41 final)

and diversify sources of supply. In 2021, ERMA published its action plan that presents a list of specific actions and industrial projects in the area of rare earths and permanent magnets[204].

The Clean Technology Materials Task Force was established in October 2021[205] to mobilise funding and financing for investments in the critical raw materials value chain, to create a joint platform and to implement a structured dialogue between the Commission, industrial alliances and investors (i.e. European Investment Bank, European Bank for Reconstruction and Development, National Promotional Banks and Institutions).

There are also ongoing efforts to increase awareness, acceptance and trust when it comes to EU sourcing. For example, the EU principles for Sustainable Raw Materials were published in September 2021 aimed at aligning Member States' understanding of sustainable EU extraction and processing[206].

In addition, in line with the 2021 Action Plan on Synergies between civil, defence and space industries, the Commission is setting up the Observatory of critical technologies. The Observatory will identify, monitor and assess critical technologies for the space, defence and related civil sectors, their potential application and related value and supply chains. It will also identify, monitor and analyse existing and predictable technology gaps, root causes of strategic dependencies and vulnerabilities.

Finally, EU research and innovation (R&I) is another important avenue to reduce dependencies. EU R&I projects on critical raw materials help to develop domestic technological solutions, academic expertise, skills for students and workers, company know-how and IP. This enables refining, processing and recycling critical raw materials in a more sustainable and efficient way, also as a supplier of these technologies to third countries. The scope of the projects is the full critical raw materials value chain: exploration, extraction, processing, refining, recycling, substitution as well as non-technological projects on capacity building.

There are also two Commission expert groups which cover raw materials:

Raw Materials Supply Group

The creation and functioning of the Raw Materials Supply Group is governed by the horizontal rules published in Commission communication C(2010) 7649 on 10 November 2010.

The mission of the Raw Materials Supply Group is to exchange of views on the competitiveness and sustainable development of the non-energy extractive industry (NEEI). To analyse, discuss and exchange views on the supply of raw materials, with a focus on the sustainable competitiveness of the NEEI sector. Subgroups provide support for the legislator in the development and implementation of EU legislation and policies and develop actions to improve sector sustainability.

EIP Raw Materials

The European Innovation Partnership on Raw Materials was set up by a Communication from the European Commission (COM(2012) 82) to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions.

[204] Rare Earth Magnets and Motors: A European Call for Action. A report by the Rare Earth Magnets and Motors Cluster of the European Raw Materials Alliance. Berlin 2021

[205] ERMA celebrates its first anniversary working towards a more resilient and greener Europe

[206] Commission européenne, Direction générale du marché intérieur, de l'industrie, de l'entrepreneuriat et des PME, EU principles for sustainable raw materials, Publications Office, 2021, https://data.europa.eu/doi/10.2873/27875

The European Innovation Partnership on Raw Materials (henceforth "the EIP") has been instrumental in implementing the EU raw materials policy. It has been the main channel to reach out to high-level representatives from industry, public services, academia and NGOs as well as to wide expert community. Its mission is to provide high-level guidance to the European Commission, EU Member States and private actors on innovative approaches to the challenges related to all non-energy, non-agricultural raw materials (primary and secondary, biotic and abiotic).

ANNEX 9: SCOPE OF MEASURES

TABLE 4: Correspondence table: pillars, actions and scope of the Critical raw materials Act		
Pillars		**Materials scope**
A. Defining critical and strategic raw materials	-	-
B. Setting strategic raw materials targets	Targets for EU capacity	Only strategic raw materials
C.1 Monitoring and risk assessment	Assessment of criticality and strategic dimension	All non-energy, non-agricultural raw materials
	Risk assessment	Only strategic raw materials
C.2 Strategic stocks	EU level coordination and assessment of MS stocks	Only strategic raw materials
C.3 Company risk preparedness	Member States to set incentives to foster companies' resilience	Only strategic raw materials
D. Exploration efforts in the EU	Requirement for MS to develop and implement public exploration programmes	All critical raw materials
E. Support to the value chain	Selection of Strategic Projects, in the EU and abroad	Only strategic raw materials (also as by-products)
	CRM projects to be considered in spatial planning	All critical raw materials
	Mandatory measures to make permitting for Strategic Projects more predictable	Only strategic raw materials
	Access to funding instrument	All critical raw materials
	Privileged access to funding instrument	Only strategic raw materials
F. Waste legislation	Enabling measures and targeted revisions to waste legislation	All critical raw materials
G. Actions on standards for the critical raw materials value chain	Increase efforts to have EU rules and principles reflected in international standards + Mandate development of standards and standardisation deliverables regarding relevant industrial processes	All critical raw materials (but strategic raw materials could be prioritised in the development of methodologies)
H. Environmental footprint of critical raw materials	Set minimum requirements for certification schemes for sustainable CRMs + Require declaration of environmental footprint for CRMs sold in the EU incl. a mechanism for setting performance classes and maximum thresholds	All critical raw materials

9.1.14. Context

9.1.14.1. The green and digital transitions, as well as defence investments, depend on critical raw materials, leading to vastly increased demand in the EU and globally

The shift to a clean energy system, accelerated by the ongoing energy crisis, relies on decarbonised and notably renewable electricity produced from wind turbines and solar panels, transported through electrical grids, stored in batteries and hydrogen and used in electric vehicles and various other end applications, including heavy industry. The technologies that will realise the green and digital transitions require materials with very specific properties. These properties make the products more efficient or performant and cannot, in many cases, easily be replaced by other materials[207]. For instance, rare earth permanent magnets used in wind turbines and electric motors are more compact, resistant and efficient at converting energy; most solar panels are made out of silicon and certain doping elements; batteries that contain manganese, nickel and cobalt can store more energy at less weight compared with other various chemistries, making them ideal for use in electric vehicles; hydrogen electrolysers and fuel cells rely on platinum group metals to catalyse the chemical reactions taking place in them; connecting all of this are electrical wires made of copper and aluminium[208].

As the world shifts its energy systems to clean energy, demand for these raw materials is therefore projected to grow multiple times. At EU level, the JRC foresight report on Critical Raw Materials for Strategic Technologies and Sectors[209] shows that, with the current state of technology, the accomplishment of EU targets for the rollout of batteries, fuel cells, wind turbines and photovoltaics would require multiples of the current demand for lithium, graphite, cobalt, nickel and the rare earth elements dysprosium, neodymium and praseodymium (figure 2).[210]

[207] The Commission's work on the criticality of raw materials assesses price, performance, availability, production and criticality of substitutes per material.

[208] As explained in Textbox 1 and in more detail in section 5.2 and annex 5, copper, nickel and aluminium are not critical raw materials according to the current methodology, but likely candidates for the strategic raw materials list (and by implication of the future critical raw materials list). The other raw materials mentioned here are all currently on the critical raw materials list.

[209] EC, 2020. *Critical materials for strategic technologies and sectors in the EU - a foresight study*. https://rmis.jrc.ec.europa.eu/uploads/CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2020.pdf

[210] Note: Of these, only nickel is currently not classified as a critical raw material in the EU, but again likely to enter the proposed future list by virtue of its strategic importance and demand growth.

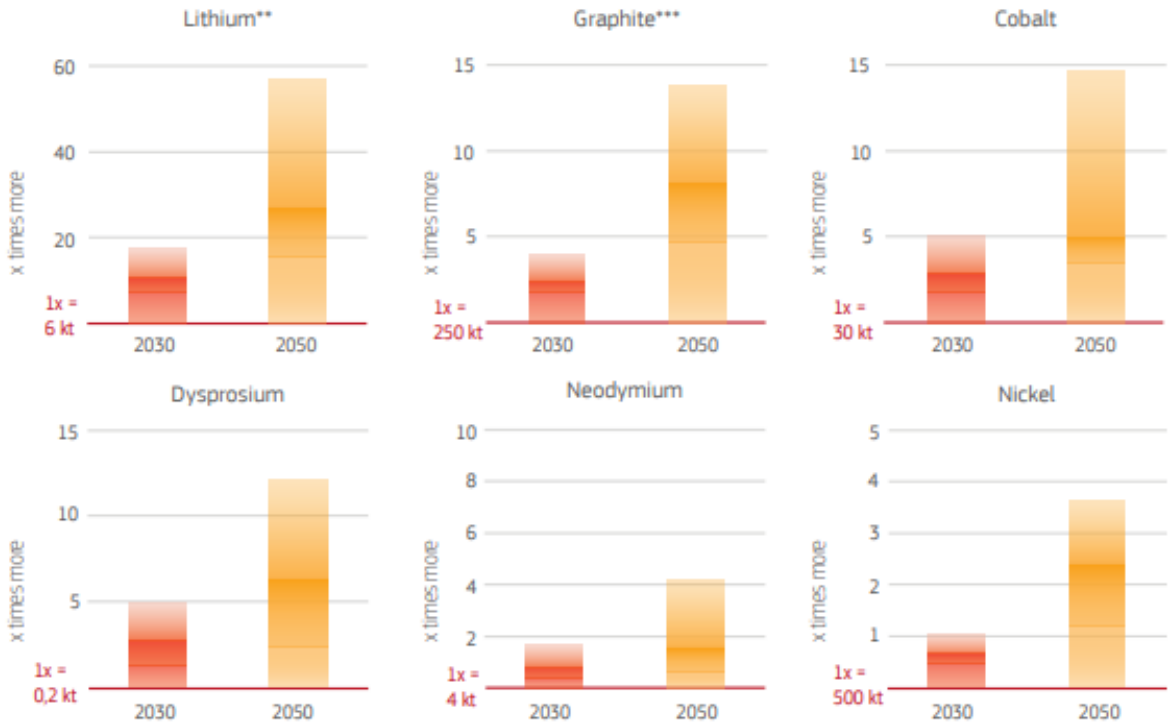


Figure 2: Material consumption for batteries, fuel cells, wind turbines and photovoltaics in 2030 and 2050 as a multiple of current (2020) EU consumption of the material in all applications[211]

At the global level, the International Energy Agency (IEA)'s 2021 Clean Energy Minerals report[212] predicts that total mineral demand[213] will increase by a multiple of between 2 and 4 times between 2020 and 2040,[214] and demand for battery-related materials such as lithium up to 42 times. Clean energy technologies are set to emerge as a major force in driving demand growth for critical minerals and the market value of energy transition minerals could overtake that of the global coal business sometime in the 2030s.[215]

For the digital transition, there has been less attention so far to the implications of the exponential growth of digital technologies to the demand for critical raw materials. However, the aforementioned JRC foresight study[216] identifies important dependencies of digital technologies including robotics, drones, 3D-printing, semiconductors and hard drives on critical raw materials. The exponentially growing number of chips and devices produced each year suggest that the digital sector could become a driving force for some critical raw materials: For tantalum, electronics is currently the main application and the growth of demand from this one sector could soon outpace

[211] EC, 2020. *Critical materials for strategic technologies and sectors in the EU - a foresight study*. https://rmis.jrc.ec.europa.eu/uploads/CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2020.pdf. Note: The different shadings refer to the low, medium and high-demand scenarios included in the report. The full height of the bars thus refers to the high-demand scenario. ** of refined supply (Stage II) instead of ore supply (Stage I) *** increase in demand of all graphite in relation to natural graphite

[212] IEA (2021), *The Role of Critical Minerals in Clean Energy Transitions*, IEA, Paris https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions

[213] Including chromium, copper, lithium, nickel, cobalt, manganese, graphite, molybdenum, platinum group metals, zinc and rare earth elements.

[214] Page 46 of IEA (2021): Clean Energy Minerals.

[215] Page 47-48 of IEA (2021): Clean Energy Minerals.

[216] EC, 2020. *Critical materials for strategic technologies and sectors in the EU - a foresight study*. https://rmis.jrc.ec.europa.eu/uploads/CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2020.pdf

its current use in all applications. Similarly, indium, used in electronic displays and touch screens, has experienced a more than fivefold growth in primary production between 1993 and 2013.[217] At the same time, it is of growing concern due to the lack of substitutes, its extraction as a by-product from carrier metal ores, low recovery efficiency of processing and non-existent recycling at end of life.[218]

In addition, the intensifying geopolitical instability has increased the focus on ensuring EU's security and resilience. This has translated into increased defence budgets and defence procurement plans[219] and a need for industrial ramp up[220] but also heightened attention to ensure EU's autonomous access to space, including concerning the protection and development of the EU space assets, which constitute EU critical infrastructure. Against this background, the JRC foresight report provides an assessment of the raw materials dependencies of the defence and aerospace sector: "As with many other economic sectors, the EU defence industry relies on the use of a wide range of materials with unique properties that make them essential for the manufacture of components used in military applications because the use of substitutes does not always guarantee the same performance. For example, REE [rare earth elements] are indispensable in remotely piloted aircraft systems, precision guide munitions, targeting lasers and satellite communications. […] High-performing alloys that are used, for instance, in fuselages of combat aircraft, require specific raw materials such as niobium, vanadium or molybdenum. Other alloys are based on titanium, which provides high specific strength and corrosion resistance, at just half the weight of steel and nickel-based super-alloys." Regarding space applications, rare gas (e.g. high purity helium) are used for propulsion and lasers and show significant import reliance. Further investigations might be also needed for germanium substrates combined with gallium arsenide semiconductors, which enter in the composition of highly efficient solar cells used for satellite PV panels.[221] This being said, the demand for raw materials used in the production of defence applications is relatively a very small share of total raw materials consumption but important due to the considerable global rise in defence and security investment after the Russian aggression against Ukraine.

Textbox 3: Can material demand mitigation measures offset the need for more critical raw materials?

The projections discussed in this chapter rely on certain assumptions regarding economic growth, technological development and consumption patterns. Many stakeholders (in the context of the open public consultation and the call for evidence) have emphasised the need to critically assess these assumptions to identify whether the EU's increasing demand for critical raw materials could be offset by putting greater attention on demand mitigation and behaviour change.

Indeed, technological innovation has led to higher material efficiency also for critical raw materials: Over the past 15 years, the amount of platinum used per kW fuel cell capacity has declined by 80-90% in the automotive sector and there are plans to decrease this amount

[217] Tercero, L., Report on the Future Use of Critical Raw Materials. SCRREEN Project D.2.3, 2019. Quoted following EC, 2020. Critical materials for strategic technologies and sectors in the EU - a foresight study.

[218] Ciacci, L., T.T. Werner, I. Vassura, and F. Passarini, 'Backlighting the European Indium Recycling Potentials', Journal of Industrial Ecology, Vol. 23, No. 2, 2019, pp. 426–437. Quoted following EC, 2020. Critical materials for strategic technologies and sectors in the EU - a foresight study.

[219] In particular, according to the European Defence Agency's data, defence spending within the EU grew in 2021 to €214 billion. This is a **6% increase compared to 2020.**

[220] Joint Communication on the defence investment gaps analysis and way forward of 18 May 2022, JOIN(2022) 24 final

[221] Joint foresight report of JRC and GROW (update in preparation).

further.[222] In the case of batteries, a clear trend to reducing the quantity of cobalt due to price and sustainability concerns is visible,[223] though this goes hand in hand with a higher consumption of nickel, which while not currently on the EU's list of critical raw materials is among the materials considered at risk of future short supply.[224] There are also efforts by wind turbine and electric vehicle motor manufacturers to reduce the quantity of rare earths in permanent magnets, though these show trade-offs between compactness, reliability and CRM content.[225]

In terms of behavioural changes, the two most relevant scenarios would be decreased electricity demand and a shift in mobility patterns, potentially including greater use of public transport, shared mobility services and autonomous vehicles – as electricity generation and mobility are the dominant sectors driving increasing demand for critical raw materials. As regards electricity consumption, projections aligned with the EU's 2030 and 2050 climate and energy goals assume that total electricity demand in the EU will increase, from 2900 TWh in 2018 to 3100 TWh by 2030 and to 6900 TWh by 2050.[226] This is despite significant energy efficiency increases being assumed in the scenario, and mainly due to the significant increase in electricity demand for electric mobility, heat pumps and the production of hydrogen and e-fuels. Since political targets for the expansion of renewable energy have been set, it can additionally be assumed that a reduced electricity demand would lead to a faster phase-out of fossil fuel-based electricity generation rather than a decreased demand for renewable energy technologies and the critical raw materials embedded in them.

As for changes in transport patterns, the JRC's Future of Road transport reviews different studies and scenarios on the impact of car sharing, automated vehicles and societal attitudes to transport systems.[227] It concludes that "Both a decline or increase in travel activity are possible, depending on the new opportunities enabled by disruptive technologies and services, although the evidence until now suggests that increases in vehicle travel activity are likely to occur for both passenger and freight transport." It also highlights the existence of rebound effects and induced demand from cheaper travel in connected and autonomous vehicles, and the potential for new business models to extending the lifetime of electric vehicle batteries through remanufacturing and repurposing.

While both the IEA and JRC studies cited in this chapter do not explicitly account for uncertainties related to behaviour change,[228] they do take into account and provide different scenarios regarding technological developments, including substitution of critical raw materials, and speed of uptake of clean energy technologies. Figure 3 (left), for example, shows the size of the electric vehicle/plug-in hybrid electric vehicle fleets assumed in the low-, medium- and high-demand scenarios of the JRC foresight study.[229] Figure 3 (right) shows the impact of different technological assumptions for renewables- and network-related technologies on demand for copper, silicon and rare earth elements in the IEA study.

[222] These numbers refer to the case of the Toyota Mirai, for which the use of platinum declined by three quarters and then by another third from the prototype in 2008 to the second generation in 2020. Source: Page 113-115 of IEA (2021): Report on Clean Energy Minerals/James et al., 2018.

[223] Page 90-92 of IEA (2021): Report on Clean Energy Minerals

[224] Page 118 of IEA (2021): Report on Clean Energy Minerals; KU Leuven/Eurometaux (2022): Clean Energy Metals.

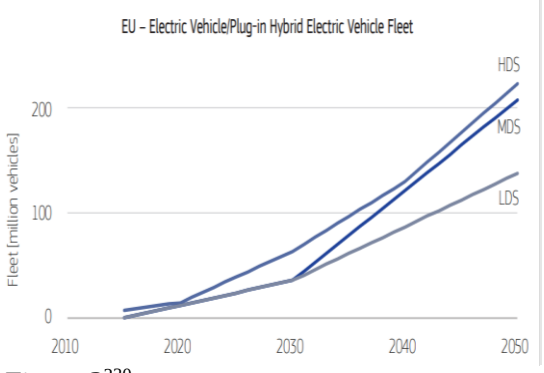
[225] JRC (2020): The role of rare earth elements in wind energy and electric mobility

[226] Source: Impact Assessment accompanying the Communication "Stepping up Europe's 2030 climate ambition Investing in a climate-neutral future for the benefit of our people", SWD(2020) 176 final.

[227] JRC, 2019. The future of road transport - Implications of automated, connected, low-carbon and shared mobility, doi: 10.2760/668964, JRC116644.

[228] Source: Page 86 of IEA (2021): Clean Energy Minerals; information provided by JRC.

[229] JRC (2020): Critical materials for strategic technologies and sectors in the EU - a foresight study.



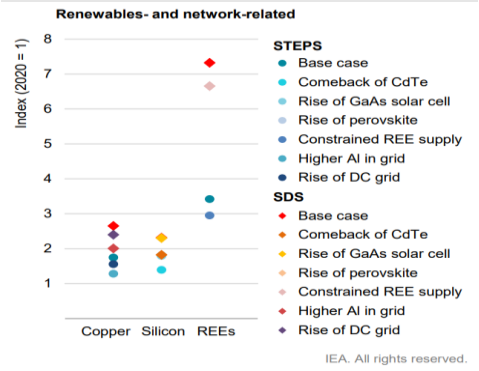


Figure 3[230]

In conclusion, there is much scope for material efficiency improvements, substitution and behaviour change to reduce the demand for critical raw materials. Such efforts can be supported not only through research funding but also through business model innovation and greater societal awareness. While such developments would somewhat alleviate the pressure, the scenarios considered in the aforementioned studies show that, while the exact level varies, a significant and challenging growth, adding to the already high supply concentration today, is certain. A different question is from which sources (primary or secondary raw materials production) this demand is met. This is discussed in the following section.

9.1.14.2. Significant supply-demand gaps for critical raw materials are projected in the medium term

While global demand is set to increase significantly for a wide range of raw materials used in clean energy and digital technologies, and more dramatically for a smaller set of raw materials used in batteries and permanent magnets, global supply is currently not projected to grow sufficiently to meet this demand without substantial price increases.[231] According to the IEA Report on Clean Energy Minerals, the required level of supply growth for most minerals under the Sustainable Development Scenario (SDS) is well above the levels seen in the past decade. For example, between 2020 and 2040, annual average demand growth for nickel and cobalt is projected to be two and five times higher, respectively, than the levels seen between 2010 and 2020.[232]

As explained in textbox 3, the raw materials value chain consists of different steps, each of which require significant time and investments to build up or expand. Supply and investment plans analysed by the IEA show a gradual increase in production over the next years, but these are far from sufficient to support accelerated energy transitions (e.g. for lithium, mines currently operating or under construction are set to produce around 1 000 kt of lithium carbonate equivalent but the primary demand under the SDS will be around 2 600 kt).[233] Several factors, including project development lead times, declining ore quality, increased ESG scrutiny and climate risks, are likely to hinder or delay the supply expansion necessary to meet demand.[234] Additionally, the fact that many critical raw materials are produced as a by-product of other raw materials (e.g. gallium and

[230] Left: Page 21 of JRC foresight report; right: Page 52 of IEA (2021): Clean Energy Minerals.
[231] It should be noted that this perspective, because it focuses on project pipelines, does not take into account economic incentives for expanded production (for the supply side) or reducing consumption (for the demand side). However, several factors mentioned in this section (notably the long lead times, and the by-product relationships) make it likely that the current pipeline.
[232] Page 120 of IEA (2021): Clean Energy Minerals.
[233] Page 119 of IEA (2021): Clean Energy Minerals.
[234] Pages 122-131 of IEA (2021): Clean Energy Minerals.

germanium as a by-product of copper production), makes their supply inflexible, as their supply depends on the economic incentives to produce their higher-volume carrier metals.

Textbox 4: Stages of the critical raw materials value chain

Most critical raw materials are metals and follow a typical value chain, shown in Figure 4. The first stage, **exploration**, consists in identifying a deposit of a certain mineral or metal and ascertaining that it is technically and economically recoverable. Based on general exploration by public authorities (geological surveys) and research institutions, exploration companies conduct targeted exploration through geological mapping, geophysical surveys, geochemical surveys and drilling. While not the most capital-intensive, this stage is characterised by high risk, as only a fraction of exploration ventures lead to successful mining projects.[235] Companies are categorised into junior (which are often founded for one specific exploration project, usually have no operating revenue and rely on equity financing) and major, or senior, companies (who are already active in the mining business, finance themselves mainly from operating cash flow and often buy projects from junior companies once their viability has been demonstrated).

The following stage is **mining**, or more generally **extraction**,[236] i.e. the development of the actual mine and of the surrounding infrastructure, as well as its operation. The development of mining projects can take a long time – according to the IEA on average over 16 years from discovery to first production but with strong variation by country and raw material[237] – and is capital-intensive and risky, as uncertainties surrounding the ore quality, cost increases, market swings and problems with permitting or social resistance can still lead projects to fail. In this time, the site has to be planned, its environmental impacts assessed, feasibility studies conducted (in multiple rounds, from an initial economic assessment to a bankable feasibility study, reflecting greater knowledge of the orebody, the design of the operation and the project's financing structure of the project) and permits requested.

In the **processing** stage, which may be located on the same site as the mine or elsewhere, depending on the mineral and the site's specificities, the ore that has been extracted at the mining stage is **beneficiated**, i.e. separated from economically worthless material, through crushing, roasting, magnetic separation, flotation or leaching, to get an ore concentrate (this is the "mineral processing" stage shown in figure 4). A second step in getting from ore to metal, sometimes included under the heading of processing, is the **smelting or refining** step. Operations here are metallurgical, and can be classified into hydrometallurgy (involving aqueous solutions), pyrometallurgy (high-temperature processes) and electrometallurgy (involving electrical energy). The result of this process is a purified metal or metal compound, with the level of purity achieved depending on the required grade. This stage, especially the smelting/refining part, requires significant amounts of energy. While generally not as impactful on the environment, also this stage requires substantial investment into specialised industrial plants, which also require permits. The level of risk, and the margins for producers, are generally smaller than at the processing stages, though also affected by fluctuations in material prices, and in particular of energy prices.

While the manufacturing step depends very much on the application (from steel and alloying plants to chemical operations, battery manufacturing and many more), the **recycling** stage again revolves around raw materials and has some typical features: After collection and, depending on the waste stream, sorting and removal of hazardous waste, material recycling is done in smelting plants, sometimes in specialised recycling smelting plants, sometimes through mixing of

[235] Several studies have estimated that the success rate of mineral exploration varies from 0.03% to less than 1%. This means that only 1 exploration target will get to the development phase out of a variable amount of exploration targets (3000 to 100). Source: Regueiro y González-Barros, Manuel & Espi, Jose. (2019). The returns on mining exploration investments. BOLETÍN GEOLÓGICO Y MINERO. 130. 161-180. 10.21701/bolgeomin.130.1.010. Also: Minerals Intelligence Capacity Analysis : Fact Sheet exploration stages, 163b11a7-d944-494e-a21e-a8f81ce8b175 (geus.dk)

[236] For lithium, for example, liquid brine extraction is a common extraction method. However, it is similar to mining in most of the described characteristics.

[237] Page 12 of IEA (2021): Clean Energy Minerals

primary and secondary inputs (which, depending on the composition of the inputs, can often meet the same quality requirements as the primary production). This means that the recycling stage is in many respects identical to the smelting stage, exposed to high energy costs and relying on specialised installations. The main added difficulty relates to the proper and separate collection that has to precede any recycling, as well as the complexity of the manufactured goods to be recycled where 1) the metal to be recycled is too low in concentration (by design) to be economically retrieved and 2) the metal compounds or alloys artificially created during manufacturing process can be much more complicated to dissemble than naturally occurring ones.[238]

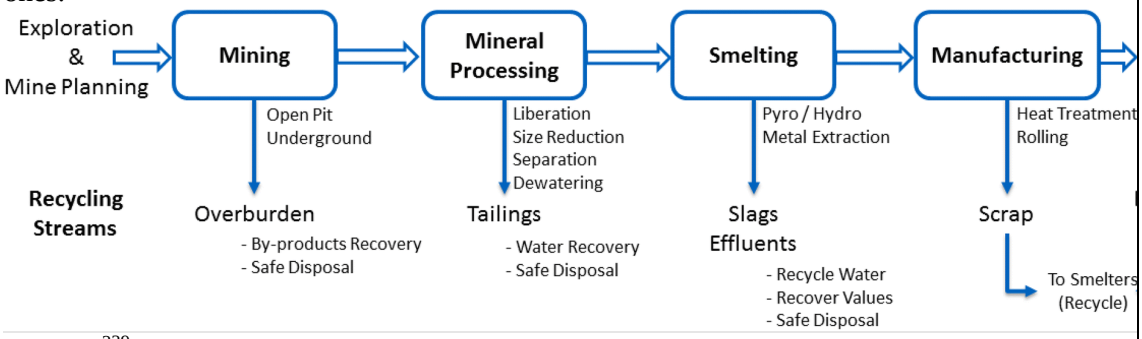


Figure 4[239]

Description based on: The stages of mining: 5 lifecycle processes explained - Crux Investor; Canada's critical minerals strategy: Discussion paper - Canada.ca; Exploration Methods: Common Ground (nsw.gov.au); Canadian Mineral Exploration Information Bulletin (nrcan.gc.ca); Materials processing | Definition, Examples, Types, & Facts | Britannica

A study by KU Leuven/Eurometaux on "Metals for Clean Energy" (2022)[240] provides detailed projections on both supply (operating, base case and best case) and demand (based on the IEA scenarios and different assumptions regarding the EU's role in the different steps of clean energy value chains) for aluminium, copper, nickel, zinc, silicon, lithium, cobalt, and the rare earth elements dysprosium, neodymium and praseodymium.[241] On this basis, it identifies that for copper, lithium, nickel, cobalt and the three rare earth elements, even the current best case supply scenario would not allow to meet demand under the IEA's Sustainable Development Scenario during the decade 2020-2030[242], such that supply bottlenecks could lead to commodity price fly ups, or will need further increased innovation and substitution efforts and consumption changes. In the worst case, this could lead to a delay of technology updates.

The study takes into account the contribution of secondary raw materials supply, based on available supply from products coming to their end-of-life and assumed average recycling rates. It projects that secondary raw materials supply could satisfy a growing share of demand by the 2030s, achieve peak primary metals demand in Europe around 2040, and, by 2050, provide more than half of the demand for most analysed metals, and over 75% for lithium and rare earths. In the short to medium term, however, secondary raw materials production will not be able to make a significant difference, as the strong growth of renewable energy and electric mobility has only begun recently,

[238] Ferrous and non-ferrous recycling: Challenges and potential technology solutions. Leslie Brooks Gabrielle Gaustad Adam Gesing Teija Mortvedt and Felipe Freire. https://doi.org/10.1016/j.wasman.2018.12.043

[239] Future of Mining, Mineral Processing and Metal Extraction Industry | SpringerLink

[240] KU Leuven/Eurometaux (2022): Metals for Clean Energy. Metals Clean Energy (eurometaux.eu)

[241] Of these, silicon, lithium, cobalt, and the rare earth elements are currently on the EU's List of critical raw materials, while aluminium, copper, nickel, zinc are not.

[242] Note: For aluminium, the best case supply would be sufficient, but not the base case, such that further investment is required. For zinc and silicon, no issues are expected.

and therefore the amounts that can be recovered in the next years would not grow as fast as demand.[243]

Focusing on the EU's ambitions for renewable energy, the demand for rare earth permanent magnets will increase five-fold compared to present levels to meet REPowerEU's objectives of tripling wind power capacities by 2030.[244] This comes in addition to a projected increase of EU demand from e-mobility as rare earth permanent magnets are used in the traction motors of electric vehicles. However, the global supply, determined by reserves and presently planned projects, would only double by 2030, which is likely to be insufficient to meet the global and EU demand.[245] This potential gap extends to other critical raw materials, notably to battery raw materials. Based on current projections and planned capacities, demand would not be met by corresponding supply for lithium, cobalt, manganese and nickel.[246]

All projections therefore underline the need to expand primary production, and to ensure EU access to it. Furthermore, the need to develop domestic circular supply chains is crucial as well as the development and deployment increasingly of new technologies that need less of these critical materials and or allow for larger amounts of reuse and recycling.

9.1.14.3. Supply of critical raw materials at both the extraction and processing stage is highly concentrated

Figure 5 shows the supply concentration, along with the level of governance of producing countries,

[243] KU Leuven/Eurometaux: Metals for Clean Energy.

[244] "Supply chain challenges: Wind Turbines and magnets" Science for Policy Brief, 1 July 2022, Joint Research Center, European Commission" Note: The over-proportional increase in demand for rare earth elements stems from the fact that in particular the offshore and large-scale wind turbines contain large amounts of rare earth elements.

[245] Idem.

[246] "Supply chain challenges: batteries" Science for Policy Brief, 1 July 2022, Joint Research Center, European Commission". Note that nickel is currently not on the EU List of critical raw materials.

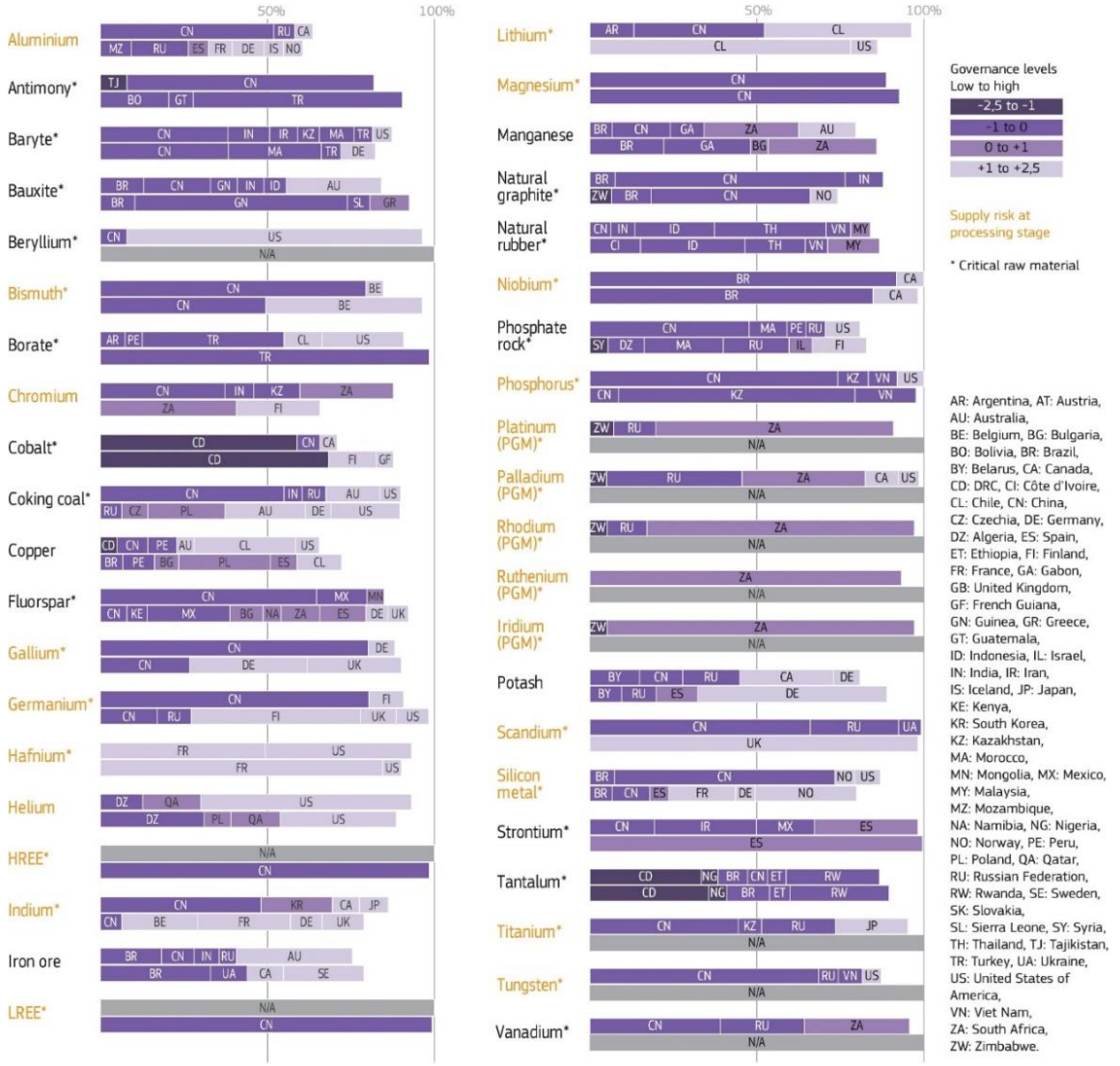


Figure 5: Geographical concentration of global production (upper bar for each material) and supply to the EU-27 (lower bars) (average 2012-2016) and the corresponding governance level in producing countries (2016).[247]

It is important to note that in addition to a concentration of the share of supply in certain countries, risks may also exist due to supply-side concentration where certain companies represent a large share of supply to the EU of a given critical raw material. This may be the case where companies own mining and/or refining assets across multiple countries. Similarly, problematic supply concentration may occur where a certain third country (for example via state-owned enterprises) controls mining and/or refining assets not just in the country itself, but also across other countries.

Figure 6 from the IEA Clean Energy Minerals report shows this more vividly for a smaller set of raw materials[248]: At both the extraction and the processing stage, there is a higher level of concentration than for the main fossil fuels. Also noteworthy is that while different countries

[247] Source: JRC Raw Materials Scoreboard 2021, Indicator 9: Geographical concentration and governance
[248] IEA (2021): Clean Energy Minerals. Note again that Copper and nickel are not currently on the EU List of critical raw materials but at risk of short supply in the future.

dominate the extraction stage, China has gained a dominant position at the processing stage for all of them.[249]

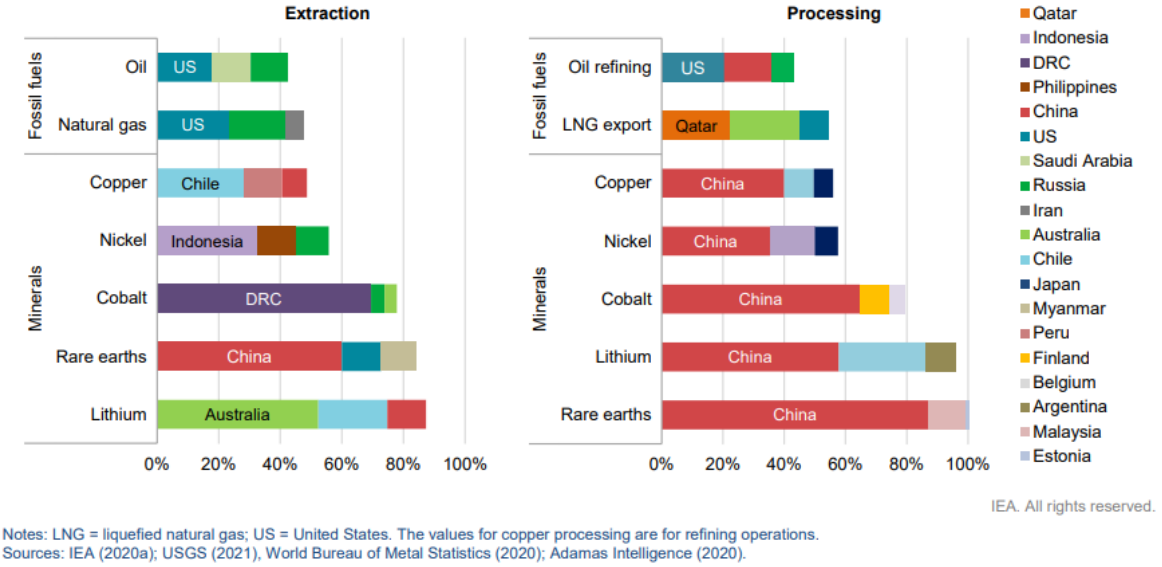


Figure 6: Share of top three producing countries in production of selected minerals and fossil fuels (IEA)[250]

Overall, the context suggests that critical raw materials markets, which are already highly concentrated, are likely to be put under strain by significantly increased demand, to which supply, especially in the EU, is expected to only be able to react gradually. This will likely lead to a sustained period of economic and geopolitical competition as well as high and volatile prices for critical raw materials – putting the EU's secure and sustainable access to critical raw materials at risk.

9.1.15. Consequences of the problem

If the EU does not contribute to the need of ramping up CRM globally by developing alternative European sourcing of CRMs, the EU's reliance on highly concentrated imports might continue with the corresponding identified risk for the EU economy:

9.1.15.1. Risk of future geopolitical vulnerability

A new geopolitics of resources is emerging, where critical raw materials such as lithium or rare earths could take the role that oil and gas held in the fossil fuel economy.[251] While their direct economic value is currently significantly smaller, it is projected that the market size for a set of raw materials used in energy applications could overtake the global coal business in the 2030s[252]. They are also significantly more concentrated in their sourcing and/or processing than fossil fuels (see figure 6 above).

[249] See also: Castillo, Purdy (2022): China's Role in Supplying Critical Minerals for the Global Energy Transition. What Could the Future Hold? LTRC_ChinaSupplyChain.pdf (brookings.edu)
[250] IEA (2021): Clean Energy Minerals. The Role of Critical Minerals in Clean Energy Transitions – Analysis - IEA
[251] Cf. 2022 State of the European Union speech
[252] Cf. page 10 of IEA (2021): Clean Energy Minerals. Note that this figure includes copper, nickel and manganese, which are currently not listed on the EU's List of critical raw materials.

In case of future geopolitical tensions, exports of critical raw materials to the EU could be curtailed, where the resulting shortage and price spike could lead to economic disruptions. The clearest example of this occurred in September 2010, when China, in the context of a territorial dispute with Japan over the Senkaku islands, halted all exports of rare earth elements to Japan. While only temporary and subsequently settled through WTO dispute settlement, this disrupted industrial production in Japan, triggered a significant price spike on global markets and led to global efforts to find alternatives to the Chinese-dominated rare earths value chain.[253] Another example of this dynamic is the ongoing energy price crisis resulting from Russia's military aggression in Ukraine: Prior to the war, Russia supplied 40% of the EU's natural gas consumption.[254] The ongoing crisis and recession are a demonstration of how costly and politically challenging the replacement of one dominant supplier in a vital input to our economy is. Russia, importantly, is also a major exporter of some critical raw materials, notably of palladium and nickel,[255] imports of which to the EU have not been covered by sanctions. Geopolitically relevant supply risks are also evident in the area of defence and aerospace, where the EU is currently highly dependent on imports of certain critical raw materials that are used in military and aerospace equipment. For example, the import dependence for titanium metal (with a majority of aerospace-grade titanium coming from Russia in 2022) and beryllium, used in air- and spacecraft, is 100%, and for tungsten, used in weapons and ammunition, 59%, and supply for both is also highly concentrated[256]. These metals are also important for other sectors of the EU economy.

9.1.15.2. Risk of adverse environmental and social adverse effects

If not properly managed, extraction, processing and waste treatment operations of critical raw materials, can have negative impacts on the environment and on populations living close to them.[257]The EU's import dependency means that these impacts mostly happen in third countries, often with relatively low levels of governance[258], and that CRM use is associated with high transport emissions. The negative impacts associated with producing CRMs have to be seen in perspective with the positive environmental effects of their applications (clean energy, reduced fossil fuel extraction, digitally enabled services, etc.). However, if left unmitigated, the potential impacts (e.g. water use, loss of ecosystems and biodiversity) associated with an exponential increase in the use of critical raw materials, notably in these third countries, would still risk undermining the achievement of EU and international objectives to transition to a climate neutral economy with low environmental impacts overall.

[253] Guillame Pitron (2022) The Geopolitics of the Rare-Metals Race, The Washington Quarterly, 45:1, 135-150, DOI: 10.1080/0163660X.2022.2059146 (p.140)

254 In focus: Reducing the EU's dependence on imported fossil fuels | European Commission (europa.eu)

[255] The supply of critical raw materials endangered by Russia's war on Ukraine (oecd.org); Securing EU critical raw material supplies after Russia's war | Comment | Encompass (encompass-europe.com). Note that nickel is not currently on the EU's list of critical raw material but a candidate to enter it as described in textbox 1.

[256] For further information, please refer to: C.C. Pavel, E. Tzimas, Raw materials in the European defence industry, JRC Science for Policy Report, 2016. https://setis.ec.europa.eu/system/files/2021-02/raw_materials_in_the_european_defence_industry.pdf

[257] Mononen, Kivinen, Kotilainen, Leino (2022): Social and environmental impacts of mining activities in the EU. Study requested by the PETI Committee of the European Parliament. Social and environmental impacts of mining activities in the EU (europa.eu)

[258] JRC (2019), Mapping the Role of Raw Materials in Sustainable Development Goals. A preliminary analysis of links, monitoring indicators, and related policy initiatives. EUR 29595 EN, Publications Office of the European Union, Luxembourg, 2019 ISBN 978-92-76-08385-6, doi:10.2760/026725, JRC112892.

9.1.15.3. Risk of unforeseen disruptions to industrial supply chains

In a context of structural supply challenges, short-term shortages or supply challenges are more likely to materialise and to severely affect the industrial base, as evidenced by e.g. the semiconductor shortage. In the 2020-present chips shortage, unavailability of an early stage input led to production curtailment of major downstream sectors (especially automotive) and economy-wide damages. The insurer Allianz estimates that the lack of chips in 2020 and 2021 cost EU-based carmakers around EUR 100 billion.[259,260] Similar scenarios may concern critical raw materials. Given the significant investments and lead times (see textbox 4 in Annex 10), supply for critical raw materials is particularly inflexible in the short term, and with their currently high supply concentration, political instability, trade dispute or natural disasters could lead to simultaneous disruptions in the major producing sites, thus producing a shortage that could only be addressed by price spikes shedding demand and thereby affecting large downstream industries from steel and alloy manufacturing to electric vehicles and renewable energy. However, if price spikes can be partly handled by industry, the fact that some CRMs are indispensable (with no known substitute and sometimes in very low concentrations) to some key components of the industry (e.g. heavy rare earth elements in magnets), a lack of access to CRM could lead to a major disruption of entire value chains in the EU (from electric mobility to defence and renewable energy production).

Evidence that such unforeseen disruptions can occur (though so far with limited downstream effects) include the magnesium shortage in the fall of 2021 (caused by China's energy prioritisation[261]) during which the import price in EU jumped from EUR 2 000 to over EUR 10 000 per metric tonne in less than a month (The EU is 100% dependant from third countries for raw magnesium metal imports). A second example is nickel whose prices spiked following the Russian invasion of Ukraine before going back to pre-war level in the following months, leading the London Metals Exchange to put a momentary halt to nickel trading in the early days of the invasion.[262]

9.1.15.4. Risk of high and volatile prices delaying the green transition

Besides the risk of unforeseen disruptions occurring, a structural shortage of critical raw materials and rising uncertainty would lead to increased and volatile prices. The price of lithium for instance has risen more than 10-fold between 2020 and 2022.[263] Such increases could derail clean energy projects in planning and make the achievement of the EU's climate and renewable energy targets more difficult to reach and costly. These possible disruptions or a structural undersupply of critical raw materials are difficult to take into account for projections for the expansion of renewable energy, hydrogen, electric mobility, etc...

The IEA Report on Clean Energy Minerals for example discusses the case of lithium-ion batteries, whose price had fallen dramatically over the 2010-2020 decade, reaching USD 137/kWh in 2020.[264] Further reductions along this learning curve and stable prices are assumed in the model that achieves the IEA's Sustainable Development Scenario, but given the rising share of costs that

[259] https://www.allianz.com/en/economic_research/publications/specials_fmo/Europe-automotives.html

[260] Ref. EU Chips Act Staff Working document – to complete

[261] For further details, refer to the publication of the in-depth review on strategic dependencies published in 2022.

[262] https://www.ft.com/content/e691a6fd-b4a8-4002-ae04-d58c46ae9a40. FT: "Nickel dogged by liquidity concerns and price volatility"

[263] https://tradingeconomics.com/commodity/lithium. In late 2017 the price of lithium carbonate in CNY per tonne was trading around 160,000, in late 2020 it was around 40,000 (minus 75% in two years) and as of December 2022 at close to 600,000 (plus 1400% in three years).

[264] Page 107 of IEA (2021): Clean Energy Minerals.

raw materials now account for, this development is becoming uncertain.[265] For example, according to IEA, a doubling of lithium or nickel prices would induce a 6% increase in battery costs. If these events happen at the same time, the cost increase would eat up the anticipated learning effects associated with a doubling of capacity.[266] According to BloombergNEF, this development has led to the first price rise for electric vehicles (EV) batteries in 2022 up to USD 151/kWh, further away from the price of USD 100/kwH usually assumed to be needed for cost competitiveness with combustion cars[267]. There is also evidence that surging materials prices, along with more expensive transportation and financing, have driven the costs of wind turbines and solar panels up between 10 and 20 per cent in 2022 and thus potentially undermining the competitiveness of the European renewables industry.[268] Similar considerations may apply to elevated critical raw materials prices delaying investment into the digital transition and into defence and security, but such analysis has so far not been published.

9.1.15.5. Risk of dominant critical raw materials suppliers leveraging market power in downstream industries

The high concentration of critical raw materials supply gives critical raw materials producers substantial market power (whether they are companies or states), impacting the pricing mechanism and price-competitiveness for important industries such as clean energy and high tech. Such market power is due to a combination of natural favourable occurrences, active industrial policies, including acquisitions by state-owned companies of mines in third countries[269][270], and outright dumping[271]. More recently, considerations by some countries of creating a supply cartel for certain critical raw materials to maintain elevated raw material prices have been made public[272].

Through such coordination but also on their own, critical raw materials-producing countries are explicitly aiming to move up the value chain and leverage their dominance at the extraction stage to move into processing and refining and ultimately, into manufacturing of end products, such as magnets, batteries, electric vehicles or wind turbines.[273,274,275] While aspirations to increase value addition is a legitimate policy objective, supported under strategic partnerships, for third countries just as for the EU, it should not be achieved through distortive practices such as dual pricing, export taxes or export bans. As of 2018, 20.5% of platinum, 22.0% of copper, 73.3% of rare earth minerals, 77.9% of cobalt and 92.1% of tungsten supply globally was subject to some form of

[265] Page 107 of IEA (2021): Clean Energy Minerals. See also: E-Mobilität: Preise für E-Autobatterien sinken langsamer als angenommen (handelsblatt.com)
[266] Page 107 of IEA (2021): Clean Energy Minerals.
[267] FT: Electric car battery prices rise for first time in more than a decade
[268] Rising prices and supply chain risks threaten Europe's renewable aims | Financial Times (ft.com)
[269] A Power Struggle Over Cobalt Rattles the Clean Energy Revolution - The New York Times (nytimes.com); Studies Reveal China's Dominant Position in High-Tech Minerals (voanews.com)
[270] Such acquisitions by state-owned companies of mines in third countries mean that a simply country-by-country comparison of supply rates to the EU may not show the full picture of supply concentration (e.g. in a case where a certain country has significant domestic mining assets and controls further such assets in other third countries via state-owned companies).
271 See e.g. EU takes action on dumped calcium silicon from China (europa.eu)
[272] Indonesia considers Opec-style cartel for battery metals | Financial Times (ft.com), Métaux stratégiques : et si les pays producteurs se regroupaient en cartel du type OPEP ? (theconversation.com)
[273] On China: China Is Moving Rapidly Up the Rare Earth Value Chain – BRINK – Conversations and Insights on Global Business (brinknews.com); How long will China's dominance of rare earths last? Investment Monitor (mining-technology.com)
[274] On Indonesia: Indonesia bans mineral exports to move up value chain – Asia Times; Indonesia's Nickel Industrial Strategy | Center for Strategic and International Studies (csis.org)
[275] General overview: Export taxes and other restrictions on raw materials and their limitation through free trade agreements: Impact on developing countries (europa.eu), table 5

export restriction.[276] This could be a threat for large European manufacturing industries such as the wind and automotive sectors.

In addition, concentration at the supply level by non-EU producers (countries or companies) may also result in increased prices for downstream industries reliant on these input materials.

9.1.16. What are the sub-problems and their drivers?

9.1.17. Sub-problem 1: Insufficient anticipation and mitigation of supply risks

9.1.17.1. Driver 1.1: Lack of systematic monitoring and risk preparedness

Given the increasing risk of CRMs shortages, both structural and acute, as well as recent experiences of Covid-19-related supply chain disruptions, there is rising awareness among EU companies that there is a need to develop risk management tools. Companies in the open public consultation reported having suffered from the price volatility (34%), supply disruptions (29%) and supply shortages (22%) in their supply of CRM in the last 5 years, while only 4% reported not having experienced any supply problems. Their supply of CRMs is deemed for at risk than their supply of other inputs by 26% of companies, with only 3% disagreeing[277].

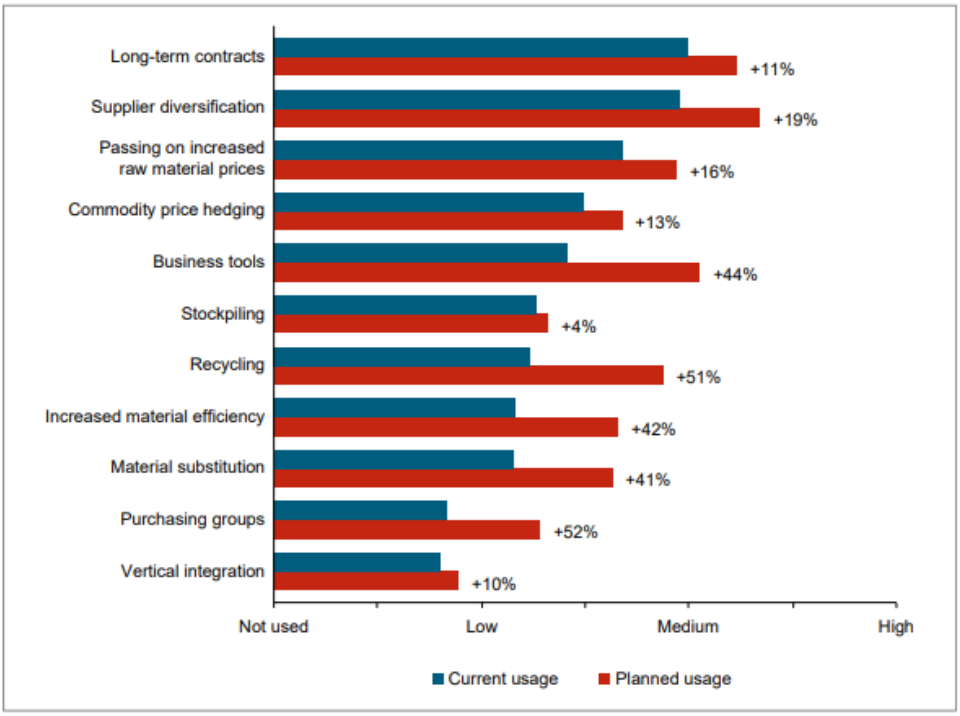


Figure 2: Usage of strategies for securing raw material supplies in the companies surveyed

Figure 7: Usage of strategies for securing raw materials supplies in the companies surveyed by PWC/DERA (2022)[278]

[276] JRC Raw Materials Scoreboard 2021, Indicator 10: Export restrictions, based on OECD and World Mining Data.
[277] The other companies did not express an opinion on this question.
[278] KÖSTER, H., NEUBERT, F. P., DIERKSMEIER, K., ADELMANN, L., LENTGE, H., SCHMIDT, P. (2022): Securing raw material supply: Benchmarking of measures of foreign manufacturing companies and recommendations for action. – DERA 5RKVWRI¿QIRUPDWLRQHQ, 52: 172 p., Berlin.

A study by PWC, commissioned by the German Resource Agency DERA[279], investigated which strategies leading international companies use to ensure their supply security. The results, presented in Figure 7, show the variety of approaches, from business tools over supplier diversification and stockpiling to material substitution and recycling. It also evidences the fact that many companies are not yet using these approaches but planning to use them in the future.

This study provides an indication of what large companies with experience and sophistication in managing critical raw materials supply risks consider effective strategies. There is evidence, in particular for the case of stockpiling/increasing inventories (the most easily quantifiable of the measures), that these strategies have been made use of in the context of recent supply chain shortages such as the chips shortage.[280] A survey conducted by the German Chamber of Industry and Commerce (DIHK) among its member firms in the summer of 2021 finds that 57% of companies across all sectors intend to increase their stockpiling in order to secure their own production capacity. 17% of companies reported the use of recycling and substitution.[281]

However, risk management by companies might not be sufficient to address the growing challenges since there is a geopolitical dimension to the problem and the often complex and opaque value chains for critical raw materials markets require a level of sophistication that most companies do not possess.

In the open public consultation, the views on this issue are nuanced: Only 29% of respondents agree or strongly agree that companies currently lack sufficient information on supply risks to take preventing measures, and 34% agree or strongly agree that companies do not have contingency plans in place to deal with supply disruptions. However, 56% agree or strongly agree that companies would benefit from public monitoring programmes, with only 3 % of respondents disagreeing on this statement. This could be interpreted as meaning that while companies do already collect information and develop their own contingency plans, they see potential to go further with the help of a public monitoring capacity.

At Member State level, only two governments have established institutions to monitor critical raw materials supply for their industry. In Germany, the German Mineral Resources Agency (DERA), a part of the Federal Institute for Geosciences and Natural Resources, has been developing a strong monitoring capacity, publishing studies on the implications of the energy transition and further technology developments for raw materials market, providing consulting services to companies and advising the federal governments in its policy development and international engagement. Albeit still at testing stage, DERA's toolbox monitors daily risk events of selected major global production facilities for around 60 materials, using a commercial AI based software.[282] The French Government is currently setting up a similar structure, namely the French Observatory of Mineral Resources for Industries (OFREMI) to provide a strategic and economic monitoring for public bodies and industries. Hosted and managed by BRGM, the French Geological Survey, OFREMI is

[279] KÖSTER, H., NEUBERT, F. P., DIERKSMEIER, K., ADELMANN, L., LENTGE, H., SCHMIDT, P. (2022): Securing raw material supply: Benchmarking of measures of foreign manufacturing companies and recommendations for action.
[280] Anecdotal: Chip Makers Stockpiled Key Materials Ahead of Russian Invasion of Ukraine - WSJ; Nintendo Appears To Be Stockpiling Raw Materials, Doubles Its 2019 Spending On Supplies | Nintendo Life; Comprehensive: New PMI Comment Tracker dataset reveals key insights into the global supply chain | S&P Global (spglobal.com)
[281] DIHK-Umfrage zu Lieferengpässen und Rohstoffknappheit
[282] Buchholz et al., Mineral Economics, 2022.

a public-private partnership building on the expertise of other public bodies[283]. In other Member States, however, such high-quality analysis and up-to-date market monitoring is not available.[284]

In some Member States, independent research organisation can provide similar services to companies and authorities. This is the case of the TNO in the Netherlands, which is notably active in the reuse of raw materials and provides policy-makers with support and advise on policy options concerning critical raw materials.

There are other Member States with similar capabilities, such as the Austrian government, which publishes yearly one of the most complete datasets on extraction globally and free of charge[285], or the Finnish geological survey GTK, which provides advisory services both to the government and business sector.

At European level, the European Commission has developed the triannual criticality assessment, establishing the EU's List of critical raw materials. This exercise serves to identify the raw materials with the greatest economic importance and supply risk and is used to prioritise research and innovation efforts and focus international engagement. It has also been well taken up by the research community and by industry. However, it relies on validated past data and thus does not serve to monitor current developments and give early warnings that would help companies prepared for an imminent supply crunch or longer-term structural shortages.[286] A sub-list of the most strategic raw materials, based on a filter of the critical raw materials list for strategic applications, and the highest expected supply-demand gap, would help focus efforts. 70% of all respondents in the open public consultation said such a sub-list would be useful to guide investment decisions of companies and financial institutions and also 70% said it should be used to target public support at EU and national level.

The critical raw materials assessment included in 2020 a foresight analysis for strategic sectors and technologies[287]. A 2023 update is expected to expand the list of technologies. This provides forecast insights into the associated demands for raw materials. Such studies are complemented at EU-level by supply chain analyses, as e.g. conducted in the context of the Russian invasion of Ukraine[288]. More in-depth supply and demand analyses, accounting also for technology developments as well as foreseen extraction/processing planning, are available for specific sectors such as e-mobility and batteries[289]. These EU-level analyses could be improved by expanding their scope.

In 2015, the Circular Economy Action Plan included the mandate to establish the EC's Raw Materials Information System (RMIS)[290]. RMIS facilitates EU-level coordination, coherence, and quality assurance of knowledge on raw materials value chains from EC services, member states, as well as e.g. Horizon projects. Profiles includes recent information on e.g. the import reliance of extracted and processed raw materials as well as on the current levels of recycling, as well as trade

[283] Launching of OFREMI - French Observatory of Mineral Resources for Industrial Sectors | BRGM; géosciences n°26, métaux critiques, concilier éthique et souveraineté?, Juin 2022

[284] Note that each Member State has a geological survey, but this is concerned with geological knowledge, mine production and environmental aspects, rather than price developments in global markets, disruptions in third countries and risk management strategies for raw material buyers.

[285] World Mining Data: https://www.world-mining-data.info/

[286] Note that the JRC foresight study on critical raw materials in strategic sectors and technologies provides demand forecasts but no analysis of supply developments.

[287] Raw Materials Information System (europa.eu)

[288] Raw Materials Information System (europa.eu)

[289] see e.g. Raw Materials Information System (europa.eu)

[290] Raw Materials Information System (europa.eu)

analyses and forecast information for various sectors/technologies. The system was further reinforced by the 2020 CRM Action Plan. However, such a system cannot provide regularly updated monitoring analyses in the contexts of security-of-supply and sustainability. Associated networks also need to be reinforced.

The Commission also maintains several expert groups and networks to advise on its policymaking and to enable an exchange of information and best practices: which bring together from technical level to high level Member States, international organisations, industry, R&D organisations, civil society, NGOs. However, none of these groups have operational capabilities to monitor markets or support companies in their risk management efforts, or powers to mandate information exchanges, harmonise reporting or build an effective strategic preparedness system.[291] In the open public consultation, 53% of respondents agree or strongly agree that Member State authorities do not have in place sufficient monitoring mechanisms allowing them to assess supply risks and anticipate problems. 58% agree or strongly agree that Member State authorities do not sufficiently cooperate and coordinate in monitoring critical raw materials supply chains.

In contrast, there are energy goods for which a systematic preparedness system exists. The EU's Oil Stocks Directive obliges Member States to hold emergency stocks of crude oil and/or petroleum products equal to at least 90 days of net imports or 61 days of consumption, whichever is higher.[292] For natural gas, Regulation (EU) 2017/1938 on measures to safeguard the security of gas supply lays down a framework for EU emergency preparedness and resilience to gas disruptions. The recently adopted Regulation on Gas Storage (EU) 2022/1032 amends this regulation and imposes minimum storage levels for natural gas.

In addition, while the proposed Single Market Emergency Instrument (SMEI) comprises measures related to the monitoring of supply chains of goods of strategic importance (article 11), those are only triggered after the activation of the vigilance mode (following a threat/incident with potential to significantly disrupt the supply chain), and such tasks would be carried out by Member States based on voluntary information requests.

Regarding stockpiling, SMEI provides for the possibility for the Commission to identify goods of strategic importance for which it might be necessary to build strategic reserves (art. 12) after the activation by implementing act of the vigilance mode (art. 9). Through implementing acts, the Commission may require to Member States information on such reserves (current stock, potential for further purchase, alternative supply option, etc). As necessary, the Commission may determine individual targets for the strategic reserves, taking into account the probability of shortages, the level of stock, the costs for building them, etc, and the Member States shall inform the Commission about their status. Only if the Member States fall continuously significantly short of its target, may the Commission make the individual targets for strategic reserves mandatory. If a Single Market emergency has been activated (art. 32), the SMEI mechanism also enables the Commission to recommend to Member States the targeted distribution of strategic reserves with a view to not further aggravate the disruptions in the single market (art. 32). Therefore, the SMEI mechanism does not provide for a permanent assessment and coordination of the stockpiles of critical raw materials outside of its vigilance mode.

[291] The Single Market Emergency Instrument partially covers such tasks, but only enters the field when a significant disruption is expected and does not provide expertise on critical raw materials markets. (see section _)
[292] EU's Oil Stocks Directive (2009/119/EC)

9.1.18. Sub-problem 2: The EU is currently not making full use of its domestic critical raw materials potential and lacks capacity in key stages of the value chain

As discussed in the introduction and context, the EU relies almost exclusively on imports for many critical raw materials (this is in part what makes them critical). In a globally integrated economy, different regions specialise in the goods in which they have a competitive advantage and this can be to the benefit of all involved; however, where inputs used in strategic applications are concerned, and when they are as concentrated as discussed above, such import reliance poses a significant risk. Besides pursuing diversification – the potential for which is limited at least in the short term due to the high concentration of global markets – it is in the European interest to reduce some of these dependencies and maintain or develop at least a certain degree of domestic capacities. Most respondents in the Open Public Consultation either agree or strongly agree with statements that refer to underexploited opportunities of critical raw materials (CRM) within the EU. 66% of respondents agree or strongly agree that the potential to extract CRM from primary sources within the EU is currently underexploited. 72% agree or strongly agree that EU's processing and refining capacities for CRM are currently underexploited. 84 % agree or strongly agree that the re-use and recycling opportunities within the EU are currently underexploited and only 2 respondents (out of 259) disagree or strongly disagree with the statement.

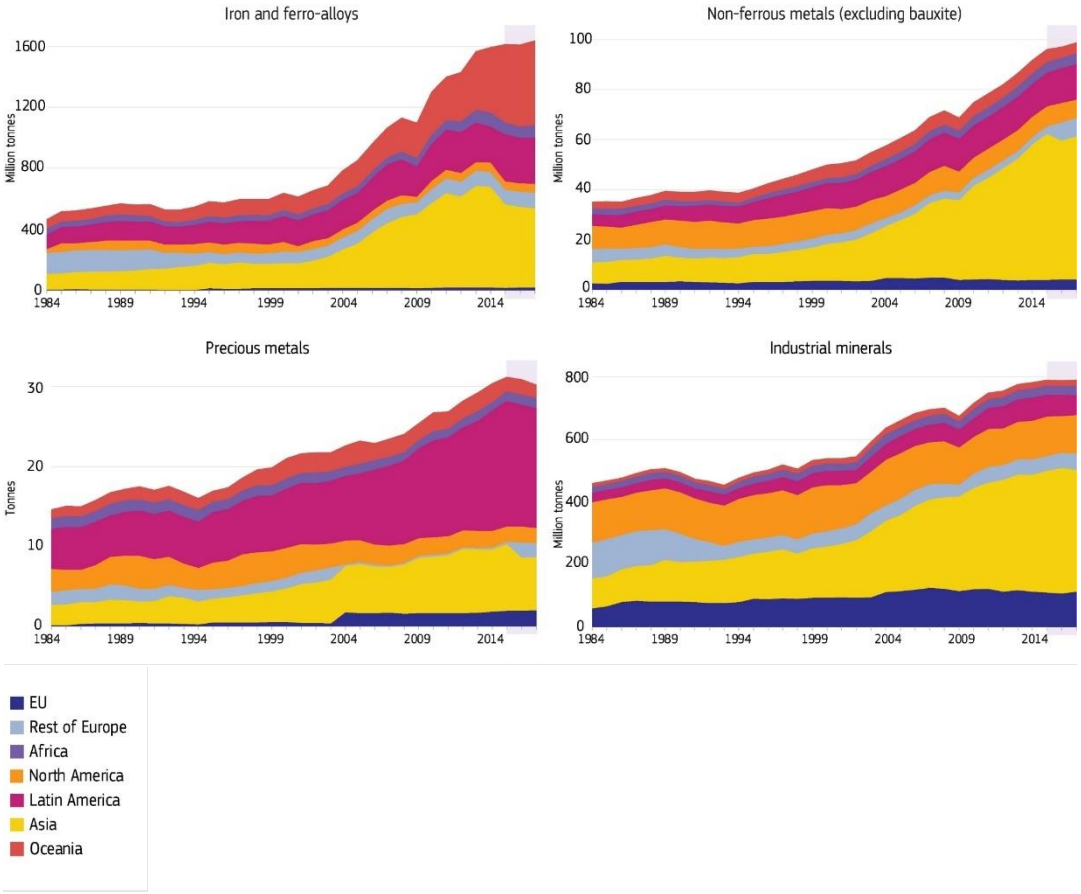


Figure 8: World regions' share in global production for different material categories (EU, 1984-2017). For data on mining production the UK is excluded (EU-27) only since 2015.[293]

[293] Raw Materials Scoreboard 2021, Indicator 7.

On the global stage, the EU is a minor player in terms of mineral production, including in the categories within which critical raw materials fall.[294] As shown in figure 8 the EU is one of the smallest producers of iron and ferro-alloys, non-ferrous metals and precious metals, while it does have a significant production (third largest globally) in the category of industrial minerals. On the institutional side, the major international mining companies are headquartered outside of the EU.[295] The major trading hubs and stock exchanges for raising capital for raw materials projects are located in Canada[296] and the UK[297]. The EU has a significant metals processing and manufacturing industry,[298] but the currently very high energy prices have led to temporary and in some cases indefinite closures or relocations at the refining stage.[299]

However, even if Europe does have mineral potential for most critical raw materials, they could only be confirmed and turned into mineral resources and reserves (economically recoverable deposits) through increased exploration (see figure 9). The SCRREEN2 project reports a summary of known deposits in EU Member States, with for instance cobalt deposits in Finland, Germany, Norway, Sweden but only extracted in Finland[300]. The EU also possesses significant potential for extraction of phosphate rock, lithium and natural graphite[301].

[294] There are critical raw materials among each of these four categories, though they are generally not the drivers of the trends seen above due to their low volumes. However, since the value chains are similar and interlinked, the low production share of the EU in these broad categories does show the focus of industrial and knowledge ecosystems.
[295] Global leading mining companies by revenue 2022 ranking | Statista
[296] Toronto: The world's mining investment capital - BNN Bloomberg
[297] About | London Metal Exchange (lme.com)
[298] The EU non-ferrous metals sector (which includes the processing, refining and downstream metal treatment activities for all metals except iron and steel, including most critical raw materials) generates €120bn in annual turnover and employs 500,000 people directly. Source: Key Industry Data (eurometaux.eu)
[299] non-ferrous-metals-ceo-letter-on-energy-crisis-06-09-2022.pdf (eurometaux.eu); Metal Plants Feeding Europe's Factories Are in Existential Crisis - Bloomberg
[300] SCRREEN project, Challenges of locating, mining and extracting CRM resources, 2018. Table 5: Geological settings, known deposits and mine production of CRM D3.3: Challenges of locating, mining and extracting CRM resources)
[301] The Geological Surveys of Europe: https://www.europe-geology.eu/mineral-resources/mineral-resources-map/critical-raw-materials-map/

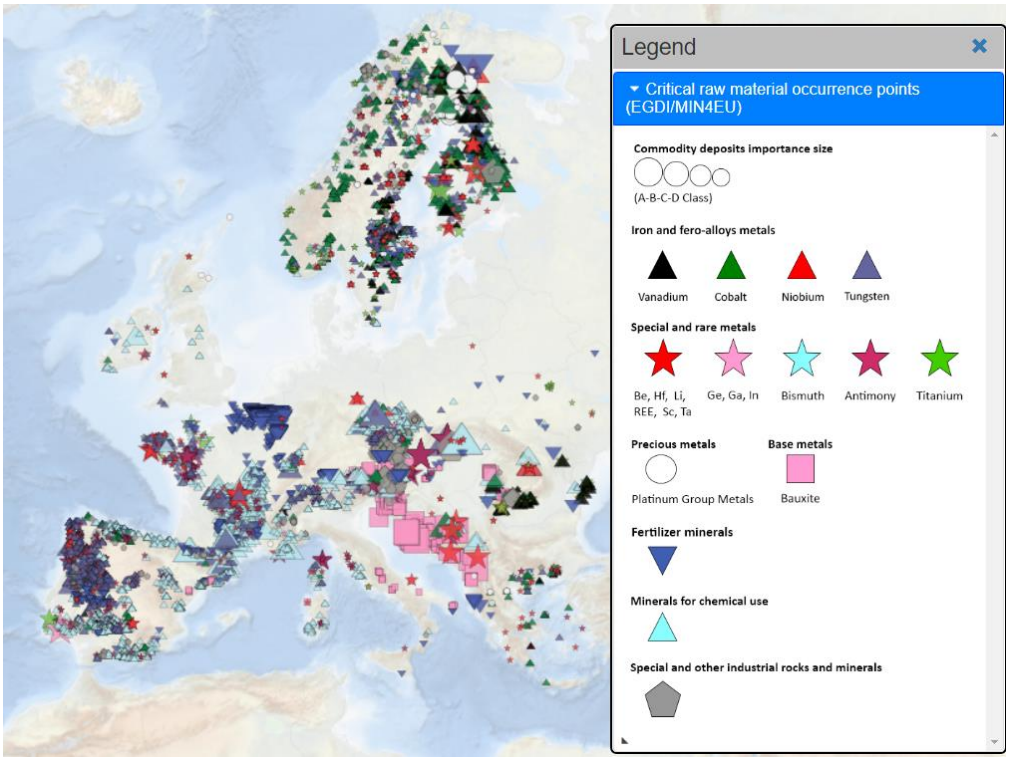


Figure 9: Mineral occurrences of critical raw materials in Europe[302]

It is important that, while exploration and extraction depend only on the location of mineral occurrences, this is only one determinant of location for processing/refining and not relevant to the recycling stages. Due to the high energy intensity of smelting and processing operations, the main determinant of competitiveness for these stages of the value chain are energy costs.

Apart from natural competitive advantages, other jurisdictions are moving more and more towards using subsidies to support their green and digital technologies and to promote their strategic autonomy.

There are also potential pipelines of projects that, if materialised, could turn those geological occurrences into concrete operations that would help achieve a higher self-sufficiency and secure a foothold in important industries and competences. For the rare earth magnets value chains, ERMA identified that investments of EUR 1.7 billion would be capable of building projects along the value chain that would allow the EU to produce 20% of its demand by 2030.[303] Only a small part of these potential pipelines, however, are planned to go ahead under current conditions.[304] More developed and likely to go ahead are investments in the lithium and batteries manufacturing value chain: The EU database of critical raw material projects[305] shows that if all the projects under

[302] Screenshot from EGDI (geus.dk) (04.12.2022). Note that incomplete reporting by Member States geological surveys affects these results.
[277] 32 Rare Earth Magnets and Motors: A European Call for Action. A report by the Rare Earth Magnets and Motors Cluster of the European Raw Materials Alliance. Berlin 2021
[304] Based on confidential information from ERMA.
[305] EU database of Critical Raw Materials projects: 2022 update. Internal Report prepared by the European Commission in collaboration with the Member States.

development in the EU as of 2022 would materialise, they could be sufficient to cover 38% of the EU's rapidly growing lithium demand by 2030 and at least 15% of EU demand by 2050.[306]

While the quality and accessibility (given high population density and environmental protection areas in the EU) of geological occurrences certainly plays a role in explaining the low investment into critical raw materials projects, the case of China, which is dominant in processing for many critical raw materials without being the dominant country at the extraction stage (see figure 6 above), demonstrates that this is not the main factor for investment and capacities at the later stages of the raw materials value chain. As discussed in textbox 4, at the processing/refining stage energy costs, reported by many stakeholders are the determining factor for location, while for recycling operations both energy costs and the availability of waste streams play a role. After lengthy permitting and a lack of support from public financial institutions, higher production costs are overall reported as the 3rd most important reasons impeding CRM's project difficulties in accessing private finance, alongside unfair competition from third countries. It should also be noted that, while certain highly economical geological endowments exist that justify investment even in a challenging regulatory and business environment, many projects are on the margin and could be made economical through price swings on global markets, customers' willingness to pay a premium for transparent and sustainable sourcing, and accelerated permitting timelines.

9.1.18.1. Driver 2.1: Insufficient exploration of European mineral resources

Exploration is a precondition for any extraction project. As noted in textbox 4, exploration is a high-risk business and therefore structured in stages of increasing cost and certainty on the mineralogical and economical properties of the project.

At global level, exploration spending (public and private) for non-ferrous metals[307] is growing (after a slump in the early 2010s) and was estimated at USD 9.8 billion in 2019, while the share of EU was less than EUR 300 million. Within this sum, three Member States – Finland, Sweden and Spain – accounted for 50% of the total spending.[308] While the EU's exploration budget is increasing (nearly doubling between 2016 and 2022), it remains very low compared to other world regions in the world, accounting for about 2% to 3% of global exploration expenditure in 2010-2022 (Figure 10) while the European continent represents around 7% of the Earth's landmass.

[306] European Commission internal database, 2022. NB: This includes only projects that are under development or operational today. Additional EU projects could be developed, making the estimation of EU demand covered by EU projects potential in 2050 a low estimate.
The 2022 EU database of Critical Raw Materials projects, initiated as Actions 4 and 5 of the Action Plan on Critical Raw materials, provides for the mapping of CRM projects at different value chain stages.
[307] A class of metals that includes most critical raw materials, as well as the precious metals gold, silver etc., and the base metals aluminium, copper, zinc etc.
[308] S&P Global Market Intelligence, 2019

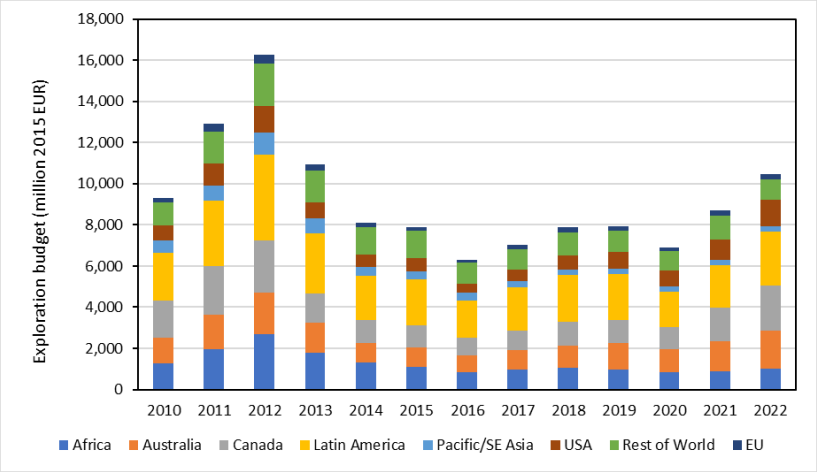


Figure 10: Global exploration expenditure. Note: 2022 refers to Jan-Oct 2022. Data include spending for gold, silver, base metals (copper, nickel, zinc and lead), cobalt, lithium, molybdenum, platinum group metals, diamonds, U_3O_8, rare earths, potash and phosphate.[309]

Since mining companies generally focus their exploration budget on a well-defined, small area covered by an exploration permit, public/general exploration is needed at regional level to define areas of mining interests for each specific mineral.

Member States' spending for these regional (or national, sometimes) surveys existed until the end of 1980's and significantly decreased in the 90s onwards.[310] In addition, these surveys were focused on materials of economic interest at that time and not on the critical raw materials needed today for the green and digital transition or for resilience and security purposes. Previous regional exploration surveys were also limited to the first few meters of the underground for technological and budgetary reasons. Advances in technological tools for raw material exploration at the end of the 1990s (mainly geophysical methods) have permitted to significantly enhance the knowledge on material resources potential, up to several hundred meters deep. The generalised lack of investments during the past decades on geological exploration by Member States (specifically on the critical raw materials and with the most advanced technology tools) has led to a general lack of knowledge regarding the true potential of critical raw materials in the EU to the present day. This impedes the further exploration by private companies on specific sites of mining interest and further exploitation.

Despite a current scarce mining industry, Europe has a long history of mining industry that resulted in the creation of a large amount of mining tailings[311] across the continent, mostly in relation with closed mines. Since mining companies generally focused on one specific substance only (mostly a base metal), some of these mining tailings have been recently recognised has major potential sources of critical raw materials across the EU. However, to which extent and for which elements the reprocessing of these mining tailings could be an economically viable source of critical raw materials remains mostly unknown due to a lack of proper exploration of mining tailings in the EU. Several Member States map the tailings, for instance the Polish Geological Survey has a dedicated

[309] Source: JRC, based on S&P Global, USD/EUR exchange rate from OECD, HICP from ESTAT. Note that the minerals shown here include not only non-ferrous metals, as the data in the preceding paragraph.

[310] Regueiro y González-Barros, Manuel & Espi, Jose. (2019). The returns on mining exploration investments.. BOLETÍN GEOLÓGICO Y MINERO. 130. 161-180. 10.21701/bolgeomin.130.1.010.

[311] Tailings are the waste materials left after the target mineral is extracted from ore.

web-tool showing identified sites.[312] The challenge is then to identify the critical raw materials in each of these tailings and develop a technology and business model to extract them. Several pilot projects of reprocessing mining tailings from selected sites to produce critical raw materials are currently underway in the EU (notably under the EIT Raw Materials NEMO project[313]), but delivering the full potential of this source of critical raw materials would require a proper evaluation of the resources through specific exploration across Member States.

9.1.18.2. Driver 2.2: Unpredictable and fragmented permitting procedures

Industrial activities along the raw materials value chains, including exploration, mining, processing, refining and recycling, make use of energy-intensive processes with potentially significant impacts on the environment and local communities. Therefore, various areas of legislation, including on land use planning and nature conservation, apply to their planning and operation. Compliance with these rules is ensured through the obligation to obtain several permits before starting operations.

EU legislation determining the process and substance of permitting procedures related to CRM projects includes the Strategic Environmental Assessment (SEA) Directive, the Environmental Impact Assessment (EIA), Birds, Habitats[314], Water Framework, Industrial Emission Directives and the Seveso Directive (an overview of permitting-related EU legislation is included in Annex 8). This legislation seeks to mitigate the risk of causing significant adverse environmental effects, such as generation of contaminants deposited on land, in the air and water, with the development of exploration, mining, refining and recycling activities. Member State legislation on the process and criteria for issuing permits reflects such EU rules and adds rules in areas of national competence.

The costs and time associated with permitting procedures and the likelihood of obtaining a permit are key considerations underlying investment decisions in the CRM sector. Currently, the unpredictability of the length of national permitting processes and of the criteria for the assessments and documentation required are often reported as barriers to investment in new CRM projects.[315] Consultations with stakeholders in the context of this initiative have further underlined the degree to which this unpredictability is perceived as a barrier to building an EU CRM value chain.[316]

For raw materials extraction projects, the MINLEX study showed that times to obtain a permit (related to all relevant rules, not only environmental) can vary between procedures from 3 months

[312] https://cbdgportal.pgi.gov.pl/haldy/

[313] Near-zero-waste recycling of low-grade sulphidic mining waste for critical-metal, mineral and construction raw-material production in a circular economy (h2020-nemo.eu)

[314] Interaction with nature protection, and notably the Birds and Habitats Directives, is important: A total of 375 out of 943 critical raw materials projects under development in the EU (40% of the total) are located within or closer than 1000m to 180 areas identified as Natura 2000 (0.6% of the total). Source: Internal analysis by DG GROW.

[315] For example, the European Federation of Geologists also identified long permitting timelines as a 'major obstacle in sourcing finance' for CRM extraction projects - Microsoft Word - 2022_EFG_Letter_Top10_Mining_Opportunities_20221021.docx (eurogeologists.eu).

[316] For example, the length and complexity of permitting procedures was the main reason for the lack of private investment in CRM projects identified by respondents to the OPC. As one company respondent put it: 'Projects along the value chain – such as mining or secondary production installations – might face delays and uncertainty, eroding viability of the investment and competitiveness of operations in the EU.'

to 3 years.[317] More problematically, outliers can be found with timelines up to 9 years.[318] Current examples of CRM projects where permitting procedures are, for different reasons, lasting longer than was initially expected include:

- the Sakatti project in Finland, aimed at producing platinum group metals (as well as nickel and copper), where the permitting process started in February of 2018 and where, as per December 2022, there was no decision yet (approx. 4 years later)[319];
- the Mina do Barroso project in Portugal, aimed at producing lithium, where the permitting process started in 2018 with a decision initially expected within 140 working days - in line with the guidelines of the responsible authorities - and where currently the decision is expected in April 2023 (approx. 4 years later)[320];
- the Talga project in Sweden, aimed at the production of natural graphite, where the EIA report was submitted in May 2020 and where, as per December 2022, there was no decision yet (approx. 2,5 years later)[321].

One reason for unpredictable timelines is that the procedure for performing the necessary environmental assessments is not consistently implemented, within and across Member States, especially with regard to the timing. The average duration of the procedure provided for in the EIA Directive (for all projects in scope, including CRM projects), for example, was, according to the most recent data, approximately 11.6 months, but with figures ranging from 5 to 27 months.[322]

Similarly, differences can be observed in the structure of the procedure, with various levels of authorities (local, regional, national) involved in this process. The "one-stop shop" concept allows applicants to interact with a single authority and facilitates efficient coordination among authorities, which is especially relevant when dealing with interdisciplinary projects. EU law also facilitates the development of a "one-stop shop" for permitting by allowing to streamline the environmental assessment procedures at planning level and project level323. However, the MINLEX study assessed that, as of 2017, only some jurisdictions have a one-stop-shop regime in place and that, without distinguishing per type of mineral, an average of 3.03 authorities were involved for exploration projects and an average of 4.02 authorities for extraction projects.[324]

Environmental assessment procedures are organised differently across Member States also in terms of content. First, the number of different environmental assessments required differs between Member States. Although the EIA Directive explicitly provides that the environmental impact assessment of projects can be integrated with other required assessments (i.e. those under the

[317] MinPol/European Commission (2017): Legal framework for mineral extraction and permitting procedures for exploration and exploitation in the EU. Final report. https://op.europa.eu/en/publication-detail/-/publication/18c19395-6dbf-11e7-b2f2-01aa75ed71a1/language-en "Minpol (2017)" in the following.

[318] E.g. For the Kallak iron ore project in Sweden, the developer submitted request for exploitation concession in 2013. In 2022, 9 years later, authorities approved to issue the concession to the developer, after which the preparations for the EIA have been initiated. Source: https://www.sgu.se/om-sgu/nyheter/2022/mars/regeringen-beviljar-koncession-for-kallak/

[319] Environment.fi (joint website of Finland's environmental administration): https://www.ymparisto.fi/fi-fi/Asiointi_luvat_ja_ymparistovaikutusten_arviointi/Ymparistovaikutusten_arviointi/YVAhankkeet/Sakatin_monimetalliesiintyman_kaivoshanke_Sodankyla

[320] See Agência Portuguesa do Ambiente (apambiente.pt)

[321] Registered by the Swedish Land- and environment court (Mark- och miljödomstolen) in Umeå in June 2020. Case number: M 1573-20.

[322] GHK (2010), Collection of information and data to support the IA study of the review of the EIA Directive. The average duration of an EIA ranges from 7 months or less (4.75 in Estonia, 5 in Slovakia, 6.5 in Latvia, 7 in Greece) to more than 20 months (21 in Denmark, 27 in Spain). New figures are expected in 2024.

[323] See Annex 10 for the different possibilities and relevant provisions.

[324] Minpol (2017)

Habitats, Birds, Water Framework and Industrial Emission Directives), offering significant potential for simplifying procedures where multiple assessments are required and several authorities are involved, this option is not consistently applied.325 Second, a lack of clarity about the scope and level of detail of the information required in the environmental assessment report can lead to multiple exchanges and new requests between the developer and the competent authorities leading to delays. The EIA Directive provides that project developers may request a scoping opinion from the competent authority identifying the content and the extent of the assessment and specifying the information to be included in the EIA report, to provide clarity from the outset. However, only in a number of Member States[326] such scoping applied consistently.

Such different time schedules and approaches applied by the authorities can generate significant uncertainty and delays for the developers, with associated additional costs. This is particularly challenging for projects along the critical raw materials chain, where large capital investments are needed to develop a plant and start production. At the same time investors need to be able to perform long-term planning of operational costs and revenues to create a profitable business model against the background of volatile commodity and energy markets. The unpredictability of permitting procedure therefore discourages private investment.[327]

An additional point made many by stakeholders is that public authorities responsible for issuing permits sometimes lack sufficient expertise and resources, such that investing into skills and the budget of permitting authorities could speed up procedures.[328] It should also be noted that, in addition to the permitting procedure as such, judicial appeals can also lead to delays. MINLEX' court cases database indicated that a majority (53 %) of the appellants are companies, followed by NGOs (14 %).[329] Appeals were reported to be a concern in the mining sector because, even though they ensure the right of access to justice, they often cause increased unpredictability for potential investors and other concerned stakeholders.

9.1.18.3. Driver 2.3: Difficulty in accessing financing

Quantification of Investment Needs (see annex 12 for methodological details)

The soaring demand for many raw materials needed for the green and digital transition and for strategic sectors relevant for security and resilience translates into massive investment needs, both globally and in Europe.

The JRC estimates that the capital investment required to refine all the battery raw materials needed for batteries placed on the European market by 2030, would amount to EUR 20 billion.[330] Of this, EUR 6.9 billion account for lithium, EUR 6.2 billion for nickel, EUR 5.5 billion for graphite, EUR 0.9 billion for manganese, EUR 0.7 billion for cobalt. These figures already take into account that

[325] 18 Member States have established a joint procedure for the Habitats Directive, but only in some cases this joint procedure also covers assessments under the other Directives.
[326] I.e. Bulgaria, Czech Republic, Denmark, Estonia, Finland, Luxembourg, and Romania.
[327] As one company respondent (Aurubis AG) to the OPC put it: 'Projects along the value chain – such as mining or secondary production installations – might face delays and uncertainty, eroding viability of the investment and competitiveness of operations in the EU.'
[328] This point was made in the position papers submitted by Junta de Andalucia, Aurubis AG, Vulcan Energy Resources and EIT Raw Materials in response to the Call for Evidence. Vulcan Energy Resources specifically calls for "hiring and training personnel not just for the direct administrative responsibilities but also for project management of the permitting process", improving the technical equipment (hardware, software, and training); and standardising application and permits.
[329] MinPol (2017).
[330] Internal calculations by JRC, see annex 12.

by 2030 a small but non-negligible share of battery raw materials demand will be covered by recycling. For 2040, the headline figure reaches EUR 33.4 billion.

The investments required to fully meet the EU's domestic needs for battery raw materials recycling amount to EUR 3 billion by 2030 and EUR 10.1 billion by 2040. This reflects the growing importance of recycling over time. These figures also take into account the different levels of recyclability, which is high for cobalt and nickel but very low for graphite. The calculation of these figures assumes similar investment costs for recycling as for refining per tonne of material.

When assessing the investment needs for the extraction projects, one has to take into consideration the mineral potential of Europe. An example, where Europe is well endowed is lithium. Calculations by DG GROW based on the JRC figures and public data indicate that required capital expenditure of EUR 4.9 billion by 2030 and EUR 8.7 billion by 2040 will be needed to extract 100% of the lithium needed for batteries domestically.

In total, the investment needs for the refining and recycling of battery raw materials as well as lithium extraction to supply the entire European battery market with fully domestically produced raw materials amounts to EUR 27.9 billion by 2030 and EUR 52.2 billion by 2040. If the EU set the goal of 25% domestic production of raw materials (primary and secondary) this would mean investment needs of EUR 7 billion by 2030 and EUR 13.1 billion for 2040.

The level of public support needed is difficult to estimate as it is very sector-dependent. A more detailed breakdown can be found for the projects receiving public funding from the American Battery Materials Initiative[331], which is part of the Bipartisan Infrastructure Law and was announced in October 2022. The initiative disburses USD 2.8 billion for several steps of the battery value chain. USD 1.6 billion are earmarked for projects to separate and process battery raw materials, for which the recipients are expected to contribute USD 3.4 billion. This represents a share of public money of 32%. Among the projects supported, there is only one project on battery materials recycling, which receives funding indicating a public share of 41%.

Assuming a similar aid intensity as well as compatibility with EU State aid rules, for comparable projects in the EU, this could result in public support needs of EUR 2.2 and 4.2 billion by 2030 and 2040 respectively, for one quarter of European needs for the refining and recycling of battery raw materials as well as for lithium extraction.

Only for battery raw materials and rare earth permanent magnets, the investment needs to ensure the supply of 20% or 25% of the European demand from domestic sources amount to EUR 8.7 billion by 2030 and 14.8 billion by 2040. Assuming a share of public spending to realise these projects comparable to the American Battery Materials Initiative, public support of EUR 2.7 billion by 2030 and 4.7 billion by 2040 would be required.[332]

Other strategic raw materials are also likely to require large investments in light of the green transition; e.g. copper for electrifying infrastructure, silicon for solar panels, platinum group metals for hydrogen electrolysis. The European Raw Materials Alliance[333] has identified potential investments of EUR 1.7 billion for rare earths extraction, refining and recycling as well as magnet production, which would ensure a supply of 20% of European demand along the value chain by

[331] https://www.energy.gov/sites/default/files/2022-11/DOE%20BIL%20Battery%20FOA-2678%20Selectee%20Fact%20Sheets.pdf
[332] The calculations can be found in the description of the driver in section 5.2 and annex 5 and further methodological details in Annex 12
[333] https://eitrawmaterials.eu/wp-content/uploads/2021/09/ERMA-Action-Plan-2021-A-European-Call-for-Action.pdf

2030. For other CRM, their potential investment cases amount to EUR 3.1 billion, fulfilling between 20 and 60% of projected EU demand in 2030 for different relevant raw materials.[334]

Difficulties in Access to Finance

Several CRM market-specific factors complicate access to (public and private) finance. The volatility of prices for CRMs makes it hard for investors in projects at all stages of the value chain to predict earnings, especially in the medium to long term. Meanwhile, given the long lead times and potential permitting delays (see previous chapter), significant investment decisions have to be taken years before a project starts gaining operational revenue. In addition, global markets for many critical raw materials are small, highly concentrated and opaque[335], increasing the risk premium that needs to be paid compared to other markets. To provide financing, the financial institutions need to possess in-depth knowledge about mining project development and global raw materials markets to be able to assess CRM projects. Maintaining this expertise in-house is difficult considering the small size of the European raw materials sector. While all such factors are not unique to the CRM market and investors routinely deal with such risks (ultimately, high returns on such projects should compensate for the risk taken and the resources invested), their aggregation does make the financing of CRM projects very costly and, given the limited overall size of the EU's mining, processing and refining industries, it can be hard to find any partners willing or able to provide the type of financing required.

Based on discussions Commission services had with various European public and private financial institutions, the following observations can be made on the state of financing for the different stages of the critical raw materials value chain:

- Exploration: Most exploration companies active in Europe are either based outside of the EU, notably in Australia and Canada, or financed by actors in these third countries. Dedicated private investment funds exist in North America (US and Canada), Australia, UK[336]. In general, the interviewed private and public financial institutions have not been involved in financing exploration projects and stated that this was due to the high risk involved. The European Bank for Reconstruction and Development (EBRD) is the only notable exception, with a team dedicated to this area and the ability to support such projects. Exploration financing mostly comes in the form of equity or quasi-equity to project companies set up *ad hoc*. To address this market gap, the Commission and the EBRD are negotiating to establish a financial instrument to invest equity or quasi-equity in companies performing innovative sustainable exploration in Europe.
- Extraction: While public institutions have limited capabilities to engage, some private financial organisations have dedicated metals and minerals investment teams. They generally require the project to be financed by a large corporation through their balance sheet rather than through project finance. Financing of junior miners is generally considered very risky and the private financial sector is not willing to engage. Furthermore, for mining projects in third countries, the involvement of an Export Credit Agency for risk sharing is key. All interviewed institutions indicated that financing of investment projects would be usually done on a syndicated basis. MS started to implement some measures to

[334] Source: Overview of the current state of the investment pipeline provided by ERMA to Commission services (not public).
[335] https://www.ft.com/content/46e5c98e-f9cd-4e88-8cd5-23427522c093: Financial Times: Tesla supplier warns of graphite supply risk in "opaque" market. Syrah Resources says lack of transparency over pricing in China-dominated market poses challenge for financing.
[336] Examples of investments funds in the mining industry Resource Capital Funds (offices in US, Canada, UK, Chile); Taurus Funds Management (based in Australia, with two satellite offices in UK and Paris); Denham Capital (offices in US, UK, Australia); The Pallinghurst Group (based in London); Waterton Global Resource Management (based in Canada).

promote investments in the CRM field in third countries (including extraction)[337]. Investing in extractive industries in EMDEs have faced increasing complex challenges in meeting environmental, social and governance standards, implying the mobilisation of significant resources in technical assistance. Furthermore, the cost and risks of litigation after investments, i.e. during implementation, have increased considerably. Given the challenges, most DFIs, including MDBs, have cancelled or significantly reduced their programme in extractive industries, including the EIB. EFSD+ guarantees investment windows have not included mining investments explicitly.

- Processing/refining: Banks indicate that in order to finance processing/refining projects, a stable and secure supply of critical raw materials would have to be ensured, which is currently not the case for a number of critical raw materials. New green field facilities could be set up next to mines outside EU, but financing of integrated projects (mining + refining/processing) is considered high-risk. Private financial institutions are willing to engage if a large established client with strong credit rating sponsors and finances the project through its balance sheet (corporate finance). The role of energy prices and the price volatility of the relevant critical raw materials has also been mentioned as important in determining the viability of European refining projects.[338]
- Recycling: The interviewed banks have little experience so far on this but generally are willing to engage. One of the main issues for the viability of this type of investment is the steady supply of material for recycling.

Overall, the results from the open public consultation and the targeted consultations of banks show that access to finance is considered a major barrier to investment in specific stages of the critical raw materials value chain in Europe[339]. While the need for financial support for projects will likely vary from case to case, many stakeholders underlined the importance of de-risking, notably through guarantees, including for projects outside the EU, of signalling through participation of public financial institutions, and of reducing the exposure of processing/refining operations to high and volatile energy and critical raw materials prices.

In addition, under the Taxonomy Regulation[340], the Platform on Sustainable Finance has started the work on Taxonomy criteria for pollution prevention and control in mining and delivered a criteria for climate change mitigation in manufacture of copper (smelting, roasting and refining operations) activities. The work on mining could resume under the new Platform 2.0.

9.1.18.4. Driver 2.5: Lack of high-quality technical standards to ensure sustainability of critical raw materials-related industrial processes

The availability of high-quality technical standards is essential to ensure a level-playing field in the single market for businesses and to underpin consumer confidence. Standards can help facilitate

337 Examples in this respect are the German UFK programme, which provides a government guarantee for privately financed projects in third countries provided that a long-term off taker agreement exists with a German client; and the French Bpifrance's Strategic Project Insurance, introduced in 2018, which provides an 80% insurance for projects located in France or involving a French business partner.

338 See also the results of the public consultation.

339 51% of respondents to the open public consultation agree or strongly agree that accessing private financing for CRM projects in the EU is difficult and a challenge for the expansion of the EU's critical raw materials capacities; many respondents are neutral on this question; 9 % disagree or strongly disagree. 56% of respondents agree or strongly agree that there is a difficulty to access public funding in the EU; 4 % disagree or strongly disagree. 64% of the 259 respondents to the open public consultation agree or strongly agree that the price volatility or unpredictability poses a challenge to the roll-out of CRM projects in Europe. Some stakeholders make the point that the absence of mining activities in the EU taxonomy would make funding and investment unattractive (see Annex II).

340 Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088 (Text with EEA relevance), *OJ L 198, 22.6.2020, p. 13–43*

the creation of a transparent global market for critical raw materials. Currently, European and international standards only partially cover critical raw materials-related industrial processes, including processes involved in their extraction, processing and recycling.

At the level of the relevant European Standardisation Organisation CEN, a number of technical committees exist in charge of the standardisation of metals (aluminium, copper, nickel and steel) but new committees have not been created for several decades, and critical raw materials are not covered by the work of these committees. What concerns the international aspect, as highlighted in the recent EU Standardisation Strategy, other actors follow a more assertive approach to international standardisation than the EU. This has led to a situation whereby in some sensitive areas non-EU actors are taking the lead at the international level promoting their technological solutions, which may be inconsistent with the EU's policies and regulatory framework.

At the level of the International Standardisation Organisation (ISO), standardisation efforts related to critical raw materials have been mainly instigated by non-EU countries. The Chinese standardisation body has initiated standardisation on rare earths (2015) and lithium (2020) within ISO, covering the whole value chain including upstream extraction and sustainability. On rare earths, the results so far point at slow progress as concerns sustainability aspects, and ambition level is not at par with what is spelled out in the EU principles for sustainable raw materials.[341] Similarly, at the end of 2021, Standards Australia was allocated the leadership of an ISO Strategic Group on Critical Minerals. The mandate of this group was to identify which minerals/metals could be standardised in ISO. [342] [1]

There currently does not exist a common European strategy to ensure that standardisation efforts for critical raw materials sufficiently reflect the sustainability principles underlying EU legislation relevant for the critical raw materials value chain. As international standards are an important point of reference for the global market, and in the absence of alternative European standards, this risks undermining consumer confidence and making it more difficult for EU buyers of critical raw materials to choose sustainable options.

9.1.18.5.

9.1.18.6. Driver 2.6: EU waste legislation does not sufficiently target critical raw materials recovery

Circularity is in many ways the optimal avenue to pursue in the area of critical raw materials. The reduction in critical raw materials use (material efficiency and substitution), the lifetime extension, reuse and remanufacturing of products containing critical raw materials, and their recovery and recycling at the end of life can all contribute to lowering demand for primary raw materials and thereby contribute to reducing dependencies. Secondary raw materials also generally have a significantly lower energy and environmental footprint[343] compared to primary raw materials.

[341] For REEs, actions focus on the whole value chain including rare earth mining, concentration, extraction, separation and conversion to useful rare earth compounds/materials (including oxides, salts, metals, master alloys, etc.), covering also sustainability of different processes.

[342] Although work is not yet finalised, several minerals or metals have been identified as being of a particularly strategic nature: cobalt, indium, vanadium, graphite, gallium, tungsten. Their mandate was extended by 12 months to summer 2023.

[343] For example, the production of secondary aluminium can save up to 95% of the carbon emissions of primary aluminium (European Aluminium Association, 2018. Environmental Profile Report https://www.european-aluminium.eu/media/2052/european-aluminiumenvironmental-profile-report-2018-executive-summary.pdf

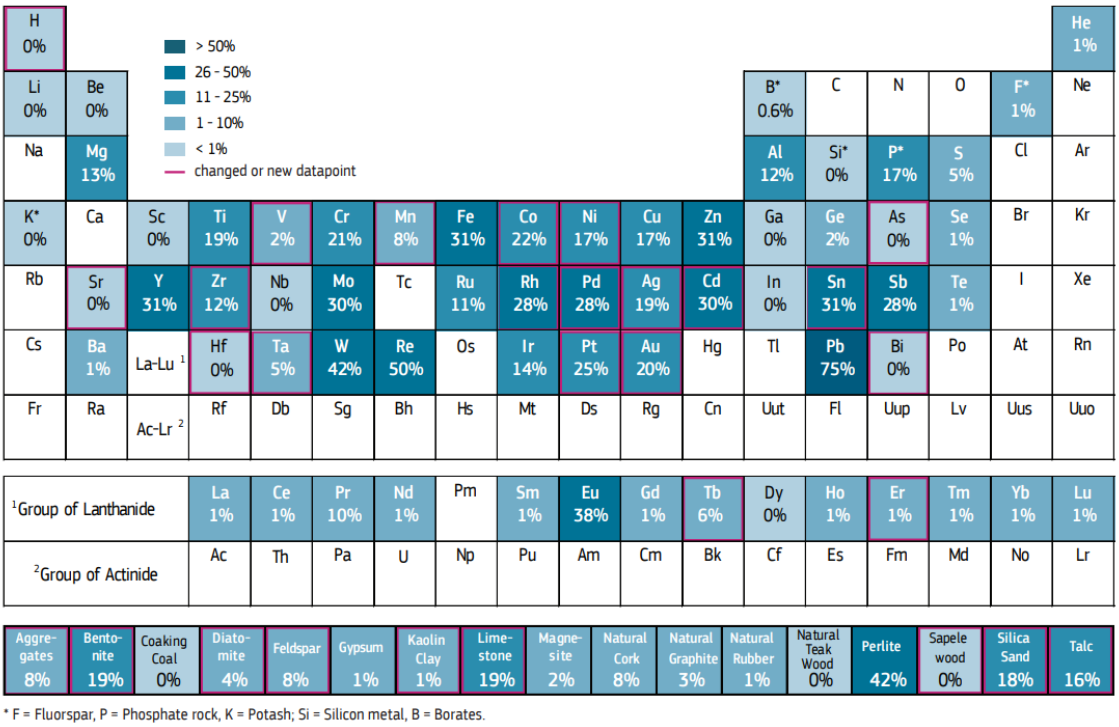


Figure 11: End-of-life recycling input rate for the EU[344]

As most critical raw materials are metals, they are in theory highly recyclable. Currently, however, the share of recycled critical raw materials that are used by clean tech industry in Europe is very low. This is the case e.g. for rare earths neodymium and dysprosium in permanent magnets in wind turbines and for gallium in integrated circuits and lighting in EVs (see figure 11). This is due to the fact that collection and sorting systems prevent end-of-life metals from reaching recyclers, a number of CRMs are locked in products that have not yet reached their end-of life, most critical raw materials are used in low quantities and/or concentrations and are scattered which make the recovery processes from end-of-life products technically and economically complex and difficult. As a result, CRMs are often disposed of at the end of a product's lifetime, or non-functionally recycled (i.e. recycled in a way that does not make use of the special properties of the raw material), leading to a significant loss of value. Moreover, current recycling practices and waste legislation often focus, to a large extent, on waste collection and de-pollution, and on mass recovery but too little on the recovery of trace metals such as CRMs, even though many of these may have a significant intrinsic economic value.

According to Horizon 2020-funded studies (ProSUM[345], SCRREEN[346]), the most important waste streams for CRM recovery are: Extractive waste ; Waste batteries; Waste electrical and electronic equipment (WEEE); End-of-life vehicles; Renewable energy: wind turbines, solar photovoltaics (PV) waste.

Most of these have dedicated sectoral waste legislation (Extractive Waste Directive, Batteries Directive/proposed Batteries Regulation, WEEE Directive, End-of-life vehicles Directive), specifying extended producer responsibility, specific treatment requirements, collection and recovery targets etc.; renewables are only partially covered (solar PV under the WEEE Directive, for wind turbines, only the electrical and electronic products that are parts of the wind turbines are covered so far). In addition, the Waste Framework Directive covers all waste streams horizontally,

[344] Source: EU Raw Materials Scoreboard 2020
[345] ProSUM | Prospecting Secondary raw materials in the Urban mine and Mining wastes (prosumproject.eu)
[346] RESULTS - SCRREEN2

setting targets for preparation for reuse and recycling, notably for household and construction waste, requiring Member States to define waste criteria, draw up waste prevention and waste management plans, and defining minimum requirements for extended producer responsibility schemes.

Apart from the proposed Batteries Regulation, these legislations do not specifically target the recycling of critical raw materials, and therefore do not give sufficient incentives to separately collect waste streams rich in critical raw materials, and to recover them. This leads to a low availability of secondary critical raw materials and an even lower take up of recyclates by European industry, as shown in figure 11.

Existing recycling targets, such as in the **WEEE Directive**, apply to overall weight ratios rather than individual raw materials, which provides an incentive to recover the bulk materials first, as this is less expensive, rather than the dispersed critical raw materials. The WEEE Directive in its Annex VII also lists proper treatment requirements that could help to remove from the WEEE collected components rich in CRM and apply targeted recovery operations; however, these are currently targeted to hazardous waste components rather than to recovery of CRMs.[347]

The **Waste Framework Directive** already requires Member States' waste prevention plans and waste management plans to target products containing critical raw materials and installations treating them, but no guidance on specific measures to be taken has been given nor have targets for the collection or recovery of critical raw materials been set.

In countries with an active mining industry or a history of mining activity, mining wastes often constitute the largest part of society's total waste flow and stock. Since historically most mining operations were targeted at high-volume commodities such as base metals iron and copper and precious metals, rather than critical raw materials, which are often a by-product of the aforementioned, extractive waste may contain significant amounts of critical raw materials. Studies have estimated significant amounts of critical raw materials such as phosphate rock, silicon, tungsten or cobalt in mining waste (see figure 12),[348] and recent industrial projects in Spain[349] and in Sweden[350] show that this can be valorised profitably. In most cases, it is unlikely that a recovery process will be economical if it regards a specific critical raw material alone, especially if present in low concentration, but by jointly recovering and valorising base metals, critical raw materials, and the rock matrix as industrial minerals and/or aggregates, the process can be realised[351]. A significant advantage lies in the fact that such operations take place on brownfield sites, thus reducing the risk of additional environmental impacts and conflicting land-use interests. In some cases, re-mining of extractive waste can even be an opportunity for rehabilitation of abandoned mining sites.[352]

A barrier to the full use of this potential, however, lies in the lack of knowledge concerning the critical raw materials potentially recoverable from closed and abandoned mines, as well as the risk and liability assumed by a company re-mining a site with potentially unknown legacy. The **Extractive Waste Directive** currently regulates primarily how to minimise and manage waste generation and it requires Member States to draw up an inventory of closed and abandoned facilities, but it does not provide incentives or targets to recover critical raw materials from the

[347] Note that at the component level annex VII also includes removal of printed circuit boards and batteries.
[348] JRC (2019): Recovery of critical and other raw materials from mining waste and landfills; pg. 93-98 of SCRREEN-D3.2-Identification-and-quantification-of-secondary-CRM-resources-in-Europe.pdf
[349] JRC (2019): Recovery of critical and other raw materials from mining waste and landfills , chapter 7.1:"Recovery of Tantalum and Niobium from tailings at the old Penouta mine
[350] Critical minerals extracted from mining waste - LKAB
[351] JRC (2019): Recovery of critical and other raw materials from mining waste and landfills
[352] JRC (2019): Recovery of critical and other raw materials from mining waste and landfills , chapter 7.1:"Recovery of Tantalum and Niobium from tailings at the old Penouta mine.

extractive waste, nor does it oblige Member States or operators to gather information or report on the critical raw materials content of the generated waste.

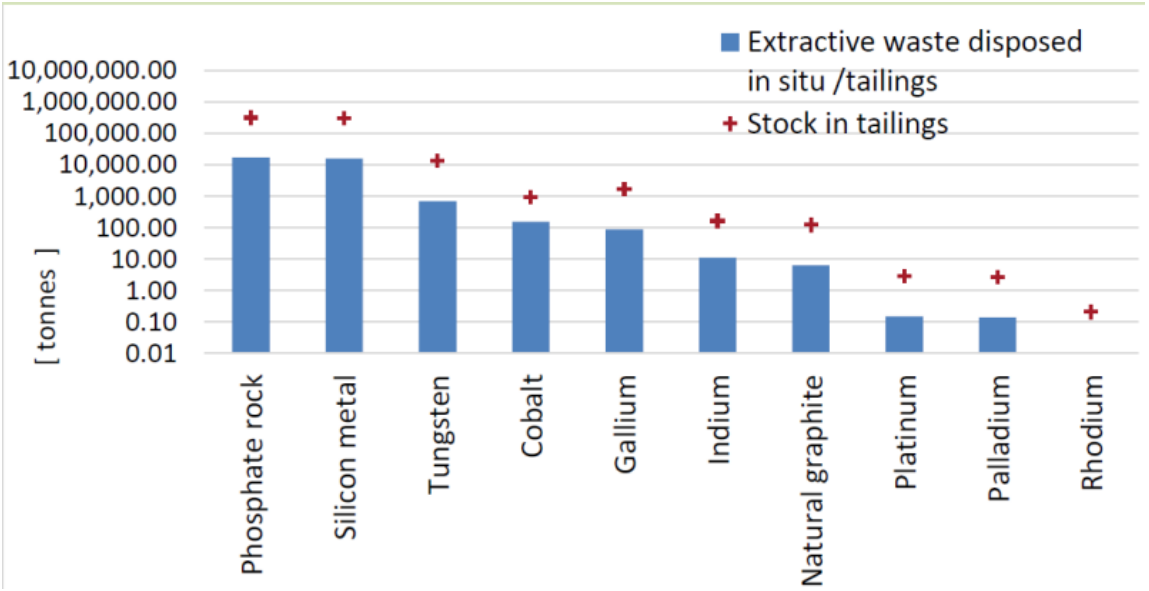


Figure 12: Estimated amounts of various CRMs in the EU-18 in 'Extractive waste deposed in situ/tailing' and 'Stock in tailing'. Source: JRC estimations based on the 2015 MSA study [353]

The Horizon 2020-funded "Near-zero-waste recycling of low-grade sulphidic mining waste for critical-metal, mineral and construction raw-material production in a circular economy" (NEMO) project found that sulfidic mining waste residues, from mining and processing sulfidic ores to produce copper (Cu), zinc (Zn), lead (Pb), nickel (Ni) and critical metals, represent the largest extractive waste in Europe. Approximately 600 Mt are produced per year and there is a historic stockpile of 28 000 Mt deposited in either tailings storage facilities, dry stacked or back-filled in mines. When poorly managed, this waste can become an environmental hazard, causing problems such as acid-mine drainage or the outflow of acidic water from mine waste. At the same time, this waste represents a new stock of critical metals and minerals needed to move to a green circular society.

NEMO focused on three cases: 1) Sotkamo Ni-Cu-Zn-REE/Sc (rare earth element scandium) mine in Finland, 2) Luikonlahti processing facility in Finland (cobalt), 3) Tara Zn-Pb mine in Ireland,

In addition, four pilots using NEMO technologies to demonstrate cutting-edge bioleaching processes to recover additional metals from sulfidic ores/residues and to boost the conversion of sulfides to sulfates – helping to eliminate the risk of acid-mine drainage. It also aimed at 'cleaning' the residual matrix allowing its use in cement and construction applications. The results from NEMO will provide the EU with a number of benefits: new resources for the metal and agricultural sectors, a reduction in CO2 levels in the metal recovery process, and the replacement of ordinary Portland cement, addressing acid-mine drainage and other environmental problems. Further steps include replicating the technologies and concepts in other mines within the EU and beyond.

In the open public consultation, 66% of respondents agree or strongly agree with the statement that "EU waste legislation does not sufficiently incentivise the recovery and recycling of raw materials". 53% agree or strongly agree with the statement that "shipments of waste containing

[353] Recovery of critical and other raw materials from mining waste and landfills - Publications Office of the EU (europa.eu)

critical raw materials between Member States are difficult, which limits possibilities for viable recycling project".

9.1.19. Sub-problem 3: EU sourcing of critical raw materials is not sufficiently sustainable

The extraction, processing and refining, as well as the potential recycling, of CRMs is associated with a wide range of environmental impacts. For example, the production of rare earth elements (REEs), used e.g. in electric motors and wind turbines, is associated with significant material and energy consumption and generates large amounts of air and water emissions and solid waste.[354] Similarly, the use of platinum group metals in electrolyte membrane fuel cells is the main determinant of the fuel cells' environmental footprint, considering e.g. the acidification impacts associated with the extraction of these metals.[355] The production of cobalt and lithium, essential for battery production, is amongst other things associated with significant greenhouse gas emissions.[356]

It was estimated that greenhouse gas emissions associated with overall primary metal and mineral production accounted for approximately 10% of total global energy-related emissions in 2018.[357] In addition, the overall environmental impacts of extraction and processing of key minerals are projected to double by 2060, as a result of both the increased scale of extraction and production and of declining ore grades.[358] Given the expected massive increase in demand, CRMs (which are currently all metals and minerals) will likely contribute an increasing share of these impacts. If left unaddressed, therefore, the environmental footprint of CRMs may cancel out, to an extent, the environmental benefits of their use in green technologies and could mean that decarbonisation comes at the cost of an increase in other environmental impacts.

9.1.19.1. Driver 3.1: The market does not take sufficient account of the environmental footprint of critical raw materials

Given the speed of developments in the critical raw materials sector, it is unlikely that the market, left to its own devices, will ensure that all costs associated to the critical raw materials value chain are properly identified and internalised. Steering the market toward more sustainable critical raw materials, however, has the potential to drive down impacts given the differences in the environmental footprint of critical raw materials available to EU buyers. This is evidenced, for example, by the difference in carbon and environmental footprints observable between critical raw materials produced using different production methods,[359] It is also clear that the varying carbon intensity of the energy used in the extraction and refining of CRMs leads to varying environmental footprints (see for example figure 13 below, showing different grid emissions factors in cobalt and

[354] Navarro, Julio, and Fu Zhao. "Life-cycle assessment of the production of rare-earth elements for energy applications: a review." Frontiers in Energy Research 2 (2014): 45.

[355] Stropnik, Rok, et al. "Critical materials in PEMFC systems and a LCA analysis for the potential reduction of environmental impacts with EoL strategies." Energy Science & Engineering 7.6 (2019): 2519-2539.

356 Gregoir, L., and K. Van Acker. "Metals for clean energy: pathways to solving Europe's raw materials challenge." Eurometaux, KU Leuven (2022).

357 Azadi et al. (2020). Transparency on greenhouse gas emissions from mining to enable climate change mitigation.

358 OECD (2019). Global Material Resources Outlook to 2060.

[359]On difference between brine and hard rock based lithium, see "Metals for clean energy'' report (Gregoir and Van Acker)'. On magnesium, see Ehrenberger, Simone. "Carbon Footprint of Magnesium Production and its Use in Transport Applications." (2020). For scandium, see Kaya, Şerif, et al. "Scandium recovery from an ammonium fluoride strip liquor by anti-solvent crystallization." Metals 8.10 (2018): 767. For titanium, see Pal, Uday B. "A lower carbon footprint process for production of metals from their oxide sources." JOM 60.2 (2008): 43-47.

REE producing countries[360]). In addition, it is clear that recycled CRMs will have generally a lower environmental footprint than primary materials, given for example the absence of the extraction phase.

Even though stakeholders, including downstream users, state that they are willing to take into consideration the relative sustainability performance when procuring materials[361], the market response so far has resulted in the creation of different methods and initiatives, with a varied level of reliability and coverage.[362] The European Commission developed the Product Environmental Footprint (PEF) with the aim to provide a common and robust method to underpin claims made about the relative footprint of different materials sold on the EU market, which could support to distinguish between environmental performances of materials.[363.] However, uptake of the PEF method for the assessment of CRM is still limited.

In addition, for critical raw materials, different public and private certification systems with different scopes and coverage are currently available to show the sustainability of raw materials sold on the EU market (e.g. the Initiative for Responsible Mining Assurance (IRMA), CERA 4in1 certification, World Bank Climate Smart Mining Initiative).[364] Having different overlapping schemes to show sustainability of critical raw materials placed on the EU market can lead to potential confusion and undermine their effectiveness. Stakeholders have underlined the need to assess the suitability of different certification schemes.[365] This incomplete information hampers fair and transparent competition for critical raw materials producers in terms of sustainability claims. Likewise, it hampers sustainable choices to underpin the green transition.

In addition, even where information is available, there is currently nothing preventing users of critical raw materials from procuring the most impactful materials. It can reasonably be assumed that, so long as the negative externalities of CRMs are not accounted for, at least some users will continue to be mainly driven by cost considerations and will continue to procure the most polluting CRMs.

[360] Source: "Metals for clean energy'' report (Gregoir and Van Acker)

[361] For example, 186 (72 %) out of 259 respondents to the PC agreed or strongly agreed that CRMs should be accompanied by information on their environmental footprint. Business interest is also driven by changing consumer preferences: based on a recent EU survey (Consumer conditions survey, European Commission, 2021.), the majority of EU consumers being "occasional" consumers of environmentally-friendly products (56%) and more than a quarter paying attention to the environmental impact of all or most goods and services (23%), and 67% EU citizens buy products that are better for the environment even if they cost more.

[362] There are currently 457 voluntary environmental labels worldwide and over a 100 in the EU (Ecolabel index 2020, http://www.ecolabelindex.com/), underpinned by non-comparable methods.

[363] Commission Recommendation of 16.12.2021 on the use of the Environmental Footprint methods to measure and communicate the life cycle environmental performance of products and organisations.

[364] See also the overview of different schemes provided in IEA, I. (2021). The role of critical minerals in clean energy transitions. World Energy Outlook Special Report, p. 240.

[365] See for example the Call for Evidence submission of the European Automobile Manufacturers' Association.

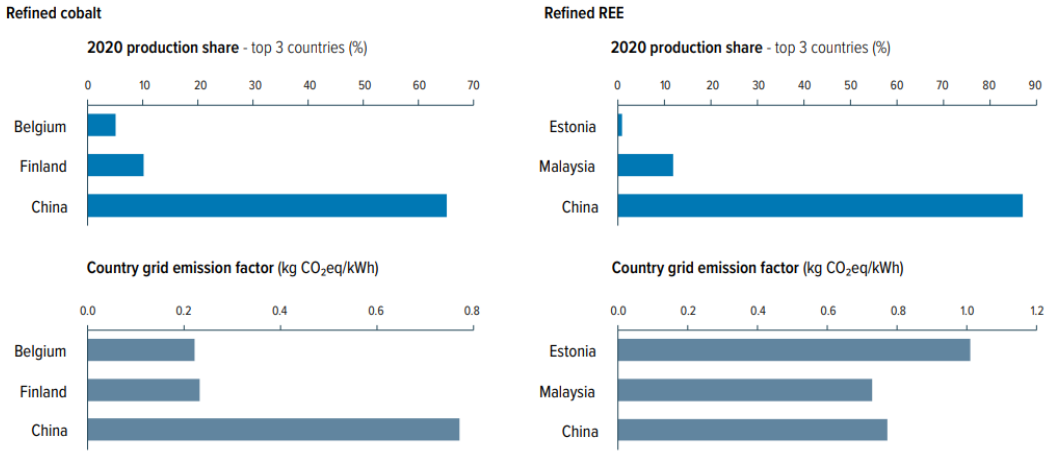


Figure 13[366]

[366] KU Leuven/Eurometaux (2022): Metals for Clean Energy.

9.1.20. Policy Option 1 – additional information on impacts

9.1.20.1. Impact on Member States

Regarding the **governance structure** (pillar C), Member States' participation to the board and the network's meetings through their representatives is expected to require 2 FTEs per year. Member States which do not have a dedicated supply and intelligence capacity yet would be encouraged to develop such structure (whether a task force in the ministry responsible or a dedicated body), whose size would vary depending on the Member State's resources. Since this is not an obligation, it would not add burden on Member States. In the public consultation, national authorities or agencies, notably in Sweden, Estonia or France, express support for the development of this type of network.

On **monitoring** (pillar C.1), rather than relying on national efforts, this option would lead to a division of tasks between Member States and enable where possible the pooling of resources to jointly create missing capacities. It is deemed more efficient than the baseline to improve monitoring and risk assessment.

On **the coordination of strategic stocks** (pillar C.2), this option would require Member States to report to the Commission on the state of their strategic stockpiles for strategic sectors, under strict confidentiality requirements, which would require 1/4 FTE for each Member States as it would add additional workload in the relevant national authority or agency in charge of stocks. It is also likely to bring benefits, as the Commission could assess the overall state of stocks in the EU for strategic raw materials and could point out, with the agreement of the concerned Member States, to potential areas of convergence. Member States have also indicated their preference for this type of coordination compared to more stringent obligations forcing them to build additional stocks.

Regarding **exploration** (pillar D), since most of the actions are voluntary, Member States would implement only those that are part of their core and regular activities. The only obligation would be the regular classification of potential projects with the UNFC classification framework and reporting to the commission. This is a task that requires minimum investment (1/2 FTE) by national Geological Surveys or other national competent authorities.

The requirement to set up strategies to **support the value chain** (pillar E) to increase access to stable and secure supply of CRMs would result in some additional costs for Member States, which would amount to 2 FTE per Member State for half a year to develop the strategies on a one-off basis and then on average 1 FTE to follow-up and implement the strategies.

Regarding **permitting** (pillar E.1), this option is expected to result in additional costs for Member State authorities. Structural integration of CRM projects in spatial plans and the application of the SEA Directive to those plans would imply an additional cost to responsible planning authorities. However, this cost will depend on the actual potential for CRM project in the area under consideration for the spatial plan, and the related amount of potential impact to be assessed, as well as the extent to which Member States already voluntarily apply the procedure. As also concluded in a recent evaluation of the SEA Directive, there are currently not enough comparable quantitative

information available on the costs of the SEA procedure.[367] However, it is clear that costs would be involved stemming from e.g. additional man-hours invested and external consulting services.

On **waste legislation** (pillar F), this option would not add additional work to Member States' policy development.

Regarding **environmental footprint** (pillar H), this option would entail additional burden for Member States, who would have to devote resources for the enforcement of a new obligation of a very technical nature. The market surveillance authorities of Member States will have to invest in developing the necessary skills to ensure that the footprint declarations, as well as the third-party verifications, are performed properly. They would also have to regularly check whether CRM sold on their market are not sold with reference to non-recognized certification schemes. This may entail training and/or hiring costs. The amount of FTEs needed for this task would depend on the amount of CRMs sold on a specific national market as well as the amount of relevant economic operator active on that market.

9.1.20.2. Impacts on the Commission

Regarding the **governance structure** (pillar C), the costs accounted for are those pertaining to supporting the organisation of the board and network, notably through a common secretariat. In terms of direct costs, this can be estimated at EUR 75.000 per year, given the standard budget for a meeting with 27 Member States experts of EUR 15.000 , and given that on average 5 meetings would be required per year, either by the board or the operational capacity, on tasks pertaining to pillars A and B (once every 2/3 years), pillar C1 (2/3 times per year), pillar C2 (once per year), pillar D (once every 2/3 years), pillar E (once every 2/3 years). In terms of human resources, the secretariat and coordination provided by the Commission would consist of 2 FTEs.

Regarding **monitoring, data gathering and risks assessment (**pillar C.1): additional capacity would be needed in the Commission to implement the tasks developed. The costs would relate to 17 FTEs for data gathering, monitoring and analysis (similar to HERA.2 Intelligence Gathering, Analysis and Innovation Unit), which in detail would mean 10 FTEs for market monitoring, drawing on expertise from JRC including links to the RMIS and existing agencies, so as to concentrate on mineral and metal raw materials, with 1 FTE dedicated to the management of studies and contracts, 1 FTE dedicated to access to data and building up the relevant dataset of information and 5 FTEs to ensure the coordination of information gathering from Member States and support the governance structure.

The coordination of **strategic stocks** (pillar C.2) would also require additional resources to analyse the state of strategic stocks as provided by Member States, coordinate actions (e.g. in the IEA working group) and provide guidance, when possible, which would be assessed at 3 FTEs and could be detached from national authorities in charge of stocks.

Regarding **exploration** (pillar D), the impact relates to coordination of Member States' submissions, which corresponds to 1 FTE per year.

On **waste legislation** (pillar F), this option would consist in business-as-usual policy development within the Commission.

The measures on **standards for the critical raw materials value chain** (pillar G) would have budgetary implications for the Commission. Coordination and planning of efforts to have for EU

[367] See Study concerning the preparation of the report on the application and effectiveness of the SEA Directive (Directive 2001/42/EC) - Publications Office of the EU (europa.eu), p. 14.

rules and principles to be reflected in international standards would require 1 FTE on a continuous basis.

Regarding **environmental footprint** (pillar H), this option would entail additional burden for the Commission, which would be responsible for assessing the suitability of different certification schemes and check them against the criteria, as well as monitor their continued compliance. This is expected to require 1 FTE per year.

In addition, the Commission would be responsible for coordinating the development and adopting the relevant calculation methods. This is expected to require 2 FTEs per year as well as costs associated with external studies to develop methods, procuring secondary datasets and consulting stakeholders.

9.1.21. Policy Option 2 – additional information on impacts

9.1.21.1. Impact on Member States

The mechanism set to determine **targets** for EU capacity and the dialogue and reporting that Member States would have to commit to can be considered as having no budgetary consequence on Member States, since they would only have to comply to it in the event that such targets are not met. Member States would however have to report on the state of CRM projects in general on their territories, which would amount to a regular cost of 1/4 FTE.

Regarding the **governance structure** (pillar C) and the sub-pillars on **monitoring, stockpiling and company risk preparedness**, the costs and benefits would be the same as in option 1.

On **exploration** (pillar D), the costs on Member States are more substantial as the option commits them to undergo further exploration programmes with a view to reinforce the knowledge and mapping of the EU's mineral resources. Since all Member States already have a body or team in charge of geological mapping, additional geological mapping should not incur extra costs. However, the development and implementation of wider mineral exploration programmes would require additional one-off costs, which would depend on the ambition of each MS. In total for all Member States, such cost could amount to EUR 82 million for aerial geophysical survey and EUR 80 million for geochemistry mapping survey, in addition to side costs (e.g., interpretation)[368].

Regarding **permitting** (pillar E.1), this option is expected to, in addition to option 1, result in limited additional costs for Member State authorities.[369]

Better coordination or integration of different types of assessments and permits can result in reduced burden. However, a reorganisation of the administration in some Member States may be

[368] Aerial geophysical survey (Mag. + Spec) for EU, assuming the coverage of half the EU (excluding the sedimentary basins) at 250 m spacing (and 10 €/kml) :EUR 82 M + 10% for designing, tendering, and managing the campaigns and sub-contractants + 10% for interpretation. (EUR 98,4 M)
The geochemistry mapping survey for EU assuming a 10 km2 sampling (covering half of the EU, including the analysis of metals and interpretation of the data) would need an investment of EUR 80 M +5% for tendering and managing the campaigns and sub-contractants. (EUR 84M)
FTE per MS: 1 unit of 10 FTEs for aerial geophysics (already operative in some MS) 1 unit of 10 FTEs for geochemical survey (also already operative in some MS) Data reprocessing and predictivity maps: 1 unit of 5 FTEs. Classification and reporting to the Commision: 1/2 FTE

[369] The assessment below is based on the assessment of similar measures in the impact assessment accompanying the 2012 proposal for revision of the EIA Directive – see footnote 93.

required and, in the short term, this may be costly. However, as this measure will avoid duplication of efforts at the various stages of the EIA process, it is expected to reduce administrative burden in the medium to long term.

Changes related to time-frames will shorten procedures but are not expected to increase administrative burden. The time-frame for public consultation on the environmental report does not entail any direct costs for public authorities. The proposed time limits for decision-making are based on time-frames that are often already achieved and aim mainly to prevent outliers and increase predictability of the process. In addition, time limits can in some cases provide incentives to public authorities to consolidate internal processes.

Mandatory scoping for Strategic Projects is expected to have no net effect on the burden for authorities. Although there are extra costs involved for MSs where scoping is not currently mandatory, those costs are likely to be offset by the fact that resulting reports would be of better quality and more focused. Thus, authorities would spend less time requesting further information to developers, reviewing lengthy reports and asking for successive modifications of these reports.

Efforts to allow documents to be submitted digitally and to make available a manual of procedures for developers of Strategic Projects will imply additional costs, especially in the short term, the amount of which will depend on the extent to which a Member State already takes these measures generally.

Regarding the **selection of strategic projects** (pillar E), Member States would participate in board meetings with the Commission to designate Strategic Projects. These meetings could occur bi-monthly and would need ½ FTE. This option however enables Member States to support projects in their territory with a European strategic dimension and access to the appropriate funding instrument, thereby creating added value on their territory.

The management expenses of the **fund** (pillar E.2) would be paid directly from the capital under management (usually, 1 to 2% are standard practice[370]). This would slightly reduce the effectiveness of the fund but would not require additional financial resources from the Member States, the Commission or the fund manager. The same holds for the costs of setting up the fund, which would directly be paid out from the fund's capital.

On **waste legislation** (pillar F), in addition to the effects described under option 1, this option would require Member States to transpose the amendments to the Extractive Waste Directive into national law, creating minor administrative costs that could be included in other ongoing revision processes. It would also require them to develop a national circularity strategy, which likely Requires 1 FTE per Member State to develop and implement.

The greatest additional burden for Member States consists in the obligations created under the Extractive Waste Directive. They would be required to create a database of all closed and abandoned waste sites, screen their available data on such sites and perform a geochemical campaign to complement this information. It is estimated that 3-4 FTE experts per Member State would be required to fulfil this obligation.

In the open public consultation, 68% of respondents agree or strongly agree that the Critical Raw Materials Act should require Member State to design waste management plans including specific measures to promote the recovery of critical raw materials, from historical mining waste. 78%

[370]https://www.investopedia.com/articles/investing/072115/private-equity-management-fees-regulation.asp#:~:text=Private%20equity%20funds%20have%20a,committed%20capital%20of%20the%20fund

agree or strongly agree that it should strengthen exploration and documentation of critical raw materials in secondary deposits and waste streams.

Regarding **environmental footprint** (pillar H), this option would entail roughly similar impacts as in option 1, with the only additional task being the need to check whether the declared footprints meet the thresholds where they are set.

9.1.21.2. Impacts on the Commission

Regarding the **governance structure** (pillar C), and the following sub-pillars on stockpiling and company risk preparedness, the costs are the same as in option 1. The monitoring and intelligence gathering and forecasting to support the assessment of critical and strategic raw materials will require additional 20 FTEs.

However, it is assessed that the new missions enabled by the **exploration** (pillar D) would require 1 additional FTE (comprised in the governance) to ensure the coordination of the new data compiled under this option.

Regarding the selection of **Strategic Projects** (pillar E), the Commission would need to send a representative to the board to determine the selection of Strategic Projects. Preserving the European angle would require more resources than the Member States, this would amount to 1 FTE (comprised in the governance). The assessment for projects would also fall on the Commission. However, it should be noted that the Commission is currently already assessing the usefulness of projects abroad, for example in its work on the Mineral Security Partnership. Hence, this obligation should not result in additional resource requirements

On **waste legislation** (pillar F), this option would require increased enforcement of the obligations under the Extractive Waste Directive (notably the database of closed extractive waste sites), performed by1 AD FTE continuously.

Regarding **standards for the critical raw materials value chain** (pillar G), this option would, in addition to option 1, have budgetary implications for the Commission. Promoting the development of technical standards regarding relevant industrial processes would require substantial additional resources, the estimation would be 1 FTE to prepare approximately 3 standardisation requests per year.

Regarding **environmental footprint** (pillar H), this option would, in addition to option 1, entail additional burden for the Commission to prepare performance classes and minimum thresholds.

9.1.22. Policy Option 3 – additional information on impacts

9.1.22.1. Impact on Member States

On **targets** (pillar B.) and on **exploration** (pillar D), the costs are the same as for option 2.

Regarding the **governance** aspects (pillar C) and the corresponding actions under sub-pillars C.1, C.2 and C.3, the indirect costs for Member States relate to their contribution to the EU budget to enable the creation of this operational structure.

Regarding **permitting** (pillar E.1), this option has the same impact as under option 2.

On **waste legislation** (pillar F), this option has the same impact as under option 2.

On **environmental footprint** (pillar H), this option would have the same impact as option 2.

9.1.22.2. Impacts on the Commission

The detailed costs of an operational capacity are already explained in chapter 6, with around 100 FTEs. In comparison, Japan's CRM agency JOGMEC has around 600 staff (2 groups on metals and minerals, 3 groups on oil, gas and geothermal energy and a horizontal stockpiling unit. The German Mineral Resources Agency (DERA) has 30 staff conducting market surveillance for raw materials. The International Energy Agency has around 6 FTEs working for its new Working Party on Critical Minerals (CMWP) and is in the process of expanding its staff numbers.

On **waste legislation** (pillar F), this option has the same impact as under option 2.

For **standards for the critical raw materials value chain** (pillar G), this option would have the same impact as option 1 and 2 combined.

For **environmental footprint** (pillar H), this option would have the same impact as option 2.

ANNEX 12: ESTIMATION OF INVESTMENT NEEDS

The estimation of investment needs in the context of the problem section is based largely on the Total Investment requirement for battery grade raw materials for batteries sold in the EU over the period 2022-2040 calculated by JRC. The JRC's calculation approach is set out here:

Methodology:

- The demand of refined **battery-grade raw** materials (i.e. products for use by cathode/anode makers) is computed on the end-use demand for batteries (sold batteries in the EU, **placed-on-the-market**) after considering production yields in the midstream stages of cell manufacturing and cathode/anode production. The supply deficit is derived after subtracting supply from the existing/operating installations in 2021.
- From the supply **deficits** calculated above, an **investment requirement** is calculated for new capacity of battery-grade raw materials. The cumulative investment requirement in a given year is defined as the sum between the previous years' requirement and the additional capacity units needed to be constructed in the current year. 2022 is set as the first year.
- Considering that the investment requirement for battery-grade raw materials can be mitigated by **EOL battery recycling**, the results also present the investment requirements after taking into account the expected supply of secondary raw materials.
- The 'investment requirement' could be interpreted as the **total investment needed for additional new supply to achieve self-sufficiency of battery-grade raw materials for end-use demand in the EU**. If investment requirement is plotted versus investments already in the pipeline, the difference will highlight the annual cost of new capacity required to be brought online to bring the market back into balance. Should the development of additional capacity be lagging, the reliance on primary supply of battery-grade raw materials will remain. The overall downstream self-sufficiency requires that cathode/anode capacity will be developed on time to treat refinery output, and that cell manufacturing capacity will be able to satisfy end-use market demand (so that all demand for battery sales could be satisfied by the EU cell producers).
- Only the **refining step** is considered in the analysis. Refineries are considered to have a greater potential for investing in additional capacity compared to the upstream supply segment of mining. Mining is excluded from the analysis; if it is included, it could be reflected by the CAPEX of the projects in the pipeline, as developing new projects and/or expanding existing mining capacity within the next years in the EU is constrained. As primary metal production capacity exceeds mining capacity, imports of mineral concentrates and intermediates would be needed to feed this additional refining capacity. Finally, investment requirements for battery cell manufacturing and anode/cathode production are excluded from the results.

Data on investments are coming from various sources:

  - Company announcements and feasibility studies
  - S&P database
  - Other sources, e.g. Roskill study for JRC (Ni)

Data on supply and demand are based on JRC internal forecast analysis, mostly from the battery model developed in 2021 for DG GROW. Table 5 displays data for demand

Table 5: Forecast of demand for battery-grade raw materials, latest update September 2021

	2020	**2021(f)**	**2025(f)**	**2030(f)**	**2035(f)**	**2040(f)**

Cobalt	32,000	37,000	69,500	92,500	116,000	124,500
Nickel	44,500	60,000	183,500	378,000	541,000	645,000
Graphite	63,500	85,500	233,000	489,000	743,000	930,500
Manganese	18,000	23,000	51,000	70,000	95,000	111,000
Lithium (LCE)	73,000	92,500	222,500	449,000	679,500	865,000

LCE = Lithium Carbonate Equivalent, NB: rounded values, Source: JRC

The initial CAPEX used in the calculations is defined as the median of the data sample collected (except for Ni, for which Roskill data are used). Table 6 shows the figures applied in the calculations:

Table 6: Initial CAPEX used for calculating investment needs

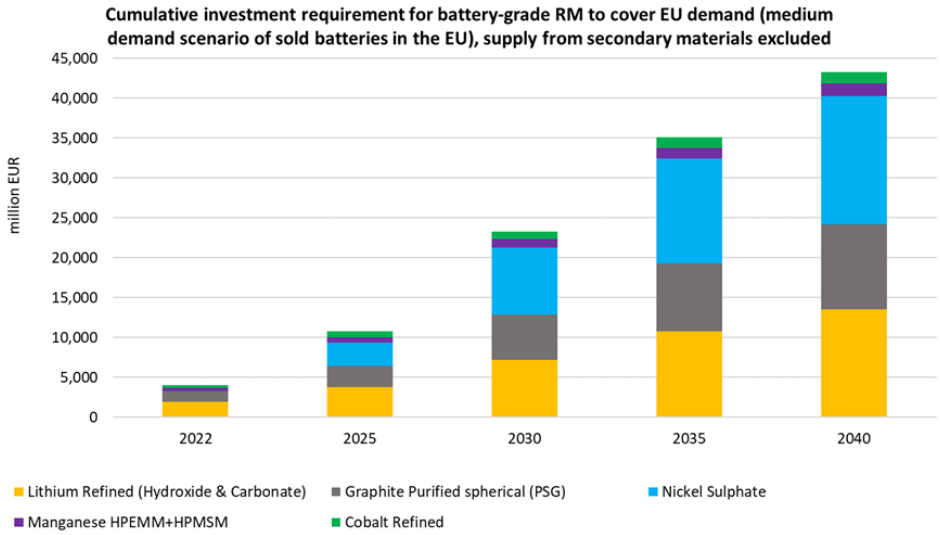
Material	**Product**	**Capital intensity (initial capital cost)**	**Unit**	**Plant type**	**Source**
Nickel	Ni Sulphate	28,500	EUR/t Ni	Greenfield	Roskill Ni study for JRC (2021)
Cobalt	Refined Co	13,000	EUR/t Co	Brownfield and Greenfield	JRC data compilation
Graphite	Purified spherical graphite (PSG)[371][1]	12,500	EUR/t PSG	Greenfield	JRC data compilation
Manganese	HP MSP[372][2]	15,000	EUR/t Mn	Greenfield	JRC data compilation
Lithium	Li carbonate and Li hydroxide	15,500-17,000[373][3]	EUR/t LCE[374][4]	Greenfield	JRC data compilation

Source: JRC

[371] Purified spherical graphite refined from natural graphite; data for spherical graphite not available
[372] HP EMM: High-Purity Electrolytic Manganese Metal; HP MSP: High-Purity Manganese Sulphate Monohydrate. Data for EMM (High Purity Electrolytic Manganese Metal) not available
[373] Production demand for Carbonate and Hydroxide is estimated in each year according to the battery chemistry forecast until 2040. The initial CAPEX is calculated accordingly, taking also into account the different feedstock material i.e. Li carbonate plants (processing Li concentrates): EUR 13,000/t LCE; Li hydroxide plants (processing Li concentrates):
[374] LCE = Lithium Carbonate Equivalent

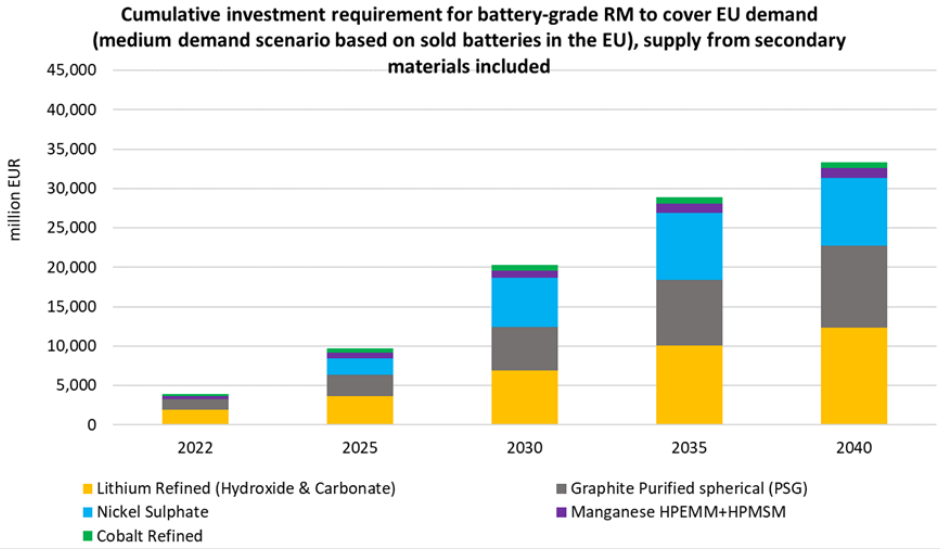
Results visible in the following figures:

Figure 14: Cumulative investment requirement for battery-grade raw materials from primary sources (supply from secondary raw materials excluded) for batteries sold in the EU



Source: JRC

Figure 15: Cumulative investment requirement for battery-grade raw materials from primary sources (supply from secondary raw materials considered) for batteries sold in the EU



Source: JRC

Notes

- the demand for production is derived from the consumption of batteries. Last data update in September 2021;
- the demand for production includes all other uses (not only batteries), while recycling is considered only for the battery sector;
- only the refining stage is represented in the graph, not the upstream investment for mining/exploration, nor investment for recycling capacity;

- for manganese: only Li-ion batteries are considered; LMO and primary batteries are excluded;
- for graphite: the demand considers the overall demand of graphite (i.e. natural and synthetic). The capital investment refers only to refined battery-grade graphite produced from natural graphite feedstock;
- for lithium: the initial capex considers a split between the future needs for lithium carbonate and lithium hydroxide (based on anticipated battery chemistries of batteries placed on the EU market);
- for nickel: existing supply in 2021 includes Class I Ni and Ni sulphate. It is noted that Class I supply is considered to be directed for conversion to sulphate. Availability is dependent on demand from other Class I consuming industries.

Final remarks

1. The investment requirements for lithium, nickel and graphite are much higher compared to cobalt and manganese until 2040.
2. Investment needs amount to almost EUR 10 billion already in 2025 (Figure 15), mainly on lithium, nickel and graphite. The most intense investment requirement for refined capacity of battery-grade RM from primary sources is in 2025-2030 (primarily for nickel, followed by lithium and graphite).