CIRAN

Triple Bottom Line policy recommendations for permitting, social model contract and ESG reporting

Deliverable 6.2

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Executive Summary

This report is written with the EU Policy-makers and Regulators in mind at both central and local-government level facing three major challenges: 1. a CRM Act now in law but with very limited knowledge or experience to date of the outcomes of the exercise of the law in the judicial process; 2. permitting the mining of Strategic/ Critical raw materials (S/CRMs) in protected area with a combined S/CRM list now totalling 53 minerals, using an untested, streamlined permitting cycle allowing at most twenty-seven months to complete; 3. most difficult, a very heterogenous, complex and seemingly expanding set of applicable Directives and Policies suffering from fragmentation, sometime conflicted regulations and inconsistent operating procedures. These regulations mask an undertow of a combination of hostility in some communities to any mining in protected areas, especially new mines, and resistance in some other areas to mining anywhere at all for anything.

On adoption into law of the CRMA May 2024, supply risks seemed to be the defining issue for successful delivery of the Act with streamlined permitting its reciprocal function to help secure weak or broken supply chains from EU-internal sources rather than further afield. During the first months of the second Trump administration, February to May 2025, defence has been catapulted to the top of the policy agenda and the whole S/CRM sourcing task has become more urgent and more complex. The economic drivers that originally focused close attention on CRMs have now been doubled with the addition of SRMs, resulting in increased supply risk, and potential tension between industrial and defence needs in terms of both raw and recyclable secondary raw materials. This will grow further if another scarce element joins the list.

2025 as a whole turned out to be a turbulent, even chaotic period dominated by tariffs, resource export controls and a major defence reset causing the task of reengineering supply- and value-chains for S/CRMs develop a life of its own. One result was that in the most recent 2026 EY annual risk survey of the mining and minerals sector[1] for the first time operational complexity has appeared on the list, entering in top place, a manifestation most likely of the "New Normal".

Our read on this "New Normal" state as not just a function of the defence reset but the reset of supply- and value chains in general, first included in drafting a part of this report in late March, was validated at two different consultation meetings during the year. These were attended by two different but highly experienced and knowledgeable panellists and participants in the field. First, a CIRAN consultation meeting May 15 in Lens hosted by ACOM and ALDA leadership brought together an expert cross-section of participants primarily from France. The second, a meeting November 12 in Brussels, hosted by the European Economic and Social Committee (EESC), assembled attendees from the CIRAN group of independent experts, the EC, EESC, a range of national officials together with representatives from OECD and Friends of the Earth. Both discussions, without the participants having had sight of our draft Report, displayed a high level of agreement with our analysis. Most encouraging was that the November session introduced some practical priorities to pursue such as drafting a standardised Social Resource Contract template with EC, OECD, FOE and other allied organisations, and formal engagement in participatory planning for new regional S/CRM projects at local level using already allocated regional development funds for financing them.

Another trend towards defining practical steps to pursue from 2026 was to propose combining the Supply Risk and Permitting streamlining agenda with the need for intensifying preparedness activities with increased investment in social capital to refresh capabilities and fill gaps in knowledge. Preparedness and digitisation, in particular the use of AI, are keys to efficient policymaking and delivery. This means investing time in anticipatory permitting, "in principle" approvals, reverse engineering of strategic planning, scenario gaming, rehearsing decision-making procedures for potentially urgent S/CRM projects before the need arise. The simple conclusion, on which there was increasing agreement from May to November, is that Europe is now

[1] The Annual EY risk survey of the mining and minerals sector is published during the last quarter of the previous year.

in a completely “New Normal” world. Regional autonomy and self-sufficiency, particularly in regard to strategic and critical minerals and their respective supply- and value-chains, are of the essence, together with insisting on the use of the CRMA “common Union framework” to protect the integrity of the single market. This CRMA framework will enable policy makers to ensure that fragmentation and delay in permitting was kept to a minimum or ideally in regard to critical and strategic materials where needed to apply the Imperative Reasons of Overriding Public Interest (IROPI) principle, enacted 1992 and still current.

This report sees a key point of intervention to avoid fragmentation and to reduce the permitting cycle time by up to 90% is planning ahead project permitting based on thorough preparation for applying the Habitats Directive IROPI approach. This gives the necessary space and authority to apply the “common Union framework”, but in a sensitive manner. Of course, that raises the corollary challenge of how to maintain a unified process when for so long permitting has been fragmented and tending in some areas to grower even more diversified. Fortunately, IROPI long predates the CRMA so the charge of opportunism cannot be raised against it. Unexpectedly, the numerous case studies of projects in or close sensitive areas, did not throw up any cases where IROPI was applied. This meant that permitting in reality is not as contentious and difficult in general as a few high-profile conflicted cases might suggest. But the use of IROPI will be a new skill to acquire as there is little current knowledge and experience how to do it.

A Nash Bargaining Solution is proposed to deliver a win/win out come to the main parties – central and local government, operators and investors. This enables parties not only to permit but also finance and manage projects in a way that balances the IROPI interest of central decision- and policymakers with local participatory investments, governance and equitable benefits or compensation. The Bargaining solution sits at the heart of a Social Resource Contract which is designed to facilitate CRMA delivery in the new normal conditions of the New Normal. How this can be done is explained in the body of this report. From a reporting and overall project performance perspective the use of Global Reporting Initiative (GRI) standards, in particular GRI Mineral Standard 14 which enters into use January 1, 2026, combined with Triple Bottom Line procedures, specific to the pilot portfolio proposed are designed in already to the concept.

The opportunity is open now to build a Bridge from Theory to Practice**:** a four part process to achieve this is outlined as follows:

i. taking first, practical steps in designing a small portfolio of Government financed S/CRM Pilot Projects within European borders to start assembling the necessary operational experience to build a blueprint for design, permitting and operation of S/CRM project delivery.

ii. applying full Triple Bottom Line customised versions of the Nash Bargaining Solution for symmetrical contract negotiation between Parties, and anchor policy green investment financing, combining social, environmental, and economic aspects in equilibrium, focused on both social capital development and the creation of innovative value chains. The outcome is a Social Resource.

iii. testing and refining this model Social Resource in an operational field framework, within a transparent governance framework.

iv. mobilising social capital investment i.e. training people in processing S/CRMs, optimising their use and innovating ways to relieve supply- dependent companies from their high dependence from third countries. A combination of increasing resource use efficiency by 200-300%, imaginative substitutions of methods as well as materials and discovery of alternative pathways can reveal hitherto undiscovered options for feedstock alternatives sourced within Europe’s borders and reduce the risk from resource weaponisation. These measures can be complemented by new approaches offered by AI to refresh exploration and mining geology, extraction efficiency, mirrored by demand-side disciplines such as “thrifting” and life cycle use extension for goods made with high supply risk materials.

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Acronyms

AA – Appropriate Assessment

ACOM - L'Association des Communes Minères de France

AI – Artificial Intelligence

ALDA – European Association for Local Democracy

CBA – Community Benefit Agreement

CCSU - Carbon capture storage and utilization

CDA – Community Development Agreement

CE – Circular Economy

CIRAN - CrItical RAw materials extraction in eNvironmentally protected areas

COVID19 – Coronavirus Disease 2019

CRM – Critical Raw Material

CRMA - Critical Raw Materials Act

CSRD - Corporate Sustainability Reporting Directive

D – Deliverable

DG – Directorate General

EC – European Commission

ECOSOC – United Nations Economic and Social Council

EESC – European Economic and Social Committee

EIA – Environmental Impact Assessment

EMMP – Environmental Management and Monitoring Plan

EOL – End of Life

ESG – Environmental, Social, Governance

E&P - Exploration and Production

ESIA – Environmental and Social Impact Assessment

EV(s) - Electric Vehicle(s)

EU – European Union

EY – Ernst & Young Consultants (mining and minerals risks)

GRI – Global Reporting Initiative

HACCP – Hazard Analysis and Critical Control Points

HAD - Habitats Directive Assessment

ICMM – International Council on Mining and Metals

IROPI - Imperative Reasons of Overriding Public Interest

JNCC - Joint Nature Conservation Committee

LOP(s) – Layer(s) of Protection

Km - Kilometre

ML - Machine Learning

MS – Member States

NATO – North Atlantic Treaty Organisation

NIMBY – Not In My Back Yard

OPI - Overriding Public Interest

PA(s) – Protected Area(s)

PPP - Public Private Partnership

REE(s) – Rare Earth Element(s)

ROI – Return on Investment

ROP – Return on Policy

S/CRM – Strategic and Critical Raw Materials

SDG – Sustainable Development Goals

SEA – Strategic Environmental Assessment

SDR - Sustainable Disclosure Requirements

SFDR - Sustainable Finance Disclosure Regulation

SLO – Social Licence to Operate

SME – Subject Matter Expert(s)

SME(s) – Small and Medium Enterprise(s)

SR – Supply Risk

SRC – Social Resource Contract

SRM – Strategic Raw Materials

SRM – Secondary Resource Materials

TBL – Triple Bottom Line

UN – United Nations

UNCTAD – United Nations

UNFC – United Nations Framework Classification

UNRMS – United Nations Resource Management System

UNTP – United Nations Transparency Protocol

OPI - Overriding Public Interest

WFD – Waste Framework Directive

WFD - Water Framework Directive

WP – Work Package

1 Introduction

1.1 The EU Critical Raw Materials Act – Principles and Drivers

The drafting of the Critical Raw Materials Act (CRMA) was completed by late 2023 and came into force May 23, 2024. This major pivot in EU economic and social policy is very recent and era-defining, as evident from the language that accompanied the ratification of the CRMA, May 23, 2024:

> Critical Raw Materials are indispensable for the EU economy and a wide set of necessary technologies for strategic sectors such as renewable energy, digital, aerospace and defence. The Critical Raw Materials Act (CRM Act) will ensure EU access to a secure and sustainable supply of critical raw materials, enabling Europe to meet its 2030 climate and digital objectives.[2]

The defining principles of the EU Critical Raw Materials Act (CRMA)[3] are to:

- establish a framework for the secure, resilient, and sustainable supply of critical raw materials within [but also into] the EU,
- strengthen domestic value chains,
- diversify import sources,
- improve circularity.

1.2 CIRAN in Context of the Critical Raw Materials Act

The topic at the centre of the CIRAN Project is addressing different aspects of Critical Raw Materials (CRM) extraction in environmentally protected areas. Should it be permitted at all[4], and if so, under what conditions? Given how radically industrial, energy transition and defence policies and financial allocations have changed even since the CRMA was taken into law,[5] making it possible that granting a permit to mine under the principle of Imperative Reasons of Overriding Public Interest (IROPI) under the 1992 Habitats Directive will become common. The CRMA recitals set the framework for this:

> Given the key role of many such critical raw materials in realising the green and digital transitions and in light of their use for defence and aerospace applications demand is likely to increase exponentially in the coming decades. (CRMA Recitals §1).

> Moreover, critical raw materials are needed at the beginning of many industrial value chains and are often indispensable inputs for a wide set of strategic sectors including renewable energy, the digital industry, and the aerospace and defence sectors. They therefore play an essential role in underpinning economic activities in the internal market, and supply disruptions could have a significant cross-border impact between Member States (MS) (CRMA Recitals §12).

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[2] See https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/critical-raw-materials-act_en#:~:text=The%20Critical%20Raw%20Material%20Act,foresight%20study%20on%20raw%20materials%20.

[3] UN Department of Economic and Social Affairs (ECOSOC), Sustainable Development The list of Critical Raw Materials for the EU, 2017 (linked to the Renewed EU Industrial Policy Strategy). https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/critical-raw-materials-act_en.

[4] The series of case studies assembled in WP2 [citation] shows how common it is to find successful mining projects in protected or sensitive areas. Prevailingly, therefore the HOW question is what dominates. Nevertheless, the IF question has to set a high bar most obviously for the defining EIA which decides whether or not to permit the first (greenfield) project. Not surprisingly industry much prefers working with brownfield sites where the chances of streamlined permitting are high.

[5] See Wolfgang Münch, DG Regio, Oral Statement, CIRAN Consultation Meeting Nov. 12, 2025.

> The list of strategic raw materials should contain raw materials that are of high strategic importance for the functioning of the internal market, taking into account their use in strategic technologies underpinning the green and digital transitions or for defence or aerospace applications, that are characterised by a potentially significant gap between global supply and projected demand, and for which an increase in production is relatively difficult, for instance due to long lead-times for new projects increasing supply capacity[6] (CRMA Recitals §6).

EU Strategic autonomy

There are two references to strategic autonomy. First:

> To safeguard the functioning of the internal market, a "common Union framework" should therefore be created to ensure access to a secure and sustainable supply of critical raw materials and to safeguard the Union's economic resilience and open strategic autonomy (CRMA Recitals §4)[7].

The stated goal is the "common Union framework" – see the emphasis on use of unified democratic principles and values in the sections dedicated to the Social Resource Contract.[8] Second:

> Given their role in ensuring the Union's security of supply for strategic raw materials, and their contribution to the Union's open strategic autonomy and the green and digital transition, Strategic Projects should be considered, by the permitting authority responsible, to be in the public interest. (CRMA Recital §27).[9]

EU Regional development

The CRMA has two references to regional development, both related to existing funds which can be applied to delivering the CRMA. There is no mention of use of S/CRMs for regional development, but use of existing regional funds for CRMA is clearly flagged:

> The relevant funds comprise cohesion policy programmes, such as the European Regional Development Fund established by Regulation (EU) 2021/1058 of the European Parliament and of the Council[10], whose allocation of grants to promote regional cohesion may enable SMEs to develop innovative projects, for instance linked to the reduction of energy consumption in the processing of raw materials. The Just Transition Fund established by Regulation (EU) 2021/1056 of the European Parliament and of the Council[11] could also be used to support such type of projects to the extent that they contribute to reducing the social and economic costs brought by the green transition.

1.3 The Evolving CRM List 2017 – 2025

The nature of these baseline changes may be documented in two complementary ways: the first, by an analysis of the changes in the CRM Lists of 2017 to 2020 and 2020 to 2023. The second by applying the EY

[6] See Recitals CRMA §2.

[7] See Recitals CRMA §4.

[8] The Social Resource Contract is referenced in CIRAN Deliverable 6.1 Section 2.2 in relation to the means of negotiating "sufficiency" agreements to moderate demand side pressure on S/CRMs, so setting an equitable Public Good framework for balancing demand-side and supply-side risk by negotiation. See section on Nash Bargaining Solution in this Report.

[9] See Recitals CRMA §27.)

[10] Regulation (EU) 2021/1058 of the European Parliament and of the Council of 24 June 2021 on the European Regional Development Fund and on the Cohesion Fund (OJ L 231, 30.6.2021, p. 60).

[11] Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund (OJ L 231, 30.6.2021, p. 1).

risk assessments of 2025[12] and 2026[13] to show just how wide is the gap between the listing world of the S/CRMs and the on and in the ground realities of EY's list infographics for two consecutive years – 2025 and 2026.

The CRM and SRM Listing Process

Annex 1 Section 1 of the CRM List covers strategic raw materials. A consequence is that the 2023 CRM list now also includes these materials as well, posing some not fully resolved challenges in the logic and structure of the combined CRM/ SRM list. This uncertainty is already evident in the order in which SRMs are dealt with. CRMs are the default raw materials on the CRM lists it might be expected that they would be listed first. But they are not, and actually they appear first in Annex 2. And while a definition of what is meant by strategic and to what applications the term applies, the CRMA itself does not define Criticality, and the general context for the term is not a particular, essential use, but overall economic benefit.

EY Chart of Risks to Mining and Processing Investments 2025

The top 10 issues associated with risk factors in the mining and mineral sector are surveyed, analysed and ranked by the consulting firm EY on an annual basis in the autumn of the year before. The report centres on an analysis of trends and underlying change drivers which are expected to dominate the coming year (see Figure 1).

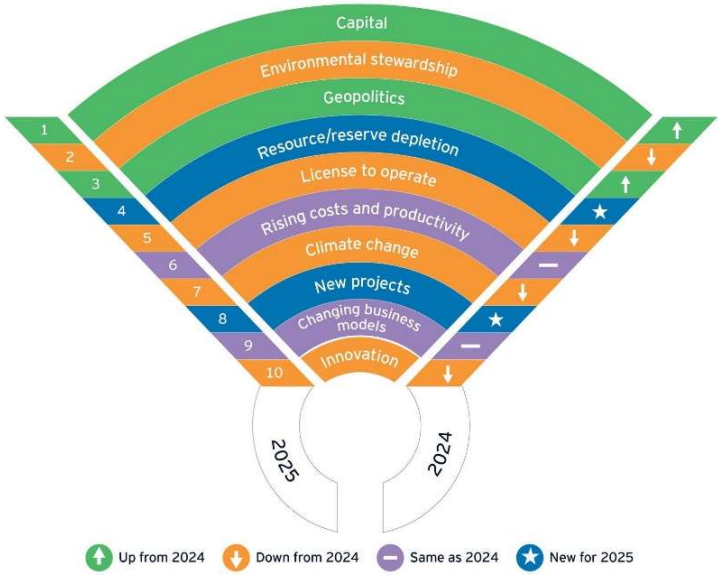

Fig. 1. Opportunities and Risks – Mining and Metals – 2024-25[15].

In this instance the trends picked up in 2024, the year when the CRMA is taken into law, are expected to dominate throughout 2025. The 3 top issues that were supposed to dominate, capital, environmental stewardship and geopolitics. These are fundamentally aligned with TBL and ESG metrics (financial, environmental and socio-political) and still reflecting the 3 TBL metrics, economic, environmental and social, but with a new set of labels.

In the transition from 2024 to 2025 as shown in Figure 1 there are two uprated risks, concerning capital availability and allocation (risk on the chart no. 1) at a time of high uncertainty and risk of resource weaponisation (risk no. 3 Geopolitics and two new risks no.4 resource depletion, another way to describe resource supply risk or criticality and no.8 New projects. New projects in retrospect reads more like wishful thinking than an oversupply of new projects. The previously dominant drivers Environmental Stewardship,

[12] See Top 10 business risks and opportunities for mining and metals in 2025
[13] See Top 10 business risks and opportunities for mining and metals in 2026
EY https://www.ey.com/en_gl/insights/mining-metals/risks-opportunities#:~:text=In%20brief:,fragmented%2C%20yielding%20only%20incremental%20gains.

Licence to operate, Climate change and Innovation fall back while rising costs and productivity and changing business models stay in their same place on the radar.

EY 2025 and 2026: Operational Complexity

In reality, within days of Donald Trump re-entering office in late January 2025, the 2025 EY risk chart had already been turned upside down and a completely new lead risk, Operational Complexity, was already bursting through to the top. Operational Complexity may be understood as follows:

> Operational Complexity describes the inherent difficulty and interconnectedness of managing a business's daily activities, particularly when accounting for global supply chains, varied regulatory environments, and diverse stakeholder expectations. In sustainability, this complexity increases significantly due to the need to track environmental and social impacts across numerous geographic locations and transactional layers. It represents the difficulty of achieving transparency and control in sprawling systems effectively.[14]

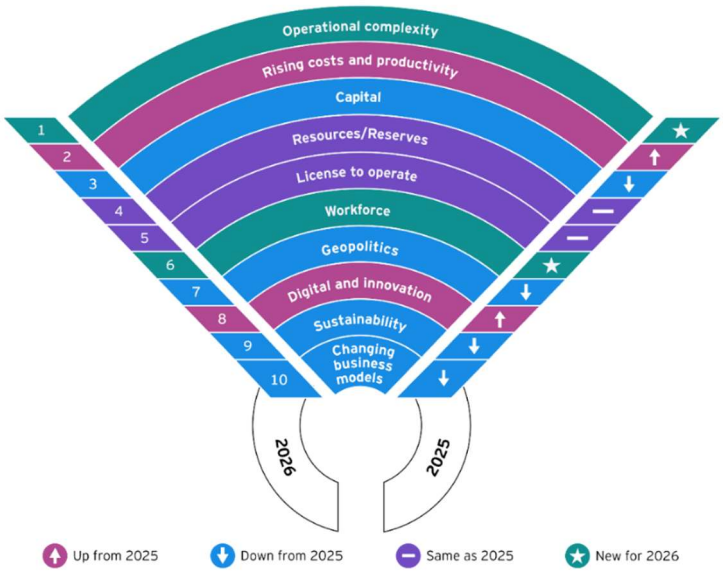

Fig. 2. Opportunities and Risks – Mining and Metals – 2025-26 Transition.

The changed picture released by EY in November 2025 (Figure 2) but in actual fact the dominant factor nearly all 2025 was the same as for 2026, Operational Complexity. Operational Complexity is completely new to the risk table and enters in top place. All the uncertainties of rolling out the CRMA so quickly coalesced into complexity, mirroring the inherent tension between what Brussels saw as the way forward in delivering security of S/CRM supply and many of the outlying and indigenous local communities far away from Brussels. Rising costs (risk no. 2) have moved above capital, and digital and innovation have moved up to no.8. causing scarcity of skilled labour in the CRMs and concerns about the work force no.6. Such seismic changes serve to underline how difficult in practice it is likely to be to implement new or expanded S/CRMs at scale and speed in the coming 2-3 years.

More positively from a change management point of view, in terms of stakeholder engagement and the social resource contract, EY's model of 2026 is well-suited to retooling via digital and innovation investments but also dealing with the worsening delays in the permitting situation. The situation summary from a commercial point of view is as follows:

[14] See ESG Sustainability Directory, https://esg.sustainability-directory.com/area/operational-complexity/resource/5/

Capital allocation definitively shifts toward future-facing minerals and growth strategies. Companies are increasing capital expenditure and reducing shareholder returns in the ongoing shift toward growth-focused strategies. The industry continues to favour brownfield over greenfield exploration, reflecting longer development cycles hampered by regulation, sustainability and permitting. Miners are exploring joint ventures (JVs) and partnerships to create long-term value while retaining cash to capitalize on opportunities.[15]

1.4 Protected Areas in the EU and UK

CIRAN has established that 85% of all available S/CRMs in the EU and western Europe are located in or within 5km of Protected Areas.[16]

Fig. 3. Natura 2000 Protected Areas EU[17].

[15] For the EY prediction of challenges and opportunities for mining and minerals in 2026 see https://www.ey.com/content/dam/ey-unified-site/ey-com/en-gl/insights/mining-metals/documents/ey-gl-top-ten-business-risks-and-opportunities-10-2025.pdf

[16] Ovaskainen, N., Luodes, N., Eerola, T., Marasmi, C., (2024). Sensitivity maps of potential conflicts over natural resources usage. Deliverable 3.2 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project. Grant Agreement No. 101091483 of the European Union's Horizon Europe research and innovation programme.

[17] For Natura 2000 Map see https://natura2000.eea.europa.eu/

The EU has the largest coordinated network of protected areas in the world, known as Natura 2000, consisting of around 27 000 terrestrial and marine sites protected under the Habitats Directive[18] and the Birds Directive[19] (known as "the Nature Directives").

In addition, EU Member States have protected large portions of their territory under national protection schemes. In 2021, around 1.1 million km² of the EU Member States' land area was designated for the preservation of biodiversity as Natura 2000 sites or nationally protected sites. This represents over a quarter (26%) of the total EU land area (Figure 3).

As of March 2024, nearly 28% of the UK's land area has some form of protected status, totalling approximately 6.8 million hectares (see Figure 4).

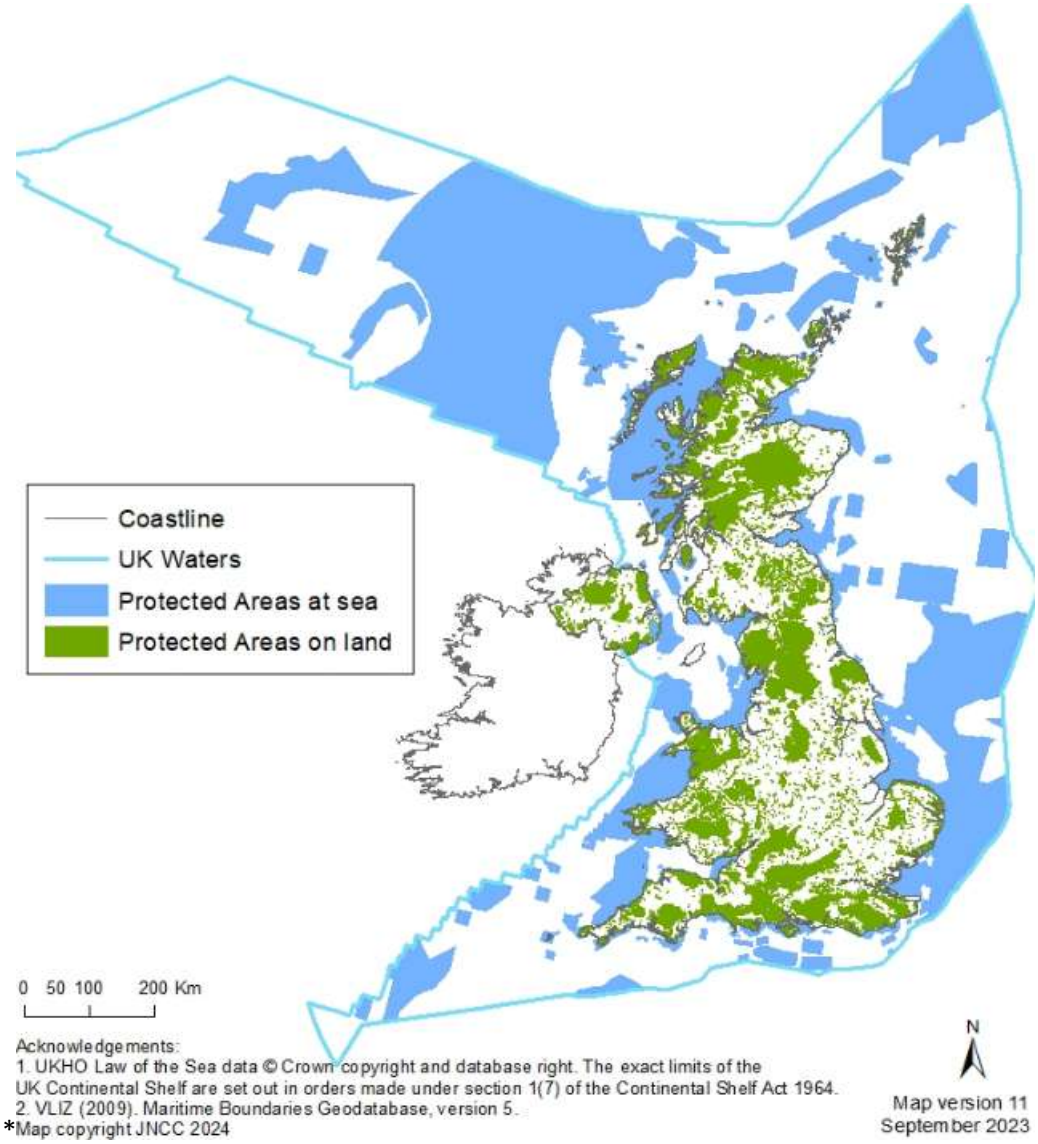

Fig. 4. Protected areas UK – Sea and Land[20].

[18] The Habitats Directive - 92/43 - EN - Habitats Directive - EUR-Lex

[19] The Birds Directive - 79/409 - EN - EUR-Lex

[20] See UK Joint Nature Conservation Committee (JNCC), https://jncc.gov.uk/our-work/marine-protected-area-mapper/

According to a 2022 British Ecological Society report (Figure 5)[21] however, this figure of 28% Protected Area can be very misleading as their research suggests the proportion of land effectively protected for nature could be as low as 5%.

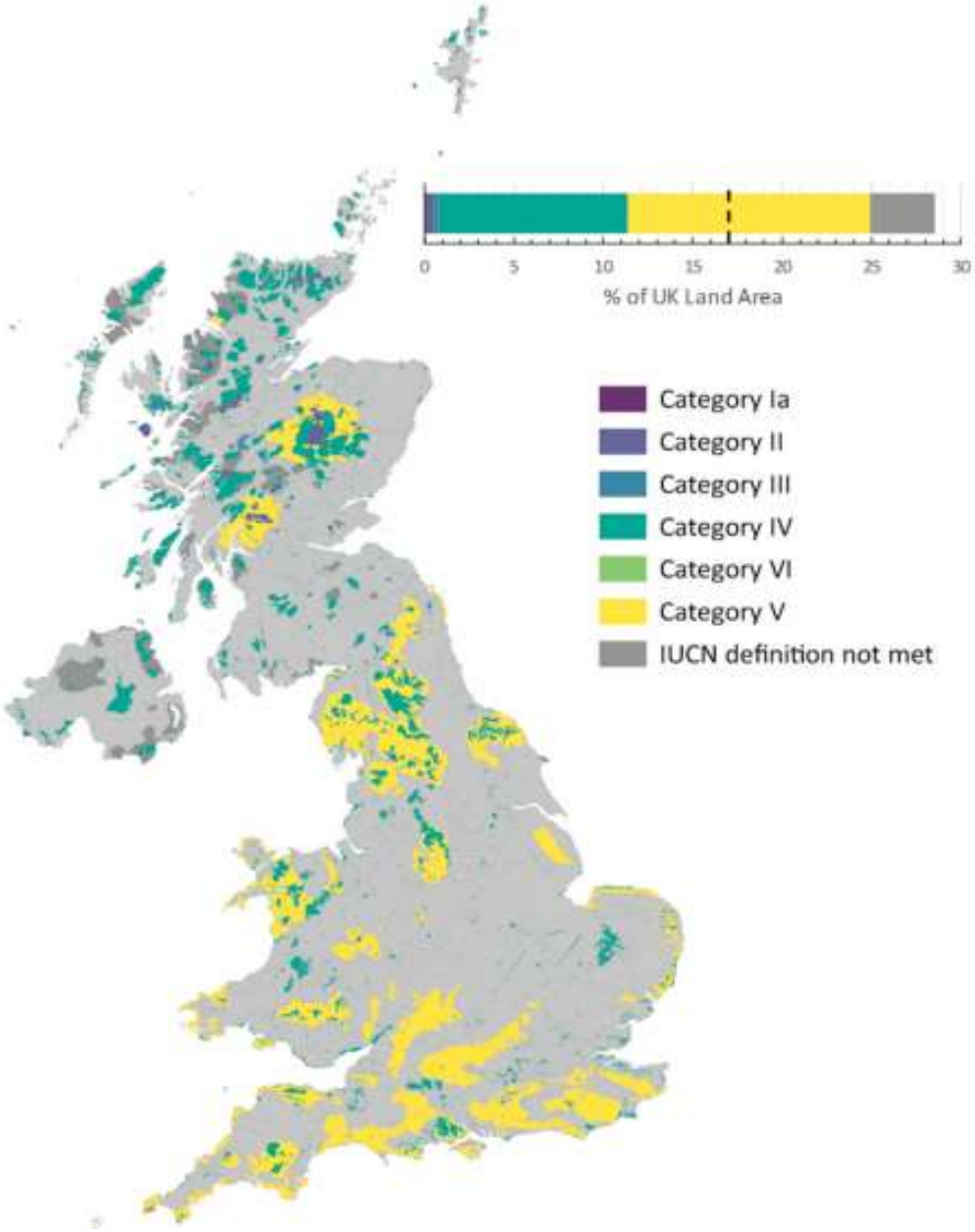

Fig. 5. UK Protected Areas by Category[21]

Many designated areas, such as National Parks, do not prioritise biodiversity and are not in favourable ecological condition. For comparison, in Finland the primary purpose of national parks, according to Metsähallitus (the government agency responsible for managing them), is to safeguard biodiversity.[22]

[21] Thomas Starnes, Alison E. Beresford, Graeme M. Buchanan, Matthew Lewis, Adrian Hughes, Richard D. Gregory, The extent and effectiveness of protected areas in the UK – Science Direct Global Ecology and Conservation, Volume 30, October 2021, e01745

[22] Thanks to Nike Luodes for this observation, 27 October 2025, see Kansallispuistot ovat luontoaarteitamme | Metsähallitus.

1.4.1 Categories of Protection

Protected areas in the UK and EU primarily follow the International Union for Conservation of Nature[23] (IUCN) categories but also include specific UK national designations such as National Parks, Areas of Outstanding Natural Beauty, Sites of Special Scientific Interest, and Marine Conservation Zones, alongside the EU-designated Special Protection Areas (SPAs) and Special Areas of Conservation (SACs), which form the Natura 2000 network (see Figure 6 for categories).

Designated sites in the UK with IUCN categories (Figure 5) are assigned by colour following Crofts et al. (2014)[24] and Underwood et al. (2014).[25] Dark grey areas indicate sites recorded in the WDPA (World Database of Protected Areas) but with designations assessed as not meeting the IUCN definition of a protected area. Where overlapping designations with different IUCN categories exist, the 'highest' category is shown, with categories ordered Ia ('highest'), II, III, IV, VI, V ('lowest').

An equivalent evaluation of the effectiveness of the protection measures across the EU would be an obvious candidate for a research project in itself and might, longer-term, help with the streamlining requirements of the CRMA and equivalent decision-making in UK.

1.4.2 Attributes of Protected Areas

Generic attributes of Environmentally Protected Areas[26] include:

- *Protected status* - established and assured by legal frameworks, derived from national or international policies, or other effective methods to ensure long-term protection e.g. ownership and joint management of trust funds, by charitable or philanthropic organisations, or other trusts.
- *Primary purpose of protection* – nature conservation, protecting biodiversity, e.g. species, habitats, rare of endangered flora, unique geological features, outstanding natural beauty.
- *Long-term goal* - ensuring the area's natural features remain healthy for present and future generations.
- *Associated values* - conserve related ecosystem services (e.g. water and carbon storage) cultural values e.g. mining history.
- *Ownership and management* – legally protected or equivalent regulatory means for safeguarding the primary purpose.
- *Clearly demarcated space with recognised boundaries* - whether on land, sea, or water.
- *Varying levels of human access allowed* - some forbid or have strict limitations on human activity, others allow for specific practices, recreation, and tourism, depending on classification category (see Figure 5).

The dilemma now facing Europe is caused by the need to reverse the relative decline of mining of any material which necessarily impact S/CRM mining in particular to secure Europe's supplies of S/CRMs. At present Europe is highly dependent on imports.

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[23] For the International Union for Conservation of Nature (IUCN) see https://iucn.org/our-union

[24] Crofts et al., 2014 Crofts, R., Dudley, N., Mahon, C., Partington, R., Phillips, A., Pritchard, S., Stolton, S., 2014. Putting Nature on the Map: A Report and Recommendations on the Use of the IUCN System of Protected Area Categorisation in the UK. IUCN National Committee UK.

[25] Underwood et al., 2014 Underwood, E., Ashcroft, R., Kettunen, M., McConville, A., Tucker, G., 2014 Protected area approaches in the EU. Institute for European Environmental Policy Lond. /Bruss.

[26] Aleff Group Edited version of https://www.google.com/search?q=generic+attributes+protected+areas&rlz=1C1CHBF_en-GBGB973GB973&oq=generic+attributes+protected+areas&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIHCAEQIRigAdIBCTE0MjI2ajBqN6gCCLACAQ&sourceid=chrome&ie=UTF-8.

CRM targets for the EU supply chain focus on achieving strategic autonomy for **Critical Raw Materials (CRMs)**, driven by the EU's Critical Raw Materials Act (CRMA), aiming for 10% EU extraction, 40% processing, and 25% recycling by 2030 to secure inputs for green/digital tech, reduce import reliance, and build resilient, sustainable supply chains through diversified sourcing, domestic capacity, and circularity.[27]

The purpose of this part of the CIRAN project is to balance the economic, environmental and social demands of Europe in the light of the new context within which mineral resources are being mined, processed and used such that an acceptable basis is found for implementing the CRMA successfully. These demands are now urgent, to the point of criticality.

1.5 Adapting Permitting to New Demands

After attending the CIRAN Consultation, November 12, 2025, in an email comment to CIRAN, Wolfgang Munch highlighted the territorial dimension: […] mining, refining and recycling fundamentally reshape local economies and therefore require strategic tools similar to those of the Just Transition Fund—not to phase out, but to "phase in" mining in a strategic, participatory way. He stressed that “mining alone will not ensure resilience; Europe also needs technology, innovation, circularity and full value chains, as well as reforms to reduce bureaucratic delays in permitting that are often rooted in Member State implementation rather than EU law itself”. He noted that large public investments in Europe still take over 20 years from idea to implementation, which is incompatible with the urgency of today's strategic challenges.[28]

With that compelling summary in mind of what needs to be demonstrated as the outcome of the CRMA in general and the related policy framework in particular for the highest bar example for a permit to be granted, the pathway is clearly set “to phase in mining in a strategic, participatory way”. This pathway requires/ anticipates a targeted reindustrialisation of Europe which can be anchored in those areas where mining and processing has long been present – in some cases to the Bronze Age. For example the tungsten/tin/copper mines in South-West England or the highly varied mining activities if the Ore Mountains in Eastern Germany.

Criteria for Designating Strategic Projects

Article 6 of the CRMA sets out the high-level criteria for the designation of Strategic Projects at the EU level, to which the UK through the Tungsten West, Hemerdon Mine project is now affiliated. These are projects that:

- Would make a meaningful contribution to the security of the Union’s security of supply of SRM…
- Are or will become technically feasible within a reasonable timeframe and in which there is [a] sufficient level of confidence in the expected production volume…
- Can be implemented sustainably.

Tungsten West meets all three criteria (see Figures 6 and 7).[29]

[27] See https://www.consilium.europa.eu/en/infographics/critical-raw-materials/#:~:text=An%20EU%20critical%20raw%20materials,and%20the%20development%20of%20substitutes
[28] Wolfgang Munch email November 17 to Vitor Correia CIRAN Coordinator
[29] Hemerdon Tungsten Mine, Tungsten West – see https://www.tungstenwest.com/

Predicted impacts on relevant ecological receptor sites

There are three European Habitats Directive sites within 10km of the installation:

- **Dartmoor SAC UK0012929** (approx **4.0 km** from the installation)
- **South Dartmoor Woods SAC UK0012749** (approx **5.4** km from the installation)
- **Plymouth Sound & Estuaries SAC UK0013111** (approx **8.5 km** from the installation)

There are no SSSI sites within 2km of the installation.

There are several Local Wildlife Sites (LWS) without statutory designation within 2km of the installation.

Fig. 6. The Permitting Process – Distance from Hemerdon to Protected Areas.

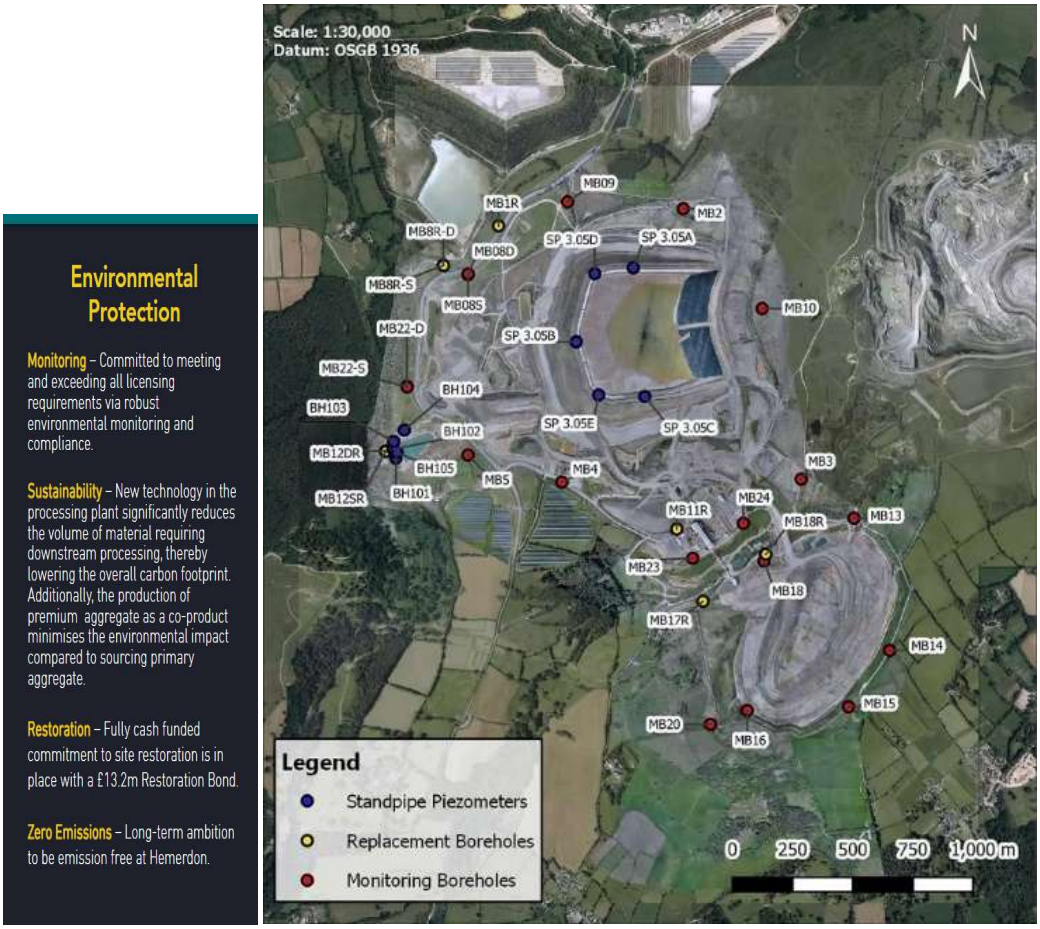

Fig.7. Hemerdon Tungsten Mine – close to three Protected Areas.

The target minerals of the Hemerdon mine are tungsten tin and copper which are either Critical or Strategic or both. The degree of social acceptance of mining in general is varied across Europe from the very negative to the very positive. There is a strong positive correlation between areas with long histories of mining activities of economic and cultural benefit to the communities that live in or near them. Many of these are in or close to protected areas all over Europe are some a designated UNESCO cultural heritage sites. Communities which are potentially new to mining or who have had bad experiences in the past resulting in

long-lasting negative externalities are understandably resistant. The situation is not risk/benefit but risk/risk in nature, see Figure 8:

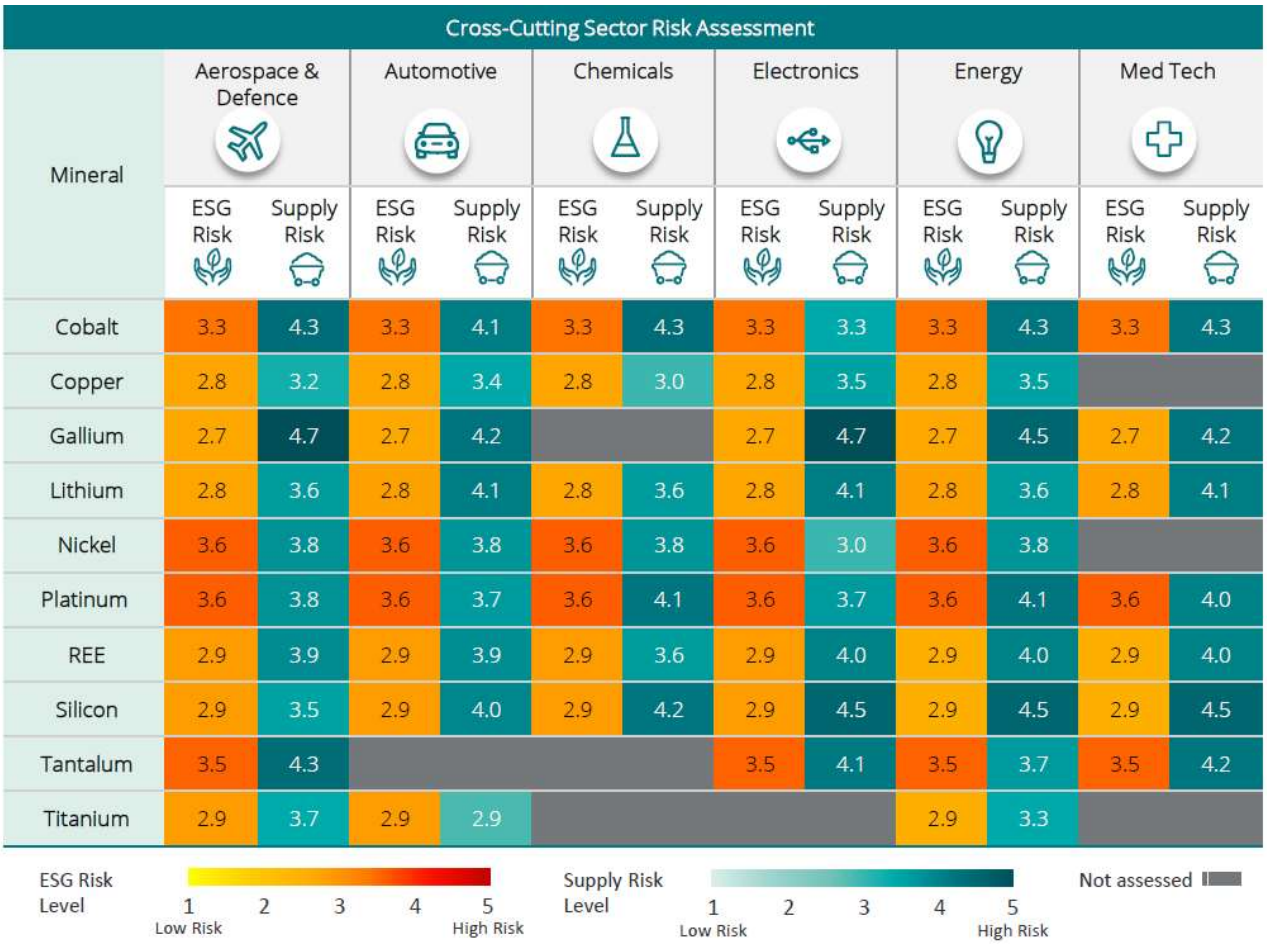

Fig. 8. Cross-cutting sector risk assessment[30].

The above table shows both economic and environmental risk and the relative criticality for both aspects for the availability of CRMs in regard to the economy and the risks of supplying these materials to the habitats where they are found.

[30] Task and Finish Group, Industry Resilience for Critical Minerals, An analysis of sector risks and recommendations for the UK's supply chain resilience, 19 December 2023 https://assets.publishing.service.gov.uk/media/65c9f85ccc433b0011a90bd0/the-task-_-finish-group-report-on-industry-resilience-for-critical-minerals-feb-2024.pdf

2 The Triple Bottom Line

This report has taken into account the need to reset the Triple Bottom Line (TBL) of combined environmental, social and financial factors on equal terms. The new situation requiring the TBL to be reset is driven by the need to accommodate TBL thinking and metrics to include the special status of S/CRMs which now have a unique role in socio-economic and environmental policy in particular connected with Protected areas. The purpose is to set out how the CRMA can be delivered while respecting the priority to streamline permitting of S/CRMs in no longer than 27 months.

It is hard to overstate the depth of the impact of the world-changing report of the 1987 Brundtland Commission, published formally under the title Our Common Future,[31] in which the concept of Sustainability was put at the centre of global social policy making. In response, from an annual performance reporting perspective John Elkington's 1994 article Towards the Sustainable Corporation[32] advocated that in deference to the Brundtland Report businesses should change their practice of calling their annual financial performance in one-dimensional terms as "The Bottom Line" and substitute instead a "Triple Bottom Line" (TBL) approach. Elkington argued that social and environmental factors were equally important and not only greatly enriched the narrative of a business's achievement and its related contributions to society and the environment, but it tended to correlate with enhancing the company's purely financial achievements at the same time.

By 1997 what the TBL meant in practice was set out in the title of Elkington's book Cannibals with Forks: The Triple Bottom Line of 21st Century Business. A sustainable business should focus on People, Planet and Profits giving equal weight to each. This made clear that there was no inherent contradiction between a sustainable business and a profitable business: a sustainable business could expect to measure its performance equally between social, environmental and financial factors. The challenge he set for business was much tougher than paying lip-service to social and environmental factors before getting back to real business. Elkington argued that performance in all three parts of the bottom line were of equal value and significance and that corporate reporting should follow suit, for example in the categories of reporting in the Annual Report to shareholders and markets. The challenge was taken up rapidly and while the TBL triad has been modulated in various ways in the thirty years since, the underlying concept has proven a very robust, but also adaptable model, and one that is particularly well suited to enhancing the reputational capital of the extractives industries in general and mining and metals in particular.

In the way Brundtland sets out the deep interaction in the evolution of sustainability between technology and society it is clear that this is likely to have moments of generational transformation. With the social and economic impact of AI now becoming defining for the new generation, it would be consistent with the Brundtland social development model to see that as the new fundamental development dynamic.

2.1 Changing technology and society - the Brundtland model

The new digital tools, which bring with them the demand for new materials required to make and power them, are decisively recasting the terms of the new social contract between the prevailing technologies of the time and society are clearly to a significant extent AI driven and facilitated. This holds out the prospect of a much finer and more sensitive approach to protecting the HOW of implementing S/CRM projects in protected areas.

[31] See Report of the World Commission on Environment and Development: Our Common Future, published as Gro Harland Brundtland, Our Common Future, Oxford 1987

[32] Elkington, J. (1994). Towards the Sustainable Corporation: Win-Win-Win Business Strategies for Sustainable Development. *California Management Review, 36*(2), 90–100. https:// doi.org/10.2307/41165746

One efficient way to do this is to accompany each project permit with a continuous Environmental Management and Monitoring Plan powered by AI using blockchain or similar technology to implement the smart features of the Social Resource Contract.

2.1.1 Intergenerational Justice

A generational cycle on from Brundtland, 1987, the new generation is looking for new perspectives, free as far as possible from uninvited negative externalities. This means modern, more stable and equitable rights of access to, and benefits from, the strategic and critical raw materials, and derivative products and services, now in focus both in and between the European democratic states.

The objective of the SRC, starting with a small portfolio of complementary S/CRM projects is to reach along the supply- and value-chains both within and beyond Europe to apply the same rights and benefits to all stakeholders in these new relationships. This way, there is a participatory way to rectify the numerous externalities associated with the conventional commoditised linear mineral economy, as set out so clearly in the 18 Recommendations of the May 2021 Policy Brie, referenced elsewhere in this report. The contractually binding outcome desired is to transform negative externalities into positive internalities, as modelled by Nash[33] and articulated as the Triple Bottom Line by Etherington and to take on a more contractual approach to protecting the rights of future generations, not just our own, through applying the principles of Intergenerational Justice[34] as part of the Public Good commitment of the SRC.

2.1.2 The Triple Bottom Line Reset

As Erika Ingvald nicely summarises, in conducting a Triple Bottom Line (TBL) assessment for S/CRMs under the CRMA the three legs of the TBL stool, environmental, social and financial are currently all of different lengths, with environmental aspects predominant. But is this realistic? Can we continue to keep the Environmental brake on, stressing the supply risk to a criticality level, or do we need to find another way? Is the environmental leg rendering the TBL stool critically unstable? Could we be putting national or European regional security at risk by refusing access to CRMs and SRMs available within European borders and already served by available supply chain infrastructure – roads, trains and barges or ships?

The case for realignment of management values around the TBL model can hardly be overstated. Brundtland emphasised the significance of the reciprocity between society and technology which tends to evolve through successive generations. The new driver is Artificial Intelligence and wider digitisation, one of the four priorities for the CRMA. A significant new business culture is taking hold based on values and management practices such as:

- Democratic principles,
- Transformative leadership from the top (CEO, Board of Directors),
- Policy investment with focus on circular economy and green energy/ decarbonisation transitions,
- Resource use efficiency,
- Circular Economic and Green Energy transitions,
- Programs, such as the UN Sustainable Development Goals (SDGs), mirroring the TBL People, Planet, Prosperity anchor points,
- Transparent reporting (e.g. via the Global Reporting Initiative).[35]

[33] John Nash, Non-cooperative games, PhD Princeton 1950, John Nash, "The Bargaining Problem", *Econometrica*, (1950) Vol. 18, No. 2, pp. 155-162.
[34] See Advancing Intergenerational Justice in Critical Raw Materials Management: Assessing the Potential of Demand-side Measures, https://unece.org/sites/default/files/2024-09/ECE_ENERGY_2024_8.pdf
[35] See The Global Reporting Initiative (GRI) perhaps the most widely used of globally known standards, see https://www.globalreporting.org/.

2.1.3 Environmental

Underlying the Environmental aspects, businesses such as the mining and minerals sector were expected to uphold the highest standards of corporate environmental responsibility, not with uniform success. The negative externalities left behind by much bad practice in mining and minerals have resulted in continuing concerns about pollution of natural resources, contamination of water and soil, heightened in protected areas in Europe where sensitivity about habitats[36] and birds[37] is a regulatory as much as an environmental concern.

2.1.4 Social and Economic

Underlying the Social and Economic aspects the stakeholder capitalism model now prevails: adherence to TBL demands that a company's responsibility lies first with its stakeholders rather than, as hitherto, giving primacy to shareholder returns. Under stakeholder capitalism, stakeholders include anyone who contributes to or is influenced, either directly or indirectly, by the activities of the business. That means employees, customers, supply-chain and value-chain personnel, educationalists, local residents, government agencies, investors. According to the stakeholder theory, the company must equitably balance stakeholder and shareholder interests and benefits.

S/CRM selection for projects may take place at local or national/EU level. Projects at local level may be financed from regional development and infrastructure funds, allocated in general to benefit local stakeholders. But these projects when there is a common S or CRM of interest, such as Tungsten, may also be aggregated from various localities to become national or Union ones potentially with more than one S/CRM. Decision-making can also go top down, starting in Brussels with policy priorities and then working down to local project level at a specific mine. The CRMA has suddenly brought S/CRM supply- and value-chains to the top of the policy agenda which it is itself is having a major impact on streamlining the permitting process.

Habitats Directive

Permitting is conventionally conducted under the Habitat Directive[38] 1992 commonly Habitats Directive 6.3 and 6.4 which deal with protected areas such as Natura 2000 designated sites. Since issued mining permits have been decided largely based on Environmental Impact Assessment, Directive 6.3. Little known is Directive 6.4, which even when a project has been refused on environmental grounds there is in the Directive provision for granting a permit under “Imperative Reasons of Overriding Public Interest” an (IROPI) mandate.

As the Habitats Directive Article 6.4 explains, “if […] in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature […]”, that project can nevertheless be permitted. Further detail is presented in the section IROPI[39] the Precautionary Principle and Case Law.

With that provision Directive 6.4 protects the state’s right to exercise overriding public interest to allow access to CRMs in protected areas even when the EIA advises against. This provides a high degree of agility and adaptability in deployment and use in critical times.

[36] See the Habitats Directive, https://environment.ec.europa.eu/topics/nature-and-biodiversity/habitats-directive_en.
[37] See The Birds Directive, https://environment.ec.europa.eu/topics/nature-and-biodiversity/birds-directive_en.
[38] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ L 206, 22.7.1992, p. 7)1992 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043
[39] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

3 Permitting – the Bayesian Operators IF and HOW

In Bayesian terms, permitting mining in protected areas may be summarised in two words “IF” and “HOW”.[40] In some instances they operate separately, others combined.

In the fundamental question of the Fitness for Purpose of current regulations for meeting the CRMA mandate to streamlining permitting the question operates at both levels. CIRAN WP3 Deliverable 3.1 assesses the Fitness-for-Purpose of regulatory frameworks across Europe[41]. The findings from a regulatory baseline and theoretical point of view are encouraging that the regulatory base is still largely able to deal with the process. The problem, however, is the time it currently takes to do this:

> Overall, the appraisal found that most countries were applying a balanced approach to reconciling mining and environmental protection, with some moderately favouring environmental protection. As of the first half of 2024, no countries have applied the requirements of the Critical Raw Materials Act (CRMA) but also have not been required to apply those requirements derived from the Nature Restoration Regulation.[42] It is therefore expected that the situation will be exacerbated over the coming years, with increasing requirement to search, identify and mine critical raw materials (CRM), but also to protected environmentally sensitive sites if regulatory frameworks were to remain the same.

IF, more formally called “Conditional Probability”, is the core of Bayesian inference[43]. The theorem uses a “Conditional probability” statement to represent how radically changed circumstances reset the probability of an existing hypothesis being true (the "if" condition) by invoking the principle of “overriding public interest”. This creates a context of legally applicable exception when a mining permit is highly likely because the material of interest is a Critical Raw Material (CRM) as defined in the EU CRM Act (CRMA) despite the fact because under normal conditions no mining is permitted in area x because the area is protected. See section on Case Law and the Precautionary Principle.[44]

The core process of Bayesian inference is founded on updating a belief about a hypothesis as new evidence becomes available. This "updating" is the direct application of conditional probability. The new evidence as to how permitting decisions will be taken, including streamlining to make such decisions on CRM materials mining in no more than 27 months, of necessity changes the probability of getting a permit, and quickly.

Under IROPI conditions business as usual as under Habitats Directive 6.3 no longer applies under 6.4 the red light switches to green because it is in the overriding public interest that it should. The only condition is that significant compensation applies, and when business as usual returns 6.4 no longer applies.

HOW focuses on what follows next if the IF question is answered affirmatively, i.e. what is the method by which the extraction process is executed. The particular challenge this poses for mining and extractive industries is that their history is one where the HOW component has commonly resulted in environmental

[40] The terms IF and HOW and not strictly Bayesian but are adopted into the Decision Tree shown in Figure 6.
[41] Barnes, J.; Berne, S. (2024) Fitness-for-Purpose Assessment of Regulatory Frameworks. Deliverable 3.1 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project. Grant Agreement No. 101091483 of the European Union’s Horizon Europe research and innovation programme.
[42] For the EU Nature Restoration Regulation, see https://environment.ec.europa.eu/topics/nature-and-biodiversity/nature-restoration-regulation_en#:~:text=The%20Nature%20Restoration%20Regulation%20is,the%20impact%20of%20natural%20disasters.
[43] For Bayes Theorem see Bayes, T. (1763). An essay towards solving a problem in the doctrine of chances. *Phil Trans Roy Soc London, 53*, 370–418.
[44] See Section IROPI, the Precautionary Principle and Case Law.

and social damage and a wider disregard for the broader social damage caused by such activities. Clearly the most sensitive of locations where such damage is caused from an environmental perspective are protected areas, hence from a permitting point of view the conditions under which the IF question may be answered "green" will be the most demanding of all. This means that the HOW answer has to be very convincing.

Prima facie the HOW implementation process for the CRMA is not facing an impossible task, or one that has essentially only one available strategy – IROPI. But from a practical delivery perspective there is little or no experience yet of negotiating permits within the S/CRM context. Likewise, as streamlining decision-making to achieve permitting within a twenty-seven month timeline or less has also not yet taken hold. As a result there is no body of practical experience – even basic dos and don'ts – to rely on for guidance and creating a roadmap based on empirical data is not yet possible. It is likely that once three projects have yielded some practical knowledge and experience the gap will close quite quickly.

An option for taking a proactive approach to meeting the requirements of the Nature Restoration Law is to follow the template Environmental Management and Monitoring Plan (EMMP) for any mining project, in particular in sensitive areas, so that the restoration process is synced closely and continuously with the mining and the mining is conducted in a manner as little invasive as reasonably achievable.

3.1 Issues at Operational Level

The key problems identified by Barnes and Berne (2024)[45] lie not in the context level but at the level of operational activity. These are:

- Governance frameworks.
- Resource identification, spatial planning and designations, including planning for CRMs in land use planning and mineral planning; the designation of protected areas, issues around Strategic Environmental Assessment (SEA), Habitats Directive Assessment (HAD) and Water Framework Directive (WFD)[46] and planning for shared use and compensations.
- Streamlining administrative procedures which consider issues of fragmentation, timelines, strategic project definition; environmental assessment procedures, roles and responsibilities, documentation, one-stop-shop, pre-planning and legal challenges.
- Stakeholder engagement and social acceptability; including forms of engagement, securing stakeholder acceptance.
- Spatial data, reporting and expertise.

The option to encourage policy-driven investment in projects which contribute to implementing these enhancements may be added to the list. Further attention is given to that aspect in the section Anchor Policy Investment.

Fragmentation issues for this WP 6.2 Report are of particular concern and under "roles and responsibilities" as noted in WP 6 Deliverable D 6.1[47] staff shortages and knowledge gaps in particular for many of the less familiar elements on the S/CRM list are to be expected. D.3.1 succinctly observes one of the key policy objectives this brings:

[45] Barnes, J.; Berne, S. (2024). Fitness-for-Purpose Assessment of Regulatory Frameworks. Deliverable 3.1 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project. Grant Agreement No. 101091483 of the European Union's Horizon Europe research and innovation programme.
[46] Water Framework Directive, see https://environment.ec.europa.eu/topics/water/water-framework-directive_en
[47] Hermann, L., Hilton, J., Marijanski, M., (2024). Baseline Report on missing segments and supply chain vulnerabilities. D6.1 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project. Grant Agreement No. 101091483 of the European Union's Horizon Europe research and innovation programme.

> Balancing these policy objectives can be achieved through a coordinated and strengthened policy framework which will ensure the delivery of CRMs and promote the protection of the environment. Streamlining more efficient, effective and transparent permitting procedures throughout the mineral extraction life cycle in environmentally protected areas, would contribute to securing sustainable access to primary raw materials, whilst taking into account and reconciling requirements in environmentally protected areas.[48]

Learning from the success stories in Description of good-practice case studies[49], it is clear there are numerous examples where a "both/and" (Boolean) approach can be taken. It is possible to conduct mining safely and in full conformity with EIA and related requirements, i.e. there is no inherent reason why mining and environmental protection are mutually exclusive. But to deliver this solution requires the mining party to conform to the highest operational standards complemented by good governance and transparent reporting. Again, such provisions are included in a typical EMMP, overseen by a neutral oversight expert team.

Given that the costs of such measures will have to be justified it will be for the Social Resource Contract negotiation process to determine where that cost is borne, when and in what proportions between suppliers and customers.

3.2 Supply Risk: Binomial and Stochastic

Binomial

The most common negative binomial factor is the "Not in my backyard" (NIMBY) attitude to nearly all industrial and infrastructure projects in close proximity to any community, which coalesces into a rigid anti-mining culture that confuses the negative practices and externalities of mining with the inherent nature and purposes of mining with its strong social affinity with Public Good and social development. In this context the reassurance brought by CIRAN Deliverable D.3.1 that despite the strident NIMBY nature of mining opponents the regulatory and policy framework remains balanced and workable.

The same deliverable presents the fundamentals involved as both binomial in nature, mine or do not mine - the IF question – but equally the goal is equilibrium between permitting and investing in mining and protecting the sensitive environment in which the project takes place:

> A system in equilibrium allows environmental and mining objectives to be reconciled so that none outweighs the other. Ultimately, this is a political process seeking to reconcile competing societal demands and requirements.[50]
>
> A key consideration in streamlining is the stage in the process when the effective decision to mine is made. The earlier the substantive decision (i.e. the decision knot), the more effective the decision-making process is, in the process ensuring certainty for investment decisions and allowing all

[48] Barnes, J.; Berne, S. (2024). Fitness-for-Purpose Assessment of Regulatory Frameworks. Deliverable 3.1 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project, p.5. Grant Agreement No. 101091483 of the European Union's Horizon Europe research and innovation programme.

[49] Nike Luodes, Hannu Panttila, Toni Eerola, Vitor Correia, Ludwig Hermann, Sybil Berne, Jerry Barnes, Marasmi Christian, Nole' Marcello, José Mário Castelo Branco, Marcelo Pereira, José Carvalho, Ariadna Ortega, Rafael Jordá Bordehore, Emma Medina Sanchez, Luis Lopes, Ronald Arvidsson, Anna Apler, Magnus Johansson, Julian Hilton, Malika Moussaid-Hilton, Eberhard Falck (2024). Description of good-practice case studies. Deliverable 2.1 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project.

[50] Barnes, J.; Berne, S. (2024). Fitness-for-Purpose Assessment of Regulatory Frameworks. Deliverable 3.1 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project, p.9. Grant Agreement No. 101091483 of the European Union's Horizon Europe research and innovation programme.

> stakeholders to engage effectively in the process and avail themselves of TBL benefits according to the model agreed during the SRC negotiation process and recorded in the substance of the SRC itself,
>
> A systemic, cross-sectoral approach enables a balanced and integrated risk and impacts assessment during the approval, permitting and ensuing strategic resource management processes. The central resolution of this balancing of often different objectives is the *decision to mine.* The corollary of it is that there may also be a decision *not to mine* for environmental or other reasons.[51]

There is good agreement between CIRAN D.3.1 and D.6.2 as to the core issues but seen in 3.1 as a decision to mine or not by the operator, while in 6.2 the decision is reciprocal, whether or not to permit the mine. This conclusion also showed that the independent reasoning of the £.1 deliverable had validated both the Bayesian IF/HOW model and the Boolean both/ and solution. With the addition made in the 3.1 comments about the Equilibrium condition required the fundamentals of the SRC algorithm we independently validated by other CIRA tasks.

Brownfield and Greenfield Permitting

Sites with a long history of mining in a region culturally highly familiar with mining and processing are integral to the communities where they belong and typically at least one family member will be employed by, or in the value chain of, the mine. In such circumstances the TBL imperatives of the public consultation process will be to balance the social, environmental and economic aspects of the value of the mine to the community.

These key stakeholders will be seeking for enhancement to all Health, Safety and Environment practices to the mining process as well as to the financial, social and welfare benefits that accompany a well run and managed mine. As Hemerdon and the nearby Redmoor site show, many generations have worked at these mines and see their labour working for the mine as an investment in the mine's generational future.

Streamlining Permitting – Norway

The CRMA requires the decision-making for permitting to be completed in at most 27 months, which is much shorter than the current average. The Norwegian petroleum exploration history and the strategy on which it is built yields by analogy a strong case for arguing that given the right preparation, mining permits can in practice be issued in six months:

> Permitting times can be shortened from years to months. This would need a boost of public capabilities moving the state into a proactive mode. National data inventories remain very central. Public Exploration and Production (E&P) efforts and increased efforts in developing standard agreements (including on the issues) in consultation with industry, capital allocators and the public would be required.
>
> This would form the basis for opening regions for exploration and production, for asking industry where in the open areas they would like to engage, for inviting competition for permits from consortia and issue permits to the winners based on work programme commitments and demonstrated capabilities for exploration and production and for environmental and social stewardship. Most of the permit terms and conditions would be negotiated and set before invitations for competition are issued. While preparations will be enduring over decades and can be done at ease, the permitting would take less than a year.[52]

[51] Barnes, J.; Berne, S. (2024). Fitness-for-Purpose Assessment of Regulatory Frameworks. Deliverable 3.1 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project, p.5. Grant Agreement No. 101091483 of the European Union's Horizon Europe research and innovation programme.

[52] For Norwegian petroleum exploration history and permitting procedures see https://www.norskpetroleum.no/en/exploration/exploration-policy/

A recent allocation of petroleum exploration and production licenses on the Norwegian Continental Shelf is a benchmark. [53] Here an application to compete for licences was due in for submission by September 2025 is scheduled to be allocated early in 2026, i.e. in 6 months, not 15 years. This required a prior effort that has been going on since 1973 of inventorying resource potentials, identifying where activities could be allowed, seeking industry inputs on where in this space they would like to compete for licenses, regulating activities through laws and regulations, standardising agreements to be applied. Significant efforts on the part of the civil services analogous to geological surveys and directorates of mining preceded the invitations to industry to commit investments. Once done on a continual basis the regular and annual issuance of exploration and production permits are swift underlining that "Preparedness" is one of the most reliable ways of streamlining permitting.

On land, the administration is more complex than offshore, and it often lacks the preparations for swift licensing for legacy reasons dating back to the non-competitive first finders' rights, a concept originally used in the Middle Ages. Assuming the IROPI principle warrants application however, that too can encourage significant investment in preparedness, see also IROPI and Preparedness sections in this report. Irrespective of the nature of the site, brownfield or greenfield, onshore or offshore, an "Appropriate Assessment" is required.

[53] In some other national jurisdictions there is a broad spread of decentralised agencies engaged with some aspects of the regulatory process traditionally within their purview, which is likely also to add a high level of friction into the decision-making process, resulting in delay, excessive levels of detailed requirements and elevated risk of fragmented or contradictory regulations. For Norwegian petroleum exploration history and permitting procedures see https://www.norskpetroleum.no/en/exploration/exploration-policy/

4 Mining in Protected Areas - Point Source vs Area Source Risk Assessment

Are we misleading ourselves when we protect habitats from the negative impacts of mining in protected areas (point source threat) when the really existential long duration threats for protected areas are climate change, rising temperatures, changing and unpredictable seasonal patterns and irregular rainfall, invasive new species, wildfires (area source threats)? Do we risk losing our balance in regard how best to protect Protected Areas?

In terms of potential sources and vectors of risk a mine site in a protected area, especially but not exclusively below ground, is likely to have much lower footprint than a protected area, while the protected area as a whole as receptor is on the receiving end of area source risks from climate change, carbon and greenhouse gas emissions, invasive flora and fauna disease and species which in aggregate cause appreciably higher levels of chronic damage than mining.

Given the long co-existence of areas such as Cornwall and Devon counties in UK which have supported and still support surface and underground mining, agriculture and husbandry, protected areas, areas of outstanding natural beauty and a high intensity of tourism, all within close proximity to each other or even cohabiting it is clear that mining and protected areas can cohabit successfully. But it requires skill, consideration sensitivity, practice, adaptability and agility to make this work efficiently and sustainably, maintaining a stable equilibrium across all the social, cultural and interest groups.

What S/CRMs have brought very recently to this mix is not Devon and Cornwall's first experience with mining, which in written dates back to the time of Julius Caesar and from archaeological evidence from that time back at least to the bronze age. What is likely to be the new mode of working is but a new level of intensity and urgency to the adoption of new smarter, less invasive exploration and extraction methods and smarter modes of working.

This covers, but is not restricted to geological exploration, new also less invasive, but significantly more efficient, revolutionary digital mining and processing techniques and technologies, with much lower carbon and GHG emissions, and higher Scope 1, 2 and 3 compliance. Resource extraction efficiency and resulting materials use efficiency may increase threefold making the financing of complex niche products such as Tungsten or Rare Earths significantly more viable and more environmentally benign processes. In consequence the new life-cycle which the Hemerdon mine, for example is about to launch proceeds from the assumption that all materials of value should be recovered for use either now or later – in this case tungsten, tin and copper – extraction efficiency and overall resource use efficiency has demonstrated the capability of engineering a step change upwards in productivity and analogous step down in energy use intensity and Scope 1, 2 and 3 emissions.

Ironically, it may not be mining that is the primary destructive force in protected areas shared for hiking, recreational sport, and tourists especially in areas like Devon and Cornwall. There are also beneficial side effects of long-established mine sites such as Hemerdon where rarely visited parts of the site over time have become established habitats for rare or threatened species. And even measures such as security fences restricting access to the terrain as a mine site for the safety of the general public bring significance benefits to the flora and fauna.

4.1 Growing Area Source Risk and Damage from Climate Change

A range of area source risks may affect even the highest IUCN categories of protection, 1A (see Figure 5):

Land and habitat damage

- **Forest degradation:** Drought, heat, and pest infestations like bark beetles are causing significant tree cover loss and damage in European forests, even in previously resilient ecosystems. This loss reduces the forest's ability to sequester carbon.
- **Increased wildfire risk:** While the total area burned in 2023 was less than in 2022, wildfires had an "exceptional impact" on protected areas, with a large portion of the total burnt area being within the Natura 2000 network.
- **Habitat loss:** Climate change contributes to the loss of biodiversity, with 81% of protected habitats currently in a poor or bad state.
- **Biome shift:** Climate change can cause a shift in natural vegetation types, a phenomenon that poses a threat to the integrity of protected areas.

Impacts on species

- **Species vulnerability:** Many species are becoming increasingly vulnerable. Studies show that some marine protected areas might be insufficient to protect the species within them, with up to 100% of species in areas like the Baltic Sea projected to be exposed to novel conditions.
- **Poor condition:** The state of many protected species is poor; 39% of protected bird species and 63% of other protected species are in a poor or bad state, with climate change being one of many contributing factors.

Other impacts

- **Cultural heritage:** Protected cultural heritage sites are under threat from climate change impacts like storms, high winds, and rising sea levels, which can weaken structures and damage artefacts.
- **Flooding:** More intense rainfall is increasing the risk of pluvial and flash flooding, which can damage both natural and cultural sites.
- **Extreme weather:** Protected areas are increasingly vulnerable to more frequent extreme weather events, which stresses ecosystems and makes them less resilient.

4.2 Public understanding of potential impacts of Climate Change on Protected Areas

In similar vein, and perhaps even more starkly, the great bulk of the populations of democratic European states do not know where even commonplace minerals or similar raw material come from and how they are turned into standard consumer products. This is because the mining industry does not sell its products directly to consumers; instead, metals and minerals are hidden in electronic devices, bridges, airplanes and kitchen utensils of which most of the people do not make any connection with mines.

If they do have an understanding of some aspects of resource processing, uses in manufacturing, distribution and sale to customers and end of life disposal into recycling and reuse, mining and processing in particular (the extractives sector) tend to have a generally negative or mistrusted image. This leads to a common assumption that mining and processing industries pollute, destroy the environment and leave damage for the local communities to remediate while the project owners and investors walk away both with the resources mined and with the related profits, without accountability or social acceptance. The key assumption therefore is that mining and processing are inherently and universally destructive in nature in general, making their presence in any area, particularly a protected area, a certain cause of environmental disaster.

There is a range of factors which compound the general problem of lack of public understanding, or ignorance of the Critical Raw Materials Act and what the roles are of the large number of different elements on the S/CRM list and what roles these elements play. A more coherent and engaging communications programme with stakeholders unfamiliar with the mining and minerals sector would likely be of benefit to the stakeholders in raising awareness and appreciation of why in the vary changed circumstances Europe it will be of benefit to them to learn and know more. Topics to address include:

1. The 2023 list of strategic and critical raw materials and why S/CRMs are of existential importance to all of us.[54]

2. The laws and regulations governing mine permitting and the process of changing laws in a way that makes the permitting process more transparent and trustworthy.

3. Politicians in recent times have increasingly adopted a "post-Truth" approach to scientific evidence, or professional experience or investor / owner integrity, leading to a catastrophic failure of trust. The outcome is typically to protest. What the CIRAN project has however typically encountered in both project site visits and case studies is that the closer a stakeholder group live to a working mine the more likely the level of acceptance is to be high or very high.

4. How, a modern mine actually affects the environment, and how the operating companies make signification events to both protect the environments but also where mining and processing is essential that operations are conducted to a very high standard of Health Safety and Environment.

5. That emissions are kept as low as possible and that renewable or green energy sources are typically used instead of fossil fuels.

If there is no common understanding of why mining and processing industries are so important to protect to preserve strategic and local autonomy, the is social friction leading to fragmentation and a weakened sense of solidarity between communities and mining areas ("Why should we have to have a mine here if it only helps people elsewhere?"), between different parts of a country with different local economies, or between fundamentally different land uses, mining and housing development. As the global population grows and resources pressures with it, especially food, energy and water nexus resources, criticality in supply risk can spiral quickly into resource weaponisation between regions, countries and even globally.

A compounding variable is that from a geological exploration point of view there is a pardonable lack of understanding of just how difficult it is to find an economically viable mineral deposit: only 1 in 1,000 exploration permits globally turns into a mine, while the doctrine of sufficiency commonly fosters the belief that recycling is the solution to all criticality issues and mining should simply be banned.

Economic Viability is Essential

Compounding this simple binomial rejection of mining and processing projects is a lack of (or perhaps resistance to) understanding of why economic viability is important for any mining project. Profitability is the key operationally to ensuring that a critical or strategic mineral project afford high environmental and social standards along the life of the mine, and during mine end of life closure, remediation and next generation economic revitalisation. Profitability ensures a mine does not go out of business in an unplanned way, or ends up in bankruptcy imposing all costs of cleanup and remediation on the taxpayers.

[54] See WP 5 findings

In parallel, methods and technologies can be developed over time for better cost-efficiency, even better environmental standards, less environmental impact, minimal "waste" and progressive remediation through the life of the mine not just at the end (see CIRAN Deliverable 4.2).[55]

Likewise, to further support supply chain security, security of supply takes precedence over return on investment, as a critical raw material supply chain failure is the worst case.

In summary, to respect the cardinal mine permitting principle of public good, there must be a mechanism that makes the local host community proud of contributing to and securing the benefits of this public good, in combination with something that answers the question "What's in it for me? And what do I need to contribute to make it work reliably into the future?".

4.3 Stipulations of the Habitats Directive – Protected Areas

The IF decision for Protected Areas under the Habitats Directive requires an "Appropriate Assessment". The risk of seeing the IF question primarily or solely through the environmental lens – business as usual - is that, at least in a Triple Bottom Line[56] (TBL) context the decision-making issue is essentially environmental. But is that in the new situation appropriate? Given the distribution of potential and current S/CRM sites across Europe between existing (Brownfield) and new (Greenfield) sites and between Protected and non-Protected areas a permitting application from existing sites such as Hemerdon are likely to be much more straightforward process than to previously undisturbed sites whether or not they are in protected areas.

The decision tree (see Figure 9) navigates through the permitting process on the basis of whether or not the project can be permitted under IROPI, mediates between the provisions of Habitats Directive[57] Article 6, Paragraphs 3 and 4.

Appropriate Assessment

An "appropriate assessment"[58] (AA) is a mandatory step in the Habitats Regulations Assessment (HRA) required by the EU Habitats Directive for any plan or project likely to have a significant effect on a Special Area of Conservation (SAC) or other protected European site, also applicable in the UK. The purpose is to evaluate potential impacts on the SAC's integrity and conservation objectives, including species and habitats within and functionally linked to the site. If negative impacts are identified, the plan can only proceed if specific derogation tests, such as "imperative reasons of overriding public interest" and the absence of alternative solutions, are met (see Figure 9).

Habitats Directive paragraphs 6.3 and 6. 4 lay down the procedure to follow when planning new developments that might affect a Natura 2000 or similar site. Thus, an "appropriate assessment" of any plan or project likely to have a significant effect on the conservation objectives of a Natura 2000 site must be carried out.

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[55] See Lucarini, M., Falck, W.E., Correia, V., Serra, M., Martarelli, L., Andrisani, M-G., Fumanti, F., Silvestri, F., Patanè, A. (2024). Protocol on Environmental Assessment of CRM extraction in protected areas. Deliverable D4.2 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project: 83 p. Grant Agreement No. 101091483 of the European Union's Horizon Europe research and innovation programme.

[56] The Triple Bottom Line (TBL) refers to the practice in commercial projects for sustainable development, the performance of a business has to give equal weight to social, environmental and financial performance indicators, see Elkington, J. (1994) Towards the Sustainable Corporation: Win-Win-Win Business Strategies for Sustainable Development. California Management Review, 36, 90-100.

[57] Habitats Directive https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043.

[58] As an effective example of how regional government helps guide the public consultation process see the Welsh Assembly, https://senedd.wales/media/l05hfwzh/17-038-web-english.pdf.

Article 6.3

Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

Article 6.4

If, in spite of a negative assessment the permit is granted under IROPI under 6.4 "the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted".

5 Graded Approach and Layers of Protection for People and Habitats

5.1 The Graded Approach

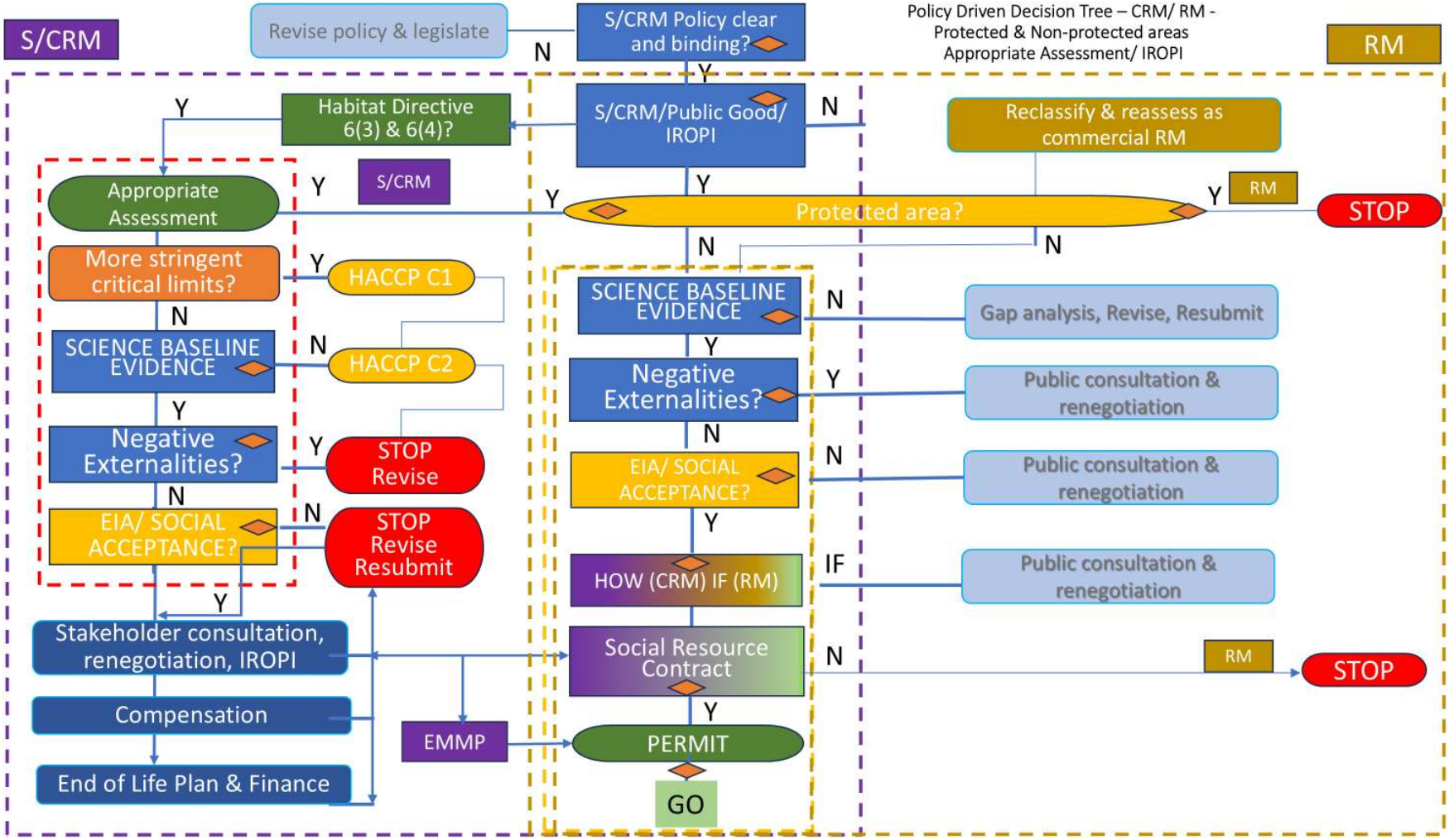
The Graded Approach is a generic scientific and regulatory methodology for mapping the nature and severity of a risk or hazard to the appropriate level of regulation or protection it requires:

> To ensure effective regulatory control of different facilities and activities with radiation sources, it is necessary to apply a graded approach in a way that the degree of implementation of regulatory requirements corresponds to the associated […] risk.
>
> The higher the risk associated with a facility or activity, the more stringent the regulatory requirements that apply to it need to be. A regulatory system built in accordance with a graded approach contributes to the optimization of resources and the increase of efficiency and effectiveness of the regulatory control.[59]

The IUCN Category System for Protected Areas in terms of degrees of restriction or regulation imposed is one of the Graded Approach methods which associate a specific layer of protection within an equivalent level of risk.

[59] For an example of The Graded Approach in use, see https://www.iaea.org/sites/default/files/20/11/rasa-applying-graded-approach.pdf

Appropriate Assessment: The IF/HOW Decision Tree – Consultation



RM – Raw Material **SRM** – Strategic Raw Material **CRM –** Critical Raw Material **IROPI** – Imperative Reasons of Public Interest
HACCP – Hazard Analysis & Critical Control Points **EMMP** – Environmental Management and Monitoring Plan

Fig. 9. Bayesian Operators IF/HOW Decision Tree for IROPI Project Permitting.

5.2 Layers of Protection

The Layers of Protection (LOP) framework[60] is a risk assessment and management methodology adapted from industrial process safety. In environmental management, it generally translates to the mitigation hierarchy, as detailed below:

- *Avoidance:* The primary layer of protection is to completely avoid impacts on the most sensitive and critical biodiversity areas. This involves steering clear of sensitive habitats or avoiding operations during critical periods (e.g., breeding seasons).

- *Minimisation:* Where impacts are unavoidable, they must be minimized. This includes implementing specific measures to reduce the scale, duration, or intensity of impacts, such as limiting noise and dust or using best available technologies.

- *Restoration:* Following the cessation of activities, the affected land should be restored to a condition suitable for a beneficial after-use, often involving regenerating ecosystems by replacing soil and replanting native vegetation.

- *Offsetting:* As a last resort, for any remaining residual impacts after all avoidance, minimisation, and restoration efforts, compensation (offsets) must be provided. This involves delivering measurable conservation gains elsewhere to achieve no-net-loss of biodiversity.

By deploying a combination of contextual mitigation strategies such use efficiency, impact minimisation combined with indirect protection through demand reduction and other holistic measures the overall criticality risk for mining in Protected Areas is significantly reduced. The range of options is considerable and when the correct combination is applied much criticality risk is prevented rather than having to be remediated. The "tool kit" contains but is not limited to:

- *Rule by Exception:* Treat mining in Protected Areas as a measure of last resort.

- *Spatial Planning and Zoning:* Protected areas are often zoned with different levels of protection, ranging from strict nature reserves (high LOP) to areas allowing managed resource use (lower LOP). This allows for strategic allocation of activities.

- *Best Available Techniques (BAT):* Permitting processes require the use of BAT to ensure discharges, emissions, and waste are minimised.

- *Ongoing Monitoring and Adaptive Management:* Continuous monitoring of environmental indicators is essential to assess the effectiveness of the protection layers. If monitoring reveals unforeseen impacts, management strategies can be adapted accordingly.

[60] For the LOP mitigation hierarchy for environmental risk see ICMM https://www.icmm.com/en-gb/our-work/nature/mitigation-hierarchy#:~:text=Applying%20the%20mitigation%20hierarchy&text=ICMM%20members%20are%20committed%20to,necessary%E2%80%94offset%20impacts%20on%20nature.

- *Stakeholder Engagement:* Meaningful and effective public participation and engagement with local communities and statutory bodies ensure that diverse perspectives are considered, potentially identifying better mitigation strategies and building trust.

- *Restricting Human Access:* Regulations on human access to at risk areas of outstanding natural beauty to protect against overuse (see ICUN protective categories).[61]

- *Combating Climate Change* - Support for Protected Areas from the consequences of climate change by reducing emissions, lower energy intensity, including relieving pressure on biodiversity.

- *Integrated Resource Management:* - Integrated management, recovery, and reuse of secondary and primary resources, with secondary resource options as the default.

- *Optimised Resource Use Efficiency:* at all points across supply and value chains.

- *"Thrifting"* **-** continuous adjustment of individual and collective behaviours for socially responsible personal and collective sufficiency – not dogmatic "degrowth" but pragmatic "self-discipline and community solidarity".

- *Anchor Investment Policies* - Use national or regional anchor policies to determine investments and capital allocations to Protected Area projects in the S/CRM sector.

5.2.1 Overriding Public Interest Mining Projects

For the extraction of Strategic and/or Critical Raw Materials (CRM), a specific provision for projects permitted under Imperative Reasons for Overriding Public Interest (IROPI)[62] may exist within legal and planning frameworks. This generally involves:

- *Strategic Project Status:* Under regulations like the EU Critical Raw Materials Act, projects deemed strategic can receive priority status and an accelerated permitting process.

- *Rigorous Assessment:* A comprehensive Environmental Impact Assessment (EIA) or Habitats Regulations Assessment (HRA) is required to demonstrate the necessity of the project and the unavoidable nature of its impacts.

- *OPI Demonstration:* The developer must prove that the project provides an "overriding public interest" that outweighs the harm to the protected area. This is often tied to national or EU-level energy security, competitiveness, and transition goals.

- *Robust Compensation:* If OPI is accepted, strictly enforced and significant compensatory measures are mandated as a condition of the permit, often delivered strategically to ensure a net positive impact overall.

[61] For the International Union for Conservation of Nature (IUCN) and the categories of protection see https://iucn.org/ and Figure 5. The ICUN uses the term "Category" to describe the different levels of protection in order of restriction; the concept of Layers of Protection simply describes the outcome for the area concerned of what being put in a particular category entails.

[62] IROPI is often shortened to OPI meaning "Overriding Public Interest".

- *Transparency and Legal Scrutiny:* The decision-making process must respect international obligations and public participation conventions, ensuring transparency and access to justice.

5.2.2 Policy Development for IROPI

Policy development specific to managing S/CRM projects under the CRMA is required to solve the fragmentation problem now posing an existential threat to the success of the CRMA:

- S/CRMs are likely to face complex technical, financial and social issues requiring negotiating or arbitration procedures including pre-agreed exceptions and exemptions as part of streamlined permitting.

- A Nash Bargaining Solution model is required for managing equitable distribution of compensation benefits from the impact of IROPI permitting on affected communities and directly impact habitats in extensive Protected Areas.

- All S/CRM projects should then work within "Social Resource Contracts" based on Nash Bargaining Solutions. Such contracts will be subject to automatic review as part of the S/CRM triennial review process.[63]

Inevitably with such a radical change of approach and speed of drafting and consultation as the CRMA it was understood that new unexpected clarifications and even entire new policies would be required. So, at the project kick-off meeting in Brussels January 2023, a nominal group analytical process was taken to identify and normalise the proposed five pillars of the development process in consultation with the members of the CIRAN Consortium.

5.3 Five Pillar Approach to Policy Formation

The five pillar approach to efficient policy formation were first presented by the authors of this report at the CIRAN kink-off meeting in Brussels January 2023, before the CRMA had been drafted. Adapting the model to the purposes of CRMA delivery the If/How Bayesian model was introduced resulting in minor modifications of the five pillars. The concept of Public Good was added to Pillar 5, the Social Resource Contract.

5.3.1 Holistic Approach

The Holistic Methodology is systemic, balanced and integrated in nature, evidence-based, within a Circular Economy Policy Frame. It deploys core competencies specific to the individual S/CRM and project and location, quality assured by Subject Matter Experts (SMEs). Where SMEs were not readily available rapid investment in development of appropriate social capital was undertaken. S/CRM Project management applied robust QC and QA procedures to critique and stress-test policy concepts, followed by whole life-cycle support for all projects in protected areas.

[63] See further explanation in the section dealing with Nash Bargaining Solution.

The day to day protection process, whether of habitats or of people, is accompanied by well-funded independent oversight, and a condition of grant of a permit is conditional on having an integrated End of Life (EoL) plan for transition to the next cycle of mining and refining the resource, transition to a pre-planned post-mining life. The choice of End of Life is to distinguish the conduct of a mining project as being part of a circular rather linear economy when the term "closure" tends to be the designation of choice when a mine stops working.

5.3.2 Criticality Taxonomy

Using the Bayesian "Conditional Probability"[64] process (summarised and simplified as IF and HOW operators), the Criticality Taxonomy process has overlaid democratic Circular Economy principles (e.g. Green Deal, CE Action Plan; energy transition) on S/CRM targets to reflect local and regional needs and priorities, based on the classical, progressive "Graded Approach".[65] Each step upwards in the condition of resource criticality is defined by a different type of risk or hazard for the value chain and its relative severity.

Consensual Permitting

The policy target for each S/CRM permitted project enshrines necessary and sufficient conditions for permitting and overseeing Public Good mining projects in Environmentally Sensitive/ Protected Areas with equitable access to and distribution of benefits to all participants in the value chains created. Using the Graded Approach and Layers of Protection (LoP) the preferred route to permitting is "as consensual as reasonably possible" particularly insofar as stakeholders in the immediate vicinity of the mine or protected area and the local community most affected – for example, a community with a long history of mining and minerals projects.

Sustainable Equilibrium and the SDGs

The United Nations Sustainable Development Goal (UNSDG) cardinal principle of a balanced and integrated resource management process is at the heart of critical resource sustainability. The desired outcome is a transformative Triple Bottom Line "win/win" resource equilibrium recovery and use of which is managed by the Bayesian IF/HOW Decision Tree. The proposed delivery mechanism is the United Nations Resource Management System (UNRMS), which applies non-cooperative game theory as formulated by John Nash to define and stabilise the sustainability point of equilibrium in the green economy.

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[64] see Investopedia: "Conditional probability is the likelihood of an outcome occurring based on a previous outcome in similar circumstances. Thus, Bayes' Theorem provides a way to revise or update an existing prediction or theory given new evidence". https://www.investopedia.com/terms/b/bayes-theorem.asp#:~:text=Bayes'%20Theorem%20is%20a%20mathematical,the%20field%20of%20Bayesian%20statistics.

[65] The Graded Approach see IAEA TecDoc Use of a Graded Approach in the Application of the Management System Requirements for Facilities and Activities: "The graded approach is a structured method where the level of control, analysis, or action is proportional to the risk and importance of a task or activity. It is used to ensure that resources are focused on the most critical areas, making processes more efficient while maintaining safety, for example, in nuclear safety, occupational therapy, and language learning. The complexity and potential hazards of an activity determine the required level of detail and control.

Social Resource Contract

These are then captured into a mineral project-, location-, and cultural context-specific Social Resource Contract (SRC) negotiated under the unifying principles and values of transparent democratic governance. The operational details of each such Contract are dealt with on a line-item by line item basis and each individual contract can be adapted through time on an ongoing basis, subject to application of the Bayesian "update" principles. The concept of Public Good is a fundamental tenet of the SRC as the justification for social acceptance of mining, as recognised in the ICMM sponsored Report Breaking New Ground, 2002.[66]

Using the John Nash Bargaining Solution method of reaching a symmetrical contract optimises all Parties returns equally. More details are included in the dedicated SRC section.

[66] International Council on Mining and Metals (ICMM), Authors IEED and WBCSD, Breaking New Ground, 2002, https://www.iied.org/mmsd-final-report.

6 The Nash Bargaining Solution

The Nash Bargaining Solution is a specific equilibrium concept in game theory that finds a unique, fair, and efficient agreement between two or more parties in a bargaining scenario (see Figure 10). It works by maximizing the product of each party's gain in utility above their "disagreement point" (what they would get if no agreement is reached). This solution satisfies key axioms like Pareto optimality, symmetry, and scale invariance, providing a principled way to resolve conflicts and ensure both parties benefit relative to their alternatives. The great advantage when applying the Bargaining Solution to S/CRMs is that the IF question has in effect become non-negotiable before the bargaining starts because once a material has been named on the S/CRM list as a member the delivery process is entirely about HOW, not IF. As a result, the classical starting point of a Nash Bargaining Solution process the "Disagreement Point" no longer applies at an IF level. As a result the "Feasible Set" of solutions is likely to be very small and so the "Nash product": The product of the gains in utility for all players over their disagreement points. The solution aims to maximize this product, represented as $(v_1 - d_1) \times (v_2 - d_2) \times \ldots \times (v_n - d_n)$, where vi is the utility from the agreement and d_i is the utility from the disagreement point. The outcome that satisfies this maximization is the Nash bargaining solution.

There is a very significant linkage between the IROPI permitting principle and the Nash Bargaining Solution the award of compensation in that solution both seen from the perspective of primary stakeholders, simultaneously at national and local levels. National level is compensated by enhanced security of supply of the S/CRMs while at local level a sustainable financial compensation award is granted. As a result, by late 2022 it was already clear that the 2023 CRM list would expand to include Strategic Raw Materials (SRMs) but also to address supply risk issues, such as permitting, greatly enhanced resource use efficiency, and agile, adaptable industrial practices.

Enabling Conditions

These are the enabling conditions for establishing the Bargaining Solution for the Parties in the SRC (see Figure 10):

- *Clearly Defined Property Rights:* Clear ownership of the resource key resources (the target S/CRM and related access rights, clean air, water) is essential for bargaining to start. PA likely to be public ownership.
- *Low Transaction Costs:* Costs of negotiation, information gathering and enforcement must be minimal. Transaction costs set as part of permits.
- *Few Parties to the SRC:* The Parties should be no more numerous than is essential. Large numbers of participants (many polluters or victims) increase coordination problems and freeriding, making bargaining difficult.
- *No Asymmetric Information:* Both sides need to know enough about the costs and benefits involved.
- *Common Reporting Standards:* Global Reporting Initiative[67] and GRI 14: Mining Sector 2024.[68]

[67] The Global Reporting Initiative (GRI) perhaps the most widely used of globally known standards, see https://www.globalreporting.org/.
[68] Sector Standard for Mining (GRI 14), A Standard for a responsible mining sector,

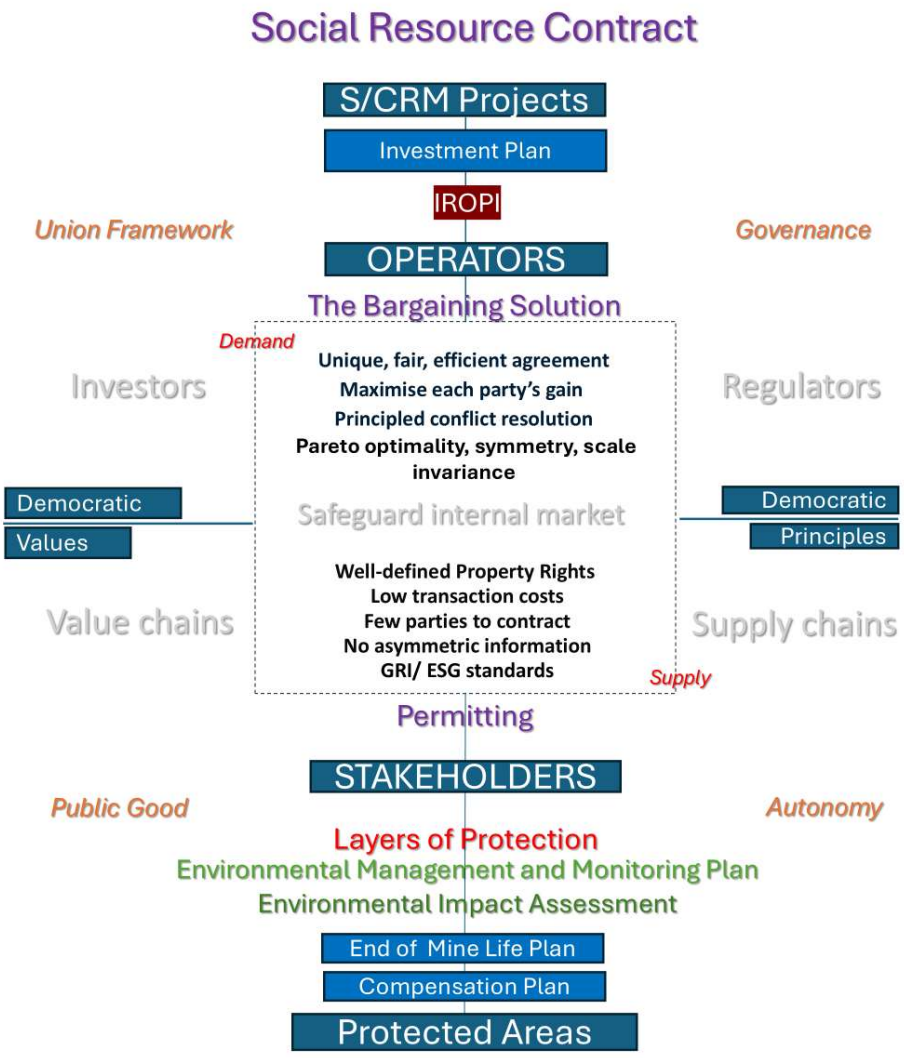

Fig. 10. The Bargaining Solution for the Social Resource Contract.

Deploying the Nash Bargaining method yields a positive symmetrical outcome for all parties the Social Resource Contract with the flexibility and responsiveness of the Bayesian reset option as criticality conditions and policies change. This is of great value to the delivery of the CRMA because the SRC mirrors the CRMA "common Union framework". As such, like the CRMA "common Union framework" it functions as a Public Good.

see https://www.globalreporting.org/standards/standards-development/sector-standard-for-mining/

7 The Four Pillars of Public Good

The four pillars of the Public Good as applied by ICMM in its commitment to follow the path of sustainable development feature prominently in Breaking New Ground.60:These are Economic, Social, Environmental and Governance. Each of these is grounded in a set of principles, summarised in Box 3 of the Executive Summary of Breaking New Ground, of which Governance is significantly the most detailed. A small selection of relevance to policy is shown below:

Economic

- Maximize human well-being.
- Ensure efficient use of all resources, natural and otherwise, by maximizing rents.
- Seek to identify and internalize environmental and social costs.

Social

- Ensure a fair distribution of the costs and benefits of development for all those alive today.
- Respect and reinforce the fundamental rights of human beings, including civil and political liberties, cultural autonomy, social and economic freedoms, and personal security.

Environmental

- Promote responsible stewardship of natural resources and the environment, including remediation of past damage.
- Minimize waste and environmental damage along the whole of the supply chain.
- Operate within ecological limits and protect critical natural capital.

Governance

- Support representative democracy, including participatory decision-making.
- Avoid excessive concentration of power through appropriate checks and balances.
- Ensure transparency through providing all stakeholders with access to relevant and accurate information.
- Ensure accountability for decisions and actions, which are based on comprehensive and reliable analysis.
- Encourage cooperation in order to build trust and shared goals and values.
- Ensure that decisions are made at the appropriate level, adhering to the principle of subsidiarity where possible.

7.1 Public Good

The modern economic theory of "public good" originated with Paul A. Samuelson in his 1954 paper, "The Pure Theory of Public Expenditure"[69] for which he won the Nobel Prize for Economics. A public good in economics (also referred to as a social good or collective good) is a commodity product or service that is both non-excludable and non-rivalrous and which is typically provided by a government and paid for through

[69] Samuelson, P. A. (1954). The Pure Theory of Public Expenditure. The Review of Economics and Statistics, 36, 387-389. https://doi.org/10.2307/1925895

taxation. Use by one person neither prevents access by other people, nor does it reduce availability to others so the good can be used simultaneously by more than one person.

Public goods include knowledge, official statistics, national security, common languages, law enforcement, flood control systems, aids to navigation and street lighting.
To help his readers understand the complex mathematical logic of his paper, Samuelson introduced Samuelson's Conditions.[70] These state that the optimal provision of a public good occurs when the sum of individual marginal benefits equals the marginal cost, suggesting government intervention is often necessary to achieve efficient allocation.[71] These include notably:

- equitable distribution of benefits from permitted SRMs and CRMs,
- strict adherence at a project level to the conditions of the project Environment Management and Monitoring Plan,
- economic autonomy,
- self-determination within the Graded Approach / Levels of Protection model required by the Habitats Directive IROPI principle.

Two particular benefits have close affinities to the Public Good concept. The first is securing the protection of Europe's peoples and cultures in equal measure to its environments. The second takes the concept of "Just Transition" across from a primary focus on decarbonisation to one of facilitating a "Just Transition" to a significantly expanded role for social factors in the new Triple Bottom Line (TBL) equilibrium.

7.2 Public Good and the CRMA

CRMA recitals §35 makes direct reference to Public Good as follows:

> Land use conflicts can create barriers to the deployment of critical raw material projects. Well-designed plans, including spatial plans and zoning, that take into account the potential for implementing critical raw material projects and whose potential environmental impacts are assessed, have the potential to help balance public goods and interests, decreasing the risk of conflict and accelerating the sustainable deployment of critical raw materials projects in the Union. National, regional and local authorities responsible should therefore consider including provisions for critical raw materials projects when developing relevant plans. This is without prejudice to existing requirements to assess the potential environmental impacts of such plans and to the required quality of such assessments.[72]

The logic of this Recital aligns clearly with the IROPI provision in the Habitats Directive 6.4. Its relevance as a key principle for preventing or mitigating risk of land use conflict, perhaps the primary factor in causing

[70] Samuelson's Conditions, Samuelson's Conditions - Google Search
[71] This Samuelson refers to as a "collective consumption good", a good to which everyone has equal right of and ability to access. This connects Samuelson's train of thought to earlier thinkers such as Jean-Jaques Rousseau[71], John Stuart Mill[71] and Knut Wicksell[71] who all explored similar concepts. Wicksell's work is complementary to John Nash's[71] in respect of the high likelihood, even inevitability, in regard to uninvestable projects which require government financial support to function.
[72] CRMA Recitals §35.

critical Supply Risk when the S/CRMs required can be sourced within EU and wider allied European boundaries.

7.3 Enabling Actions for Delivering the CRMA

Within the concept of Public Good, when conflict prevention principles are also taken into account, enabling actions for delivering the CRMA in a non-conflicted manner include:

- streamlining permitting, exploration, development, production, waste revaluation/avoidance, repurposing and decommissioning,
- fostering strategic partnerships,
- investing in innovation,
- investing in social capital (capability in the form of qualification + competence),
- optimising digitisation and AI tools and procedures for accuracy and efficiency of resource use and optimization,
- monitor supply chain risks and opportunities including identifying and correcting vulnerabilities and knowledge gaps,
- significantly enhancing public investment and access to finance in the four priority areas for the CRMA – renewable energy, aerospace, digitisation, defence,
- transparent governance and reporting e.g. ESG and GRI.

7.4 Reporting and Protected Areas

Self-evidently the primary connection between environmentally protected areas (PAs) and either voluntary adherence to ESG or via the terms of the project-specific SRC is through the **Environmental (E)** pillar. This assesses either a company's or a project's impact on the natural environment and its management of environmental risks.

This report recommends that to streamline the management of environmental risk, and effectively the project as a whole but on a locally accountable basis a HACCP based Environmental Management and Monitoring Plan (EMMP) (see Figure 8) be developed for each project which is applied through the project's whole lifecycle. The EMMP translates the Permit into an oversight tool that works literally at ground level and as such has more immediacy than a report sent to Brussels. The premise of the EMMP is that it catches issues and problems immediately and within the operational scope of the project.

The differences between ESG and the SRC EMMP lie primarily between ESG being a company obligation whereas the SRC operates at individual project level. Hence in the EMMP/SRC list "company" is replaced where appropriate by "project", although in many S/CRM projects the project and the company are one and the same:

- *Biodiversity and Ecosystem Protection:* Reporting frameworks increasingly emphasise a project's efforts to protect biodiversity and restore ecosystems. This is critical for projects whose operations might directly affect natural habitats.

- *Proximity and Impact Disclosure:* Specific reporting metrics are required for permitting a project in or adjacent to protected areas and/or key biodiversity areas.

- *Risk Management:* Projects must evaluate and report on environmental risks under the EMMP, including those related to the potential negative impact on the integrity of protected sites due to development, resource extraction, or pollution.

- *Social Aspects:* The social pillar also comes into play, as disruptions to protected areas can impact the livelihoods, culture, and access to natural resources for indigenous and local communities.

- *Land Rights:* Respecting land rights and preventing the forced relocation of people is fundamental to the SRC.

- *Aligning with Global Goals:* The global community has recognized the importance of protected areas through frameworks like the Kunming-Montreal Global Biodiversity Framework[73], which includes a target to conserve and manage at least 30% of global land and sea areas by 2030. ESG reporting helps align corporate actions with these broader goals.

The above categories are recommended for inclusion in voluntary local report to employees, stakeholders and value chain members as part of the Social Resource Contract which is based on similar local reporting and accountability models but of a less rigid nature.

Generic Reporting Requirements Mining and Minerals

The sections below comprise a repository of reporting modalities for companies of varying size which are aligned to different levels of reporting intensity.

All companies operating in the S/CRM space are obliged to undertake a wide range of reporting activities, especially in regard to any activities in sensitive or protected areas. By the nature of the SRMs such and copper and aluminium, there companies are commonly large and global in nature and typically have specialists preparing such reports according to differing regulatory requirements. By contrast of the CRMs will be much smaller companies, often venture funded startups the demands on which have been significantly relaxed by Brussels primarily to reduce their costs and make them commercially more viable. These companies are being strongly to continue their reporting but in a more targeted manner of interest to their local stakeholders. This is known to counter some of the problems they face from public scepticism or even hostility.

7.5 Repository of Reporting Standards

The modulation of the Triple Bottom Line into the closely related concept of Environmental, Social and Governance (ESG) investing was formalised in a report commissioned from the financial community by the United Nations Environment Programme (UNEP) Finance Initiative, 2004.[74]

[73] For the Kunming-Montreal Biodiversity Framework see https://www.cbd.int/gbf

[74] See The Materiality of Social, Environmental and Corporate Governance Issues to Equity Pricing, 11 Sector Studies by Brokerage House Analysts at the Request of the UNEP Finance Initiative Asset Management Working Group, UNEP June 2004.

In the light of the relaxation of mandatory ESG reporting requirements approved by the European Parliament December 15, 2025 the original intention of this report to "foster ESG" for S/CRM projects as part of mandatory reporting has been modulated into a voluntary commitment to honour the ESG principles on an individual S/CRM, location and project basis. This has a natural place in the SRC scope but tightens the connection between reporting and project management at a local level in a more immediate and constructive way, aligning the incentives between operators and stakeholders to optimise all aspects of the project.

The roots of TBL and ESG can be traced back to the creation of values-based banks such as Barclays in the late 17th century whose founders were Quakers. That in turn led to the development of philanthropic capitalism in the 19th century when enlightened industrialists saw looking after the welfare of their employees as their primary responsibility. This established a genuine Nash economic win / win since what was clearly demonstrated was that a healthy, safe workforce was more consistently productive and hence more profitable than a sick or injured one. The ethical basis for the ESG approach translates easily into the ethics of the SRC and overlaps with good financial management practices. With UN Secretary-General Kofi Annan's powerful support, the UN Global Compact Report, 2004, Who Cares Wins - Connecting Financial Markets to a Changing World[75] - is based on ten principles which apply as well to the SRC as to ESG:

Human Rights

- Principle 1: Businesses should support and respect the protection of internationally proclaimed human rights within their sphere of influence.
- Principle 2: Make sure that they are not complicit in human rights abuses.

Labour

- Principle 3: Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining.
- Principle 4: The elimination of all forms of forced and compulsory labour.
- Principle 5: The effective abolition of child labour.
- Principle 6: Eliminate discrimination in respect of employment and occupation.

Environment

- Principle 7: Businesses should support a precautionary approach to environmental challenges.
- Principle 8: undertake initiatives to promote greater environmental responsibility.
- Principle 9: encourage the development and diffusion of environmentally friendly technologies.

Anti-Corruption

- Principle 10: Businesses should work against corruption in all its forms, including extortion and bribery.[76]

[75]UN Global Compact Report, 2004, Who Cares Wins - Connecting Financial Markets to a Changing World, https://documents1.worldbank.org/curated/en/280911488968799581/pdf/113237-WP-WhoCaresWins-2004.pdf

[76] The UN Secretary-General Kofi Annan introduced this principle at the Global Compact Leaders Summit on 24 June 2004.

The rationale for the Who Cares Wins Report was clear: "We […] believe that this is the right time to provide the [finance] industry with better guidance on ways to improve the consideration of environmental, social and governance issues in investment decisions."

The process of turning the UN principles into specific reporting requirements for implementing the CRMA is one of the tools by which the policy requirements for the Act are overseen at the level of the individual CRM and the individual CRM project.

> ESG requirements for critical raw materials emphasize transparency, traceability, and sustainable practices, particularly under the EU's Critical Raw Materials Act (CRMA), which sets targets for domestic extraction, processing, and recycling. These requirements mandate that companies must identify and mitigate environmental and social risks, ensure high social and environmental protection standards, and implement strong supply chain due diligence.
>
> Key goals include a minimum of 10% domestic extraction, 40% domestic processing, and 25% recycling by 2030, along with reducing dependency on single external suppliers.

The CIRAN Lens consultation meeting co-chaired by ALDA and ACOM illustrated exactly the same approach intersecting the "horizontal" values and principles of democratic governance (ALDA) but anchored the CRM projects outcomes from a mining and minerals perspective in the "vertical" supply chain of S/CRMs into the European economy from within EU borders and from close allies such as Norway, Switzerland and the United Kingdom.[77] In this case ACOM provides a major platform of mining and minerals social capital – i.e. how to turn the CRMs into essential products and services – while ALDA looks primarily at the Environmental dimension but also the social dimension of child and forced labour, both being no strangers of the global S/CRM supply chains.

7.5.1 Corporate Sustainability Reporting Directive (CSRD) Reporting – Large companies only

The primary ESG reporting requirement in the EU is the Corporate Sustainability Reporting Directive (CSRD). This mandates large companies to report on their environmental, social, and governance (ESG) impacts, risks, and opportunities according to the European Sustainability Reporting Standards (ESRS).

This directive requires detailed, third-party audited disclosures on areas such climate change, pollution, biodiversity, social issues in the value chain, and business conduct.

The December 15, 2025, changes have reduced the scope of companies required to report under ESG by some 80%, with more detailed relaxations for smaller companies as follows:

[77] The Lens meeting was attended in person by Dr. Julian Hilton and Dr. Malika Moussaid, who presented an update to the meeting at the invitations of the Chairs. Prior to attending the Lens Meeting they had held a three hour preparation and briefing with Jean-Pierre Kucheida President ACOM and team thanks to a kind introduction by Marzia ALDA lead on CIRAN Work Package 5.

Changes to CSRD and ESRS

- *Higher Thresholds:* CSRD scope is reduced, applying mainly to very large EU companies (e.g., >1000 employees, >€450m turnover).

- *Phased Implementation:* Reporting for Wave 2/3 companies (due 2026/2027) is delayed by two years (to 2028).

- *Simpler Standards (*ESRS): EFRAG's revised standards clarify mandatory ("shall") vs. guidance, move non-essential info to optional guides, and remove vague terms.

- *Voluntary Sector Standards*: Sector-specific ESRS are now voluntary, not mandatory.

- *Transition Exemption***:** Companies reporting for FY2024 but now out of scope get an exemption.

7.5.2 Global Reporting Initiative

The eight principles of the Global Reporting Initiative (GRI) to be observed are:

- Accuracy,
- Balance,
- Clarity,
- Comparability,
- Completeness,
- Sustainability context,
- Timeliness,
- Verifiability.

The Independent Consultant who supervises the mandatory Environmental Management and Monitoring Plan (EMMP) independently of the operator is likely to use such generic reporting concepts as GRI as a matter of professional course. Among these modern analytical tools is the concept of Double Materiality risk assessment. This looks at a) financial impact and b) social and environmental impact. The signature emphasis of GRI is on social and environmental factors first is well suited to protected areas' and equally to projects where access to the S/CRMs is policy driven, i.e. the financial impact reporting dimension in a Double Materiality sense is likely to take second place to the other aspect of Double Materiality reporting, social and environmental.

More specific to the strategic and critical materials categories covered in the 2023 CRM list is GRI Sector Standard 14 published in February 2024[78], GRI 14 as yet makes no specific provisions for S/CRM projects, nor for the specific conduct of projects in Protected Areas. Such provisions are envisaged for negotiation and adoptions into the Social Resource Contract envisaged in this report.

[78] For GRI 14 see https://www.globalreporting.org/standards/standards-development/sector-standard-for-mining/stakeholder-support-for-gri-14/ and for GRI 14 text see https://incp.org.co/wp-content/uploads/2024/02/GRI-14-Sector-minero-2024.pdf

7.5.3 EU: Taxonomy – Large Companies Only

The EU Taxonomy is a classification system established to create a common language for what qualifies as an "environmentally sustainable" economic activity. Under the Sustainable Finance Disclosure Regulation (SFDR), investors are required to report on the EU Taxonomy (EUT), consisting of 18 criteria that encompass a range of sustainable economic activities. This framework evaluates investments aligned with standards such as climate change mitigation, circular economy practices and biodiversity preservation in line with the objectives of the Paris Agreement.

The Taxonomy affects large companies subject to the CSRD, indirectly companies marketing themselves as sustainable, financial services companies offering sustainability-related products and investors who can use the tool to identify investments genuinely contributing to environmental sustainability.

Overall, the EU Taxonomy is a key piece of the EU's sustainable finance framework, impacting companies seeking sustainable investments and financial institutions managing those investments. It also empowers investors to make informed decisions based on a shared understanding of sustainability.

7.5.4 Sustainable Disclosure Requirements (SDR) – United Kingdom

The UK Sustainability Disclosure Requirements (SDR) are a set of rules aimed at increasing transparency and reducing misleading information (greenwashing) in sustainable investment products in the UK. Requirements affect financial services firms who must comply with the anti-greenwashing rule and labelling requirements for investment products they offer and investment product distributors who need to ensure product information (including labels) is available to consumers. As of July 15 2025, the UK has scrapped its plan to develop a UK Green Taxonomy.

7.5.5 International Sustainability Standards Board (ISSB) – Large companies only

The ISSB, is a relatively new organisation working on global sustainability reporting standards. The aim is to develop a comprehensive set of baseline sustainability disclosure standards for companies, focusing on the needs of investors. Primarily listed companies (publicly traded) will likely be the first to be impacted by mandatory ISSB standards. However, the specific companies and timelines for adoption will depend on national regulations.

The ISSB standards aim to benefit investors by providing them with high-quality information about a company's sustainability performance, alongside financial information.

Who is impacted by the reporting regulations?

The reporting regulations primarily affect large companies. In the UK, this includes businesses with £500 million in turnover or more than 500 employees. However, it's likely that the scope for participating companies will broaden in the future.

Summary

As a general observation the range of reporting requirements, options, frequencies and objectives all have in common the engagement and communication process that builds and retains among the most important assets of any S/CRM company, public trust and confidence.

The requirements of regulating projects in Protected Area are in a process of rapid development, consistent with the evolving management of the CRMA. As practical experience is gathered in the coming time with actual permitted projects the good practices in regard to the delivery of the CRMA will be assimilated into a standardised practice. This will facilitate the streamlining process based on experience and consolidate a platform of Preparedness. Stakeholder engagement is a significant part of the Preparedness process.

7.6 CRMA Requirements

Environmental

- **Increase recycling:** The CRMA sets a target of 25% of the EU's annual consumption of strategic raw materials coming from recycling by 2030.
- **Promote circular economy:** The EU aims to develop a more circular economy for critical materials through increased recycling, reuse, and recovery.
- **Ensure sustainability:** Mining and processing activities must adhere to high environmental standards, including protection of biodiversity and the rule of law.

Social

- **Protect human rights:** Projects must uphold human rights and ensure that the local community's interests are at the forefront.
- **Promote stakeholder engagement:** Companies are encouraged to engage with local communities and other stakeholders to manage ESG risks proactively.
- **Ensure fair labour practices:** There is a focus on ensuring that labour is not subject to forced labour or other exploitative practices, which is supported by upcoming regulations.

Governance

- **Ensure transparency and traceability:** Supply chain traceability is key to meeting these requirements. (see section in this report on the UN Transparency Protocol (UNTP)
- **Streamline permitting:** The CRMA intends to streamline the permitting process for "Strategic Projects" to accelerate domestic capacity development, while still ensuring high environmental and social protection.
- **Conduct due diligence:** Companies are obligated to identify, assess, and mitigate environmental and social risks within their supply chains.

Strategic security

- **Reduce dependency on single countries for CRM supplies:** By 2030, no more than 65% of any strategic raw material should be sourced from a single third country.
- **Diversify supply chains:** The CRMA aims to secure supply chains through domestic production, processing, and recycling, as well as through strategic partnerships with resource-rich countries.

- **Restructure supply-chains into value-chains:** Local stakeholder participation, based on equitable distribution of benefits to local CRM host communities, but also equity participation in anchor investments is encouraged
- **Enhance defence capabilities:** in the cause of local autonomy, supply chains can be localised and shortened where possible, but adhering to CRMA Recital §4, consistency of values and practical approach across Europe as a whole to safeguard CRM supply-chains from the risk of fragmentation.

7.7 Stakeholder Engagement and Communications: Building Trust

Stakeholder consultations from across a range of EU countries and the UK from the outset, led from CIRAN Work Package 5. Since January 2023 there was a constant flow of opinion and analysis into the policy-making process represented in this report. This came in on a monthly basis online through the CIRAN group meetings, and in-person meetings held in host cities such as Brussels, Lisbon and Bologna. This was complemented by the occasional participation of independent experts who joined some of the in-person activity, as for example in Ljubljana and Lens. Since the in-person meetings also involved site visits, such as to Monte Tondo in Emilia-Romagna and to the quarries cooperative of the Parque Natural das Serras de Aire e Candeeiros, both inside Protected Areas.

These visits gave excellent context for trying to work out how the Critical Raw Materials Act (CRMA) would be received, in particular by the geological exploration and permitting organisations immediately facing the very tough demands of the CRMA in regard to the speed and successful delivery of permitting, especially if that means the Strategic and Critical Raw Materials in demand available in Protected Areas. Of particular value to CIRAN Work Package (WP) 6.2 was the parallel consultation process conducted under Work Package 5. The detailed results are to be found in Report 5.2[79] Guidelines for public engagement and dialogue. The conclusions came in two distinct forms. Of these the first comprised:

> All focus groups (conducted in the Czech Republic, Slovakia, Italy, Portugal, France, and Ireland). [Each] revealed deep concern for environmental sustainability, strong public mistrust of mining actors, and a widespread call for education, transparency, and genuine public involvement. Across all countries, citizens favoured circular economy approaches over extraction and supported mining only under strict, ethical, and transparent governance frameworks.[80]

The second was a single, handpicked group assembled jointly by the CIRAN ALDA partner and by the ACOM Secretariat, France also and ALDA member organisation who met in Lens, France, the former coal-mining capital of France.

> The focus group conducted in Lens, France, was characterised by a high level of participant expertise, which led to more nuanced and specific discussions. These emphasised the need for a strategic approach to sustainable resource management, as well as a clear commitment from both public and

[79] Cescon, Marzia; Bednáriková, Pavla; Robert-Campos, Helena; Rosendo, Luis (2025). D5.2 Guidelines for public engagement and dialogue. Results of public engagement activities. CIRAN project, Grant Agreement No. 101091483 of the European Union's Horizon Europe research and innovation programme.
[80] Ibidem, p.3

private actors to sustainable transitions, innovation, and ethical consumption. The importance of education and mediation, along with transparency and informed consent, was also highlighted as essential to addressing low awareness and public distrust.[82]

For the current report, it was a very significant event in regard to the shape that has been taken for Deliverable 6.2 since many of the themes in deliverable 6.1 Baseline Report on missing segments and supply chain vulnerabilities[81] resurfaced in the Lens meeting. It contains some very powerfully argued points as to where the first steps in testing efficient ways in developing policy for successfully deploying the CRMA were going.

How WP 5 bridged from tasks from WP 3 through to WP 6.2 is shown in Figure 11.[82]

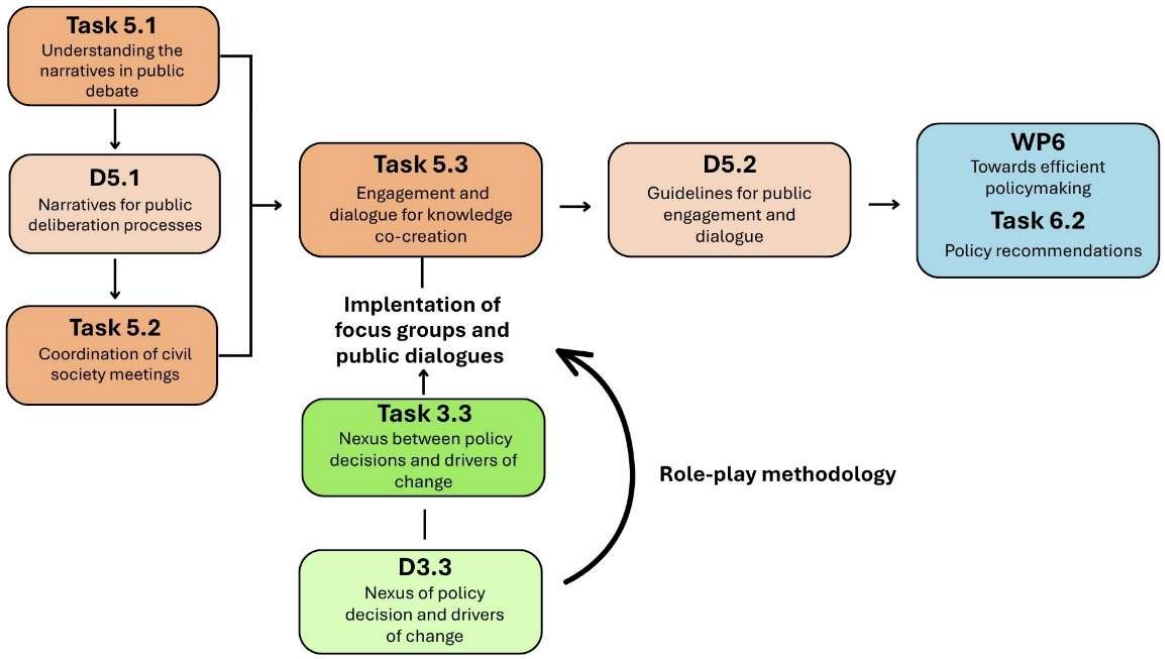

Fig. 11. Relation with other CIRAN tasks and deliverables.

The current report reaches back further into WPs 2 and 3, and, into WP 6.1, including on the subject of "Policy recommendations for permitting, model social contract and ESG to achieve a social-environmental-economic equilibrium". These consultations validated the progress towards the Social Resource Contract as a new vehicle bringing all these components together.

[81] See Hermann, L., Hilton, J., Marijanski, M., (2024). D6.1 Baseline Report on missing segments and supply chain vulnerabilities. CIRAN project, Grant Agreement No. 101091483 of the European Union's Horizon Europe research and innovation programme.

[82] Rosendo, L., Bednáriková, P. (2023). Understanding the Narratives in Public Debate. Deliverable 5.1 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project. Grant Agreement No. 101091483 of the European Union's Horizon Europe research and innovation programme.

The CIRAN consultation meeting held in Lens, France May 15 2025, convened by ALDA[83] as part of its contribution to CIRAN WP5 and cochaired by Adrien Licha, was extremely helpful to WP6.2 for formulating the policy of intersecting the values of democratic Europe with the modern way of managing S/CRM projects in line with democratic values and principles in pursuit of strategic autonomy.

Particularly reassuring in the view of the extent of policy and regulatory fragmentation across the EU is the finding of the WP 5 team that "Despite national differences in emphasis, these shared themes [across all four focus groups] reflect a consistent public vision for a more ethical, transparent, and ecologically responsible approach to critical raw material governance in Europe".

This meant that our approach, which we found strongly validated by the Lens participants, was one in which we could feel considerable confidence. A similar experience was also provided for us during a meeting November 12 in Brussels with representatives of the European Economic and Social Committee, the Organisation for Economic Cooperation and Development (OECD) and the Friends of the Earth (FoE). That led to the recognition that the policy challenges currently lie not in supply risk or investment but in clarifying the policy itself in a rapidly changing context.

The authors of the current report drew the following conclusions from these consultations:

1. **Preparedness.** There is an urgent need to consolidate and implement preparedness measures across the permitting and critical and strategic project planning cycle.
2. **Strengthening National Geological Surveys**. They need to be strengthened and granted additional powers to lead on specific tasks related to Preparedness, assisting in national resource inventory and preparations for prefeasibility studies and screening for permitting projects.
3. **Investment in training regulators and operator**. New or enhanced competencies required for executing the CRMA mandates in regard to streamlining permitting, resource inventorying and, where needed, rebuilding trust in local stakeholder participation in promoting S/CRM projects.

These conclusions are elaborated in detail in the following Sections 8, 9, and 10.

[83] The European Association for Local Democracy (ALDA), see https://www.alda-europe.eu/

8 Preparedness

Of course, preparedness[84] is key to smooth efficient translation of policy into practice. Measures to be adopted to build a preparedness platform combining policy and practice are in part at least already outlined in the CRMA:

Short Term

1. Map and inventory both available and accessible S/CRMS and existing mining and processing capabilities.

2. Identify and rectify strategic gaps in S/CRM supply and value chains for specific minerals and jurisdictions to enable strategic complementarity of mine development and resource recovery.

3. Assure policy-anchored, government-underwritten investment for any critical project, which under previous conditions would be uninvestable.[85]

4. As policymakers and capital allocators combined, Governments must take lead in financing and managing opportunities and risks. Their portfolios are broad and therefore largely insensitive to project risks and advanced approval of dedicated funds for S/CRM projects will underpin the push to preparedness.

5. Reaching operational readiness will be much swifter if both funding and operational infrastructures are mobilised, they are engaged in investments that on average provide returns.

Medium Term

6. Implement targeted incentives for partners and other companies investing in full value -chain development for high criticality resources enables government led PPPs.

7. Develop industrial clusters (actual and virtual) around CRM processing and manufacturing, prioritised for both economic energy transition and defence requirements.

8. Support cross-border value chain collaboration by encouraging Member States to specialise in different segments of strategic value chains based on their comparative advantages while ensuring EU-wide and aligned European state integration.

9. Appoint local specialist working groups or committees tasked with identifying a) if a locally protected area does contain any S/CRM materials of interest and b) setting out an “in principle” permitting

[84] The mid-point review meeting held in Bologna October 2024 attended by the Project Officer and Independent Expert Prof. David Peck conducted a “sprint” session with a group on independent experts looking at the definitive findings of the CIRAN. Among the most significant of these was the need for preparedness, planning and practice to “game” complex permitting consultations and decisions well ahead of having to make such decisions in practice. The turbulence already experienced in late 2024 significantly worsened in spring 2025 but having broached the need for preparedness CIRAN policy formation was already capable of a reasoned response to the new challenges.

[85] See actual European Bank for Reconstruction and Development (EBRD) Anchor Policy Investment strategy and practice for key secondary raw materials for food security, https://www.ebrd.com/home/who-we-are/our-organisation/our-headquarters.html

process long before and actual application for a mining permit shows up. This would enable a process of negotiation to be conducted that would set out a draft Social Resource Contract for the oversight of that project, including its governance, financing, equitable sharing of both access to and benefits from the materials the mine contains.

10. Roll-out of Digitisation and AI: The revolution in the professional labour market is developing at great speed, leading to layoffs and significant reduction in entry-level graduate opportunities. But particular care must be paid to how digitisation and the transition to AI-based working is first deployed and it will be a great service to other national geological surveys if BGRM as clearly AI can equally effectively be used to generate fake news and spread toxic disinformation as to detect it.

This protected new normal foundation is key to the **development of AI tooled S/CRM industrial mineral refining operations**, using both secondary and primary raw materials. By the nature of the regional geographical distribution of S/CRMs successful deployment enjoying broad local support will balance alignment with regional and local development goals and opportunities as well as EU- and European level priorities of economic security, environmental performance as well as decarbonisation circular and green energy transition imperatives.

Impact

These AI/ML advancements are vital for securing critical minerals needed for Europe's green energy transition, making mining more efficient, safer, and environmentally responsible.

The superordinate socio-economic and policy goal is to define a new, Nash-model[86] sustainable point of CRM equilibrium, focused on consultation, autonomy and collective self-sufficiency as well as balanced TBL returns.

8.1 Current and Predicted Gains

AI and ML are driving major gains in European (and global) mining by boosting exploration accuracy (finding more minerals faster), cutting costs through automation and predictive maintenance, enhancing safety, optimizing processing (like ore sorting), and improving sustainability via better environmental monitoring and supply chain transparency, all crucial for securing critical minerals for the green transition. European firms, alongside global players, are focusing on this for compliance, efficiency, and securing vital resources.

8.2 Key Areas of Gain

1. Exploration and Discovery

- **Faster Targeting**: Machine Learning (ML) analyses vast geological, seismic, and satellite data to pinpoint promising drill sites, increasing discovery rates and reducing exploration time.
- **Higher Accuracy**: AI models predict deposits with greater precision, reducing wasted drilling efforts and costs.

[86] John Nash, Non-cooperative games, PhD Princeton 1950, John Nash, "The Bargaining Problem", *Econometrica*, (1950) Vol. 18, No. 2, pp. 155-162.

2. Operational Efficiency and Cost Reduction
    - **Automation**: Autonomous vehicles and robotics handle hazardous tasks, while AI optimises mine planning, scheduling, and logistics.
    - **Process Optimization**: AI improves energy efficiency (e.g., ventilation control) and boosts recovery rates in processing plants.
    - **Predictive Maintenance**: Sensors and ML predict equipment failures, minimizing downtime and repair costs.

3. Sustainability and ESG (Environmental, Social, Governance)
    - **Environmental Monitoring**: Drones, IoT sensors, and AI track water/air quality and land degradation in real-time, supporting proactive mitigation.
    - **Community Engagement**: AI analyses social media and community feedback to help companies address concerns and maintain their "social license to operate".
    - **Supply Chain Transparency**: AI tracks raw material origins to ensure ethical sourcing and accurate emissions reporting.

4. Refining and Processing
    - **Enhanced Recovery**: ML improves mineral separation and recovery in refining stages.
    - **Recycling**: AI makes recycling of valuable minerals like cobalt more economically viable and efficient.

5. European Focus and Challenges
    - Europe emphasises sustainability and regulatory compliance, making AI's role in environmental monitoring and governance particularly important.
    - Challenges include managing legacy data, cybersecurity, workforce skill gaps, and integrating AI into standard operations rather than one-off projects.

Impact

These AI/ML advancements are vital for securing critical minerals needed for Europe's green energy transition, making mining more efficient, safer, and environmentally responsible.

9 Strengthening National Geological Surveys

National geological surveys across Europe need to be strengthened and granted additional powers to lead on specific tasks related to preparedness, assisting in national resource inventory and preparations for prefeasibility studies and screening for permitting S/CRM projects. As an example, Bureau de Recherches Géologiques et Minières (BRGM), France, initiated this first step already in February 2025:

> BRGM is undertaking a major inventory across parts of mainland France and the French overseas territories to update national knowledge of geological potential for strategic metals. The €53-million, five-year programme will identify areas of interest for around fifty targeted elements.[87]

In similar vein, second step in the national inventory conducted by BRGM envisages issuing exclusive research permits (PER - Permis Exclusif de Recherche) to which accelerated consultation procedures for permitting commissioned S/CRM projects will also be added. Such a platform of contemporary data of available S/CRMs will further strengthen both industry and public confidence in the anchor policy investment process which would enable fast track operational startup for mine extensions or new mines.

At the Lens meeting the BRGM representative expressed interest in the Social Resource Contract option which could be tailored to both national S/CRM supply- and value-chain needs. This was consistent with the emphasis of the Lens consultation on strengthening local community stakeholder participation in the new generation of S/CRM projects which is likely to follow on from the national inventory update process. To facilitate the process in line with the CRMA priority to digitisation, AI and Machine Learning (ML) can also be applied.

Roll-out of digitisation and AI

The integration of AI techniques and ML technologies in combination with measures such as national inventorying of available S/CRMs is clearly a fundamental requirement. The revolution in the professional labour market is developing at great speed, leading to layoffs and significant reduction in entry-level graduate opportunities. But particular care must be paid to how digitisation and the transition to AI-based working is first deployed and it will be a great service to other national geological surveys if BGRM as clearly AI can equally effectively be used to generate fake news and spread toxic disinformation as to detect it.

This protected new normal foundation of all work in digitisation is key to the **development of AI tooled S/CRM** geological exploration and inventory update. By the nature of the regional geographical distribution of S/CRMs successful deployment enjoying broad local support will balance alignment with regional and local development goals and opportunities as well as EU- and European-level priorities of economic security, environmental performance as well as decarbonisation circular and green energy transition imperatives.

Impact

Improves resource inventory, reduces delays, and supports consistent decision-making and new project planning.

[87] This resource inventory initiative was launched February 13, 2025 by https://www.brgm.fr/en/news/press-release/new-programme-identify-french-mineral-resources#:~:text=BRGM%20is%20to%20carry%20out,for%20around%20fifty%20targeted%20elements.

10 Investment in Training Regulators and Operators

New or enhanced competencies are urgently required for executing the CRMA mandates in regard to streamlining permitting, resource inventorying and, where needed, rebuilding trust in local stakeholder participation in promoting S/CRM projects.

Lack of technical capacity in permitting bodies slows down assessments and increases risk of poor or flawed decisions (see findings from CIRAN Deliverable 6.1). Invest in training programs for regulators, operators, and local communities to manage and maintain advanced technologies. Successful implementation depends on skilled personnel and informed stakeholders. Capacity building reduces risks and enhances long-term sustainability.

Actions

- Invest in **training programmes** for competent authorities on CRM, EIA, AA, and UNFC, and tailored courses for local stakeholder and affected communities.
- Promote **interdisciplinary teams** for permit evaluation and policy development.
- Encourage **knowledge exchange** between Member States and regions.
- Develop **guidance documents**, **best practice toolkits**, and **case study repositories**.
- Develop digital tools, machine learning and AI to support the entire S/CRM lifecycles.

Conclusion

The combination of preparedness, strengthening national geological surveys and investing in regulatory training and capacity building in S/CRMs the conditions will be put in place for fostering the next generation of S/CRM projects. This will include screening and prefeasibility studies that blends geological and regulatory considerations to enable streamlined permitting as and when needed. Given the likelihood of the IROPI provision as a special point of focus to be actioned to enable the permitting to move quickly holding meetings in advance with the local host communities as part of the consultation process.

Imperative Reasons of Overriding Public Interest

IROPI is a critical part of a Habitats Regulations Assessment (HRA). It uses the graded approach Layers of Protection (LoP) to progressive adoption of the provisions of Habitats Directive Article 6,4. 6,4 allows Overriding Public Interest to be applied to a particular project permit application to extract strategic or critical raw materials even if the Environmental Impact Assessment returns a negative verdict. See also CIRAN D3.1 6.4.5, IROPI and Derogation Procedures[48] and Figure 16.

The principal LoP steps towards invoking IROPI permitting are:

1. No Feasible Alternatives

First, it must be demonstrated that no less damaging alternative solutions exist to achieve the project's objectives.

2. Assessment of Overriding Public Interest

If no alternatives are found, the plan or project must next be shown to be justified according to IROPI principles.

3. Consultation and Opinion

To form an opinion on the IROPI case, the competent authority must then consult with relevant bodies, such as devolved administrations and the Joint Nature Conservation Committee (JNCC).

4. Compensatory Measures

If an IROPI judgment is established, appropriate compensatory measures must be implemented to mitigate the adverse impacts on the protected site and its stakeholders.

Examples of IROPI may include:

- *Human Health and Safety*: A project essential to address a serious risk to public health or safety.
- *National Security:* Projects related to national security or defence.
- *Economic or Social Benefits*: Projects that provide a vital contribution to economic development, regeneration, or that address significant social or economic needs.
- *Environmental Benefits:* Projects that provide clear and demonstrable direct environmental benefits on a national or international scale.

As can be seen from the examples shown, this approach is fully compatible with Triple Bottom Line sustainable performance metrics for assessing the IROPI eligibility for any raw materials extraction and processing project in a protected area.

The Habitats Directive makes clear provision for respecting IROPI, even for the IF question i.e. is it allowed at all. When IROPI is to be activated needs to be timed right and requires a basis of trust in the integrity of the process, confidence in the applicable regulations, in the operating company in question, and in the regulatory authorities. From experience, this is a true challenge for all parties and most European countries have a public consultation phase included in the adjudication process. In relation to CRMA and fast track permitting for Strategic Projects, IROPI is a distinct component in the national permitting process. In many countries however, the risk is high that the adjudication process will fall foul of regulatory fragmentation or even conflicted regulations.

What often happens is that opposition groups that are not directly concerned, gather around projects and try to hinder the permit. Their communications are of a post-Truth type, based on false facts that are rarely challenged during public debate. These are good examples of post-Truth spoiling behaviour and tactics. Those groups may have other reasons for wanting to stop a project than their ostensible arguments for objecting.

It is not unusual when locals express strongly adverse opinion that the underlying cause is pecuniary; but equally, many objections raised will be sincere and those who raise them have no conflict of interest. Objectors may have alternative or ulterior motives, a tendency which tends to get more likely especially on the part of objectors who do not live close the proposed mine site or have no direct or known connection with the CRM at issue.

They may even have little or no knowledge of the CRM in question's operational and supply chains, or the purpose that using the material is designed to serve. In those cases, it would likely be impossible to arrive at a Nash Bargaining Solution as the real game at hand is to undermine the project altogether. The Nash bargaining solution typically involves only the essential parties to the commercial and operating contract, and the bargaining process follows once the permit in principle has been granted.

10.1 IROPI, the Precautionary Principle and Case Law

An IROPI permitting decision can be highly contentious which is why it is not unknown to go to court on an objection to the IROPI permit. This is one reason why devolving matters of state importance to local communities is very risky. It can easily cause conflicted decision-making between different communities in the same country, giving the impression of allowing contradictory legal standards and systems to apply in the same jurisdiction. At the same time, while IROPI, like the EIA system, is science-based, there is no absolute certainty in any scientific judgements about the absolute safety of such a decision. CRM materials, at least early in their mining and use in new products or processes, are likely to be unfamiliar. The risk results from unfamiliarity not because the material is inherently unsafe and hence requires specialist handling and related Health, Safety and Environmental standard operating procedures.

As a result of the uncertainty in terms of jurisprudence:

1. the precautionary principle is regarded in law as "integrated"[88] into the Habitats Directive. In any case the highest scientific standards should apply to the granting of a permit under IROPI which would subsume the precautionary principle into the conduct of the EIA. From experience it is very rare that courts override the scientific opinion applied to a specific application of an IROPI type, even in the US.

2. the IROPI procedure does override certain 6,3 decisions subject to satisfying tight legal standards,[89] even when the precautionary principle is being applied in an integrated manner.

3. there is no consensus in law that the precautionary principle is a legal principle as opposed to a guidance, integrated into the permitting process.[90]

As a general note on the above, these are decisions of case law concerning the Habitats Directive, still applicable in the UK, and may not be followed in quite the same way in other countries where the Directive is also applied. In this context, the Habitats Directive 6,4 is an example of an exercise of the precautionary principle in an opposite way in that it protects the state's right to exercise the IROPI clause and so safeguard its access to particular resources in a protected area, even when the project does not fully pass the high bar

[88] See https://www.landmarkchambers.co.uk/news-and-cases/news/high-court-rejects-habitats-challenges-on-nutrient-neutrality-in-the-solent#:~:text=32.,%E2%80%9Cintegrated%E2%80%9D%20the%20precautionary%20principle.
[89] See https://legalresearch.blogs.bris.ac.uk/2024/10/the-public-interest-in-environmental-law-a-pragmatist-turn/#:~:text=Yet%2C%20Article%206(4),using%20a%20trade%2Doff%20logic.
[90] See https://opil.ouplaw.com/display/10.1093/law:epil/9780199231690/law-9780199231690-e1603#:~:text=15%20The%20precautionary%20principle%20has,norm%20of%20customary%20international%20law.

scientific standards as would be applicable to an EIA under 6.3. This is where applying the Bayesian reset model can be very efficient.

Using the Bayesian "conditional probability" model the CRMA and the 2023 S/CRM list represent fundamental policy changes to the likelihood of a permit being granted which necessitates a systemic update to the permitting process, as the CRMA requires. That does not however, mean that just being on the S/CRM list would be sufficient in itself for justifying an IROPI ruling, and hence an automatic permit.

The assumption is that the precautionary principle is also integrated in 6.4 but the barrier for allowing it to be set aside is lower than under 6.3, though to the extent possible without denying the permit the judgement standards should be as high as reasonably achievable. That is where the case for IROPI has to be very robustly reasoned.

10.2 Nash Economics and the Negotiated Equilibrium

Underlying the TBL model from an Economic perspective was of course the work of radical economists such as John Nash whose non-cooperative game-theory based negotiated equilibrium economics were robust enough to point TBL theory towards what would become the pathway through sustainability and sustainable development goals to the circular economy transition.

10.2.1 Permitting and the Negotiated Equilibrium

In the mining and minerals sector, nowhere are the values, principles and practices of the negotiated equilibrium more pertinent than in the current crux of “if” and if so “how” to permit the mining and processing of Strategic and Critical Raw Materials, most notably in Protected Areas.

When the concept of critical raw materials was first brought into currency in Europe in 2014 it was as a class of resource of high significance for the economy in general and in particular for the circular economic and renewable energy transitions. By the 2020 release of a new, apparently more settled list of CRMs, the focus had sharpened on supply-risk, together with the opening of gaps and vulnerabilities in supply- and value-chains (see CIRAN deliverable 6.1). These gaps and vulnerabilities were compounded with chronic underinvestment in stockpiles of CRMs leaving them inadequate to safeguard either economic performance and prosperity or remedy the inadequacy of critical social capital – contemporary mining and metals knowledge and expertise – to know how to mine, process and use these S/CRMs even if they are made available.

10.2.2 Learning by Doing

Efficient policy making will depend heavily on patience, tolerance and partnership, but also by using robust well-tested tools such a Hazard Analysis and Critical Control Point (HACCP) based risk/ hazard assessment (see Figure 12).

Once the target S/CRM following the granting of the permit starts, the extraction and processing stages and is moved around as a raw, concentrated or processed product, the Hazard Analysis and Critical Control Point (HACCP) procedure takes on a different purpose. This integrates monitoring on both occupational, public and

environmental health and safety grounds (the molecules) and on economic grounds (the monies). These integrated challenges are now being addressed by the United Nations through a single, unified set of procedures included in the UN Transparency Protocol (UNTP).[91]

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This initiative has a direct bearing on managing and mitigating Supply Risk, potentially in a very significant way because every year billions of dollars' worth of valuable mineral, many of them S/CRMs, which are lost from or leak undocumented out from supply-chains, aggravating criticality states unnecessarily and causing resource weaponisation or blackmail.

[91] For UNTP specifications and architecture see https://spec-untp-fbb45f.opensource.unicc.org/docs/specification. Aleff Group has been part of the team that has help define and build the specifications for the UNTP.

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11 HACCP Environmental Management and Monitoring

Developing a tailored Environmental Monitoring and Management (EMMP) Plan is integral to the conclusion of an IROPI base permitting application to provide reassurance that heightened attention is being provided to environmental impact issues throughout the life of the new S/CRM Project. An EMMP is applied even when such a IROPI decision to proceed has been taken. But it must be accepted that an IROPI state is likely to be divisive between two "goods" - in that case good of the habitat or good for the national interest. Again, the Bayesian conditional probability process applies because as the permitted project progresses, breaches of critical limits can lead to suspension or cancellation of operations and the potential for court action if the breaches are negligent or criminal in nature.

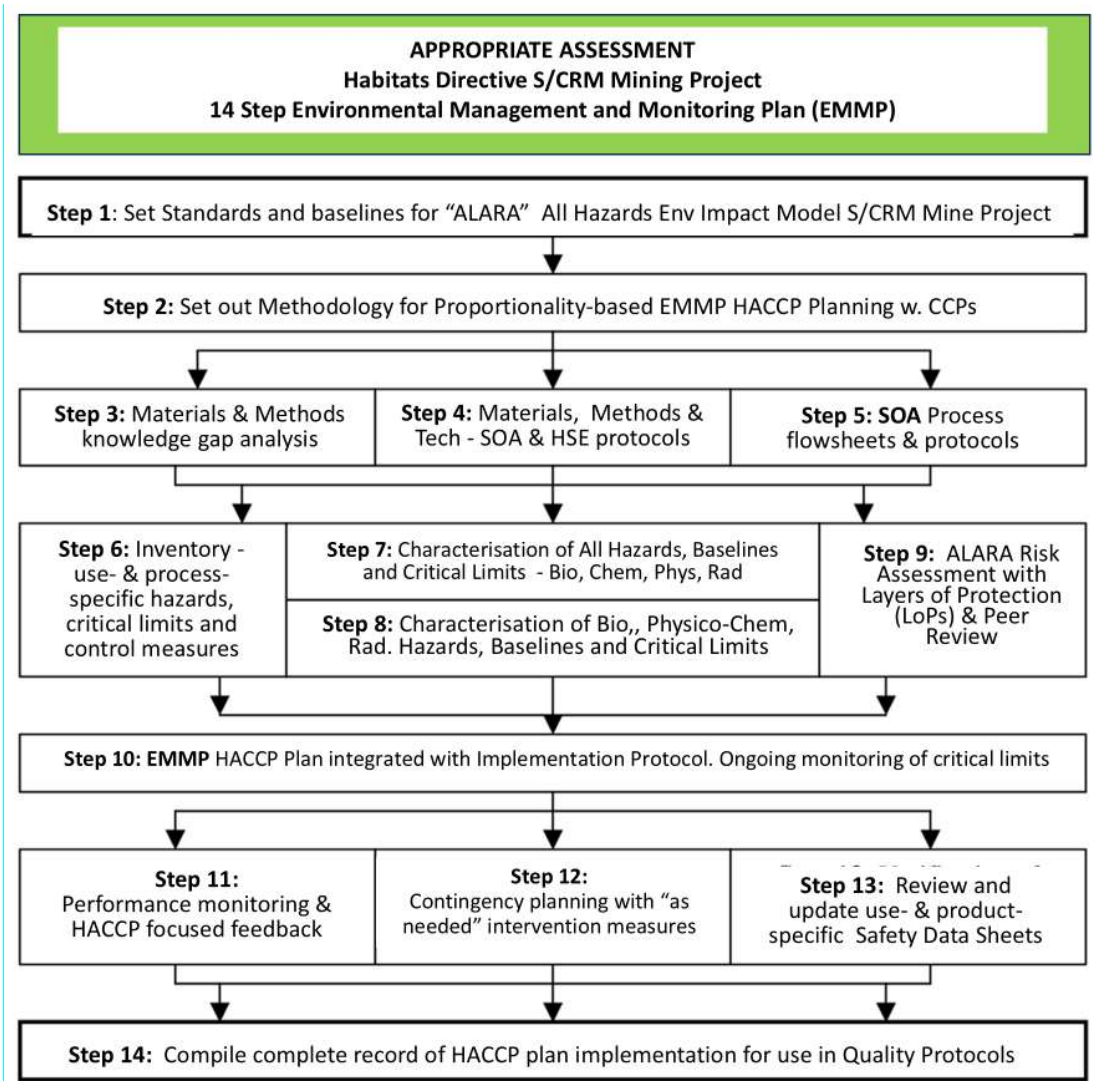

Fig. 12. 14 step HACCP Environmental Management and Monitoring Model.[93]

[93] The HACCP system is adapted and deployed for use in an "all hazards" approach to risk assessment and environmental.

11.1 UN Extractives Industry Policy Brief – A Reality Check

A powerful critique of the pervasive negative externalities which have caused deep reputational damage to the extractives industries are listed by the UN in the Policy Brief, Transforming Extractive Industries for Sustainable Development, May 2021, delivering this bracing Reality Check:

> The **transition to a net-zero economy must be a just transition for all countries, regardless of their sources of income, current energy mix or level of development**. As our world moves toward an uneven and partial recovery, **failure to transition to more sustainable systems will generate stranded assets, perpetuate vulnerabilities, jeopardize the fight against climate change and threaten human well-being, ecosystems, and economies for decades, if not centuries, to come**. **Transforming extractive industries must be part of the solution. This will require giving equal weight to the management of the impact of extractives on societies and the environment, as has been given to economic considerations in the past.** A shift in mindset is also needed away from short-term economic considerations to long-term financial risks and broader-based benefits associated with the transition to net-zero economies, that include social, environmental and cultural externalities.[94]

Three factors had however, coalesced during COVID most notably in the EU that had the capacity to transform that situation by fundamentally changing the nature and purpose of Extractive Industries.

1. The Green Deal started to take real operational shape in the minerals sector during the "Build Back Better" planning phase for the COVID recovery by focusing on decarbonisation for net zero climate action. This policy focused on green, clean-energy minerals, such as Rare Earths, complemented by renewable sources of energy such as wind and solar, for which REEs are essential, for example for renewable energy generation technologies, battery storage and distribution resources high-capacity, and for transitioning vehicles powered by fossil fuels to electric vehicles (EVs).

2. A wider, structural transition to the Circular Economy which moved the focal point of extraction to:
    a. primacy to resource use efficiency for all resources,
    b. recovery and reuse of Secondary Raw Materials as first resort for sourcing CRMS and SRMs,
    c. focus on compliance with Scope 1, 2 and 3 emissions to continue to deliver Climate Action decarbonisation targets.

3. Replacing the broken and unsustainable linear economy model of one-way, negative externality generating supply-chains of the industrial revolution into value chains commonly of a circular economic nature. The governance principles applicable are i. destroy no value (i.e. eliminate waste as a simple cost of doing business) and ii. where possible add value.

    New exploration, extraction and processing technologies, such as a now deployed at the Hemerdon, tungsten, tin and copper mine (see case study CIRAN WP 2 and WP 6.1), exemplify how to create operate and manage such facilities in ways that fundamentally change assessments of resources and reserves, optimise recovery efficiency and reduce Scope 1 and 2 emissions with follow-on benefits for Scope 3.

[94] United Nations, Transforming Extractive Industries for Sustainable Development, New York, May 2021. For the list of negative externalities see pp. 6-7

At the same time, as envisaged in the UN Transparency Protocol (UNTP), the new generation Distributed Ledger applications, commonly known as block-chain, together with AI and digital mining tools facilitate a process of safeguarding critical resources of both materials and monies from losses to theft and corruption. And even when such practices continue the ability to recover them again is advancing rapidly, a quantum jump above previous capabilities. For context, the annual losses to theft and corruption were estimated by the UNCTAD in 2021 to be of the order of $88.6 billion in the Africa region alone, more than the combined $54 billion Foreign Direct Investment and $48 billion Official Development Assistance (ODA) combined.[95]

11.2 The UN Transparency Protocol

11.2.1 Architecture

The architecture of the United Nations Transparency Protocol (UNTP) (see Figure 13) is the blueprint for all the components of the specification and how they work together. It defines the design principles which underpin the system and shows the components working together from the perspective of both a single actor and across the entire value-chain. The UNTP is a fundamentally decentralised architecture with no central store of data. Conceptually, its approach is fully consistent with the distributed ledger model of Blockchain where governance is devolved to the users who benefit simultaneously from the empowerment and control conferred by the technology while as conditions of establishment and the smart contracts it operates automatically making it exceptionally difficult to cheat or defraud the system.

The UNTP is broken into several distinct and separately implementable components so that each actor can implement only what is relevant for their role:

- The Sustainability Vocabulary Catalogue is for scheme owners and regulators to publish their rules and criteria so that they can be unambiguously referenced by conformity claims about products or facilities.

- The Identity Resolver and Digital Identity Anchor are for operators of authoritative registers of businesses, facilities, trademarks, and products so that their members can prove their identity and link their identifiers to rich data like products passports and facility records.

- The Digital Product Passport and Digital Facility Record is for supply chain actors to securely publish discoverable information about their products and facilities, including sustainability claims.

- The Digital Conformity Credential is for conformity assessment bodies to issue third party assessments of products and facilities so that greater trust can be associated to the claims made by product and facility owners.

[95] UN Extractives Policy Brief 2021 p. 5

- The Digital Traceability Event provides a means for supply chain actors to map the output products to input materials as well as logistics providers and service centres to record post sale events about products.

- The Verifiable Credentials Profile and Decentralised Access Control specifications are underlying technical capabilities that would be supported by any software system that is used by supply chain actors that implement UNTP.

A further benefit is that governance procedures such as Product Passports and tracking and tracing technologies are now available to transform the safeguarding of both critical materials and the vast sums of money lost each year through a combination of careless leakage and corruption. With the introduction of the UNTP new mandatory procedures to check and validate proof of materials provenance, with accompanying product passports for materials in transport, are themselves powerful means of challenging and disrupting corrupt behaviours.

Global Reporting Initiative (GRI) Mining Standard 14 released in late 2024 and taking effect from January 1, 2026, also marks a further significant step forward in eliminating such practices in the mining and minerals sector which when combined with effective ESG reporting and follow-up can greatly reduce both materials and financial supply risk for S/CRMs. Effective enforcement is of course essential.

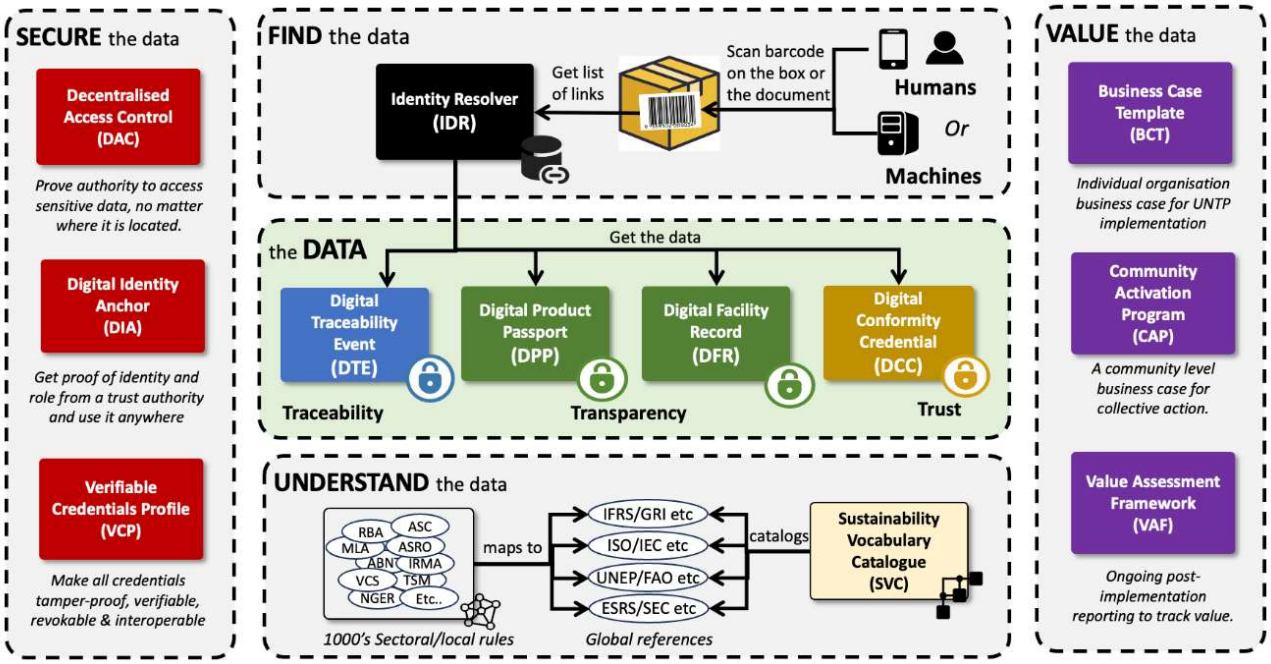

Fig. 13. The UN Transparency Protocol Architecture.[96]

[96] For further details of the UNTP system, see UN Transparency Protocol (UNTP) https://spec-untp-fbb45f.opensource.unicc.org/

11.2.2 Anchor Policy Investment and Double Materiality

In terms of investment policy focused on achieving the CE transition, investment banks in Europe such as the European Bank for Reconstruction and Development (EBRD) have explicitly adopted an "anchor policy" based approach to[97] Green Economy Transition (GET) investments in CRMs and SRMs, using a Double Materiality risk/benefit analysis approach in combination with the GRI 14 reporting standard.

This sets a precedent in judging the success of such a class of "green investments" that is [less]" Return on Investment" (ROI) [than] "Return on Policy" (RoP) delivery that is decisive. The logic behind that is persuasive because an ROI model typically references one single project while the RoP creates a major opportunity for a whole new class of operations, the class more than the individual project generating the basis of long-term ROI. For example, opening up access to secondary raw materials (such as tailings and residues) by investing in projects which lower or eliminate technological and/or regulatory barriers to market participation creates a new class of potential projects.

These in aggregate will certainly yield a strong ROI, but where the broader value of the asset class is not just to valorise and use the residues or tailings, but in doing so progressively recover the land used to date solely for "waste" disposal back into economically productive use. This meets both Circular Economic (CE) and CRMA requirements, the one based on principles, the other on complementary laws and regulation.

The successful achievement of CE and energetic minerals transitions, an approach that is true to the Double Materiality objectives of a) **impact materiality** (how the company's activities affect people and the environment) and b) **financial materiality** (how sustainability-related risks and opportunities impact the company's financial performance and long-term value growth) depends on developed new policy and related financial instruments targeted specifically to delivering S/CRMs to meeting the various needs of democratic EU or wider European countries. One such recent innovation is the combination of Strategic Projects approved by the EU March 25 and June 4 2025[98]; another is the UK government announcement November 24 "Government guarantee to strengthen UK critical minerals supply chains".[99]

Both the ICMM 2002 Breaking New Ground and the UN Extractives Policy Brief of May 2021 showed unequivocally that industry on its own was not capable of fixing and therefore had to be taken out of their direct control. Similar conclusions are reached in the Draghi Report.[100] Starting with re-engineering value chains to engage directly and transparently with primary stakeholders and building on the stakeholder capitalism model proposed by the Davos economic forum leadership, the value chain metamorphosed away from the primacy of shareholder value creation. The first step was to ensure that fair returns on investment were prioritised for sharing with local communities, the company workforce and local contractors, participants in more complex value chains, infrastructure workers in schools, hospitals and public services, all of which made non-financial contributions, but which all had measurable value in the value chain.

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[97] Green Economy Transition, see EBRD https://www.ebrd.com/what-we-do/get.html

[98] See https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/strategic-projects-under-crma/selected-projects_en

[99] See https://www.gov.uk/government/news/new-government-guarantee-to-strengthen-uk-critical-minerals-supply-chains

[100] Mario Draghi, The Future of EU competitiveness, Parts A and B, 2024 see https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en

11.2.3 Scaling Investments

Investment decisions can be taken according to democratic, transparent, equitable principles, which inherently advance the efficient policy making and delivery process through a financial channel, resulting in the optimised recovery of S/CRMs in return from both secondary and primary raw materials. As the European Bank for Reconstruction and Development[101] (EBRD) summarises it: "The EBRD is committed to scaling investments and capacity-building efforts to help both public and private sector clients identify and implement circular economy solutions. As demand for resources rises, harnessing […] industrial by-products will be central to advancing the transition toward a resilient and circular economy in [CRM/ SRM] producing countries". Some 50% of the EBRD investments in minerals goes to green projects centred on both primary and secondary S/CRMs, typically taking equity positions. This mirrors the Bargaining Solution component of the SRC and from a principles and policies perspective the EBRD would be a natural supporter of the SRC. It was not by coincidence that implementing this stakeholder capitalism model started in 2019 with some of the major banking and investment houses. On the one hand, the complete collapse of trust and public faith in the traditional business models of the extractives sector left investors with effectively no choice but to implement radical reform. That answered the IF question. But what the leadership of banks and investment house undertook, using the consultative platform of Davos Economic Forum provided, a neutral ground on which to rethink and reset policy, was a systemic adoption of a new approach to investment and resultant capital allocation.

With the relaxation of ESG reporting requirements December 2025 the SRC would also be alternative which aligns well with the Stakeholder Capitalism concept which socialises S/CRM projects because is close ties with Public Good in part because a significant number of these projects from a purely commercial point of view are not investable.

11.2.4 The Nash Equilibrium

A Nash equilibrium is fundamental to non-cooperative game theory, which Nash used in his Princeton University PhD[102]. It has applications in various fields such as economics of S/CRMs, supply-chain de-risking strategy through participative value-chain formation, and public policy.

This was a new model of Triple Bottom Line, one that also gave birth to another of CIRAN's approaches to policy formation, the application of Double Materiality risk and benefit assessments to CRM and SRM project funding. This reinforced the green light given to the IF question, if Stakeholder Capitalism could be accepted by the financiers might it result in a Nash economic "win/win" equilibrium that all stakeholders would experience tangible social and environmental benefits and ROI would also rise. This was a necessary combination of outcome to address the need under double materiality to show that first, the materiality social and environmental impacts were measurable and transparent, especially to primary stakeholders, and secondly that investors also saw fair Return on Investment (ROI), as mining and extraction project must by one means of another be profitable in order to meet the social and environmental standards expected of them.

[101] For the European Bank for Reconstruction and Development see Green Economy Transition, see EBRD https://www.ebrd.com/what-we-do/get.html

[102] John Nash, Non-cooperative games, PhD Princeton 1950, John Nash, "The Bargaining Problem", Econometrica, (1950) Vol. 18, No. 2, pp. 155-162.

12 The Defence Reset

In the light of developments on the defence front since the start of the Trump administration, the continuing aggression of Russia both to the Ukraine and to the West, but also Trump tariffs, 2030 climate and digital objectives, which also rely heavily on the raw materials on the CRM list, are now being recalibrated to make considerable policy and financial space for addressing defence needs involving both critical and strategic minerals.

As commented by DG REGIO representative, Wolfgang Münch, in his opening statement at the November 12, 2025, CIRAN consultation meeting with the European Economic and Social Committee, Brussels,[103] "Defence is now the game changer", during the panel discussion also commenting "we are now in a completely different world". Münch developed his line of thought in a manner highly significant for the policy objectives of CIRAN, highlighting:

> …the territorial dimension: mining, refining and recycling fundamentally reshape local economies and therefore require strategic tools similar to those of the Just Transition Fund—not to phase out, but to "phase in" mining in a strategic, participatory way. […] mining alone will not ensure resilience; Europe also needs technology, innovation, circularity and full value chains, as well as reforms to reduce bureaucratic delays in permitting that are often rooted in Member State implementation rather than EU law itself […] large public investments in Europe still take over 20 years from idea to implementation, which is incompatible with the urgency of today's strategic challenges.[104]

This also means there is a major policy shift for EU and UK to become much more focused on national and regional autonomy and self-sufficiency in any resource that can be classified either as strategic or critical. However classified, both categories, Critical and Strategic, may have equal relevance to defence and industrial economy needs. As such, these are co-dependent priorities in regard to securing strategic and critical raw materials against all forms of supply risk.

Relative to the longer-term threat of climate change, current war(s) will be short lived relative to the environmental challenges. But the comparison is perhaps hard to make in terms of impact, as the traumatic consequences of a war waged on the young, old, vulnerable and weak which counts as a war crime at least will also be generational in nature.

From a short- to medium-term perspective the fundamental reset of defence policies, human, technological and investment needs, has effectively pivoted management of mineral resources from "critical" as an essentially economic measure of resource priority to "strategic" as an existential measure of geopolitical vulnerability. This makes it a key priority for policymaking in the materials sphere to align, even converge, the enabling actions listed in this report.

It must also be taken into account that there are reservations among some members of the CIRAN consortium in respect of over-emphasising the significance of the defence reset both at a national and an

[103] Consultation meeting with the European Economic and Social Committee, Jacques Delors Building, Brussels, November 12, 20205 14.00-17.30

[104] Email November 17, 2025, commenting on meeting notes from the November 12 CIRAN Consultation Meeting

individual level. From a national perspective, Austria, Ireland and Malta are neutral and individual members of the consortium also express reservations about the risks of unbalanced emphasis on defence while Habitat risks e.g. from climate change are in key respects such as their longevity even more challenging to calibrate into the IROPI decision-making process in regard to permitting.

12.1 The Russian Invasion of Ukraine

Since the Russian invasion of Ukraine, one consequence has been consolidation and confirmed structural changes in US defence policy in regard to the funding of NATO, as started in the first Trump Presidency. It has also determined which military resources are to be deployed to defend democratic Western Europe[105], from which states they come and in what proportions. Bearing those considerations in mind, the concept of a CRM, and now also SRMs, has changed significantly from a focus on industrial needs within the Circular Economy and Green Energy transitions to one that places equal emphasis on defence economy needs as well as industrial. This is classical Bayesian updating.

This new normal condition has led to the minerals list, since its origin in 2014 defined only as "critical", now since 2023 to also mean "strategic" raw materials. This has also meant that the signals about geological risks of minerals shortages slowing or preventing industrial and commercial growth which attracted moderate attention[106] are now compounded by acute geopolitical stress manifesting itself in resource weaponisation and similar tactics, At the same time, there has started in 2025 an urgent push in Europe to double defence spending, meaning that in addition to meeting the underlying objective of managing the security of supply of the listed minerals for the economy national and regional security – the social benefits of defence - is now resuming its Cold War position as the dominant Social one of the three Triple Bottom Line leg.

The policy challenge this raises is clear. Can democratic Europe afford to make supply risk management decisions using the current fragmented and protracted decision-making system against such a threatening background from a hostile neighbouring country? Or, to meet the radically streamlined permitting requirement of 27 months is there only one plausible option? The process must be unified and treated as a necessity of overriding public interest – IROPI. If the OPI conditions can be met, the IF decision will be affirmative. To make that acceptable to the majority public opinion, the HOW question now also requires a very high quality, well-founded response which includes stating how potentially competing demands for access to and use of certain of these materials, for example, for rare earths, can meet the essential needs of both industrial, green energy and defence users.

12.2 Synergising S/CRM Policies and Operational Solutions

Synergising S/CRM policies and operational solutions between industry and defence is a collective responsibility. The more supply chains can be shortened and localised, the more lost social capital can be regenerated in terms of identifying knowledge and capability gaps in the S/CRM inventories, including both

[105] Democratic Western Europe is defined in this Report as all European states from those in the extreme west, i.e. on the Atlantic coast, to those on whose Eastern borders are the Russian Federation or its client states.
[106] See Web special Fraunhofer magazine 3.2021, Raw materials are scarce. Time and again, shortages have forced companies to cut back on their production. The circular economy may be the solution − for far more than just the climate. https://www.fraunhofer.de/en/research/current-research/what-the-future-is-made-of.html

secondary and primary raw materials, the more efficient the uses of time in policy formation and decision making can be made by streamlining. Streamlining this way makes it much easier to safeguard national and regional autonomy and protective capabilities simultaneously for natural or human habitats and in an integrated and holistic manner. The more integrated the LoP process the less risk we expose ourselves to high levels of resource criticality. Major benefits can also flow from putting much greater emphasis on preparedness and practice than on reactivity and cris management.

12.2.1 Strategic Raw Materials

The superordinate principle for inclusion of Strategic Raw Materials (SRMs) in the SRM list is their "strategic importance". This is "to be determined on the basis of the relevance of a raw material for the green and digital transition as well as defence and aerospace applications". Selection is in accordance with the following clear criteria:

a) the number of strategic technologies using a [specified] raw material as an input;

b) the amount of a raw material needed for manufacturing relevant strategic technologies [used in one or more of the specified applications];

c) the expected global demand for relevant strategic technologies.

The emphasis is on tangible raw materials, and strikingly in regard to its place in the CRMA on the strategic significance of these materials, the strategic importance of the technologies they enable or fuel and level of global, demand for them which by inference directs attention to their degree of availability within the span of control of the EU and its close partners, e.g. Norway, Switzerland and United Kingdom.

Given however, that Supply Risk is a feature of the CRMA it is surprising that while demand growth is factored into the principles of SRM selection Supply Risk is included as an attribute of the materials on the CRM list. It would make sense to fold SR into the SRM selection process since that would open the door for defining and including fallback options for substitute SRMs in the event of insecure or unavailable supply of the specific SRM listed.

Overall, the inclusion of a definition of what is meant by strategic importance and the sectors to which it applies greatly clarifies the nature and purposes of SRMs. Ironically it thereby highlights the absence of such a definition of criticality at the head of the CRM list. It is also strange that in the CRMA the SRM list precedes the CRM list despite being defined as a sub-set of that list.

Two aspects of this approach are open to question. The first is the consistent use of the term "strategic" when the materials to be selected are primarily grouped as "crucial". As with the merger of critical and strategic minerals in the 2023 CRM list, the uncertainties of definition of these terms is problematic and can be confusing.

An obvious policy recommendation is to revisit the definitions of fundamental terms such as critical and strategic in regard to the terms applying both to categories of materials but also to their relative status in terms of supply risk and economic significance.

12.2.2 The Pivot Critical Raw Materials List 2023 – SRMs and CRMs Merge

How quickly things can change is evident in the radical transformation of the 2023 list, compiled as the CRMA is being drafted. The 2023 list conveys the opposite impression, a growing uncertainty as to what the real purpose of the list is. This is most evident in the appearance for the first time of the category Strategic Raw Materials to complement the CRMs. The distinction between strategic and critical is blurred by some of the explanations given:

1. "Copper and nickel [both listed for the first time] do not meet the CRM thresholds but are included on the CRM list as strategic raw materials in line with the Critical Raw Materials Act". This begs the question as to what filters are applied to merit that explanation.

2. Four of the 2023 "strategic" materials are specifically chosen in their battery grade, which in its specificity of use makes "strategic" an unusual term for classification by use which logically would invite the classification "critical" meaning critical for battery production.

3. To add to the nomenclature confusion Nickel is specifically listed as "battery grade" in both the critical and strategic groupings and likewise Titanium is specified as "metal" in both categories while others such as Lithium as CRM is listed only as Lithium, but Lithium is strategic only in the battery grade.

4. Indium is dropped from the CRM list without explanation, oddly the only one of the fourteen materials selected for the 2011 list which has not appeared in all five of the lists.

5. There is a significant inconsistency between the Strategic Raw Materials list in the CRMA and that published in the EU Resource Management Information System (RMIS). CRMA includes bauxite/ alumina/ aluminium and identifies 17 SRMs while RMIS does not include bauxite/ alumina/ aluminium and has 16.

6. For the first time PGMs, Platinum Group Metals, are called by their name and are actually six in number though listed as 1.

7. Starting out in 2011 as REEs by 2023 the authors have shed the acronym for the full text, Rare Earth Elements, and are separated into Heavy and Light Rare Earth Elements – 8 Light and 8 Heavy.

8. Once the PGMs and REEs are disaggregated a further 19 elements are added.

9. In total, in disaggregated form the 2023 list of 34 CRMs swells to 53, nearly half the members of the periodic table.

10. The very helpful JRC Report which includes a summary chart of a wide range of materials of significance to the EU economy, the uses to which they are put and the level of criticality each is assessed as having from a supply risk perspective is dropped in the 2023 List while a second governance map is added, looking at a global level rather than just focusing on the EU.

12.3 Towards a Mining Policy Singularity?

The original key assumption of this Policy Brief, Towards Efficient Policy Making for Critical Raw Materials in environmentally protected areas, adopted in 2022 into the Project Scope, was that it would be built on a stable "current state baseline". In 2022, that baseline was strongly characterised by the global trend in recovery from the 4.5% drop in global GDP during COVID and by the primary policy determination that recovery should not just be to restore the status quo ante of pre-COVID but to "build back better".

From an Extractive Industries and critical materials perspective, the baseline in 2021 could hardly have been more challenging in that a) there was an almost total failure of trust and confidence of the general public and the industry as justifiably linked to the widespread, socially corrosive, environmentally damaging and economically highly protective corporate cultures and b) at a practical level the permitting process in general and the sheer complexity, time-scale and cost of starting or extending new mining projects, meant that the industry as a whole was becoming largely uninvestable.

What has developed since in certain parts of Europe, notably in 2025, is the high risk of a regulatory singularity i.e. such a level of regulatory fragmentation and policy inconsistency that the permitting process takes on the nature of matter in a black hole and becomes infinitely dense. That risk at its highest when the safeguard against such an out, the IROPI principle, is set aside or circumscribed by procedural objections. delays and layers of unnecessary detail.

12.3.1 The 2025 Seismic Shift

In just a few months, starting spring 2025, Europe's mineral policy makers have rapidly adjusted to the recognition that investment in energy and Circular Economy transition minerals applies equally significantly to defence as the archetypal example of IROPI – overriding public interest.[107] This reset, the most profound since the end of the Cold War, has also revolutionised, even turbo-charged approaches to safeguarding supply chain security, refocusing on autonomous decision making, rapid reappraisal of available resources in local and regional supply chains ("circuits courts"). Given the urgency of the need for a coherent and consistent approach to avoiding the risk of a singularity, including one that can be induced by external third parties the risk management strategy uses the Circular Economy transition process to turn supply chains into value chains, in the process reintegrating alienated stakeholders into active, equitably compensated members of the value chains.

12.4 Protecting Efficient, Evidence-based Anticipatory Policy Making

Despite the rapid rise of Post-truth Era approaches to policymaking[108], or perhaps before it starts to damage science based approaches to policy making for CRMA delivery, value-chain design and project implementation approaches resisting a drift to "new normal" operational conditions should consider a 90-

[107] See comment by Wolfgang Munch DG REGIO at the CIRAN Project EESC Consultation Meeting Brussels November 12, 2025.

[108] For an in-depth analysis of Post-Truth era policy-making conditions see Andi Rasyid Pananrangi, Imran Ismail, Wahyuddin Hamid, Andi M Rusdi Maidin, Zaenuddin Mustapa, Andi Rizal, The Impact of the Post-Truth Era on Transparency and Accountability in Public Administration: Systematic Literature Review, Journal of Posthumanism, Volume: 5, No: 5, pp. 3767–3789, May 2025 and relevant Sections of this Report.

day push to recentre the permitting process in the streamlined, 27 month CRMA framework for project permitting, or less where feasible.

Rapid negotiation of a Social Resource Contract tailored to both national S/CRM supply- and value chain-needs could follow smoothly, accompanied by the requisite EMMP. The SRC negotiation process will safeguard the integrity of both the design and delivery process for the CRMA and the new projects under development such that the risk of post-Truth fake news-based policies being deployed to further delay permitting is mitigated or contained.

12.4.1 Double Materiality and Reengineering Value Chains

Central to the building of these double materiality value chains are issues such as inventory development, permitting, optimizing resource use efficiency and the enactment of "Social Resource Contracts" to make equitable participation in and benefits for stakeholders enforceable, especially those in close proximity to the mining areas. It may therefore turn out to be the most efficient, effective, efficacious and equitable policymaking, to make the protected area the default condition for inventorying available resources, contingency planning, permitting and investment in any CRM project, irrespective of location.

It also appears increasingly obvious that as many CRM projects are not likely to be profitable (or even investable) by any financial ROI measure, the trigger to capital allocation is securing resource availability, led by or underwritten by government – the so-called "policy anchor" investment strategy. At present this is heavily focused on valorisation of secondary raw materials such as tailings and residues, but also transforming extraction efficiency through innovative technologies which, as for example with Tungsten, have also radically enhanced the economics both of resource estimation and of recovery efficiency, as for example with the Tungsten West project in Devon, SW England[109], now also an EU Strategic Project[110].

12.4.2 Double Materiality, Circular Economy Minerals Policies

From experience to date as the CRMA enters its second year after formal adoption, consultation with CIRAN consortium members, industrial organisations and related stakeholders such as the UN Economic Commission for Europe, the sponsor of the UN Framework Classification[111] (UNFC) now mandated for use under certain aspects of the CRMA:

- Integrate management of secondary and primary resources, with secondary resource options as default / preferred option where feasible.
- Recover, reuse as much and as continuously as possible – all resources.
- Optimise resource use efficiency at all points in supply and value chains.

[109] See Fact Sheet https://op.europa.eu/en/publication-detail/-/publication/83ac5d3d-65e6-11f0-bf4e-01aa75ed71a1
[110] For Tungsten West project see https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/strategic-projects-under-crma/selected-projects_en
[111] UN Framework Classification for Resources, https://unece.org/sustainable-energy/united-nations-framework-classification-resources-unfc

- Modify individual and collective behaviours to assure individual self- and collective self-sufficiency (not dogmatic "degrowth" but pragmatic "self-discipline and community solidarity").

- Anchor policies determine investments and capital allocations in the SRM and CRM sectors, policies that express national and regional priorities, also take protected area requirements into responsible consideration, according to special measures such as Overriding Public Interest (OPI)[112] and to project-specific, pre-agreed exceptions and exemptions.

- A range of "Social Resource Contracts" based on common core principles will be applied to value chains to ensure transparency, good governance and trackability and traceability of monies and materials.

The UNFC is uniquely suited for categorising mining projects in environmentally protected areas. This stems from its project approach, and from applying two distinct sets of categories. One reflects the status of environmental, social and economic contingences, the other the status of technical contingencies (feasibility), i.e. which phase the project is in from exploration to decommissioning. The uncertainty in the relevant project metrics, i.e. the confidence in estimates is recorded (in a third set of categories). Being a classification of projects first and resources second, UNFC lends itself to be used in many applications, including extractive activities and projects enhancing anthropogenic resources in the circular economy. Using one classification for several activities helps manage portfolios of diverse projects as is the task in government, business combinations and diversified investment funds.

The Double Materiality investment process will follow a Nash-Stackelberg equilibrium model where a) all members of the value chain will be engaged through "smart contracts" managed through trackability and traceability tools and b) in related project implementation aligned to the UN Transparency Protocol[113], using resource passports to verify origins and validate authenticity.

12.5 Why a Social Resource Contract?

A Social Resource Contract, also known as a Resource Social Contract,[114] has its origins in Europe during the Enlightenment most influentially in the work of Jean-Jaques Rousseau who conceived the social contract as a compact between the individual and a collective "general will" aimed at the common good. The contract was reflected in the laws of an ideal state designed to reform the existing society of the time which embodied a false social contract that perpetuated inequality and autocratic rule.

As the transformative concept of a social contract evolves into the nineteenth century it to an extent normalises in an implicit or explicit agreement between a state and its citizens regarding the allocation and use of natural resources. It involves the state managing resources in exchange for revenue, which it then uses to provide public services, and is built on trust, where citizens pay taxes in return for government-

[112] See Habitats Directive Article 6 §6(4)
[113] UN Transparency Protocol (UNTP) see https://spec-untp-fbb45f.opensource.unicc.org/
[114] Jean-Jacques Rousseau, Le Contrat Social (1762), https://ebooks-bnr.com/ebooks/pdf4/rousseau_du_contrat_social.pdf

provided services. A breakdown in this contract, often due to resource mismanagement, can lead to a loss of trust and social instability.

That trust and social stability has to an extent been in part restored from late 2019 with the emergence of the concept of stakeholder capitalism as proposed by Jamie Dimon at the 2019 Business Roundtable and as formally articulated by the Davos World Economic Forum. [115]

The structure of the Social Contract is defined by four elements having much in common with stakeholder capitalism:

- **State obligations:** The state has a duty to oversee and on occasion when overriding interest prevails control natural resources, secure revenue from them, and use that revenue to provide public services like health, education, and security.

- **Citizen obligations:** Citizens agree to pay taxes and accept the state's authority in exchange for a safety net and the opportunity to thrive.

- **Trust and legitimacy:** The sustainability of a social contract depends on the trust citizens have in their government. This trust is built through the effective provision of quality public services.

- **Shared expectations:** It is a system of collective expectations about the rights and duties of individuals, institutions, and the state, as well as the narratives that bind them together.

12.5.1 Consequences of a Broken Resource Social Contract

The symptoms and consequences of a broken Social Resource Contract (as it is called in Singapore) are:

Primary Symptom:

- **Failure to provide public services:** Without sufficient revenue from resources and taxes, governments are unable to fund essential services, creating a vicious cycle of poor services and low trust.

Main Consequences:

- **Erosion of trust:** When the government fails to deliver on its promises, citizens lose trust, which can lead to a reluctance to pay taxes and a weakening of the social fabric.

- **Social instability:** A broken contract can lead to conflict as state-society relations deteriorate and legitimacy is lost.

The policy formation process for S/CRMs at the end of 2025 is a complex mixture of both aspirations to innovate circular economic business models aligned to stakeholder capitalism while reversing the damaging fragmentation trend in the regulatory and policy world of contemporary Europe in favour of reinvigoration.

[115] See Klaus Schwab, Peter Vanham, Stakeholder Capitalism: A Global Economy that Works for Progress, People and Planet, Davos 2021, https://www.weforum.org/stories/2021/01/klaus-schwab-on-what-is-stakeholder-capitalism-history-relevance/

12.5.2 Influence on the CRMA

This inevitably carries through to implementing the CRMA. The CRMA at one level is a perfect example of a regional government, the European Union (EU) seeking to redress significant shortcomings in its management of natural resources, as in that case, criticized by the UN in 2017 for its lack of attention to these problems. (see CIRAN deliverable 6.1). A similar problem is even more deep-seated in the mining and metals sector.

This was recognised by ICMM as a major governance failure in the 2002 Breaking New Ground Report[116] sponsored but not written by ICMM. In the same vein the Breaking New Ground highlighted the lack of legal force behind the protection of the Public Good as a fundamental justification for permitting mining projects at all.

Even focusing on a Social Licence to Operate for mining projects since 2002, as the ICMM has done, has not brought back public trust and confidence in mining companies, most notably in areas where it has been lost to negative externalities of many kinds. That instrument of social and environmental protection has frequently failed or been vulnerable to weak governance and accountability. The discussion of environmental and social effects has often taken the form of seeking good behaviour from all through what some lawyers term “good boy’s clauses” with limited obligations attached rather than through hard core, enforceable obligations.

This has to change and is clearly one of the CRMA objectives. The inclusion of the UNFC classification system in the CRMA is one instrument that puts legal force into resource classification and progression based on the integrity of the UN as the guarantor of the transparency of the system.

[116] See International Council on Mining and Metals (ICMM), Authors IEED and WBCSD, Breaking New Ground, 2002, https://www.iied.org/mmsd-final-report

13 A New Approach for Europe's Mining and Minerals

A new, Europe-centred approach is required that will bring with it a new, efficient and widely accepted methodology for managing permitted mining projects in protected areas where primary resource mining is the last Layer of Protection option of many, not the first. And by businesses investing in digital and innovative solutions, a major step forward in resolving the bottle-necking challenge of the shortage of experienced, suitably qualified staff on the permitting side, e.g. for adjudicating the mandatory "Appropriate Assessments" and Environmental Impact Assessment can be significantly relieved.

The Social Resource Contract is premised on all signatories being equally empowered, equally developed, equally protected from resource weaponisation and external existential threats so there is alignment of incentives for all stakeholders in achieving the streamlining goals. What the decision-maker must, however, do, is develop a screening policy to separate committed as opposed to opportunistic participants in the consultation process especially for Habitats Directive IROPI projects under Article 6 para 6(4). The similarity between the Blockchain of "smart contracts" and the theoretical objectives of the Social Contract suggest that from a values and cultural perspective grounding smart contracts in social contract, democratic principles will facilitate a good fit between the technology and society. In other words, the Brundtland definition of how major changes in technology redefine how the societies using them work is fully applicable to the current time.

As the origins of modern Social Resource Contract thinking lie in the Enlightenment, particularly as articulated by Jean-Jacques Rousseau prior to the French Revolution it is perhaps unsurprising that the recalibration of the concept started in France.

13.1 Origins of Social Resource Theory

In contrast to the political and philosophical origins of social contract theory, social resource theory is a concept from social psychology and sociology developed in the mid-20th century:

- The theory*:* Psychologists Edna and Uriel Foa[117] are credited with developing social resource theory. This posits that individuals produce and use various resources, both material (like money) and immaterial (like love, status, or information), which are central to their well-being.

- Social exchange*:* The theory examines how these resources are distributed and exchanged in interpersonal and social interactions. Social resource theory suggests that the rules governing these exchanges vary depending on the type of resource being traded.

- Network analysis*:* Sociologists have further applied this concept to understand how individuals access and mobilize resources through their social networks to achieve their goals, such as finding a high-status job.

The combination of the concepts, implied in the term "Social Resource Contract", refers to an agreement, either explicit or implicit, about how a society's resources are to be distributed and exchanged.

[117] Edna B. Foa and Uriel G. Foa, Resource Theory - Interpersonal Behavior as Exchange (New York 1980).

- Corporate social contract*:* For example, in the business world, the idea of a "social contract between business and society" emerged in the 1970s. It suggested that a company operates with the public's consent and therefore has an obligation beyond profit to serve societal needs, such as creating jobs and protecting the environment. This has resurfaced in 2019 in the concept of stakeholder capitalism.

- Modern application to governance*:* In contemporary international and development studies, a "social contract" is used as an analytical tool to describe the implicit agreements between governments and societal groups. This is particularly relevant in resource-rich countries where the distribution of wealth from resources like oil and minerals affects state legitimacy. When governments fail to distribute resource benefits fairly, it can lead to instability, conflict, and the breakdown of the implicit social contract.

- Psychological contract of work*:* Within organizational behaviour, a psychological contract describes the unwritten set of expectations between an employee and employer regarding what they will give and receive in a relationship. A modern interpretation of this is a "social contract of work," which focuses on the collective understanding and power dynamics within the workforce, rather than just individual beliefs.

Reaching Full Circularity

The SRC is the host mechanism of a broad range of measures available for inclusion in the recitals of any specific C/CRM project using the SRC structure. This enables the Parties to assess, mitigate and where possible eliminate risks of all kinds to strategic and critical materials. This means aiming for circular economic values, expressed as value chains rather than supply chains, in which the value chain is based on common values. These values include maximised resource production and use efficiency, notably from recycling and reuse, extraction from secondary raw materials, resource thrifting and related consumer behavioural modification.

A further implication of the shift of emphasis to value-chain from supply-chain as part of the Circular Economy transition is that the underlying linear nature of the conventional supply-chain assumes that some residual waste is an inevitable consequence of minerals extraction and use. By contrast, the framing condition of a circular economic approach is that tailings and residues must be regarded as resources of potential value, realisation of which necessarily requires imagination, creativity and investment in research and development (R&D). This approach needs to be accommodated in a future revision of the EU Waste Framework Directive (WFD).[118]

Full circularity will not be possible before a stock of materials to be recycled has been built up through extraction, production, beneficiation, refining, and use in products that at the End of Life are dismantled and go into the stock. In quantitative terms the dynamics of this process must be understood, and excellence established in circular economic product design and manufacture including for easy dismantling and component reuse. In some cases, such as the management of Platinum Group Metals, the dynamics have

[118] Waste Framework Directive https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en

already largely been understood and implemented achieving some 70% circularity as of late 2025. The pathways to full circularity are therefore, being mapped mineral group by mineral group.

These practical measures are protective in nature of an already developed economic system under threat such as in western Europe. They are not aspirational as found in a low or medium income country. Responsibility for supply- and value-chain resilience and projection is collective, part of a wider transition from the linear to the circular economy, a social duty shared by all, delivered by all available legal and ethical means, to gain or regain public trust in mining and minerals, especially where the Social Licence to Operate (SLO) has failed.[119]

The SRC is grounded in a public interest and common good project. It commits industry to sharing more of the benefits derived from mining in a particular community in low- or middle-incomes, with more emphasis as a social benefactor than a long-term business partner where economic interests are aligned. It assumes, based on long-standing experience of negative externalities imposed on the developing communities by mining, that mining companies are still quite commonly seen as untrustworthy, even as enemies by host communities, not partners.

So, a range of project-specific Social Resource Contracts is required with active long-term collective engagement and good governance by all parties and enforceable laws. The crux is that the CRMA requires there be an equilibrium between the centralised and devolved aspects of permitting which assign primacy under "compelling reasons" to the central authority to retain market integrity – the IROPI principle. Hence the Social Resource Contract assigns primacy to the "common Union framework" under the CRMA:

> To safeguard the functioning of the internal market, a "common Union framework" should therefore be created to ensure access to a secure and sustainable supply of critical raw materials. CRMA Recital §4.

1. The stated purpose of the CRMA is to protect the supply chains of the European economy.

2. CRMA Recital §27 by contrast does encourage "the use of allocated regional development funds to make significant investments at regional level in ensuring the Union's security of supply for strategic raw materials […] Strategic Projects should be considered, by the permitting authority responsible, to be in the public interest". The reason why the CRMA envisages supporting investments in a common Union framework at a consistent local level is to make sure there is a homogeneous and consistent approach to meeting local needs not a free-standing solution including local powers of veto. Such powers by definition undermine the Union framework and make the single market unworkable.

13.2 Social Resource Contract - Basics

A Social Resource Contract describes the implicit agreement in a "common Union framework for S/CRMs" regarding the allocation and management of resources, including natural resources and social goods. The

[119] See the UN Extractives Policy Brief May 2021 pp.6-7

principles of democracy—such as accountability, transparency, and equality—are essential for ensuring this contract is fair, legitimate, and beneficial to all citizens.[120]

Rooted in classical social contract theory,[121] and developed under the aegis of Sciences Po, Paris, the concept of a Social Resource Contract has evolved to include society's expectations concerning the fair use and distribution of its resources, rather than just the relationship between the state and the individual.

It addresses core questions such as:

a. How are resources (such as land, water, oil, and mineral wealth) managed and distributed?
b. What is the balance between individual property rights and the collective interest in resources?
c. What is owed to future generations in terms of environmental protection and resource conservation (intergenerational justice)?

For a Social Resource Contract to be considered just and legitimate, it must be supported by strong democratic principles and be anchored in the Public Good.[122]

13.2.1 Citizen Participation and Consent

- Ensuring legitimacy: Democratic decision-making processes for resource allocation, such as public hearings or inclusive policymaking, ensure that citizens grant legitimate consent to how their resources are governed.

- Empowering communities: Meaningful participation is especially critical for local and Indigenous communities living near natural resource extraction sites, who are often disproportionately affected by environmental and social harms. A rights-based approach empowers these historically marginalised groups in resource management decisions, including through free, prior, and informed consent (FPIC).

13.2.2 Transparency and Accountability

- Counteracting corruption: Lack of transparency is a major factor in the "resource curse"—where resource-rich nations experience conflict and underdevelopment. Strong democratic oversight, like civil society participation in initiatives such as the Extractive Industries Transparency Initiative (EITI), helps hold authorities and corporations accountable for resource revenues.

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[120] Esther Kibe, Maria Nzomo, and Fred Jonyo, Citizen Participation in Natural Resource Governance: A Case of Oil in South Sudan, European Journal of Development Studies, Vol 3 | Issue 5 | September 2023 www.ej-develop.org DOI: http://dx.doi.org/10.24018/ejdevelop.2023.3.5.293 39

[121] For recent developments in social contract theory triggered by major political changes e.g. in UK (Brexit) and France (Gilets Jaunes) see The social contract: a framework for rethinking our common ground, Blog post June 20th, 2024 https://www.iddri.org/en/publications-and-events/blog-post/social-contract-framework-rethinking-our-common-ground#:~:text=The%20term%20refers%20to%20a,specific%20to%20different%20social%20classes).

[122] Nanang Indra Kurniawan, Päivi Lujala, Ståle Angen Rye, Diana Vela-Almeida, The role of local participation in the governance of natural resource extraction, The Extractive Industries and Society, Volume 9, March 2022, 101029

- Informed decisions: The democratic right of citizens to access information about environmental quality and resource management is a prerequisite for effective participation. Transparency enables citizens to scrutinize decisions and demand better outcomes.

13.2.3 Equity and Justice

1. Addressing inequality: Extreme economic inequality can distort democracy by allowing the concentration of resources to secure disproportionate political influence. Democratic principles help ensure that all social groups, regardless of wealth, benefit fairly from public spending and have access to essential resources and services.

2. Balancing interests: A democratic social contract must balance competing needs for resources among different social groups and generations. It requires mechanisms to negotiate how to sustain resources for the future while addressing current needs.

13.2.4 Rule of Law

- Providing stability and protection: The rule of law guarantees that resource governance is not arbitrary and that all individuals and entities, including governments and corporations, are subject to the same laws.
- Protecting rights: Robust legal frameworks that uphold environmental regulations, property rights, and avenues for legal recourse provide security and protection for all parties, especially the most vulnerable.

13.3 Developing the New Social Resource Contract

The five pillars of the SRC modelled early in the first quarter of 2023, starting with the CIRAN kick-off meeting in January, set off the process of scoping the first theoretical design. In parallel, throughout 2023 and into 2024 the WP6.2 team was also working on practical case studies in the UK. Two mines, Hemerdon and Redmoor, concerned directly with S/CRMs tungsten, tin and copper, and two mines, Woodsmith and Boulby, dealing with generic issues of re-permitting mining in Yorkshire, NE England. In the case of Redmoor and Hemerdon, the mines had their origins in the 18th century as part of the industrialisation of mining. Woodsmith and Boulby originally created for coal mining were part of 19th century industrialisation, now crossing over from mining coal to mining and processing polyhalite for farmers from deep under the North sea. All four projects have in common considerable success in reindustrialising their communities while building their local profiles on stakeholder engagement and well-earned levels of social acceptance, despite being located in sensitive Protected Areas known in England as National Parks.

The four projects area each in a different stage of development, from exploration geology to infrastructure development and engineering for mining and extraction, to build out for commercial scale output to large-scale commercial activity. Between them they cover a significant range of a mine's life cycle, end to end. They also show that End of Life for a phase of a mine's life is not the end of the mine. These examples are important reference points for the new challenges of S/CRMs. All four show how the pre-existence of a

commercial mining culture is a major factor in successfully streamlining permitting in the current time because the important knowledge and experience already available is a key foundation for Preparedness.

In 2024, two CIRAN team site visits in January and October opened the analytical process to include field work in two countries, Portugal and Italy with significant presence in the quarry sector. The first was to Parque Natural das Serras de Aire e Candeeiros, Portugal's only Nature Park, January, and Monte Tondo, in Emilia-Romagna also a Protected Area. This also gave the 6.2 Team insight into the various different emphases that are placed locally on what the local SRCs negotiations are likely to have to accommodate in conducting the Bargaining Solution and related SRC tasks.

13.3.1 Consultation

As captured in CIRAN Deliverable 5.2 five key cross-cutting themes emerged from the Europe-wide consultation process:

1. a broad demand for transitioning to circular economies and more sustainable lifestyles,
2. firm prioritization of environmental protection, especially in opposition to mining in protected areas,
3. conditional acceptance of mining only under strict ethical, environmental, and oversight standards,
4. widespread mistrust in institutions and corporate influence,
5. strong support for education, innovation, and inclusive public engagement.

Despite national differences in emphasis, these shared themes reflect a consistent public vision for a more ethical, transparent, and ecologically responsible approach to CRM governance in Europe confirming the results of the previously conducted focus groups.

13.3.2 Current State of the SRC's Development

The implementation process for the SRC proceeds in two stages of which this report is the first. It is by necessity deterministic and theoretical in nature, i.e. principles based, because there is as yet no practical body of knowledge or experience of how to formulate the SRC from empirical experience and evidence of implemented S/CRM projects. The development of the deterministic part may be see summarised in three primary sections. These are set out across this document as 1. the **Nash Bargaining Solution** whereby the SRC, especially its financial governance terms can be negotiated between the Parties in a specific S/CRM project; 2. the **Recitals**, which are included in this Section which define where the SRC fits with the CRMA; and 3. the **Anatomy** which is set out in a standalone form capturing the SRC in 10 detailed Principles.

The progress made on defining the SRC from the empirical perspective has been very rapid as confirmed since May 2025 in the meetings in Lens and Brussels consultation meetings referenced above. And in the context of coming to terms rapidly with the New Normal, the Anatomy function in a similar way to as Manifesto

The recitals of the Social Resource Contract are in clear alignment with the objectives of an "ethical, transparent, and ecologically responsible approach to CRM governance in Europe" and in this report mining in protected areas is a decision of last not first resort. How these perspectives are phrased differs because of the nature of the tasks set by the different work packages, and as this is new ground for all of us to explore

and map variances are to be expected. But in the Bayesian IF/HOW model, the IROPI model, and the Bargaining Solution model there is no obvious confounding variance between the objectives, only variations as to which way is the best to reach them.

The thematic overview from 5.2 Section 4.3.2 is therefore cited verbatim as a bridge to 6.2:

1. Environmental protection as a non-negotiable baseline
   - Environmental protection consistently emerged as a dominant public priority, with particular concern over the risk of mining in protected areas, biodiversity loss, water contamination and long-term ecological damage.
   - All five countries strongly advocated limiting or outright banning mining in protected areas, **unless under exceptional, heavily regulated conditions**.
   - There was broad agreement that irreversible environmental or health damage must be avoided at all costs.

2. Conditional acceptance of mining based on ethics and oversight
   - While there was widespread scepticism toward mining, in general participants did not fully reject it. **Conditional acceptance** depended on factors such as **transparency**, **ethical conduct**, **strict environmental criteria**, and **democratic oversight**.
   - **Ethical standards and codes of conduct** for companies (especially those operating abroad) were broadly supported in each
   - Emphasis on **modern, low-impact extraction techniques** and **mandatory environmental restoration**.
   - General preference for **public or EU-based entities** over private multinationals to lead projects.

3. Distrust in institutions and corporate influence
   - A widespread **lack of trust in national and EU-level institutions**, alongside corporate scepticism, shaped the dialogues. This mistrust often translated into rejection of mining proposals, especially where participants felt excluded, manipulated, or insufficiently informed.
   - Portugal, Slovakia, Czech Republic, Ireland: participants reported public trust deficits.
   - Concerns about lobbying, corporate capture of EU policy, and biased consultation processes were frequently raised.
   - Transparent, participatory decision-making was seen as essential for rebuilding trust.
4. Public engagement, education and innovation as enablers of change
   - There was a strong call for **investment in public education**, **community participation**, and **innovative approaches** to facilitate informed, future-oriented decisions. Participants wanted **transparency, inclusion**, and **respect for local values and knowledge**.
   - All countries highlighted the **importance of education and awareness-raising**, particularly around sustainability and mining impacts.
   - Participants emphasised the need for **local and community involvement** in decision-making.

- Many dialogues pointed to **future-facing solutions**: alternative materials, AI, or even space mining.[123]

13.4 Efficient Policy Making and Dynamic S/CRM Contracts

Efficient policy making as it continues to evolve, like the S/CRM list itself, will shape the Social Resource Contract recitals and Nash Bargaining procedures. Like the circular economy it is continuous and dynamic not static. By definition it may be continually renegotiated in response to new challenges and needs, such as one or more of the following change drivers:

1. Ecological transitions*:* The shift toward sustainability and addressing climate change requires adapting the Social Resource Contract to include environmental stewardship and intergenerational equity.
2. New domains*:* The traditional view of resources as commodities is being replaced by a more comprehensive understanding of socio-ecological systems. New frontiers of resources, such as digital data, also challenge and expand the scope of the contract.
3. Evolving TBL expectations*:* Citizens today have higher expectations for transparency, accountability, and participation in the management of public resources, especially in regard to public and defence, This demands more inclusive and dynamic models of resource governance.

13.4.1 Social Resource Contract - Core Principles

As confirmed during the major public consultation meeting on this Policy Brief hosted by ACOM and ALDA in Lens, France on May 15, 2025, these core democratic values and principles set a robust, unifying frame within which the SRC can be negotiated and continue to evolve:

1. Security of supply of critical and strategic minerals protects democratic Europe in terms of both democratic values and critical and strategic materials - that is the rationale for the Social Resource Contract which negotiates the HOW the process is conducted across the whole lifecycle including End of Life provision.
2. The Social Resource Contract (SRC) template is a statement of unity based on common democratic values, agreed at the Lens CIRAN consultation meeting.[124] It will form a platform for delivering the high-level policy objectives of the CRMA.
3. Public Good and good Governance define the Social Resource Contract as the Guarantor of security of supply. So negative externalities are turned into positive internalities.[125]
4. The "All tools in the box" approach it requires means everyone is an active participant in implementing that Social Contract within the democratic values frame.

To these may be added the observation that the best way to fight post-Truth is with the Truth.

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[123] Cescon, Marzia; Bednáriková, Pavla; Robert-Campos, Helena; Rosendo, Luis (2025). Guidelines for public engagement and dialogue. Results of public engagement activities, pp 50-51. CIRAN project, Grant Agreement No. 101091483 of the European Union's Horizon Europe research and innovation programme.

[124] The primary finding of the public consultation, CIRAN WP5, Lens May 15, 2025.

[125] Portuguese former mayor Paulo Cunha at the WRF CIRAN meeting made exactly this point, Geneva Sept 3, 2025.

13.4.2 The Fragmentation Risk to Social Cohesion and Democracy

In regard to related challenges, the CRMA requirement to streamline permitting and regulations is clearly correctly framed, but the on-the-ground evidence is that the streamlining target is getting ever harder to achieve just when it is being challenged to deliver to the objective.

If the fragmentation challenge within democratic Europe is not only met but put into reverse, the (ACOM)[126]/ European Association for Local Democracy (ALDA)[127] common principles of maintaining unity of purpose and values in S/CRM projects both in regard to policy and operations will greatly facilitate delivery. But that will require the political will to execute. Decision makers need to insist on reform.

13.4.3 Retooling the Mining and Extraction Business

So, from a business retooling perspective as seen by CIRAN in 2024 (see Deliverable 4.1, Protocol on Environmental Assessment of CRM Extraction in Protected Areas) four drivers are now forcing a retooling of the mining and extraction business in a fully transformative manner.

a) addressing the damaging legacies of the industrial era, especially the environmental and social negative externalities, and in the process
b) resetting the nature of the extractives industries to be anchored in meeting the good governance and public good obligations
c) management and administration systems (streamlining)
d) refocusing capital allocation towards growth, with reduced emphasis on investor ROI.

These are all essential new business strategies, together with digital innovation.

13.5 Social Resource Contract: Recitals

A detailed anatomy of the Social Resource Contract is a standalone Section of the Report after the Conclusions section. The Social Resource Contract:

1. Exists at the point of intersection between democratic principles and democratic practices.

2. Has to be understood as a dynamic, living text, reviewed no later than every three years in sync with the S/CRM list review. The Bayesian principles of IF and HOW combined with the Bayesian "conditional probability" facility to change the terms when needed must apply.

3. Has to serve the purposes of the CRMA, notably streamlined permitting in no more than 27 months with feedback to the permitting process from the findings of the Environmental Management and Monitoring Plan accompanying each S/CRM Project.

[126] For ACOM l'Association des Communes Minères de France, see https://www.acomfrance.org/l-association/
[127] For the European Association for Local Democracy (ALDA) see https://www.alda-europe.eu/about-us/?_gl=1*1uni8cg*_up*MQ..*_ga*MTUxMTY3OTgwNy4xNzYzMzE5NDA0*_ga_5LD43JB3TT*czE3NjMzMTk0MDMkbzEkZzEkdDE3NjMzMTk0MTUkajQ4JGwwJGgw

4. Has to accommodate dynamic management of permitting rules and procedures including sudden changes to reporting requirement in supply- and value-chains, such as ESG, changed December 15, 2025, for some 80% of companies.[128]

5. The SRC recitals will encourage companies engaged in S/CRM projects to reinvest any savings from relaxation of the ESG and similar reporting requirements back into strengthening their company internal sustainability policies and practices as part of the participatory bargaining solution method by which the wording of the SRC is finalised and signed.

6. Regards mining S/CRMs, particularly in Protected Areas, as a last resort in a state of resource criticality, under IROPI conditions, and under a ""common Union framework"".

7. Integral to the Green Energy Transition, is based on shared common language across primary documentation such as the CRM and now S/CRM lists together with clear definitions of "critical" and "strategic" raw materials and Circular Economy and Green Energy Transition resources.

8. A standardised template[129] for the SRC comprised of these Heads of Agreement is required designed for the specific tasks of derisking supply chains for S/CRM materials.

9. The Social Resource Contract must be symmetrical between all parties. A wider failure to invest in protecting vulnerable communities and populations has contributed to the resource policy asymmetry between central policy and decision-making and locally devolved decision-making which CRMA Recital §4 rejects on grounds of high risk of fragmentation and dissonance.

10. Emphasising the policies of self-defence and protecting autonomy strengthens social cohesion when applied in a uniform, symmetrical way.

11. At Critical Times Supply Risk is more likely to be existential in nature than Habitat Risk which is relative in nature even in Protected Areas.[130] The SRC will negotiate when a Criticality state is to be declared, under which conditions the IROPI principle will be applicable.

12. To safeguard the functioning of the internal market, a "common Union framework" under both critical and non-critical conditions should therefore be created to ensure access to a secure and sustainable supply of critical raw materials and to safeguard the Union's economic resilience and open strategic autonomy.

[128] Some 80% of companies in the EU have been taken out of scope of mandatory ESG Reporting as of December 15, 2025, see https://www.responsible-investor.com/eu-lawmakers-approve-sustainability-omnibus-package/#:~:text=Reporting%20requirements%20will%20also%20be,reporting%20regime%2C%E2%80%9D%20it%20says.

[129] Recommended by Bridget Donovan, OECD representative at the November 12 CIRAN Review meeting with Brussels

[130] See Figure 10, Task and Finish Group, Industry Resilience for Critical Minerals, An analysis of sector risks and recommendations for the UK's supply chain resilience, 19 December 2023 https://assets.publishing.service.gov.uk/media/65c9f85ccc433b0011a90bd0/the-task--finish-group-report-on-industry-resilience-for-critical-minerals-feb-2024.pdf

13. The list of strategic raw materials should contain raw materials that are of high strategic importance for the functioning of the internal market, taking into account their use in strategic technologies underpinning the green and digital transitions or for defence or aerospace applications, that are characterised by a potentially significant gap between global supply and projected demand, and for which an increase in production is relatively difficult, for instance due to long lead-times for new projects increasing supply capacity.[131]

14. Critical raw materials are needed at the beginning of many industrial value chains and are often indispensable inputs for a wide set of strategic sectors including renewable energy, the digital industry, and the aerospace and defence sectors. They therefore play an essential role in underpinning economic activities in the internal market, and supply disruptions could have a significant cross-border impact between Member States (MS). CRMA Recitals §12

15. The use of allocated regional development funds to make significant investments at regional level in ensuring the Union's security of supply for strategic raw materials […] Strategic Projects should be considered, by the permitting authority responsible, to be in the public interest". CRMA Recitals §27

16. Well-designed plans, including spatial plans and zoning, that take into account the potential for implementing critical raw material projects and whose potential environmental impacts are assessed, have the potential to help balance public goods and interests, decreasing the risk of conflict and accelerating the sustainable deployment of critical raw materials projects in the Union. CRMA Recitals §35

13.6 Validations

The CIRAN consultation meeting held in Lens, France May 15, 2025, co-chaired by CIRAN Partner ALDA[132] and ACOM[133], addressed the same topics but from the unifying principle that democratic values and practices must be followed to protect the sovereignty of European democracies and their local, national and regional autonomy (see Figure 10).

Hence in matters referred to by Balmont, such as guiding the current fast-moving policy evolution process as applicable to awarding mining concessions, selection and prioritisation of strategic and critical resources, impact materiality (environmental and social impacts of mining activities) new forms of public consultation and engagement to enhance governance and public trust, there is broad agreement between her observations from a legal perspective and the viewpoints of local democracies (ALDA) and the mining communities themselves (ACOM).

[131] See CRMA Recitals §2.

[132] ALDA The European Association for Local Democracy (ALDA), see https://www.alda-europe.eu/

[133] ACOM L'Association des Communes Minères de France, https://www.acomfrance.org/

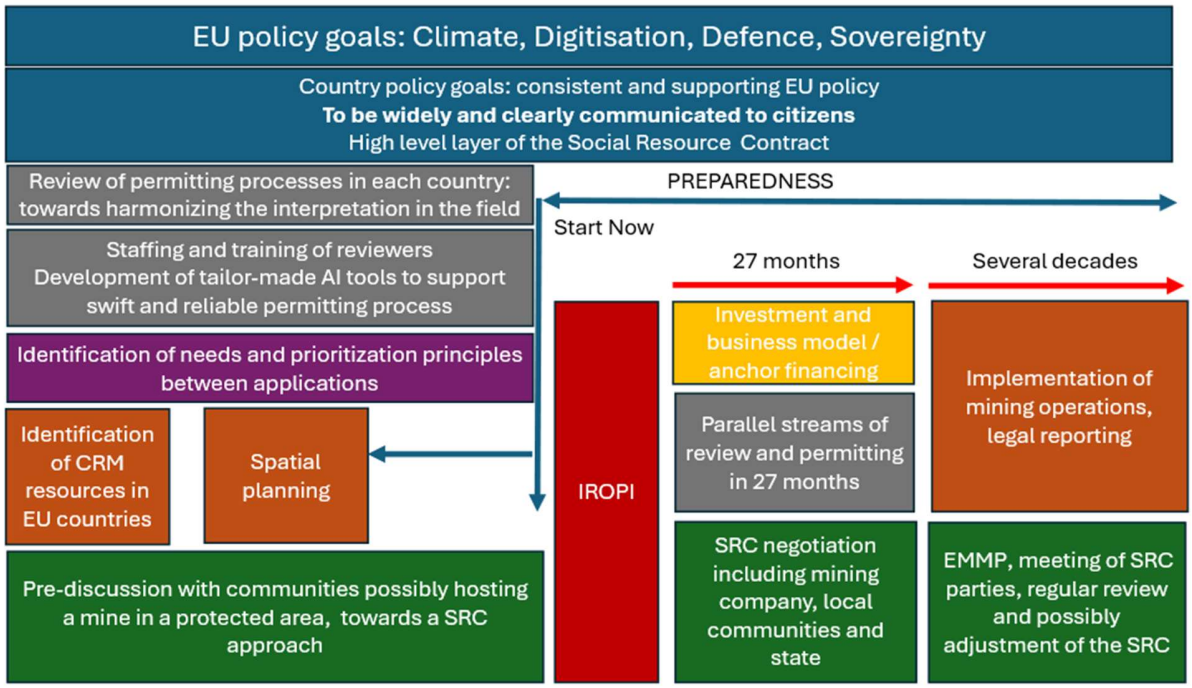

Fig. 14. The Model Pathway to the Social Resource Contract (see also Fig. 10).

13.6.1 Independent Validation of the Social Resource Contract

The Lens meeting was not originally intended to shed light on the development of the SRC, but as it turned out, it achieved this result in a significant way. The participants in the plenary discussions were highly experienced senior figures from various political, industrial, scientific, academic and social organisations across France. They were very interested to be briefed on the concept of the Social Resource Contract about which the ACOM team had already been consulted in depth at an online consultation, May 12. The conversation over lunch and the link to the work of Jean Jaques Rousseau was explored and found to be timely because of the policy shift in the minerals space in France, back to reindustrialisation. The origins of this new policy were clearly significantly by the ACOM team hosting the Annual "Assises d'energie" March 28, 2025, which the 6.2 Team attended online.

Drawing together the conclusions, the following points were noted:

- Europe, and where possible nations or regions themselves, must be self-sufficient in critical and strategic materials to retain their adaptability, accountability, governance and autonomy through "circuits–courts" tight value chains. (CRMA Recital §27) Europe must not become "a slave to hostile external supply chains" – J-P Kucheida, President ACOM.

- Funding for securing supply chains must be government policy-anchor led and underwritten whether within EU/European borders or across national/ regional boundaries to third countries with available S/CRMs.

- S/CRM policy determinations, S/CRM project investments and S/CRM project management and resource distribution and use must be aligned with, and grounded in, democratic values and principles, whether the source areas are protected or not.

- S/CRM projects must be funded and managed in compliance with democratic social, environmental and economic principles in equal, optimised measure, based on the highest level of scientific and socio-environmental rigour expected of permitting in Protected Area and applying the principle of Public Good to S/CRM resource to ensure equitable access to benefits as part of the Nash Bargaining Solution.

- The new normal for all S/CRM projects is grounded in the circular economic transition, climate action through investment in energy transition minerals, and defence. People are as rigorously protected as nature reserves or NATURA sites, both from physical and from psychological risks and threats.

- Preparedness, agility and flexibility are key requirements in terms of both policy and practice. Optimum use of AI, machine learning, block chain must be made with pre-prepared permitting embedded into government lead investor mandate.

- Based on a graded approach to assessing criticality states a "Layers of Protection (LoP) model" will be applied, with appropriate hurdles or decision gates such that the Terms & Conditions of working in protected areas are pre-agreed. In the context of national interest and public protection, no absolute prohibition can be made.

13.7 Building a Bridge from Theory to Practice

The above summary confirmed that there should now be a four part process to initiate the structured development of the SRC. This will draw together:

i. testing and refining the theoretical model of the Social Resource in a unifying Bayesian dynamic IF/HOW planning and operational framework, grounded in democratic principles (see Figure 10).

ii. applying full Triple Bottom Line customised versions of the Nash Bargaining Solution for symmetrical contract negotiation between Parties, and anchor policy green investment financing, combining social, environmental, and economic aspects in equilibrium focused on both social capital and the creation of innovative value chains.

iii. taking first practical steps in designing a small portfolio of Government financed S/CRM Pilot Projects to start assembling the necessary operational experience to build a blueprint for design, permitting and operation of S/CRM project delivery.

iv. targeting social capital investment in processing S/CRMs, optimised their use and innovating ways to substitute resource available within Europe's border for this which are supply- dependent from third countries or at risk from resource weaponisation to complement measures to enhance efficiency measures to of 200-300% in supply areas such as exploration and mining geology,

extraction efficiency, and resource use efficiency, mirrored by demand-side disciplines such as "thrifting" and life-cycle use extension for goods with high supply risk materials.

13.7.1 Europe Arriving Late Again to the Party

As early as 2017, using the same metrics as applied to social, environmental and economic (i.e. holistic Triple Bottom Line) performance under the Sustainable Development Goals, the UN Department of Economic and Social Affairs identified two significant weaknesses in the EU's policy regarding critical raw materials, one tangible the other intangible. The tangible concerned lack of investment in securing supplies of CRMs sufficient to meet national or regional economic needs; the intangible concerns investing in social capital to a level that a) ensures optimal extraction and use efficiency of what resources and quantities are available and b) what fall back capabilities, knowledge, policies and strategies are required in terms of materials substitutes, behavioural modifications to maintain resilience and to promote flexibility and agility. Both aspects were neglected, creating preconditions for rapid escalation of criticality levels in supply risk.

Conditions for accelerating changes to resource management policies formed during and immediately after the COVID pandemic (March 2020 – March 2022) the urgent need for a new, radical approach to the circular economic and the green energy transitions being understood with greater clarity and urgency during the reflective pauses of lockdown. So, the energies of Build Back Better, together with the Russian invasion of Ukraine in 2022-24 crystallised in the EU into the CRM Act and a little earlier in the UK into a Critical Minerals Strategy, 2022. But even then, Europe while seeing the urgency of the economic case for rapidly streamlining permitting by mid-2024 had not grasped that the same urgency was about to come for reforming Europe's Investment in defence - by doubling it only a few months later.

A recent sign of the impact of this change was shown by the UK government on November 25 2025 release a "**New Government guarantee to strengthen UK critical minerals supply chains"**.[134] The need for such a facility has been argued by the authors of this report for the duration of the CIRAN project so it is with some satisfaction that the inevitable consequence of the policy of derisking S/CRM value chains is that governments are the lender/guarantor of first resort, along the "anchor policy" lines set out in this report in the section on EBRD.

13.7.2 The Draghi Report

A more recent strong reinforcement of the same line of thinking may be found in The Future of European competitiveness, Part A: A competitiveness strategy for Europe[135], otherwise known as the Draghi Report, which argues cogently for enhanced innovation and engagement of the private and public sectors in enhancing Europe's competitiveness:

> And we must take a new stance towards cooperation: in removing obstacles, harmonising rules and laws, and coordinating policies. There are different constellations in which we can move forward. But what we cannot do is fail to move forward at all.

[134] See https://www.gov.uk/government/news/new-government-guarantee-to-strengthen-uk-critical-minerals-supply-chains.
[135] See https://commission.europa.eu/document/download/97e481fd-2dc3-412d-be4c-f152a8232961_en

13.7.3 The EBRD – Green, Circular Economic Investment

The European Bank for Reconstruction and Development (EBRD) Green Economy Transition Fund (GET) focuses first on the policy driven social and environmental impact of the Green Economy Transition its Double Materiality risk assessment mode, positioning that impact to trigger the financial impact by reshaping the nature of the terms of the financial support. The emphasis on taking an equity stake and playing as much or perhaps more the role of partner than venture capitalist.

This may on the surface seem idealistic and philanthropic, but in fact it recognises that social resistance to a capital investment in the minerals sector or protest against negative externalities as damaging legacies in or to the environment are the number 1 and 2 risks to mining and processing project investments worldwide.[136] In particular, sensitivity on impact materiality in countries applying democratic values is to be the platform on which all investments are based:[137]

The EBRD defines a circular economy as one where the inherent value of resources is retained and extended across multiple product life cycles. For phosphogypsum, this means transforming it from a waste product to a resource, allowing for recycling and repurposing within various industrial processes.

This approach aligns with the European Commission's Circular Economy Action Plan[138], [139], and the categorisation system developed by the Directorate-General for Research and Innovation, which provides guidance on activities that qualify as circular economy investments. [140] As a participant in the creation of this categorisation system, the EBRD integrates these principles into its Green Economy Transition (GET)[141, 142] approach, providing its personnel with tools to assess projects' circularity and environmental benefits (see Figure 15).

The EU Categorisation System for the Circular Economy aims to establish a shared language and understanding among stakeholders,[143] promoting circular design, supporting procurement decisions, highlighting circular products in the market, fostering innovation, aiding policymakers and integrating circularity across supply chains. It seeks to provide criteria and definitions to advance the transition to a circular economy by encouraging sustainable practices and guiding various sectors towards circularity.

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[136] See EY Top 10 risks and opportunities for mining and metals companies in 2025, https://www.ey.com/en_uk/insights/energy-resources/risks-opportunities#:~:text=Capital%20is%20the%20No.,waste%2C%20water%20and%20nature%20positive.

[137] See From Waste to Inventory, General Editor Julian Hilton, International Fertiliser Association, Paris 2025

[138] EU Circular Economy Action Plan see https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

[139] European Commission, Circular Economy Action Plan see eur-lex.europa.eu_legal-content_EN_TXT_HTML__uri=CELEX_52020DC0098; see also https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN

[140] European Commission Directorate-General for Research and Innovation, Categorisation System for the Circular Economy European Commission Directorate-General for Research and Innovation, Brussels, March 2020, https://circulareconomy.europa.eu/platform/sites/default/files/categorisation_system_for_the_ce.pdf

[141] Green Economy Transition see https://www.ebrd.com/what-we-do/get.html

[142] European Bank for Reconstruction and Development, Implementing the Green Economy Transition Technical Guide March 2024, https://Implementing-the-Green-Economy-Transition--Technical-Guide-March-2024%20.pdf

[143] European Commission Directorate-General for Research and Innovation, Categorisation System for the Circular Economy European Commission Directorate-General for Research and Innovation, Brussels, March 2020, https://circulareconomy.europa.eu/platform/sites/ default/files/categorisation_system_for_the_ce.pdf

The strategic economic goal is to define a new, Nash-model sustainable point of CRM CE equilibrium, focused on consultation, autonomy and collective self-sufficiency.

Fig. 15. Green Investments and Policy Dialogue, European Bank for Reconstruction and Development[137]

For these compelling reasons, this report makes a strong policy recommendation:

1. to apply this model of a shared common language across documentation such as the CRM and now S/CRM lists together,
2. to develop a complementary clearer and more consistent understanding of what the GET investment is in service of managing supply risk through targeted anchor investment,
3. to define more clearly the varying types or categories of Protected Area and /or CRMs contained within them, where mining and processing may need to be assisted financially by government to support projects,
4. to develop a small portfolio of “Next Generation” S/CRM projects to innovate techniques and technologies in the S/CRM space, notably for minerals likely to be uninvestable or commercially marginal from a purely market perspective and hence need to find vale add products and services to assist S/CRM project to find new ways to increase margins by leveraging participatory local support and engagement.

This approach applies even in Protected Areas where the risk/risk equation is weighted significantly towards dealing with the supply risk than environmental risk because that is actually the true position. The supply risk is much more likely to be existential than the habitat risk, as is shown by the risk data shown in the twin supply risk and ESG risk reporting which focuses existential criticality on Supply Risk as compared with challenging but manageable risk in regard to ESG.

13.7.4 Failures of Trust, Alienation and Weaponisation

There was a further highly significant driver of supply risk in the EU and wider western Europe, as identified in the UN Extractives Industries Policy Brief (May 2021), a catastrophic breakdown in trust and confidence between the mining and processing sector and society at large as expressed in a series of negative externalities both material such as environmental damage and pollution, but also social, psychological and reputational. At the core of meeting the supply risk challenge were energy transition and climate action minerals.

At the core of societal risk were two different challenges, both highly demanding. The first was long-term alienation between places of origin of the materials feeding the supply chains and their customers because of the grave social, environmental and economic impact caused by extractives industries over two hundred years or more. That said, during the 19th and well into the second half of the 20th centuries. many of the raw material were domestic (iron mined in Germany, in France, in UK, …); and what is perceived today as a failure was not perceived that way when miners were the heroes of their time.

The second was fierce competition for CRMs, in certain situations so severe that the concept of resource weaponisation[144] was advanced to describe it. Sometimes this weaponisation was a function of purely economic tension; but sometimes it was deliberately induced by a country possessing such CRMs applying pressure on another for market reasons, or military strategic purposes, or both. Both aspects have featured prominently in the Ukraine-Russian war.

13.7.5 Policy Rethink – Safeguarding CRM Security of Supply and Strategic Autonomy

While the Critical Raw Materials Act was not on the radar when CIRAN was first adopted into the Horizon programme mid-2022, the predicted endpoint of Work Package 6, the need to fundamentally rethink minerals policy making for industrial and economic reasons had become clear. Hence, access to CRMs in protected areas was already a highly significant issue. That meant Europe was forced to address the weaknesses pinpointed by the UN in 2017, but under much greater time pressure than was the case in 2017.

But it has taken until the turbulence caused by the second Trump administration in early 2025 to force the pace of a ground-up rethink of European defence policy, capabilities, resources, financing and strategic autonomy. The rapid accession of two new European states into NATO, both significant holders of mineral resources, but also highly sensitive to the challenges of extraction of such resources from protected areas. But in similar brusque fashion, states such as Germany had to undertake a fast reset of their defence policies and related expenditures, breaking a defence posture which had been in place since the late 1940s. An unexpected impact of the return of the Trump administration is that the Task 6.1 Report of the CIRAN Work Package 6, on Gaps and Vulnerabilities in Supply Chains which was finished and signed off June 30, 2024, by March 2025 by end March 2025 had to be reopened as part of 6.2.

[144] A concise definition of “resource weaponisation” may be found in Sustainability Directory, 26.04.25 - Leveraging control over essential resources for strategic coercive power.

13.8 Gaps and Vulnerabilities in Supply Chains – Revisited

Material or infrastructure gaps

The list of critical raw materials provides a factual tool for trade, innovation and industrial policy measures to strengthen the competitiveness of European industry in line with the renewed industrial strategy for Europe, for instance by:

- identifying investment needs which can help alleviate Europe's reliance on imports of raw materials
- guiding support to innovation on raw materials supply under the EU's Horizon 2020 research and innovation programme
- drawing attention to the importance of critical raw materials for the transition to a low-carbon, resource-efficient and more circular economy.

In the language of "missing segments and vulnerabilities" the analysis of Deliverable 6.1[145] pinpoints two missing segments, i) meeting targeted, unmet investment needs to alleviate (or perhaps substitute for) imported raw materials from third countries; and ii) filling the missing supply-chain knowledge segment that resource use efficiency (RUE) and enhanced economic circularity were both individually, and in combination, essential for the decarbonisation process.

Now the cocktail of trade tariffs and re-calibrating the entire western European defence landscape has forced a rapid rethink on how to diversify the scope of quantities and variety of uses of S/CRMs and how to accelerate the investment in developing social capital in learning how to process and use S/CRMs but equally, permit them quickly and accurately as well as in supply-chains of material to generate innovative value chain and high growth potential industrial clusters.

Supply Risk or Demand Risk?

Another underestimated vulnerability is to focus heavily or exclusively on supply risk. There are a variety of demand modifiers, such as those highlighted in D.3.2 which can contribute significantly to managing supply risk in regard to availability of some CRMs to a point well below the criticality threshold.

Among these will feature optimising resource use efficiency, resource "thrifting" to modify individual and collective demand and consumption, and to educate societies to understand that achieving security of supply is not simply a right but also one grounded in individual and societal collective responsibility, i.e., not just the mission or duty of the mining and processing industries.

Vulnerability to Fake News and Manipulative Propaganda

A vulnerability to a different risk which has increasingly become evident in the patchy and often hostile public acceptance (or rejection) process of mine permitting is that of fake news, manipulative propaganda and a systemic rejection of evidence-based appraisal and mistrust of and disrespect of all experts. This phenomenon has risen sharply since the start of the second Trump administration and has seen a level of

[145] See Hermann, L., Hilton, J., Marijanski, M., (2024). D6.1 Baseline Report on missing segments and supply chain vulnerabilities.

impact in the public sphere similar to the meteoric rise of AI and Block chain as if one is the mirror opposite of the other. What is now very clear is that evaluation of science and technology is not the trusted platform for much contemporary policymaking in the current era of "post-Truth", but under such conditions, rational policymaking becomes fraught with many complex issues.

Post-truth may be defined as "a period where objective facts are less influential in shaping public opinion than appeals to emotion and personal belief. This phenomenon is characterized by the prioritization of feelings over evidence, the spread of misinformation, and a decline in public trust in traditional institutions and experts. The term became prominent around the time of the 2016 Brexit vote and both during and after the 2024 U.S. presidential election".

The direct impact of this phenomenon may be seen across many areas of regulatory decision- and policymaking, whether focused on child vaccination, global warming, or mine permitting, so impacts the process at the heart of permitting – the Appropriate Assessment". At such a polarised socio-political time, the dilemma as to how to define what Appropriate mean in this assessment context is acute. Given the scope of this report and its associated recommendations concerns the policy framework for delivering the CRMA, one of its first tasks is to consider how core principles of adhering to democratic values and logical, civil, evidence-based decision-making can be safeguarded. Post-truth may be characterised as "a rejection of objectivity and standards of common truth that threatens the foundations of knowledge and rational discussion"[146].

In a powerfully insightful literature review published May 15, 2025, the context is set by the authors as follows:

> The post-truth phenomenon has significant relevance in public administration because it affects policymaking, transparency, legitimacy, and the government's relationship with the community. In this era, policies are often influenced by the pressure of public opinion based on emotions or populist narratives, rather than scientific facts (Fischer, 2003); Political polarization and related distortion of information exacerbates the situation in which people trust only the information that suits their political views, thus hindering consensus in policy implementation (Lewandowsky et al., 2017).
>
> The rise of disinformation on social media undermines the credibility of government, making it difficult to deliver official information (Wardle and Derakhshan, 2017). Technologies, such as social media algorithms, create filter bubbles that block people from objective data (Sunstein, 2001). Additionally, declining trust in public institutions threatens the legitimacy of the government (Habermas, 1984), and the use of "alternative facts" in policy communication creates an ethical dilemma (Kakutani, 2018). In crisis management, such as that during the COVID-19 pandemic, disinformation further weakens the effectiveness of public health policies (van der Linden et al., 2020). Therefore, information literacy, transparency, and evidence-based policies are crucial for overcoming the challenges of the post-truth era in public administration.

From a transparency and social acceptance perspective, evidence-based policy making now requires robust defence and persistent communication especially when the issue at stake has a fundamentally economic and

[146] Andi Rasyid Pananrangi, Imran Ismail, Wahyuddin Hamid, Andi M Rusdi Maidin, Zaenuddin Mustapa, Andi Rizal, The Impact of the Post-Truth Era on Transparency and Accountability in Public Administration: Systematic Literature Review, Journal of Posthumanism, Volume: 5, No: 5, pp. 3767–3789, May 2025.

financial purpose, security of supply of strategic and critical raw materials (or minerals) into democratic Europe's industrial and defence industries.

13.9 Mining in Protected Areas

Within the double materiality framework component of impact materiality perhaps the most thorny issue to be addressed is the strongly held assumption by some stakeholders that environmental protection and mining are by definition fatally conflicted activities. The extent and depth to which this position has taken hold may be seen in the NO GO concept as formalised by the International Council on Mining and Metals (ICMM) in 2003 for UNESCO World Heritage sites.

The unfortunate assumption that mining and nature are irreconcilable states of being was no doubt born of the fundamental breakdown in confidence between the mining companies and wider society which was prevalent at the turn of the millennium. That led to ICCM in 2002 – a year before the 2003 agreement with UNESCO – publishing a landmark 477 page report Breaking New Ground: Mining Minerals and Sustainable Development on the current state of the mining industry and its existential need for deep reform.[147] The Report itself was compiled independently for ICCM by the International Institute for Environment and Development (IEED)[148] and the World Business Council for Sustainable Development.

> Even the best modern operations may have some undesirable environmental impacts, and good practice has far to go before it spreads to all parts of the industry. The objective of improved performance is to ensure that critical natural capital is maintained that ecosystems are enhanced where possible, and that minerals wealth contributes to net environmental continuity. The challenge is to define where, in the short and medium term, resources can be targeted to ensure the best chance of meeting these objectives in the future.

The two main points to address were first, to adopt "the four pillars of sustainable development" and secondly, to radically strengthen the industry "governance structures" based on the legal protection of Public Good as expected by society as a fundamental duty of the mining industry.

Governance

Breaking New Ground is very frank in its analysis of the governance failings:

> Widespread community demands for relevant, direct, and sustained benefits from mineral wealth are a relatively recent phenomenon, so frequently neither government institutions nor companies or communities themselves have been properly equipped to respond to them. Governance structures, particularly in developing countries, are often inadequate to ensure that communities receive a fair share of the benefits that could be put to equitable and sustainable use. If governance structures are weak and unrepresentative, so too generally is the legal framework regarding citizens' rights and the protection of the public good. This challenge cannot realistically be met by individual companies acting alone.

[147] Breaking New Ground https://www.iied.org/sites/default/files/pdfs/migrate/9084IIED.pdf
[148] For the IEED see https://www.iied.org/george-takes-over-iied-trustee-chair

With the rise of ESG finance and financial reporting these issues have experienced a significant degree of reform; but this process remains vulnerable not least from governments that have withdrawn or even outlawed their ESG commitments, most obviously the United States. Under the Trump Administration, where some Republican states have actually made ESG investment illegal. In the case of the EU, as of December 15, 2025, its hitherto rigorous reporting requirements have been lifted from some 80% of the companies leaving only large enterprises with that obligation.

13.10 Common Principles and Practices in Selection, Governance and Operation of CRM Projects

The CIRAN consultation meeting held in Lens, France May 15 2025, convened by ALDA[149] as part of its contribution to CIRAN WP5 and cochaired by Adrien Licha, Coordinator of the Secretariat & the Eastern Partnership Unit and Jean-Piere Kucheida, President, L'Association des Communes Minières de France (ACOM)[150], addressed the same topics but from the unifying principle that democratic values and practices must be followed to protect the sovereignty of European democracies and their local, national and regional autonomy. Hence in matters referred to by Balmont, such as guiding the current fast-moving policy evolution process as applicable to awarding mining concessions, selection and prioritisation of strategic and critical resources, impact materiality (environmental and social impacts of mining activities) new forms of public consultation and engagement to enhance governance and public trust, there is broad agreement between her observations from a legal perspective and the viewpoints of local democracies, ALDA, and the mining communities themselves, ACOM.

Negotiating the Social Resource Contract on Democratic, Triple Bottom Line Principles

The process of appointing local specialist working groups or committees tasked with identifying a) if a locally protected area does contain any S/CRM materials of interest and b) setting out an "in principle" permitting process long before and actual application for a mining permit shows up. This would enable a process of negotiation to be conducted that would set out a draft Social Resource Contract for the oversight of that project, including its governance, financing, equitable sharing of both access to and benefits from the materials the mine contains. Based on the composition and conduct of the CIRAN WP5 meeting held in Lens, France, May 15, 2025, this is both demonstrably possible to set up and both rational and highly sensitive to following and applying democratic principles and decision-making procedures aligned both to local community needs. priorities and governance modalities but also aligned with national and regional perspectives,

In such a model, a fixed set of principles at the superordinate level gives the strength and robustness that the democratic framework needs, but also the flexibility and adaptability at local and operational needs to keep operational aspects under continuing review such that the risk of erosion or fracture of trust between the primary stakeholders does not occur. In the permitting stage a Social Resource Contract is negotiated around a Triple Bottom Line (People, Planet, Prosperity) framework where the performance metrics are equally social, environmental and economic in nature. Governance is enabled and supported in both "soft" and "hard" ways. The defining ingredient of the soft approach is trust; the hard approach uses AI and Blockchain tools to power protocols such as the UN Transparency Protocol for traceability, trackability and

[149] The European Association for Local Democracy (ALDA), see https://www.alda-europe.eu/
[150] For ACOM, L'Association des Communes Minères de France, https://www.acomfrance.org/

certification of the source and origin of the materials themselves, by means of which flows both of “monies” and “molecules” are kept under tight scrutiny across all their various supply and value chains.

These are the enabling tools to ensure that once the Social Resource Contract is signed, in line with the superordinate principles set by democratic values, and the “negotiated equilibrium” at the heart of Nash economics where such an equilibrium has the great virtue that its primary characteristic is that in the transactions the equilibrium ensures that both parties win, rather than one wins and by definition the other loses, a function typical of political financial decision-making in which there are always winners and losers.

14 Natura 2000 Sites and Other Protected Areas - Policy and Procedural Recommendations

The CIRAN project examined successful case studies of mining operations near Natura 2000 areas (see Figure 4), identified the best available technologies supporting these activities, and analysed the policy framework along with the nexus of societal vulnerabilities. On the basis of those studies and the present analysis the following recommendations are proposed.

1. Integrate CRM Planning into Spatial and Environmental Frameworks

Mineral planning is rarely integrated into spatial or environmental planning. This leads to uncertainty, delays, and conflicts. Using sensitivity mapping and strategic environmental assessments, CRM zones should be embedded into national and regional spatial plans. This integration must occur early in the planning process to identify and mitigate conflicts with protected areas.

Actions

- Include CRM zones in **national, regional, and municipal land use plans**.
- Use **source-pathway-receptor models** to identify potential environmental risks early.
- Ensure **Strategic Environmental Assessment (SEA)**, **Water Framework Directive (WFD)**, and **Habitats Directive** assessments are conducted during planning and project preparations.
- Promote **early-stage strategic assessments** to reduce permitting risks and improve project predictability.

Impact

This approach de-risks projects before permitting, improves transparency, and shortens timelines by resolving conflicts earlier.

Technological Support

Use remote sensing, drone-based surveys, and geospatial data platforms to inform land-use decisions and environmental assessments.

2. Support Strategic Project Designation and Prioritisation

CRM projects often lack prioritization mechanisms, delaying development and investment. Designate strategic CRM zones and link them to fast-tracked permitting and financial support. Align with CRMA and EU Green Deal goals.

Actions

- Implement **priority project mechanisms** at national and regional levels.
- Designate **strategic CRM zones** with pre-assessed environmental and social criteria.
- Link strategic designation to **fast-tracked permitting**, **financial support**, and **public engagement**.
- Align national strategies with the **Critical Raw Materials Act (CRMA)** and EU Green Deal objectives.

Impact

Accelerates development of high-impact CRM projects while maintaining environmental and social safeguards.

3. Enhance Data Quality, Classification, and Transparency

Inconsistent data and lack of harmonized classification hinder strategic planning and cross-border cooperation. Mandate UNFC classification for CRM deposits and ensure public access to geological data via INSPIRE-compliant platforms.

Actions

- Mandate the use of **UNFC classification** for CRM deposits across Member States.
- Require **public disclosure** of CRM data using the **INSPIRE Directive** framework.
- Support **Geological Survey Organisations (GSOs)** in mapping and updating CRM inventories.
- Use **GIS-based tools** to overlay CRM occurrences with protected areas and land use zones.

Impact

Improves strategic planning, supports CRMA implementation, enables evidence-based decision-making.

Technological Support

Adopt big data analytics, AI, and core scanning technologies to improve ore body knowledge and enhance evidence- and science-based decision-making.

4. Streamline and Harmonise Permitting Procedures

Permitting is often fragmented, sequential, and involves multiple agencies, leading to delays and administrative burdens (see Figure 16).

Actions

- Apply Screening criteria for potential CRM target deposits (see Figure 16)
- Create **one-stop-shops** or **single contact points** for CRM permitting.
- Allow **parallel processing** of permits to reduce delays. Define **clear roles and responsibilities** among authorities to avoid duplication.
- Introduce **legal timeframes** for decision-making and discourage “stop-the-clock” practices.
- Use **digital platforms** for permit tracking, inter-agency coordination, and public transparency.
- Include **closure and rehabilitation plans as a condition for permitting**.
- Enable **adaptive management**: Regularly review and update rehabilitation plans as technologies and environmental conditions evolve.
- Ensure **financial provisioning** (trust funds or bonds) for rehabilitation costs from the start.

Impact

Improves efficiency, reduces uncertainty, increased accountability, financial security for rehabilitation, flexibility to adopt new technologies and respond to environmental changes and aligns with CRMA goals for faster permitting of strategic projects

Technological Support

Digital permitting platforms, real-time monitoring systems can enhance transparency and coordination.

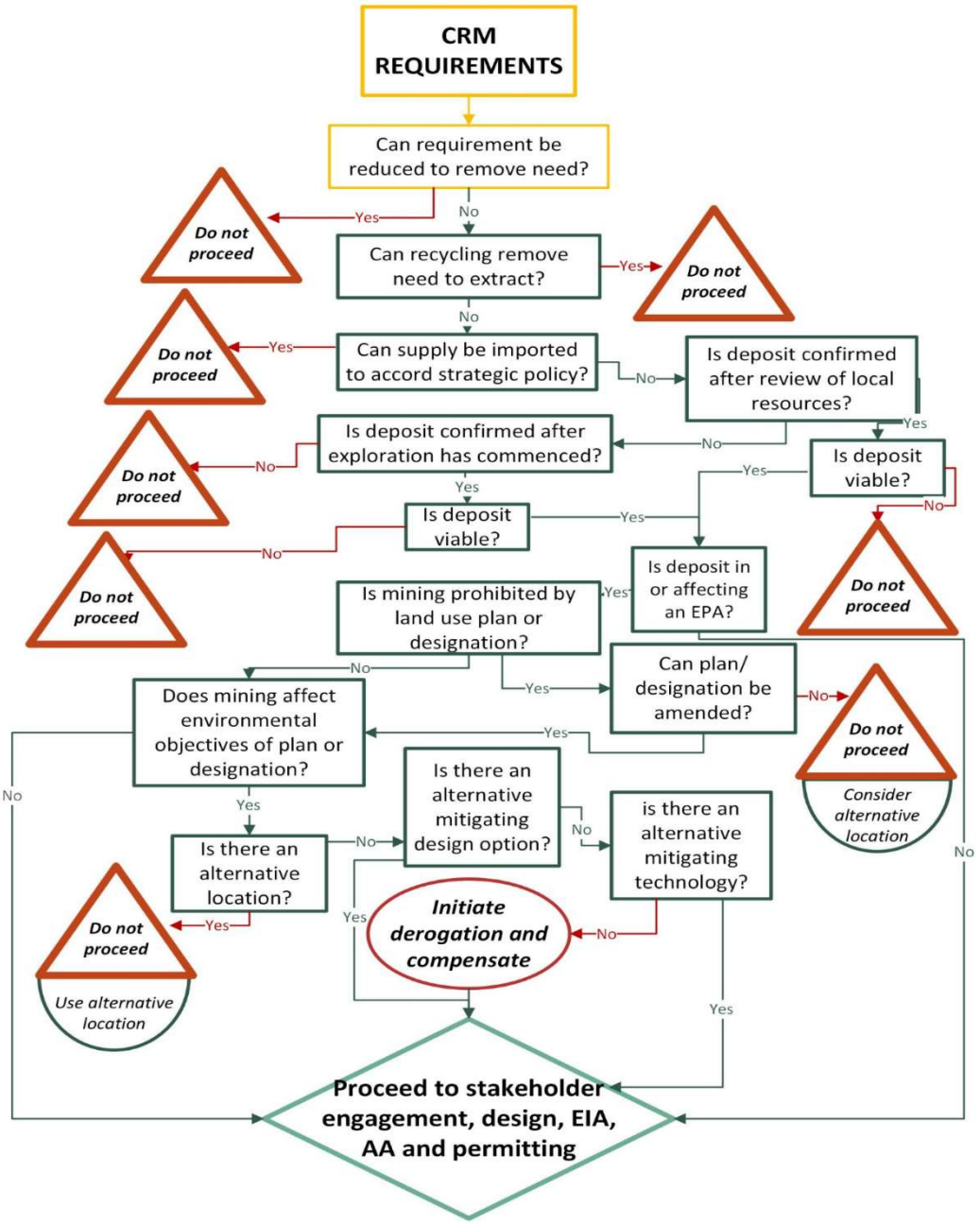

Fig. 16. CRM Permitting Requirements – the Path to the successful EIA.[151]

[151]Figure 17 is kindly provided by Jerry Barnes (Jerry Barnes, MacCabe, Durney, Barnes, Dublin, https://mdb.ie/) to illustrate the point made in the CIRAN Deliverable 3.1, based on the assessment made by Nike Luodes in CIRAN Deliverable 2.1 Description of good-practice case studies, Nike Luodes, Hannu Panttila, Toni Eerola, Vitor Correia, Ludwig Hermann, Sybil Berne, Jerry Barnes, Marasmi Christian, Nole' Marcello, José Mário Castelo Branco, Marcelo Pereira, José Carvalho, Ariadna Ortega, Rafael Jordá Bordehore, Emma Medina Sanchez, Luis Lopes, Ronald Arvidsson, Anna Apler, Magnus Johansson, Julian Hilton, Malika Moussaid-Hilton, Eberhard Falck (2024). Description of good-practice case studies. Deliverable 2.1 of the Critical raw materials extraction in environmentally protected areas (CIRAN) project.

5. Improve Environmental Assessments and Compensation Mechanisms

Environmental assessments are often duplicated across permitting stages and lack consistency, while mitigation is not standardised. Streamline EIA and AA procedures into a unified process. Develop standardised mitigation protocols and clarify IROPI procedures, in particular in focusing on "both/and" options where mining and habitat protection can be implemented simultaneously so defining replicable methodologies to ensure complementary environmental, social and economic performance.

Actions

- Integrate **Environmental Impact Assessment (EIA)** and **Appropriate Assessment (AA)** into a single streamlined process.
- Require **early ecological assessments** during plan preparation to inform project feasibility.
- Apply, refine or enforce **standardised mitigation and compensation protocols**, including:
  - Seasonal restrictions (e.g. nesting periods) [152]
  - Habitat restoration and biodiversity offsets
  - Water recycling and dust control

Tailor Solutions to Site-specific Conditions

Mining projects are highly variable, and a one-size-fits-all approach is ineffective. Customised solutions ensure better environmental and social outcomes. Require site-specific assessments to determine the most appropriate low-impact technologies based on geology, ecology, and community context. The mine life cycle has to be considered from the planning stage onwards and plan for post mining established.

- Incorporate rehabilitation goals during the exploration and feasibility stage, supported by baseline environmental and social studies.
- Mine design alignment: Design slopes, waste placement, and infrastructure to facilitate future rehabilitation.
- Progressive rehabilitation: Implement rehabilitation during operations, not just at closure, to reduce environmental footprint and costs.

6. Promote Low-impact, Low-visibility Extraction Technologies

Encourage the use of technologies that minimise surface footprint, emissions, and waste—especially in protected areas.

Examples:

- In situ recovery and phyto-mining for minimal disturbance.
- Sensor-based ore sorting to reduce waste.
- Electric and hydrogen vehicles for decarbonisation.
- Sonic drilling and novel geophysical methods for non-invasive exploration.
- Bioremediation and mine backfilling for post-mining restoration.

[152] As shown in CIRAN WP2 case studies, careful planning and habitat management can support both nesting and mining operations simultaneously.

Encourage Footprint Minimisation and Non-invasive Techniques

These approaches allow resource extraction with minimal disruption to ecosystems and landscapes, making mining more compatible with conservation objectives.

Prioritise technologies that reduce surface impact, such as in situ recovery, tunnel boring machines and advanced geophysical exploration methods. Promote remediation and land restoration practices such as bioremediation and phyto-mining.

Facilitate Real-time Environmental Monitoring and Data Integration

Continuous monitoring enables early detection of environmental risks and supports adaptive management strategies, improving regulatory compliance and stakeholder trust. Mandate the use of integrated monitoring systems (e.g., drones, autonomous sensors, remote operating centres) for real-time environmental data collection and impact assessment.

Promote Technology-driven Mining Optimisation

These technologies enhance efficiency, safety, and sustainability across the mine life cycle, and are particularly valuable in sensitive areas where minimizing human presence and surface disturbance is critical. Encourage the adoption of digital and automated technologies—such as AI, IoT, robotics, and remote sensing—to optimise mining operations, reduce human exposure to hazards, and improve environmental monitoring.

Support Emissions Reduction through Clean Energy and Process Innovation

Reducing greenhouse gas emissions and local pollutants aligns mining with climate goals and improves air quality, especially in underground and protected environments. Implement incentives and regulatory frameworks that promote the use of electric vehicles, hydrogen-powered machinery, renewable energy sources, and low-emission processing technologies (e.g., electric smelters, Carbon Capture Storage and Use (CCSU).

Develop Green Protocols for Energy and Resource Efficiency.

Efficient resource use lowers operational costs and environmental impact, contributing to both sustainability and economic viability. Establish standards for energy-efficient operations, including ore sorting, ore body knowledge, and optimized haulage systems. Promote technologies and optimise workflows that reduce water and energy consumption.

Technological Support: Renewable/green energy operations (solar, wind, geothermal, hydro, nuclear for base load), Ore pretreatment and sorting to reduce grinding energy, IoT-enabled energy monitoring systems.

Advance the Zero Mining Waste Paradigm

Minimising waste generation and improving material recovery are essential for circular economy goals and ore reducing long-term environmental liabilities. Support research and implementation of technologies that reduce, reuse, or eliminate mining waste—such as sensor-based ore sorting, mine backfilling, and tailings recycling.

Technological Support: Combining backfilling with recycled materials, tailings monitoring and recycling, and carbon capture storage and utilization (CCSU).

Address Technology Maturity and Scalability Challenges

Many promising technologies are not yet commercially viable or accepted by regulators. Demonstration projects can build confidence and accelerate adoption. Create funding mechanisms and pilot programs to test and validate emerging technologies in real-world conditions. Encourage collaboration between industry, academia, and regulators.

Clarify and standardise S/CRM permitting procedures

The need for clarification for permitting an S/CRM project on grounds of Imperative Reasons of Overriding Public Interest (IROPI) is particularly urgent as the IROPI option has been very little used in recent years.

In view of the recent relaxation of ESG reporting requirements for some 90% of companies it is also advisable for companies to restructure that obligation as a voluntary company commitment to reinvesting the cost savings from the ESG relaxation back into the company's internal sustainability policies.

The Omnibus package is not a retreat from sustainability regulation, but a strategic recalibration aimed at enhancing competitiveness and fostering innovation. This shift is designed to empower businesses by reducing administrative burdens and freeing up resources for growth. However, the value of this recalibration will only be realized if firms no longer in scope invest strategically in sustainability and accelerate their net zero efforts. If the reduced obligations are simply used to maximise short-term profits or divert attention away from ESG, it risks undermining both sustainability performance and broader societal progress.[153]

7. Adopt suitable rehabilitation methods

It is essential to establish a set of integrated actions aimed at restoring extractive site to a stable and productive condition, these could include landform, topsoil properties, revegetation, water and waste management. Examples could include:

- reshape the terrain through landform recontouring to prevent erosion and mimic natural landscapes,
- improve soil quality through topsoil replacement and nutrient enrichment,
- revegetate using native species and techniques like for example hydroseeding to re-establish ecological balance,
- for water management adopt treatment systems and create wetlands to restore hydrological functions,
- secure containment and reprocessing of tailings to minimize contamination.

These measures are supported by continuous monitoring and maintenance to ensure long-term success and complemented by community engagement to align rehabilitation with local needs and create socio-economic benefits.

[153] Jan Niewold, EY EMEIA Climate Change and Sustainability Services Leader, October 14, 2025, see https://sustainabilitymag.com/news/esg-reporting-what-the-eus-new-omnibus-draft-means

8. Build Capacity and Expertise in Regulatory Authorities

Lack of technical capacity in permitting bodies slows down assessments and increases risk of poor or flawed decisions. Invest in training programs for regulators, operators, and local communities to manage and maintain advanced technologies. Successful implementation depends on skilled personnel and informed stakeholders. Capacity building reduces risks and enhances long-term sustainability.

Actions

- Invest in **training programmes** for competent authorities on CRM, EIA, AA, and UNFC, and tailored courses for local stakeholder and affected communities.
- Promote **interdisciplinary teams** for permit evaluation and policy development.
- Encourage **knowledge exchange** between Member States and regions.
- Develop **guidance documents**, **best practice toolkits**, and **case study repositories**.
- Develop digital tools, machine learning and AI to support the entire S/CRM lifecycles.

Impact

Improves regulatory quality, reduces delays, and supports consistent decision-making across jurisdictions.

9. Public (national) interest

Even though governments have the option of permitting extraction projects according to (**IROPI**)**, none of the cases addressed in the WP2 Report cites this justification as the basis for requesting and granting approval**. This is perhaps the clearest evidence of the distortion of the TBL equilibrium in favour of an "either/or" (No Go) solution to the complementarity of mining and habitat management rather than a "both/and" approach. The easy way out has prevailed to the probable increase in TBL vulnerability as a whole as the preferred metric for achieving equilibrium of social. Environmental and financial returns.

All the case studies summarised Deliverable 2.1 have in common the 4 interdependent pillars of sustainable extractive activity:

i. spatial governance,
ii. mineral governance,
iii. environmental governance,
iv. stakeholder engagement and communication. Common to all four aspects of governance is the objective of either preventing or resolving disputes or resource weaponisation.

The exploration and mining projects reviewed either predate or have been developed adjacent to or overlapping with protected areas. But they share a founding assumption of the need for respecting the operational outcome of causing the minimum disturbance possible and for mitigating or preventing potential negative impacts on people or the environment, to the extent reasonably possible. That said, opposition has arisen in many cases even when a good environmental performance has been demonstrably delivered.

For example, in Norway, a mining company planned to adopt underwater waste disposal to operate according to best environmental practices determined at national level and approved by the government and the environmental agency. But despite that, eleven organizations complained about the practice leading to four years of legal and social wrangling as to the merits of the practice.

Several cases (Finland, Ireland, France, Norway) show that the projects solicit widely different, even contradictory opinions. For example, in both the Finnish cases, although widely approved by the local communities and respective municipality administration, both faced opposition from local and/or national NGOs. In reality, a split vote between those for and against a mining project is a common feature across many of the cases reviewed. Protected areas are one of those sensitive contexts in which mining and mineral exploration disputes are expected to occur. But such divisions are not restricted to projects seeking permits in sensitive areas nor even more likely to happen because of the protected nature of the site than in areas not designated as protected.

Figure 18 presents a four-quadrant synthesis of the four primary governance factors in S/CRM management seen simultaneously from an authorities (government) and operators (company) good practices perspective.

The model embraces fiscal, regulatory and contractual regulations, as well as the broader social and environmental function, supply chain regulations, common standards for data management, model contacts accounting standards and much more. This reminds us that mineral governance needs to be transparent and adaptive, reaching well beyond setting goals, issuing permits and submitting annual reports to owners, investors and stock markets.

Within the cases operative near protected areas the procedures have been intensively scrutinised for their ecological and socio-economic impacts. Wider socio-economic need (IROPI) is usually a reason for these projects, most obviously for S/CRM projects.

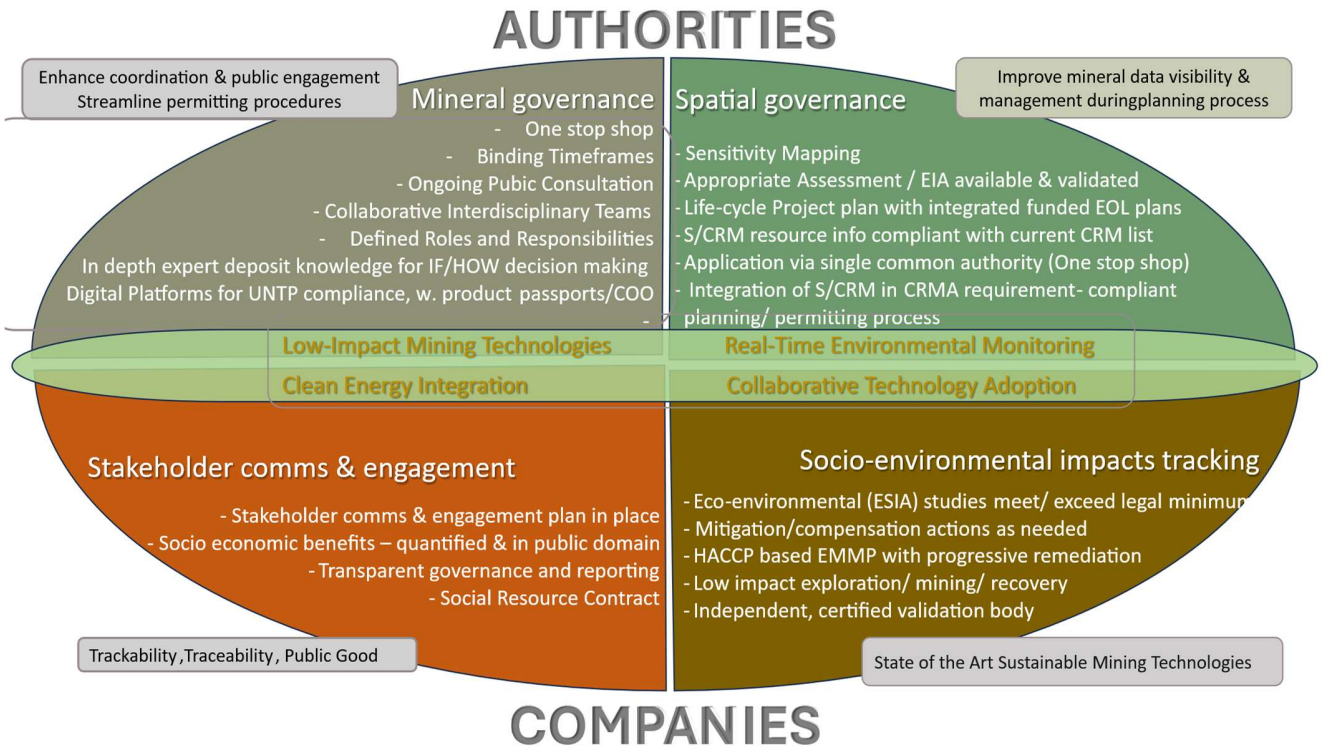

Fig. 17. Good practice, transparency, governance - see WP2 case studies.

Despite the superficial impression of deep public resistance to mining and minerals projects, the actual impact of stakeholders raising social and environmental concerns has been prevailingly positive. Against such a background, technical innovation and adoption of creative and socially sensitive new solutions have been common ground between industry and society, supported by sustainable environmental safeguarding and transparent management techniques.

10. Trust, disputes and doing the right thing

Disputes over mining seems to be more about the trustworthiness or otherwise of both mining companies and governments and the more the proposed project is found in an area noted for its social, economic and cultural history of mining the higher its likely acceptance, with employment opportunities and economic stimulus to the local economy being the main factor in the reasons for why the project gains that acceptance. Alignment of economic interest between different stakeholders of the local resources is also an important aspects to be considered, as one party might receive the economic benefits and the other the costs, producing hidden agenda for blocking projects, not related necessarily to the issue in dispute.

From the cases analysed it appears that requirements from authorities have been higher when impacting protected areas, but the companies have in many cases exceeded the mandatory conditions whether or not the operational context is a protected site. As they see it, it is simply the right thing to do and significantly derisks the business and investment case. While social acceptance is never guaranteed and rarely universal, this approach is the most likely to result in permitting mining projects in sensitive or protected areas.

15 Conclusions

The primary conclusion in this report into efficient policy making for permitting Strategic and Critical Materials projects in protected areas, within the maximum twenty-seven-month timeframe as allowed by the CRMA, from a theoretical point of view is clearly achievable:

a) if there is common awareness (referred to in the Critical Raw Materials Act as the "common Union framework") of the ongoing and probably irreversible changes in the world, and Europe's place within it, meaning we are now in a new world,

b) on which basis, the policy recommendations as set out in this report are robust and achievable.

Of necessity, as the CRMA has only been in force since May 2024 this primary conclusion is reached on deterministic grounds, not empirical. It is going to take quite a long time before worked examples are available which test and validate the practicalities of changing so fundamentally the way the permitting process in the future is expected to play out.

It is already clear from other industry sectors that with the application of digitisation and Artificial Intelligence the administrative procedures required in mining and processing can be adopted and applied also with up to 90% savings of time and effort.

Much of the report therefore addresses how to align the incentives for all parties in a Strategic and/or Critical Raw Materials S/CRM project such that parties and stakeholders will be willing to see the objectives as shared and mutually beneficial to democratic European economies.

Step-changes

In the time between the original development and submission of the CIRAN Project proposal in early 2022 to its end, December 2025, Europe underwent major step-changes, each of which is probably irreversible:

i. In response to the growing security and economic threat to the EU and its close allies, Norway Switzerland and United Kingdom, the revised 2023 CRM list was extended to include Strategic as well as Critical Raw Materials. This extended the list of individual minerals to 53. At the same time, defence uses of S/CRMs were added to the existing policy priorities of the Circular Economy, Green Energy transitions, and decarbonisation / climate change. By May 2024 the CRMA which set these new boundaries was in law.

ii. Trump administration took office in late January 2025 which accelerated and reset both a) the global trade agenda in these S/CRM supply chains through the tariff system and export control, while b) the fundamental assumptions of defence policy, practice and finance such that at the end of 2025 EU Member States and Allies have realised that they need to plan for a world with no dependable US strategic support.

These step changes are irreversible, and we are all in new territory. The policy context for the CRMA, and the sourcing of S/CRMs from within EU and allies' borders has a completely new and highly uncertain policy

landscape. The end of CIRAN, December 31, 2025, marks the need to start a high-tempo policy revision and reformation process no longer led just by streamlining permitting, but by increasing European sovereignty and moderating supply risk. This prioritises Preparedness in terms of materials and related capabilities and technologies.

Apply Double Materiality to Create Resilient Value Chains

Double Materiality gain can be achieved by combining significant investments in tangible S/CRMs with new social capital.

The Double Materiality investment process will follow a Nash-Stackelberg equilibrium model where a) all members of the location- and S/CRM resource value-chain will be engaged through "smart contracts" managed transparently through digital trackability and traceability tools and b) in related project implementation aligned to the UN Transparency Protocol.113 This means using tools such as resource passports to verify origins and certify authenticity and quality of materials. Further assistance can be sourced via the companion to both tools, the UN Resource Management System (UNRMS).

UNFC is already integrated into the CRMA and a number of countries such as France are already well-advanced in conducting their national materials inventory revision.

Changes in ESG Reporting Requirements

The mandatory ESG reporting framework has been withdrawn from some 80% of companies less onerous in view of the current turbulence. For transparency, the Global Reporting Initiative (GRI) has recently published a new Mining and Mineral Standard GRI 14. Such readily available policy-shaping resources and support tools can be integrated into the policy revision process.

New Instruments for New Conditions

The single metric which encapsulates the ambition (or perhaps now necessity) of the CRMA is the imposition of a maximum duration of 27 months on the permitting process. Over-simplified perhaps but this cuts the average duration of the permitting process by 90%.

The only reliable way to meet and maintain such an accelerated permitting process is to greatly improve the level of preparedness across Europe before a particular material reaches a high criticality state. And given the current practice of reviewing and updating the S/CRM list in a three-year cycle, the new normal puts a high premium on flexibility, agility, adaptability and ingenuity.

The Triple Bottom Line Transition

The Triple Bottom line model of an equal balance of Economic, Social and Environmental factors in Europe's democratic economies has proven well aligned to the Sustainable Development values and policies brought in by the Brundtland Commission in 1987 and published as Our Common Future, a simple, robust, flexible and resilient landmark publication.

Towards a Social Resource Contract

The step-changes outlined above, compounded by a seismic technological change in AI, have led the 6.2 team to conclude that a new class of tools is required to respond, defined by the Social Resource Contract (SRC). The SRC is a smart contract in nature operating in the context of the circular economy and green

energy transitions, and now integral to the preservation of the autonomy of European democratic values and principles. S/CRM resources, whether Critical, Strategic or both, are of existential significance to almost all industry, commerce, education and defence, and define their futures.

In the terms of the CRMA recitals, Social Resource Contract aligns well with “common Union framework” (CRMS Recital §4) for S/CRMs regarding the allocation and management of resources, including natural resources and social goods.

The Nash Bargaining Solution and IROPI

The Nash Bargaining Solution is a key part of the financing of each project dedicated to S/CRMs, such that local stakeholders as well national, and regional government have equal rights and responsibilities in the common Union framework of a symmetrical contract. When the Bargaining Solution and the IROPI principles are combined for the same project, the natural outcome is a transparent, sustainable governance model. This safeguards the Protected Areas of highest sensitivity but nevertheless secures the flow of S/CRMs into the EU economy.

Where Layers of Protection are applied to initial permitting and the management of each project, and other options are demonstrated to be non-viable before the IROPI option is actioned, there is an urgent need to find a new point of policy balance by combining the IROPI, established since 1992 and still valid, with the Nash bargaining solution which together set the framework for the SRC.

Two key stakeholder requirements emerge as essential conditions for successful implementation. First, each permitted project in a protected area, particularly those operating under IROPI provisions, must have a pre-approved Environmental Management and Monitoring Plan (EMMP) overseen by independent consultants or equivalent qualified bodies throughout the project lifecycle. Second, each mine permit must be issued conditional upon having a robustly financed End of Mine Life Plan, incorporating measures such as progressive remediation to ensure long-term environmental and social responsibility.

The Normal Now: Public Good, Governance, Reciprocity

The Normal Now reapplies the Justification Principle in regard to mine permitting is that there must be a compelling Public Good element in the Permit terms and conditions.
Good governance is the guardian of that segment of the Public Good, and Guarantor of the integrity of the Social Resource Contract - itself a Public Good.

Actionable Policies for Natura 2000 And Similar Sites

For a detailed review of this very important topic the previous section is dedicated to detailed analysis of the issues currently identified for attention at the centre of CIRAN, Natura 2000 and related Protected Areas. This item is a summary to integrate it into the wider policy making and triple bottom line analysis.

Even though governments have the option of permitting extraction projects invoking IROPI, none of the case studies addressed in the CIRAN Work Package 2 cites the IROPI justification as the basis for requesting and granting approval. This is perhaps the clearest evidence of the distortion of the TBL equilibrium in favour of an “either/or” (No Go) solution to the complementarity of mining and habitat management rather than a “both/and” approach. The easy way out has prevailed to the probable increase in TBL vulnerability as a whole

as the preferred metric for achieving equilibrium of social, environmental and financial returns. The well balanced analysis by the CIRAN team maps efficiently into a set of detailed policy and procedure recommendations focused on Natura 2000 and similar sites.

The CIRAN project examined successful case studies of mining operations near Natura 2000 areas, identified the best available technologies supporting these activities, and analysed the policy framework along with the nexus of societal vulnerabilities. On the basis of those studies and an assessment conducted in the past six weeks with a number of members of the CIRAN consortium, the following recommendations are proposed specifically for enhancements to policies and procedures for use in Protected Areas.

Integrating CRM Planning into Spatial and Environmental Frameworks

Mineral planning is rarely integrated into spatial or environmental planning frameworks, leading to uncertainty, delays, and conflicts. The primary policy recommendation addresses this gap by advocating for CRM zones to be embedded within national and regional spatial plans using sensitivity mapping and strategic environmental assessments. This integration must occur during early planning stages to identify and mitigate conflicts with protected areas proactively.

Policy actions to achieve this integration include incorporating CRM zones into national, regional, and municipal land use plans; employing source-pathway-receptor models to identify potential environmental risks at early stages; ensuring that Strategic Environmental Assessment (SEA), Water Framework Directive (WFD), and Habitats Directive assessments are conducted during planning and project preparation phases; and promoting early-stage strategic assessments to reduce permitting risks while improving project predictability.

The anticipated impact of these measures includes de-risking projects before formal permitting processes commence, improving transparency in decision-making, and shortening timelines by resolving potential conflicts at earlier stages. Technological support for these initiatives, aligned with CRMA priorities for digitization, can be provided through remote sensing, drone-based surveys, and geospatial data platforms to inform land-use decisions and environmental assessments more effectively.

Enhancing Data Quality, Classification and Transparency

Inconsistent data and lack of harmonized classification systems currently hinder strategic planning and cross-border cooperation. Policy recommendations address these deficiencies by mandating UNFC classification for CRM deposits and ensuring public access to geological data via INSPIRE-compliant platforms, while encouraging systematic updates of national resource inventories.

Specific policy actions include mandating use of UNFC classification for CRM deposits across all Member States; requiring public disclosure of CRM data using the INSPIRE Directive framework; supporting Geological Survey Organizations (GSOs) in mapping and updating CRM inventories; and deploying GIS-based tools to overlay CRM occurrences with protected areas and land use zones.

These measures will improve strategic planning capabilities, support CRMA implementation, and enable evidence-based decision-making. Technological support mechanisms may include big data analytics, Artificial Intelligence, and core scanning technologies to improve ore body knowledge and enhance evidence- and science-based decision-making processes.

Harmonising and Streamlining Permitting Procedures

Permitting processes are frequently fragmented, sequential in structure, and involve multiple agencies, resulting in delays and excessive administrative burdens. Policy actions to ensure harmonization include applying screening criteria for potential CRM target deposits; creating one-stop-shops or single contact points for CRM permitting; allowing parallel processing of permits to reduce delays; defining clear roles and responsibilities among authorities to avoid fragmentation and duplication; introducing legal timeframes aligned with CRMA models, such as the twenty-seven month limit for permitting decisions while discouraging "stop-the-clock" practices; and utilizing digital platforms for permit tracking, inter-agency coordination, and public transparency.

The anticipated impact includes improved efficiency, reduced uncertainty, and alignment with CRMA goals for accelerated permitting of strategic projects. Technological support may encompass digital permitting platforms and real-time monitoring systems to enhance transparency and coordination among multiple stakeholders.

Improving Environmental Assessment and Compensation Measures

Environmental assessments are often duplicated across permitting stages and lack consistency, while mitigation approaches are not standardized. Policy actions to address these deficiencies include applying screening criteria for potential CRM target deposits; creating one-stop-shops or single contact points for CRM permitting; allowing parallel processing of permits to reduce delays; defining clear roles and responsibilities among authorities to avoid duplication; introducing legal timeframes for decision-making while discouraging "stop-the-clock" practices; and using digital platforms for permit tracking, inter-agency coordination, and public transparency.

Closure and Rehabilitation as Essential Permitting Conditions

Closure (End of Life) and rehabilitation plans must constitute essential conditions for permitting. These plans should enable adaptive management through regular review and updating as technologies and environmental conditions evolve. Adequate financial provision through mechanisms such as trust funds or bonds must be established for rehabilitation costs from project inception. Rehabilitation goals should be incorporated during exploration and feasibility stages, supported by comprehensive baseline environmental and social studies.

Mine design must align with rehabilitation objectives by designing slopes, waste placement, and infrastructure to facilitate future restoration activities. Solutions must be tailored to suit site-specific conditions, recognizing that mining projects are highly variable and that one-size-fits-all approaches prove ineffective. Customized solutions ensure superior environmental and social outcomes.

Actions to achieve this customization include requiring site-specific assessments to determine the most appropriate low-impact technologies based on geology, ecology, and community context, and promoting low-impact, low-visibility extraction technologies. Encouragement should be given to technologies that minimize surface footprint, emissions, and waste generation, particularly in protected areas.

Adopting Suitable Rehabilitation Methods

It is essential to establish integrated action programs aimed at restoring extractive sites to stable and productive conditions. These programs may address landform reconstruction, topsoil properties, revegetation, and water and waste management. Specific examples include reshaping terrain through landform recontouring to prevent erosion and mimic natural landscapes; improving soil quality through topsoil replacement and nutrient enrichment; revegetating using native species and techniques such as hydroseeding to re-establish ecological balance; adopting water management treatment systems and creating wetlands to restore hydrological functions; and ensuring secure containment and reprocessing of tailings to minimize contamination.

These measures must be supported by continuous monitoring and maintenance programs to ensure long-term success, complemented by community engagement initiatives to align rehabilitation efforts with local needs and create socio-economic benefits for affected populations.

Stakeholder and Social Engagement

A clear and coherent regulatory engagement process with local communities and stakeholders must accompany all S/CRM extractive projects from the outset. Engagement varies widely across jurisdictions. This therefore requires early, inclusive, and transparent stakeholder engagement, including indigenous communities, local residents, NGOs and environmental groups, scientific institutions. Regulators must be provided with training and support in the conduct of these procedures.

Feedback Mechanisms and Grievance Procedures

Effective feedback mechanisms and grievance procedures must facilitate coherent organizational action while ensuring that consultation processes are accessible, well-publicized, and incorporate robust feedback mechanisms. Engagement must be maintained throughout the project lifecycle, including End of Life planning, closure, and remediation phases. Rehabilitation efforts should be aligned with local needs and values to enhance social acceptance and deliver tangible socio-economic benefits.

This alignment can be achieved through consulting communities on post-mining land use options; creating economic opportunities such as eco-tourism or agricultural development; providing training and education for rehabilitation activities; promoting community gain programs encompassing infrastructure investment, educational support, local employment, and procurement opportunities; and encouraging corporate social responsibility (CSR) and social license to operate (SLO) practices.

These actions will increase social acceptance and trust, promote economic diversification and resilience, improve public and occupational health outcomes, preserve or enhance cultural heritage, and support the overarching objectives of the CRMA.

Supporting Strategic Project Designation and Prioritisation

CRM projects often lack prioritization and streamlining mechanisms, resulting in delayed development and reduced investment. Policy actions to address these deficiencies include designating strategic CRM zones and linking them to fast-tracked permitting and government-underwritten financial support while aligning national strategies with CRMA and EU Green Deal goals.

Implementation mechanisms include establishing priority project frameworks at national and regional levels; designating strategic CRM zones with pre-assessed environmental and social criteria; linking strategic designation to fast-tracked permitting, financial support, and enhanced public engagement; and ensuring alignment of national strategies with Critical Raw Materials Act (CRMA) and EU Green Deal objectives.
The anticipated impact includes acceleration of high-impact CRM project development while maintaining robust environmental and social safeguards.

Building Capacity and Expertise in Regulatory Authorities

Lack of technical capacity within permitting bodies slows assessment processes and increases risks of poor or flawed decisions. Investment actions to address these capacity gaps include investing in training programs for regulators, operators, and local communities to effectively manage and maintain advanced technologies; providing training and continuous professional development to prepare regulators for conducting social consultation and feedback processes that remain sensitive and responsive to public opinion; establishing training programs for competent authorities covering CRM policy, Environmental Impact Assessment (EIA), Appropriate Assessment (AA), and UNFC classification, along with tailored courses for local stakeholders and affected communities.

Additional measures include promoting interdisciplinary teams for permit evaluation and policy development; encouraging knowledge exchange between Member States and regions; developing guidance documents, best practice toolkits, and case study repositories; and developing digital tools, machine learning applications, and AI capabilities to support entire S/CRM lifecycles.
Successful implementation depends fundamentally on skilled personnel and informed stakeholders. Capacity building reduces operational risks and enhances long-term sustainability. The direct impact manifests as improvement in regulatory quality, which reduces delays and supports consistent decision-making across jurisdictions.

Public Interest and Public Good

Protected areas must account for human populations and not solely focus on at-risk flora and fauna. The Social Resource Contract is formulated in language that recognizes Protected Areas must now encompass human beings, particularly those populations facing high social and economic risk, including risks associated with armed conflict.

A broader failure to invest adequately in protecting vulnerable communities and populations has contributed to resource policy asymmetry between centralized policy and decision-making structures and locally devolved decision-making processes—an imbalance that CRMA (Recital 4§) explicitly rejects.
By maintaining the "common Union framework" approach, particularly for IROPI projects, the Social Resource Contract would channel regional funds toward regenerating social capital in specific local communities tasked with hosting S/CRM projects. This approach would emphasize how policies of self-defence and autonomy protection can strengthen social cohesion at European levels, transcending merely national or local perspectives.

The Graded Approach and Integrated Layers of Protection

The Graded Approach maps the nature and severity of risks or hazards to appropriate levels of regulation or protection required to manage them effectively. The IUCN categories of protection for Conservation of

Nature, for example, deploy six differentiated levels of protection—one for each category of site—ranging from the least restricted (level 6) to the most stringently protected (level 1A).

Layers of Protection

The Layers of Protection framework adapts concepts from industrial process safety to environmental management contexts. In environmental management, this framework generally translates to the mitigation hierarchy encompassing avoidance, minimisation, restoration, and offsetting of impacts.

Optimisation of use efficiency and impact minimisation, combined with indirect protection achieved through demand reduction and other holistic measures, can be accomplished by deploying one or multiple combinations of the following mechanisms: rule by exception, spatial planning and zoning, best available techniques (BAT), ongoing monitoring and adaptive management, stakeholder engagement, restrictions on human access, climate change mitigation measures, integrated resource management, optimized resource use efficiency, and consumption moderation ("thrifting").

Synergising S/CRM Policies and Operational Solutions Between Industry and Defence Aids Efficiency

Synergising S/CRM policies and operational solutions between industry and defence is a collective responsibility. The more supply chains can be shortened and localised, the more lost social capital can be regenerated in terms of identifying knowledge and capability gaps in the S/CRM inventories, including both secondary and primary raw materials, the more efficient the uses of time in policy formation and decision-making can be made.

Digitisation Gains

S/CRMS also provide many of the technologies that power and enable the new industrial technologies, wind turbines and a wide range more so it is not yet clear how permitting policy can immediately reduce that risk.

So, finding higher degrees of resource use efficiency of what Europe does have in its possession and finding ways for speedier discovery of both primary and secondary CRMs must be an immediate policy and investment priority.

In terms of both general advances in mining and processing – exploration (finding more minerals faster and resource estimation (more accurately), TBL modelling – but also in specific applications of AI and ML to deliver the CRMA. These include cutting costs through automation and predictive maintenance, enhancing safety, optimizing processing (like ore sorting), and improving sustainability via better environmental monitoring and supply chain transparency. All capabilities are crucial for securing critical minerals for the circular economic and green transitions and the defence reset.

Preparedness

A unified decision-making approach is now a critical dependency to have an efficiently functioning system. This report has identified the following components for inclusion in a Preparedness Policy:

Short-Term Priorities

Short-term preparedness priorities encompass mapping and inventorying both available, accessible, and tangible S/CRMs alongside existing mining and processing capabilities, accompanied by gap analysis identifying staff recruitment and training needs for efficient permitting that reduce or eliminate avoidable

delays. This effort requires significant social capital investment to address new challenges and absorb shocks associated with the current transition period.

Additional short-term priorities include identifying and rectifying strategic gaps in S/CRM supply and value chains for specific minerals and jurisdictions to enable strategic complementarity of mine development and resource recovery; assuring policy-anchored, government-underwritten investment and business models for critical projects that would otherwise prove uninvestable under previous market conditions; and recognising that governments, as combined policymakers and capital allocators, must assume leadership in policy innovation and revision, financing, and managing both opportunities and risks.

Government portfolios are inherently broad and therefore largely insensitive to individual project risks. Advanced approval of dedicated funds for S/CRM projects, combined with demand aggregation or strategic stockpiling initiatives, will underpin the preparedness agenda. Operational readiness can be achieved much more rapidly when both funding and operational infrastructures are mobilised and engaged in investments that ensure security of S/CRM supplies whilst generating, on average across the S/CRM portfolio, acceptable financial returns.

Medium-Term Priorities

Medium-term preparedness priorities encompass implementing targeted incentives for partners and other companies investing in complete value-chain development for high-criticality resources, thereby enabling innovative, government-led Public-Private Partnerships; developing industrial clusters, both physical and virtual, around S/CRM processing and manufacturing, prioritised according to both circular economic and energy transition requirements as well as defence needs; and supporting cross-border value chain partnerships by encouraging Member States to specialise in different segments of strategic value chains based on their comparative advantages whilst ensuring EU-wide integration aligned with European state objectives, consistent with the common Union Framework model articulated in CRMA Recitals.

An additional medium-term priority involves appointing local specialist working groups or committees tasked with two critical functions: first, determining whether locally protected areas contain S/CRM materials of interest; and second, establishing "in principle" permitting processes well in advance of any actual mining permit application being submitted.

A unified decision-making approach to enhancing preparedness proves essential to preventing regulatory fragmentation from undermining the common Union framework. Grounding the development of new policies and operational procedures in common unifying values, whilst actively engaging affected communities in decision-making, permitting, and investment processes formalised through project-specific Social Resource Contracts, represents the path forward. Such specific contracts could include provisions for community equity participation, tools for environmental monitoring, and significant roles in project governance.

This comprehensive approach requires support through well-designed and effectively managed communications campaigns between central and local governments, with particular attention to those local communities that currently host or are likely in the near future to host S/CRM projects. Through such coordinated efforts, the ambitious timelines and transformative objectives of the CRMA can be achieved whilst maintaining democratic values, environmental protection, and social cohesion across Europe.

16 Accompanying Documents

This section contains accompanying documents for this report ranging from a Factsheet and a Policy Brief to three Perspectives from Austria, France and Norway related to the core topic of Permitting in Environmentally Protected Areas and the relationship with delivery of the Critical Raw Materials Act.

Factsheet 6.2

Policy Brief – Ludwig Hermann, Strengthening the EU's Resilience to Critical Raw Material Supply Chains

Perspective 1 – Sigurd Heiberg, Strengthening EU's Resilience to Critical Raw Material Supply Chain Policy Frameworks and Design

Perspective 2 – Association des Communes Minères de France, Perspectives d'évolution de la réglementation

Perspective 3 – Christophe Xerri, Julian Hilton, Social Resource Contract in Context

16.1 Factsheet Deliverable 6.2

Background

The Critical Raw Materials Act (CRMA) was only just on the radar when the CIRAN project was first adopted into the Horizon program mid-2022. But the need to fundamentally rethink EU and wider European minerals policymaking to address the two cardinal weaknesses in CRM policy pinpointed in 2017 by the UN Economic and Social Council, under-investment in both building CRM physical supply chains and in developing CRM-related social capital – the capabilities required to understand and use CRMs - was already clear. In February 2022 the Russian invasion of Ukraine left no doubt as to the speed of the response and degree of commitment and investment required for achieving it.

The impact was the start of a ground-up, fast-track rethink of how to combine the Circular Economy and Green Energy transition with European defence policy, capabilities, resources and financing. A common sense of urgency led to the CRM Act being ready for adoption by the end of the year. This ground-up rethink has since been further accelerated in Europe since January 2025 under the impact of the United States Trump administration to significantly advance defence spending.

Findings

To enhance social acceptance of the mining and processing effort that delivering CRM policy objectives, determinations, project investments, management and resource distribution and use would require it was recognised that the CRMA delivery plans must be grounded in democratic values and principles, including recognition of CRMs as Public Good, whether the source areas for providing those CRMs are protected or not. As established by the CIRAN project more than 85% of Europe's available CRMs are estimated to be found either beneath, or within 5km of protected areas. That suggests the obvious normalising approach to permitting mining and processing of all CRMs will be to use the same level of socio-environmental and techno-scientific rigour expected in permitting in protected areas in all areas, complemented by intense engagement with local communities and primary stakeholders in all cases.

Democratic values and a holistic equilibrium of social, the public good, equitable economic return and environmental protection – the "Triple Bottom Line" – must define the core of the "social resource contract" to be applied to address the crisis of trust and confidence in extractive industries, which could destabilise or even defeat delivery of the CRM Act if left unaddressed.

On the assumption of CRMs as in principle Public Good, funding for securing supply chains and out of the forging resilient value chains, must be government policy-anchor led and underwritten with public-private partnerships as a strategic complement. But essential to a workable permitting process both in– and outside protected areas, in the context of national interest and public protection, no absolute prohibition can be entertained of permitting mining and processing CRMs from protected areas.

In practical terms three capabilities are likewise keys to success:

1. Preparedness and flexibility.
2. Deployment of powerful technologies and optimum use of AI, machine learning and block chain to rectify vulnerabilities and weaknesses in the current body of human CRM knowledge and expertise.
3. Application of a predetermined graded approach to assessing, managing resource and ideally preventing criticality states.

So is installed a finely structured “layer of protection” (LoP) operational model, with appropriate escalation, de-escalation and two-way decision gates for managing project activities from the least to the most contentious states.

That way, Terms & Conditions of mining and processing in protected areas are pre-agreed, well-rehearsed and tested long before being activated.

Recommendation: Apply a two-mode Layers of Protection (LoPs) Strategy – 1. Precautionary & Preventive and 2, Interventional

Precautionary and Preventive

The primary assumption of the precautionary mode is that mining and processing in a Protected Area is a last not first resort.

The Precautionary and Preventive LoPs are designed as a multi-purpose set of policies and procedures to prevent an active state of criticality occurring. These include but are not restricted to:

- Integrated management, recovery, and reuse of secondary and primary resources, with secondary resource options as the default, minimising energy loads and carbon emissions where possible in line with Scope 1, 2 and 3 emissions
- Optimise resource use efficiency of all materials and energy sources at all points across supply and value chains
- Encourage continuous adjustment of individual and collective behaviours for personal and collective sufficiency - not dogmatic “degrowth” but thrifting, recycling and reuse and pragmatic “self-discipline and community solidarity”
- Use national or regional anchor policies to determine investments and capital allocations in the CRM sector, policies that take protected area requirements into responsible consideration, and manage complex issues through preparedness and by applying pre-agreed exceptions and exemptions
- Steer the CRM investment and IROPI permitting process by a win/win Nash bargaining solution model
- New value chains and smart contracts in everyone’s best interest emerge from the bargaining solution

- S/CRM materials flows and their value chains are managed through trackability and traceability tools aligned to the UN Transparency Protocol (UNTP), eg resource passports and certificates of origin confirm protected area permitting procedures are enforced
- Once critical mass of S/CRM “social resource contracts” is reached, based on common core principles Public Good is a predictable outcome.

Interventional

The primary assumption of the interventional mode is when an IROPI or similar permit has been issued, based on an acceptable Environmental Impact Assessment and where the primary objective is to keep the negative environmental and social impacts “As Low as Reasonably Achievable” and the standard of Governance “As High as Reasonably Achievable” and in compliance with the law, the Habitats Directive and related GRI and, where applicable, ESG reporting standards.

The accompanying measures as have been set out in detail in this report include but are not restricted to:

- A project specific protocol driven Environmental Management and Monitoring Plan designed to accompany the entire project life cycle
- The design of the (EMMP) includes a Hazard Analysis and Critical Control Point (HACCP) oversight and reporting system overseen by, or conducted by, suitably competent and experienced Independent Consultants responsible for regular reporting and observance of appropriate regulations and good practices
- Provision of HSE and other SOPs as aligned to the particular S or CRMs being mined and processed.
- On the basis of the interventional protective measures taken, to ensure robust governance and transparent reporting

The New Normal

Developing EU and wider strategies for defining indispensable resilient value chains for competitiveness and sustainable value chains built on the talents and resources available in the EU (or similar).

Value-chain design and project implementation approaches under "new normal" operational conditions should consider a 90-day push, with AI techniques and ML technologies at the core to:

1. Map existing capabilities and identify and rectify strategic gaps in CRM value chains
2. Develop industrial clusters (actual and virtual) around CRM processing and manufacturing, prioritised for both economic energy transition and defence requirements
3. Assure policy-anchored, government-underwritten investment is assured for any critical project which under previous conditions would be uninvestable (see actual EBRD Anchor Policy Investment strategy and practice for key secondary raw materials for food security)
4. Implement targeted incentives for partners and other companies investing in full value -chain development for high criticality resources enables government led PPPs
5. Support cross-border value chain collaboration by encouraging Member States to specialise in different segments of strategic value chains based on their comparative advantages while ensuring EU-wide and aligned European state integration.

This new normal foundation is key to the **development of industrial clusters around mineral operations**, with a focus on regional development goals and opportunities as well as EU- and European level priorities of economic security, environmental performance and transition imperatives. The strategic economic goal is to define a new, Nash-model sustainable point of CRM equilibrium, focused on consultation, autonomy and collective self-sufficiency.

16.2 Consolidated Policy Brief

Strengthening the EU's Resilience to Critical Raw Material Supply Chains

Ludwig Hermann
Proman

Problem

The European Union's transition to a green, digital, and secure economy hinges on reliable access to **critical raw materials (CRMs)** — essential for batteries, semiconductors, renewable energy, and defence technologies. However, the EU is still **heavily import-dependent**, sourcing over **65–100%** of many CRMs from non-EU countries, often from geopolitically concentrated suppliers.

Impact

Supply chain disruptions caused by geopolitical tensions or export restrictions could result in **economic losses of €100–200 billion annually** across manufacturing, transport, and energy sectors. The vulnerability undermines not only industrial competitiveness but also **citizen wellbeing**, through inflationary pressures, employment risks, and delayed green transition goals. A 1% lower economic growth rate due to supply chain disruptions stands for losing € 175 bn every year.

This brief outlines four strategic policy pillars to reduce vulnerability and ensure long-term resilience.

1. Securing the Value of Resources at the Point of Production

Goal: Enhance the EU's ability to produce, process, and recycle critical raw materials within its borders and trusted partner regions.

Recommendations:

- **Create a European, 500 billion Euro fund to ensure the Value of Resources** under any circumstances, including retaliation by competitors.
- **Incentivise domestic extraction and refining:** Mobilise the *Critical Raw Materials Act* to fast-track permitting and co-fund sustainable mining projects, ensuring environmental and social safeguards.
- **Support secondary raw materials markets:** Set up harmonised EU standards for recycled materials and expand "urban mining" from end-of-life products.
- **Promote strategic stockpiling and circularity:** Develop a coordinated EU CRM reserve mechanism for key industrial sectors.
- **Develop regional production clusters:** Integrate CRM recovery into regional innovation ecosystems (e.g. raw materials valleys, industrial symbiosis zones).

Expected outcome: Increase EU CRM self-sufficiency by 20% by 2030 and capture more value domestically.

2. Aligning Interests of Rights-Holders and Stakeholders

Goal: Foster equitable partnerships between governments, industries, local communities, and third-country suppliers to ensure transparency and mutual benefit.

Recommendations:

- **Implement transparent governance frameworks:** Mandate due diligence and traceability under the EU Battery Regulation and Corporate Sustainability Due Diligence Directive (CSDDD).
- **Promote fair benefit-sharing with partner countries:** Support capacity building, environmental governance, and community engagement in source countries through Global Gateway investments.
- **Strengthen social licence to operate:** Encourage companies to co-develop CSR and GRI frameworks that respect labour, human rights, and local environmental standards.
- **Public–private coordination mechanisms:** Create CRM Roundtables at EU and Member State levels to align industry needs with policy objectives.

Expected outcome:
Secure stable supply partnerships and mitigate reputational and social risks across CRM value chains.

3. Managing Risks and Opportunities

Goal: Anticipate and mitigate systemic risks in CRM supply chains while capturing innovation and investment opportunities.

Recommendations:

- **Expand the Scope of the International Raw Materials Observatory by Risk Monitoring:** Integrate early warning indicators on trade disruptions, export bans, and geopolitical risks.
- **Strengthen investment screening mechanisms:** Expand FDI screening to strategic CRM assets and processing technologies.
- **De-risk innovation and scaling:** Support industrial pilots and recycling technologies through Horizon Europe, the Innovation Fund and the above-mentioned Value of Resources Fund.
- **Leverage financial instruments:** Blend EIB, InvestEU, and private financing to diversify supply sources and build strategic reserves.

Expected outcome: Enhanced resilience and agility of CRM supply chains, reducing disruption risks by up to 30% through better forecasting and contingency planning.

4. Safeguarding Knowledge, Information Technology, and Communication

Goal: Protect intellectual property, technological know-how, and data essential for CRM exploration, processing, and substitution.

Recommendations:

- **Promote open but secure innovation ecosystems:** Balance data sharing with cybersecurity and IP protection in critical technology fields.
- **Develop EU digital infrastructures for traceability:** Use blockchain and AI-driven data platforms to monitor CRM flows, ensure provenance, and prevent illicit trade.
- **Invest in skills and knowledge networks:** Support training and research through EIT Raw Materials and European Universities alliances.

- **Enhance strategic communication:** Build public awareness of CRM importance and transparency in value chain governance.

Expected outcome: Strengthened innovation sovereignty and technological leadership in materials science, recycling, and digital traceability.

Conclusion

Europe's dependency on critical raw materials is a systemic risk comparable to energy insecurity. Implementing these four pillars — **production value security, stakeholder alignment, risk management, and knowledge protection** — will not only shield the EU economy from disruptions but also promote **strategic autonomy, green growth and societal wellbeing**.

For references and details, consult the CIRAN Reports.

16.3 Perspective 1. Supply Chains Policy Frameworks and Design

Strengthening EU's Resilience to Critical Raw Material Supply Chain Policy Frameworks and Design

Sigurd Heiberg
Petronavit AS

Executive summary

In the Ciran Grant Agreement – Description of the Action - it is stated that CIRAN will develop, test and validate processes to arrive at systemic policymaking, balancing environmental protection and societal needs for accessing critical raw materials (CRMs). This will be achieved through 1) streamlined permitting procedures in environmentally protected areas; 2) modern policies and social contract frameworks that reconcile the protection of environmentally sensitive areas and domestic sourcing of CRMs in the EU; and 3) the development of a community of practice to support the uptake of the CIRAN recommendation and that will remain active after the project funding period.

This section takes as a starting point the current need to transform the European economy to become efficient, secure and competitive under conditions that have not been experienced before. It points to the need for coordination of actions by government at all levels, industry, capital allocators and the public.

The parties will require qualification and capacity, here referred to as Capability to navigate well in creating the transformative changes required. These Capabilities need to be integrative among the parties and dynamic helping each party to excel in the roles they have at any one time, in such a way that they can change to scale to the next level of performance.

Four goals are highlighted and elaborated. Each requires an ensemble of policies:

1. Securing the value of resources at the point of production.
2. Aligning interests of right-holders and stakeholders.
3. Managing opportunities and risks.
4. Safeguarding knowledge, information technology and communication.

Then some comments are added on how these may allow the streamlining of the permitting process. This incorporates the elements of the Social Resource Contract.

Problem

The European Union's transition to a green, digital, and secure economy hinges on reliable access to **critical raw materials (CRMs)** — essential for batteries, semiconductors, renewable energy, and defence technologies. However, the EU is still **heavily import-dependent**, sourcing over **65–100%** of many CRMs from non-EU countries, often from geopolitically concentrated suppliers.

Impact

Supply chain disruptions caused by geopolitical tensions or export restrictions could result in **economic losses of €100–200 billion annually** across manufacturing, transport, and energy sectors. The vulnerability

undermines not only industrial competitiveness but also **citizen wellbeing**, through inflationary pressures, employment risks, and delayed green transition goals. A 1% lower economic growth rate due to supply chain disruptions stands for losing €175 bn every year.

Towards efficient policymaking – overview

Extraction or not of raw materials from environmental protected areas in Europe must be seen in the context of the unprecedented need to secure affordable and sustainable resource-based services to a peace seeking population. The parties affecting policy making and execution in this regard are primarily:

- Government, i.e. the democratic EU, national and local governments supported by highly professional civil services.
- Industry.
- Capital allocators.
- The public to the extent that their interests are not handled through government.

All parties remain responsible for what they do, and most importantly for what they do not do. They succeed best when they act in concert as a public-private partnership. This demands constant renewal or updating of Capabilities in all camps. However, it is recognised that individual Capability in governing, conducting industrial processes, allocating capital and communicating with the public will not deliver. Capabilities must be integrated.[154] This means that each party must assess its flexibility and that of the other parties and adjust to deliver the wanted results jointly, while maintaining their own vital interests. Parties are well advised to cooperate in a manner that allows them to capture the opportunities of success fully, recognising that that one step to mitigate climate change, secure peace, preserve nature, extend mining and care for the population will open up for new ways of progressing, much like learning a new language allows a new world to appear. In sum therefore, Capabilities need to be both integrated and dynamic, facilitating change. Nothing less will do.

The cooperation required is one where:

- Government sets framework conditions such as the legal, regulatory, fiscal and contractual frameworks. Government may also play a pivotal role in managing environmental and geological information and using it through its own resources or by guiding industry to determine where permitting may take place, when and by whom, possibly through competition amongst interested industries. Additionally, Government acts in permitting infrastructures, both hard in the form of energy, water, transport facilities; and soft through education, R&D, health and other vital social supporting structures. Public demands are considered in conjunction with government actions.
- Industry provides Capabilities in mining and processing of the mined material. They face new and unknown challenges in developing their Capabilities to be integrated with those of government and capital allocators as markets and demands change, while excelling at what they are doing at any one stage. At best these activities are technical and professional. Activities that do not contribute to securing production and sale will often not be a part of the core corporate management and should not be expected to be prioritised highly.

[154] See also the Draghi report – https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en

- Capital allocators manage capital, both cost and revenues. Most industries do not have money but debt that belongs to the lenders and equity that belongs to the shareholders. Many governments are in debt and depend on the cooperation in the partnership addressed here to bring revenues. Allocators of the very large amounts of capital required for the just transition have obligations of their own. This demands that the capital allocated is returned with commensurate compensation for inflation and risks. Some capital allocators may provide highly valuable grants that help initiate progress. The quantities of grants are generally small in comparison with the amounts of capital required for full scale industrial development.
- Public right-holders and stakeholders possess valuable insight that may guide government, industry and capital allocators in their efforts to take sound decisions in support of the public interest. They also possess specific interests and occasionally powers to enforce them which may further or block progress. In a functioning democracy interests are resolved efficiently through government. When this is not the case, costly delays are common.

How the cooperation is structured is case specific and will differ for different resources, countries, industries, capital allocators and right-holder/stakeholder groups. With the risk of oversimplifying, the following cardinal elements are identified:

1. V**alue of resources at the point of production must be high**. If resources have no value at this point, they will not be produced. If they have a high value, enhanced recovery and environmental and social benevolent processes may be achieved, baking a bigger cake to be shared.
2. **Align interests in projects**, especially economic interests. If the plans aim for one party to reap the benefits and the other to mend the inconveniences, the prospects of reaching efficient decisions are significantly reduced. Not all interests may be aligned as the parties have different "portfolios". They may see optimal solutions differently as projects may generate different consequences and values for their holdings outside the project itself.
3. **Opportunities and risks** must be understood and managed by all based on assessments of uncertainty.
4. **Knowledge and information systems** are required to facilitate the cooperation in the partnerships.

Each of the elements have far reaching consequences for the way effective policies can be formulated.

Securing the value of resources at the point of production

A high value at the source of production justifies the recovery of economically marginal quantities, thus generating higher economic rent. This is particularly important in the case of extractive activities since they are what in physics is termed irreversible or non-conservative processes. The result is not dependent only on the source and the potential as in hydro developments for instance. It is also dependent on the process of recovery from start to finish. Expectation of a low future value at source may cause producers to skim the cream off the milk, blocking economically marginal resources from future recovery. Expectations of high values prevent this. The cake to be shared will be bigger than what the case will be if the economic rent is lost between the market and the source. It will also be much easier to accommodate necessary protection of the environment and society based on the higher economic rent that a high value at source generates.

A high value of resources at the point of production requires a high market value for the products and services provided by the resources, but this alone is not enough. It is also necessary to "transport" this value to the point of production.

The market value may be determined through **supply and demand.** The value for the user of the services is in turn influenced by the efficiency in consuming the products, e.g. an energy efficient building will harvest more comfort from a unit of energy spent heating it than an inefficient building. Users may therefore value energy more highly in an energy efficient building. This goes further in **support of a circular economy** where the services obtained from a resource is determined not only by the value of the first use, but also of the subsequent uses.

To "transport" this value to the point of production with minimal loss requires consideration of several policies. It requires the building of efficient and effective infrastructures, engineered to be low cost, but of solid quality. To achieve return on the capital employed requires naturally that the capital is employed. This means running the capital-intensive elements of infrastructure at high-capacity utilisation. In many metal production value chains, the bulk of the cost may be in beneficiation and refining. To reduce the unit cost in these elements may require a comprehensive mineral exploration and production strategy whereby the beneficiation and refining facilities are be fed at the right times so that they can run at capacity for long.

Add to this that leakage of economic rent between the market and the point of production should be minimized. A Rockefeller type system where control of the infrastructure is used to harvest economic rent through tariffs or otherwise will erode the value at source.

Goal: Enhance the EU's ability to produce, process, and recycle critical raw materials within its borders and trusted partner regions.

Recommendations:

- **Create a European, 500 billion Euro fund to ensure the Value of Resources** under any circumstances, including retaliation by competitors.
- **Incentivise domestic extraction and refining:** Mobilise the *Critical Raw Materials Act* to fast-track permitting and co-fund sustainable mining projects, ensuring environmental and social safeguards.
- **Support secondary raw materials markets:** Set up harmonised EU standards for recycled materials and expand "urban mining" from end-of-life products[155].
- **Promote strategic stockpiling and circularity:** Develop a coordinated EU CRM reserve mechanism for key industrial sectors.
- **Develop regional production clusters:** Integrate CRM recovery into regional innovation ecosystems (e.g. raw materials valleys, industrial symbiosis zones).

Expected outcome: Increase EU CRM self-sufficiency by 20% by 2030 and capture more value domestically across the supply chain.

Aligning the interests of right-holders and stakeholders

Agreements are facilitated by policies that aim to align interests. Economic interests between government/right-holders, industry and capital allocators may be aligned to some degree by introducing neutral fiscal and contractual policies. In the ideal case this means that the parties share the cash flows proportionately receiving the same share of revenues as they pay of the costs. There are few systems that are ideal in this respect, but some have elements in this direction. Norwegian offshore policies have tested most of them. It started with introducing a 100% state owned company, Statoil. The equivalent in Swedish mining is LKAB. Statoil was later privatised selling 33% of shares on the stock exchange. After that, it was treated as any other licensee. The focus was on industrial Capability development and deployment. A State

[155] See ongoing work by the Horizon Europe Futuram Project: https://futuram.eu/

Direct Financial Interests in selected licenses and with variable participating interests was established when Statoil was privatised. This was and is managed by an agent, Petoro which is financed over the state budget while the cash flows go directly to and from the state. Petoro does not operate activities and exercises its voting rights cautiously leaving the private sector in control of daily activities.

The final move has been to design a special petroleum tax in such a way that the sum of the corporate tax and special tax approach a cash flow tax. This involved allowing an uplift of investments before applying depreciation for special tax calculation to compensate for the asymmetry inherent in the corporate tax system. Depreciation for petroleum tax calculations are immediate. In summary cash flow taxes causes the taxing party to become a co-investor with the taxed party in the same way as other parties in a group of licensees are. The parties will find that projects are equally profitable before and after tax. Materiality is shifted. A taxed party may take the costs contributed by the taxing party elsewhere to reestablish materiality and improve diversification.

One effect of aligning economic interests in this way is that the taxing party may have a large take without substantially hurting the taxed party as long as the materiality remains interesting. Currently, Government take from the petroleum activities offshore Norway is over 80%, and still 20 companies applied for licences in the ongoing 2025 licensing round by the deadline on the 2nd of September. Permits are expected to be issues early in 2026.

Under such schemes, an operator may be tempted to load costs on the project accounts that are irrelevant for the activities being operated. Government may mitigate this by budget reviews and approvals, which is labour intensive and difficult considering the lack of exposure to operations that the controlling party has. Alternatively, licensing can be designed to include non-operating partners with appropriate exposure to operations. They will have the same interests as Government in mitigating this risk.

Another measure is to license exploration and production rights on a competitive basis where the selection of winners is based on their corporate Capabilities and past records. This can also speed up the permitting process. The Norwegian example above shows that it can be as short as six months, which is less than the 15 years experienced in some mining projects.

This requires the development the directorates of mining, geological surveys, environmental agencies etc over the long term to proactively identify prospective areas where mining may take place. Standardisation of permit terms and conditions by government in dialogue with industry and capital allocators before invitations to compete for permits are announced is constructive. Then gauging industry's appetite for permits within identified areas and announcement of a competition for permits with a deadline for applications in those parts of these areas where there is interest.

Applicants will be judged on the quality of their interpretations of the information provided, committed work programmes, and their documented capabilities to explore, produce and protect environments and social structures. Permits are issued to industry consortia consisting of one operator and partners (including government for alignment of project economic interest, information, data accumulation/management, monitoring and advice etc.) shortly after the receipt of applications and in alignment with the strategic and policy measures of national and local communities. The permit forms the hard elements of the Social Resource Contract.

Aligned economic interests in projects between government, local authorities, industry and capital allocators is one of several issues that may facilitate agreements and speed up decisions. However, the parties will

often have interests outside the projects that are affected by the project activities. Effects on protected areas and environments more generally, on labour and on society and legacy modes of life are among them. Also industry and capital allocators may see effects of the project on other interests they hold, and which may influence their interest in project decisions. While such portfolio interests cannot be aligned in the way project economic interests may be, a well-constructed partnership between the parties will help bring relevant facts on the table by the affected parties. This facilitates a rational deployment of the flexibilities that each party has to contribute to solutions.

Goal: Foster equitable partnerships between governments, industries, local communities, and third-country suppliers to ensure transparency and mutual benefit.

Recommendations:

- **Implement transparent governance frameworks:** Mandate due diligence and traceability under the EU Battery Regulation and Corporate Sustainability Due Diligence Directive (CSDDD).
- **Promote fair benefit-sharing with partner countries:** Support capacity building, environmental governance, economic interest alignment and community engagement in source countries through Global Gateway investments.
- **Strengthen social licence to operate:** Encourage companies to co-develop CSR and ESG frameworks that respect labour, human rights, and local environmental standards.
- **Public–private coordination mechanisms:** Create CRM Roundtables at EU and Member State levels to align industry capabilities with policy objectives and capital allocation potentials.

Expected outcome: Secure stable supply partnerships to capture and mitigate economic, operational, reputational and social opportunities and risks across CRM value chains.

Managing opportunities and risks

Securing value at the source of production and the alignment of interests will be made under uncertainty and distribute opportunities and risks to each actor. This cannot be avoided, but it can and must be managed. The opportunities and risks will often determine the way in which projects are designed and conducted, their pace and the participation of each partner in them. It is therefore essential that uncertainties are assessed, and the resulting opportunities and risks identified.

Geologic, environmental and technical opportunities and risks may be managed first by investing in information that reduces the uncertainties. The value of investment in information must be measured by comparing the added value of the project with additional information against the cost of acquiring the information. When there is little information available, the value of additional information may be easily assessed as justifying investing in it. As projects are matured, additional information will add to the substantial amount of information already available and gradually affect the project value much less.

This may lead to an acceptance of the uncertainty and drive a flexible project design that can be modified as uncertainties are being reduced during operations. Investment in additional information will then be replaced by investments in real options to be exercised or not as information becomes available.

Operational opportunities and risks may be assessed based on the Capability that the operator or contractor has. An operator with many similar activities will often have more options, particularly if there is a possibility to divert capacity from low priority or time insensitive activities in one project to urgent activities in another. This can lead to a change in roles, where a company with for instance strong Capabilities in reducing

exploration skills may yield its position during the design and development phase to a company with strong Capability in these activities, thus keeping project opportunities and risks under control through the project phases. In this way the value of the assets may be kept high through the exploration, development, operating, and decommissioning phases.

Economic uncertainties cannot be avoided as the future is not predetermined. The opportunities and risks that this causes must be judged by how uncertainties affect the opportunities and risks of the portfolio of the capital allocator. Governments may hold a well-diversified portfolio that could be insensitive to individual project opportunities and risks. If this is not the case, as it would often be for local government, then this has consequences for the degree of economic engagement that can be managed. To some degree it may be possible to bring risk exposure to manageable levels by reducing the participating interest or by adjusting the pace of expenses and revenues through scheduling.

By way of example, Norway judged that the economic risks associated with their participation in offshore operations would not to a significantly affect the state portfolio risk making it safe to finance those operations. It was at the same time clear that the consequences of the oil price volatility were too large to be managed in any other way than by not spending the money. The result was to place revenues in a sovereign wealth fund invested abroad and manged by Norges Banks Investment Management, NBIM.[156] A part of the interest earned on the investments in this fund is channelled back to the state budget. This is a stable, predictable cash stream shielded for the oil price risk.

Safeguarding knowledge, information technology and communication
This report does not go in depth on how knowledge is safeguarded and the role that information technology and communication has. Here are some highlights

The value of resources at the point of production is strongly dependent on information. National data inventories represent through this a strong part of the nation's capital. With this information, governments may be able to identify where exploration and production can take place. There is little point in asking the mining industry to repeat exploration efforts that already have been done. There is also little point in asking industry to perform environmental and social studies to prove that mining is safe or not, when the Capability for doing this resides with government and its civil services.

Knowledge of the factors that affect exploration, environmental protection, design, development, operations and economic outlooks is necessary for the conduct of an efficient and effective public-private partnership as described above. Information technology and communication must make this knowledge accessible, applying key performance indicators and otherwise.

The **EU Critical Raw Materials Act** and the IFRS/ISSB **Sustainability Financial Reporting Standards** both specify important information that must be communicated. This takes the form of scalers, e.g. total produced quantities, and time series with targets. Most business models focus on the latter. The United Nations Framework Classification for Resources (**UNFC**) is mandated to be used in the CRMA. It may communicate the metrics that projects hold and that users need, including life cycle quantities and time series of production, costs, emissions, and inputs such as water, energy and labour. The UNFC is therefore an important template for structuring essential information on mining activities in protected areas. This holds

[156] See nbim.no

not only for assessing the geological potentials but also for setting targets, the probabilities of reaching them and of checking targets against actuals.

Conclusions and recommendations

Europe's dependency on critical raw materials is a systemic risk comparable to energy insecurity. Implementing these four pillars — **securing value at the source of production, rightsholder alignment, risk management, and knowledge protection** — will not only shield the EU economy from disruptions but also promote **strategic autonomy, green growth, and societal wellbeing**.

The aim of the CIRAN project is described as follows:

"According to the last report of the Intergovernmental Panel on Climate Change released on 28 February 2022[157], 'Any further delay in concerted anticipatory global action on adaptation and mitigation will miss a brief and rapidly closing window of opportunity to secure a liveable and sustainable future for all'. This closing remark of the report underlines the importance of immediately progressing towards the European Green Deal's climate ambition, and a secure and sustainable supply of critical raw materials is a prerequisite for this.

The aim of CIRAN is to reconcile two, sometimes conflicting, societal objectives and needs: protecting environmentally sensitive areas and increasing socio-economic resilience. In an era of uncertainty and demanding outcomes for people and government, CIRAN will deliver a functional solution to resolve such conflicting interests with the help of endorsed 'social contract' models that consider the dynamics, links, and complexity of coupled social-ecological systems, enabling streamlined permitting and policymaking processes, to be taken up and continuously adapted/improved by a Community of Practice that will remain active after the project funding period."

This report describes in outline form the policy environment that needs to be in place to achieve this. It suggests building on a public-private partnership consisting of governments at all levels, industry, capital allocators and the public to the extent that public interests are not already managed by the government parties.

This partnership must navigate through the successive and transformative changes that are required to meet the Sustainable Development Goals and secure affordable and sustainable resource services for all to preserve and enhance the European civilisation.

Important families of policies are required to meet four important controlling goals:

1. Securing the value of resources at the point of production.
2. Aligning the interests of right-holders and stakeholders.
3. Managing opportunities and risks.
4. Safeguarding knowledge, information technology and communication

[157] International Panel on Climate Change Feb. 28, 2022. See https://www.ipcc.ch/2022/02/28/pr-wgii-ar6/

16.4 Perspective 2 : ACOM Perspectives on Mining Policy Development

ACOM Perspectives d'évolution de la réglementation[158]

La réglementation des concessions minières est appelée à évoluer pour répondre aux défis contemporains. Plusieurs axes de réforme sont envisagés ou en cours de discussion :

1. Renforcement de la protection environnementale : L'intégration plus poussée des objectifs de développement durable dans le processus d'attribution et de gestion des concessions est une tendance de fond. Cela pourrait se traduire par des exigences accrues en matière d'éco-conception des projets miniers et de restauration des écosystèmes.

2. Amélioration de la transparence : La mise en place de mécanismes de reporting plus stricts sur les impacts environnementaux et sociaux des activités minières est à l'étude. L'objectif est de permettre un meilleur contrôle par les autorités et la société civile.

3. Adaptation au contexte de transition énergétique : La demande croissante en métaux stratégiques pour les technologies vertes (lithium, cobalt, terres rares) pourrait conduire à une révision des priorités dans l'attribution des concessions.

4. Renforcement de la participation citoyenne : De nouvelles formes de consultation et de participation du public dans la gouvernance des projets miniers sont envisagées, allant au-delà de l'enquête publique traditionnelle.

5. Harmonisation internationale : La tendance est à une plus grande coordination des réglementations minières au niveau européen et international, notamment sur les questions environnementales et de droits humains.

6.Ces évolutions potentielles visent à établir un équilibre plus durable entre exploitation des ressources et protection de l'environnement, tout en répondant aux attentes sociétales croissantes en matière de transparence et de participation citoyenne.

[158] See source ACOM, https://www.acomfrance.org/l-association/

16.5 Perspective 3. Social Resource Contract in Context

Christophe Xerri
Aleff Group

General considerations were summarised when the CRMA was ratified on May 23. 2024: "Critical Raw Materials are indispensable for the EU economy and a wide set of necessary technologies for strategic sectors such as renewable energy, digital, aerospace and defence. The Critical Raw Materials Act (CRM Act) will ensure EU access to a secure and sustainable supply of critical raw materials, enabling Europe to meet its 2030 climate and digital objectives".[159]

But in the light of developments on the defence front since the start of the Trump administration and the continuing aggression of Russia both to the Ukraine and to the West, 2030 climate and digital objectives, which rely heavily on the raw materials on the CRM list, have now been recalibrated to include defence. From a short- to medium-term perspective, the fundamental reset of defence policies, human, technological and investment needs has effectively pivoted management of mineral resources from "critical" as an essentially economic measure of resource priority to "strategic" as an existential measure of geopolitical vulnerability. This makes it a key priority for policymaking in the materials sphere to align, even converge, the enabling actions listed below.

Strategic Raw Materials

The superordinate principle for including particular materials in the Strategic Raw Materials (SRM) list is their "strategic importance". This is "to be determined on the basis of the relevance of a raw material for the green and digital transition as well as defence and aerospace applications". Selection is in accordance with the following clear criteria:

a) the number of strategic technologies using a [specified] raw material as an input;
b) the amount of a raw material needed for manufacturing relevant strategic technologies [used in one or more of the specified applications];
c) the expected global demand for relevant strategic technologies.

The emphasis is on tangible raw materials, and, strikingly in regard to its place in the CRMA, on the strategic significance of these materials, the strategic importance of the technologies they enable or fuel and the level of global demand for them. Automatically that directs attention to their degree of availability within the span of control of the EU and its close partners, eg Norway, Switzerland and the United Kingdom. Given however, that Supply Risk is a feature of the CRMA it is surprising that while demand growth is factored into the principles of SRM selection, Supply Risk is included as an attribute of the materials on the CRM list. It would make sense to fold SR into the SRM selection process in the event of insecure or unavailable supply of the specific SRM listed, since that would open the door for defining and including fallback options for substituting specific SRMs for other alternatives.

This approach is open to question as despite the consistent application of the term "strategic" to the materials selected they are primarily grouped as "critical".

[159] https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials/critical-raw-materials-act_en#:~:text=The%20Critical%20Raw%20Material%20Act,foresight%20study%20on%20raw%20materials%20.

The Foundations of the Social Resource Contract

The European Union has set ambitious targets to address climate change, achieve a "net zero carbon" society and to position the region as a leader in the technologies which are embedded in most of the products and services and in the infrastructure of our societies. This is what is known as the energy and digitization transition, or (r)evolution. To achieve these targets, many minerals are essential. Some such as copper or nickel have been classed as "strategic" for many decades, some of them such as lithium, cobalt or rare earths are newcomers to wide use in innovative new materials and devices, such as smart phones, wind turbines, Electric Vehicle battery materials are classed as "critical".

In other words, mineral resources are the backbone of our "new normal" daily life, whether we see them directly (buildings, trains…) or not (batteries, smartphones, fertilisers). They are the first link in the value chain of most of products, services and equipment we benefit from. Without minerals, decarbonisation and sustainable development goals cannot be reached. In this respect, like the essential resources air and water, such minerals whether strategic or critical are a "public good" or a "common good".

The foundations of the Social Resource Contract: supplying sufficient quantities of the Necessary Resources

Those minerals most needed to enable or deliver the European green economy and 4G industrial ambitions, while contributing to and assuring European Union and wider democratic Europe's security and geopolitical strength are deemed strategic - and access to them is deemed critical when their supply shows significant signs of stress or vulnerability.

While a circular economy of recover, recycle and reuse can be a long-term perpetual source of raw materials, and doubtless will be in the future, at this point the great majority of them – and in the case of materials such as rare earths almost all – the resources we need for possibly decades ahead will = have to come from the ground as primary resources. This means we need to significantly expand equipment to harness, use and store renewable energies, meeting great surges in demand for electricity as a zero carbon source. We need to build and power data centres and communication networks to bring the benefits of new technologies to all aspects of our lives, from health and well-being, to education, to commerce and industry, to defence and to recreation and entertainment.

The Sufficient Citizen Engagement and Responsibilities

"**We**" because all citizens of democratic European citizens will benefit from a cleaner energy, efficient AI, better health. If minerals are a "public good", it means that all of us – "we" collectively – must feel responsible for the access, mining, transformation of these minerals which are keys to ensure our wellbeing. No more "I want the smartphone and the solar panels, but I don't want to know where they come from".

 **1** <u>This is anchor one of a "Social Resource Contract": a common responsibility to access and wisely use the minerals which must be taken out of the ground</u>.

Minerals are found where they are. They are not manufactured, they are the fruits of geology, the earth's endowment. So, there is not much choice as to where to "site" a mine. The mine decides for itself based on where materials are found and Nature draws the map (admittedly, it is hard work to know where the minerals are and draw the map, it is a slow and painstaking discovery process). But once the map is drawn

there can be some choices to consider. If a large cobalt deposit were found below Paris, Berlin, or Budapest would it be the preferred choice to open a mine in the middle of that city? Or a choice of last resort? Conversely, if a deposit is found in the middle of a mountainous area, considering mining it would be a "more straightforward" decision. The population impacted will be much smaller, but they deserve the same level of respect as the urban population. And the environment which will be impacted deserves the same level of sensitivity to its needs as meeting the housing needs of the urban population.

 **2**. This is anchor two of a "Social Resource Contract": properly recognize, respect and appreciate these so-called local communities which happen to be the stewards of the minerals for which we are looking.

Everyone should feel connected to them, not distanced from them.

Some S/CRMs (strategic and critical minerals) are not found in Democratic European territory. There is no choice but to source them from a different third] country. Yet, many strategic and critical materials are found in Europe. So, should Europeans prioritize "getting the minerals from abroad" because they do not want to disturb or degrade their environments and while it does not bother us if sensitive environments beyond our borders are disturbed for the purpose of satisfying our demand maintaining developed country lifestyles? Or should Europeans prioritize getting the raw materials to satisfy European needs from Europe? There is an ethical argument, which comes even before the "sovereignty" and "security of supply" arguments, which concludes with "do domestic".

 **3.** This is part of the "Social Resource Contract" to take into account the democratic and ethical values of Europe and not be shy to mine at home. Besides, as Europe is expecting foreign countries to mine with as much respect for human rights and environment as we would do in Europe, mining in Europe is a good way to set the standard, show the way and lead by example.

In our current world in transition, from a happy globalization of trade and cooperation to a more transactional and adversarial "de-linking" and de-globalization, there is a strong argument to increase resilience and strategic autonomy by localizing in Europe a) raw materials' extraction, b) when possible, beneficiation and c) as many of the next steps in the value chain as possible.

This is nothing new: energy security has been a driver of national policies in the last decades, a striking example being the decision of France – which has no natural resources such as oil, gas or coal – to launch an ambitious and successful nuclear energy program after the first oil crisis in the 70's; and to launch at the same time a strong campaign towards sobriety and energy efficiency ("let's hunt wastefulness" and "we have no oil, but we have ideas"). It resulted in France having one of the lowest prices of electricity in Europe once all the nuclear power plants were built and amortized. There has been in France a kind of implicit social contract to support nuclear energy because everyone understood the value of energy security and energy sovereignty.

 4. Today at European level sovereignty and energy security will benefit every citizen, becoming an anchor of the public good and the keystone of an over-arching Social Resource Contract.

The Social Resource Contract and the local community

Now, at the local level where a deposit is found, the first question is "Why I am the [un]lucky one?" The lucky or unlucky determination will be one made by the local community, and within the community there may be different opinions. Unlucky if the local community is happy as it is and does not welcome mining and industrial activity, impacting the environment and their social life. Lucky if the community is looking for more economic activity and employment, which can come directly and indirectly from a mining activity.

Whether the local community feels lucky or unlucky, the conditions going with a mining project must be defined. However, if the unlucky feeling is predominant, it becomes imperative to demonstrate that the mining project is not a nice to have (or a capitalistic predation) but really a must have to serve global interests (a public good which will enable better well-being for all, including addressing climate change or bringing the benefit of communication network). The strategic nature of the raw material must be confirmed, and as the case may be the criticality case. Hence, the basis of any Social Resource Contract must be an explicit policy alignment, which should be supported by as wide a political spectrum as possible. This will provide the justification for the mining project, and the recognition of the local community as, if not "heroes of the public good", at least "appreciated stewards of a strategic resource".

The justification can take several forms and can call on several concurrent policies: reduce carbon footprint, strengthen resilience and strategic autonomy, encourage policies of thrifty and efficient use of all resources (reducing the need of raw material to be mined – and in the spirit of "everyone should contribute" - consider for instance banning e-bike in flat cities), mandate recycling and provide support to R/D and economic viability in this respect. The lack of alternative can also be checked. For instance, when France was looking for a site to dispose high-level nuclear waste, the law passed in 1991 called for checking alternatives and their feasibility as a condition to, 15 years later, authorize a geological repository if no credible alternative was found.

European Union and European countries have a well-developed framework to assess and regulate environmental aspects, hazardous material and activities, working conditions, social benefits, taxation derived from large industrial activities. The existence and enforcement of this legal and regulatory framework is another foundation of the Social Resource Contract with a given local community. The permitting process can be legitimately fast tracked to address the criticality status of some raw materials but shall not take any shortcut which would prevent a proper environmental assessment and reasonable environmental management, or which would not guarantee safe working conditions. The same applies during the operation and closure of the mining project.

The Social Resource Contract shall make clear the determination of the strategic nature and of the criticality situation. With a European list updated every three years, a very short frequency compared to the typical duration of a mine of 15 to 50 years, a raw material once thought critical may disappear from the list a short time later. It may be that, thanks to this mining operation, a strategic material remains strategic, but the criticality has been addressed. This should be understood and the mining project credited for this improvement. It is a further justification to continue the operation. If the material is no longer strategic, or if the criticality situation has improved, thanks for instance to a higher level of recycling, the question may be raised whether to keep on extracting material from the ground or to end operations. The Social Resource Contract could include "sunset clause provisions" to either address such situation from the outset (keep on in any case, stop in any case…) or provide for a discussion and re-assessment if such a case happens.

This leads to the question of the social and economic parameters of the project. Should the mine be operated as long as possible, or just as little as needed to address a crisis situation? As part of a sustainable stewardship of resources, should the mining operation aim at recovering all material whatever the cost is, or set a techno-economic limit? Should the mining operations be as invisible as possible and as automatized as possible, or foster significant low, medium and high level employment opportunities? Should the next step of beneficiation be integrated with the mining site, or should the mineral be sent as soon as practicable to another site far away from the mine? There is no unique answer to these questions. A proper discussion between the local communities, the investor or operator, and the national government is desirable. The governance process, and/or the result of the discussion, can be part of the Social Resource Contract.

The financial structure and economic viability of the project should be addressed. The price of raw materials can be volatile, and a high level of environmental and social standards may well be at a cost. The strategic nature of the mined raw material shall come with some mechanism to give mid-term to long-term visibility to the investor, and to the hosting local community. Here, there is a role for the government: it can be a buyer to build strategic inventory and commit to pay a high enough price to ensure the economic viability of the project; it can be an anchor investor to show commitment and attract private investors; it can offer financing or tax incentives; etc … When the government has an active role, it can also be part of the Social Resource Contract.

What does Development mean?

We have addressed the "Why me?" and the "How?". The Social Resource Contract is a good instrument to make clear the rationale and public good benefits which are the foundation of a project, and the framing of permitting and operation in a sustainable manner in line with European values, leading to a healthy triple bottom line. The third question is "What is my win?". This is usually cast as the question of development. The project will bring development to the region or local community. But is it only a matter of economics?

Changing lens, it is not only about money, local tax or otherwise, and money must not be perceived as the "ultimate bribery" of a sometimes not-so-poor hosting community. The question of development is really the question of the vision of its future seen by the hosting community. There is therefore a need for co-construction, and then co-implementation, with the local community. A given community could see its future with more economic activity and expect support to attract and keep new small or large businesses. A given community could face a lack of public services, such as medical desertification, closure of post offices or local shops, low frequency of train and coaches. A given community may wish to strengthen its stewardship of nature and culture. The vision of the future brings also the question of what current generation and next generations will get, and how to address it: from a sustainable economic activity to a trust fund, through environmental conservation.

The Social Resource Contract is a good instrument to address the question of development in a holistic and inclusive manner: set-up the discussion, establish the goals, needs and priorities of the community and explain the common action plan towards the common goal between the local community, the government, and the investors in and operators of the project. It will also define a governance structure and process to monitor the implementation and from time to time adjust the objectives and the action plan.

The Social Resource Contract to bridge global and local legitimate expectations

The Social Resource Contract is an articulation of a global policy serving the interest of the public good, aligned with the sustainable development agenda, and a local contract built on these foundations and explicitly defining the right and duties of the hosting community, the government and the investor or operator. It includes the objectives set by the local community as their benefit for being the fatal host of a public good resources, the justification of the project in light of the strategic and critical raw material situation, the fair and effective enforcement of protective and tax benefits regulations, and additional commitments which may be agreed by the government or the operator of the project. Besides the hosting community dimension, the strategic/critical dimension means that the Social Resource Contract also includes provisions to support the business model of the project, safeguarding against the volatility of pure market mechanism.

Being a contract, the local Social Resource Contract will strengthen the legal rights of all parties and offer a mechanism for governance and discussion before, during and at the end of the project.

That mechanism deploys the combination of AI and Distributed Ledger (Blockchain) technologies to both empower and enforce the terms and conditions of the smart contracts which manage the governance and oversight of public good on which together with the core democratic principles the contracts rest.

The European defence reset

The war on European soil and the resetting of NATO is pushing defence to the top of the agenda, in the European Union and in the UK. Addressing this new reality, European countries are modernising and strengthening their military capabilities, from missile technologies to drones and cybersecurity, along with more traditional tanks and jetfighters. In addition, access to energy and access to a robust digital infrastructure are enablers to defensive and offensive military and intelligence warfare The technologies being developed to reduce carbon footprint - wind, solar, geothermal, nuclear, etc – will increase energy security and resilience. European based data centres and secure digital networks will enhance strategic autonomy. Defence will benefit.

There is therefore an alignment between the strengthening of defence and military capabilities and the climate objectives and the digitisation transition. All of them will require minerals classified as strategic and possibly critical or both.

Some of the minerals which are strategic to build military equipment are specific (ie use only for these applications), some are in common with the digital and climate objectives (ie in equipment components used by the military and in household appliances). Other minerals of the category S/CRMs are not necessary to build military equipment but will contribute to strengthening the defence infrastructure (eg those needed for wind turbines or to power nuclear plants).

With defence becoming a high priority of the European agenda, and most likely staying at the top of the list for many years, the minerals supporting strengthening and maintaining defence should be given the appropriate level of priority. Mineral access strategies could be developed accordingly (with due consideration to the fact that what is security-sensitive cannot be much publicised):

- **Defence specific minerals:** An appropriate level of technical and financial resources should be provided for the Identification of “defence specific” mineral deposits in Europe. When deposits are identified, conditions for mining – from mining technologies to environmental impact, from

human resources availability to cyber and physical protection – should be planned in advance. Where possible, planning should be discussed with potential host communities, so that mining can swiftly start when needed. In an ideal case, such deposits should be thought of as not only a national asset but as a European asset at the same time. In addition, access to extra-European deposit could be secured and some level of stockpiling considered.

- **Dual use minerals**: for those minerals which have both use in both military equipment and civilian applications, proper planning should identify the quantities needed for defence purposes both in the current state of "strengthening capabilities", and what would be needed in a "hot war" situation. This would provide a rationale for proportionate allocation of the available resources to each. European domestic sourcing could be prioritised for defence needs, while a extra-European sourcing could be earmarked for increasing or repurposing import.

- **Infrastructure specific minerals:** Considering the importance of energy and digital networks to collective defence, the implementation of the CRM act should be reviewed on a regular basis to assess a sufficiently robust and reliable supply of related minerals and materials.

Conclusion

In line with the democratic values of European countries, any policy needs the understanding and support of its citizens. Climate change and the drive towards de-carbonisation is now widely known of at every level of society. It is regularly in the news, taught in schools, discussed in parliament, acted upon by civil society initiatives. This is not yet the case for recently recognised defence priorities. For many citizens, war is something perceived as either far away or wholly detached from them, and new threats are perceived as mainly economic in nature.

The current "tariff offensive" of the Trump administration and the growing technological and marketing strength of China is compounding this unbalanced perception. Even if not yet explained, security is a common good, and an essential component of the social contract in every European country. What is today the European Union was designed to bring peace to the continent. Raising further awareness on the security environment and the need to "prepare for war in order to achieve peace" would contribute to an informed support of citizens aligned with the pressing urgency that is felt in Brussels and in other capital cities. It will be one of the foundations of the Social Resource Contract.

Considering this backdrop, while Strategic and Critical Raw Materials have already gained visibility and relevance for climate and digital transition, their significance and relevance for achieving defence objectives must be raised to the same level. The next logical step in democratic European countries is to convey to Europe's citizens that developing European domestic mining of S/CRMs is essential to achieve the peace and stability that the Social Contract is calling for.

There is therefore a compelling reason to forcefully explain the importance of S/CRMs both to support the transition to a sustainable more robust energy and digital infrastructure and to the strengthen European defence capabilities. This would add to the rationale and the co-construction of the implementation of the CRM act and anticipate the discussion of the Social Resource Contract with stakeholders of identified deposits.