CIRAN

POLICY BRIEF

Strategies for Balancing Diverging Societal Needs:

Critical raw materials extraction vs. environmental protection

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Executive Summary & Key Messages

The Challenge:

Europe faces an unprecedented dilemma in achieving strategic autonomy for critical raw materials. Research from the Horizon Europe CIRAN project reveals that 85% of EU critical raw material (CRM) deposits are located either within environmentally protected areas or within 5 km proximity. As the Critical Raw Materials Act (CRMA) drives domestic extraction to reduce import dependency, policymakers must balance two fundamental public interests—resource security and environmental protection—without clear precedent or established frameworks.

The Solution:

A transparent, evidence-based decision-making protocol that systematically evaluates competing societal needs through iterative optimisation. This framework enables defensible decisions on whether, when, and how to permit CRM extraction in or beneath protected areas while ensuring environmental integrity and stakeholder confidence.

Key Benefits:

- No legislative changes required—operates within existing EU and national regulatory frameworks.
- Transparent justification process addressing public interest, economic viability, and environmental compatibility.
- Accommodates diverse ecological sensitivities and stakeholder values across Member States.
- Reduces permitting delays and legal challenges through systematic, defensible decision-making.
- Enables low-impact mining technologies compatible with surface protection status.

Call to Action:

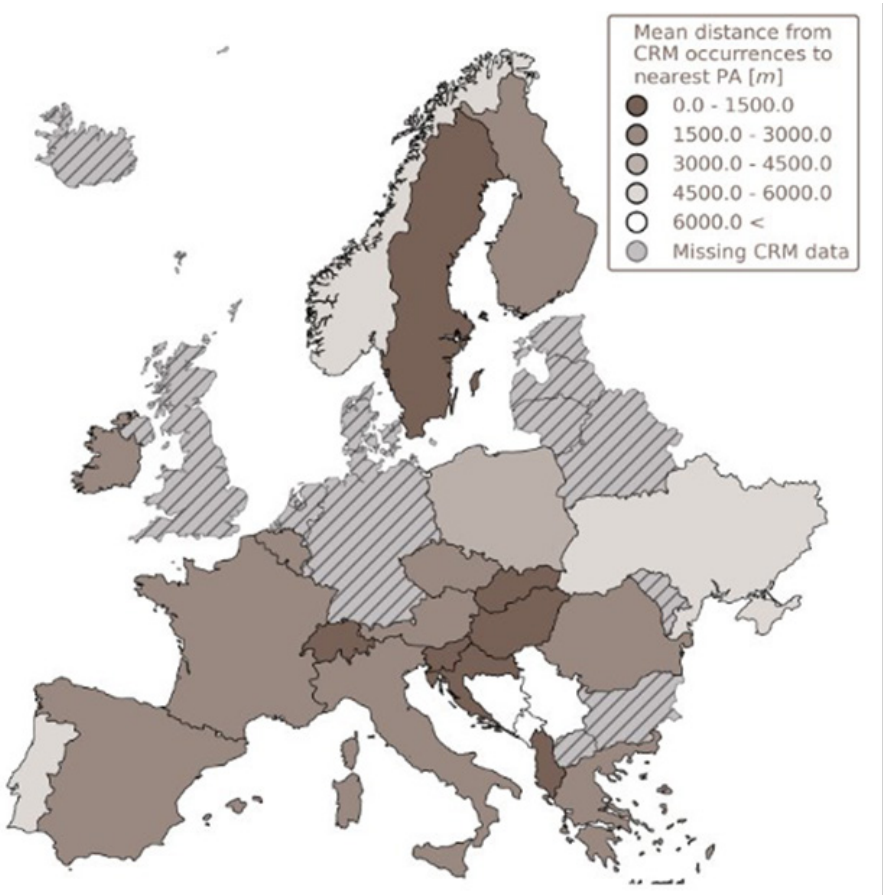
Member States should adopt this decision-making protocol for all CRM exploration and extraction permits in or near protected areas. EU institutions should integrate these frameworks into CRMA strategic project criteria and provide guidance, resources, and coordination mechanisms to ensure consistent, transparent, and defensible decision-making across Europe.

The Challenge: Why Balancing is Urgent and Complex

The Scale of the Dilemma

Europe's dual commitment to environmental protection and strategic autonomy creates an unavoidable tension. Decades of conservation policy have established extensive networks of protected areas under multiple designations—IUCN categories, Natura 2000 sites, Ramsar wetlands, UNESCO Geoparks, and national protections. Simultaneously, the European Green Deal and CRMA demand rapid scaling of domestic CRM production to supply clean energy technologies, digital infrastructure, and defence systems.

The geographical reality is stark: 85% of currently known CRM occurrences in Europe lie beneath or within 5 km of environmentally protected areas. With recent calls to expand protected areas to 30% of EU territory by 2030, this land-use conflict will intensify rather than diminish.



Mean Distance (km) from CRM Occurrences to nearest Protected Area (PA) across Europe (Source: CIRAN project).

Policy Drivers Creating Urgent Demand

CRM demand is not market-driven speculation but the direct consequence of policy decisions:

- Decarbonisation commitments requiring massive deployment of batteries, wind turbines, and solar panels,
- Digital transformation demanding rare earth elements and specialty metals,

- Defence and aerospace requiring strategic materials with limited supply chains,
- Circular economy targets needing primary materials to build recyclable infrastructure.

These are not hypothetical future needs. Current supply chains demonstrate acute vulnerability to geopolitical disruption, price volatility, and strategic dependencies that threaten European autonomy in critical sectors.

The Time Dimension Problem

Decision-making complexity is compounded by temporal misalignment. The EU updates its CRM list every three years based on evolving technology, markets, and geopolitics. Yet exploration-to-production lead times span 10-15 years or more. Decisions made today about extraction permits will reach fruition in a dramatically different technological and political landscape. By the time mined products reach the market, the original justification may have disappeared—or intensified.

This temporal mismatch demands decision-making protocols that account for uncertainty while providing sufficient confidence for decade-long investments in both mining infrastructure and environmental protection measures.

Trust, Cohesion, and Legitimacy Risks

Opposition to mineral projects typically stems not from technical concerns but from disconnection between EU-level policy priorities and local interests. Resource-rich regions—often in underdeveloped or peripheral areas—may feel they carry concentrated environmental and social burdens while serving distant Brussels priorities.

Without transparent, defensible decision-making frameworks, CRMA implementation risks:

- Deepening territorial disparities and undermining European solidarity,
- Amplifying Eurosceptic sentiment in mining-affected regions,
- Prolonged legal challenges and permitting delays exceeding project economic viability,
- Precedent-setting refusals that effectively sterilise Europe's CRM deposits,
- Loss of public trust in both environmental protection and industrial policy.

Current Approaches Are Insufficient

Traditional permitting processes rely heavily on technical Environmental Impact Assessments (EIAs) and expert consensus. While these are necessary, they have proven insufficient to address legitimate societal concerns about:

- Threats to biodiversity and ecosystem services,
- Impacts on cultural heritage and traditional ways of life,
- Distribution of benefits and burdens between national/EU interests and local communities,
- Long-term liabilities extending beyond mine closure.

What is missing is not more technical assessment but a transparent framework for weighing incommensurable values—economic development against environmental preservation, European strategic autonomy against local community autonomy, present needs against future generations' interests.

The Framework: A Transparent Decision-Making Protocol

Principles and Approach

This framework provides a systematic, transparent protocol for determining under which conditions—if any—CRM extraction from within or beneath protected areas may be justified. It operates through iterative optimisation, examining multiple dimensions simultaneously rather than applying rigid exclusion rules.

Core Principles:

- Transparency: All decisions and their justifications are documented and publicly accessible.
- Evidence-based: Technical assessments inform but do not dictate decisions involving normative values.
- Iterative optimisation: Solutions are refined through multiple assessment cycles adjusting technical and social parameters.
- Proportionality: Protection measures and mining technologies are matched to site sensitivity.
- Temporal awareness: Decisions account for uncertainty in long-term demand and technology evolution.

The Three-Tier Decision Process

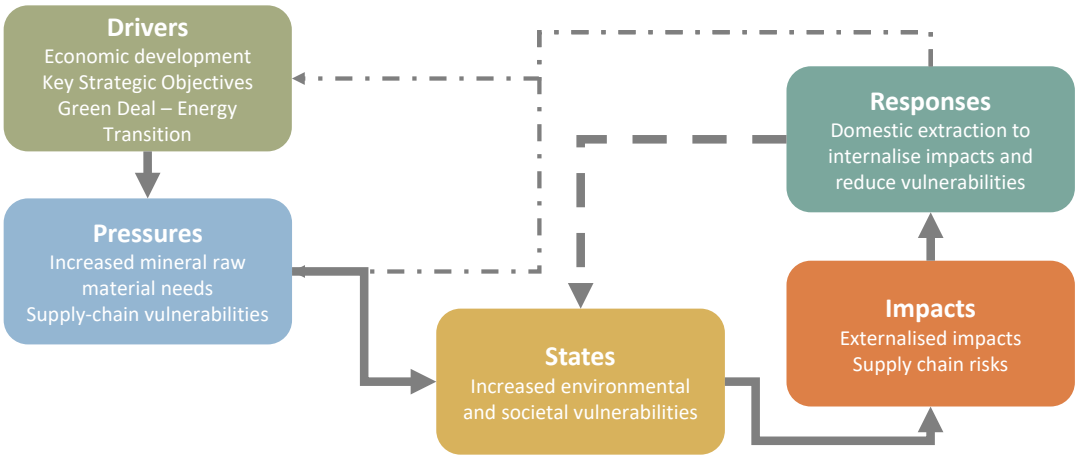
The framework structures decision-making through three sequential assessments, each with clear criteria and decision points. Importantly, justification is not required for basic geological mapping and prospecting—governments have a legitimate mandate to understand their natural resource endowments.

Tier 1: Public Interest Assessment

Question: Is there an overriding public interest for domestic extraction of this specific material?

- This tier uses the Drivers-Pressures-States-Impacts-Response (DPSIR) framework to systematically evaluate whether CRM demand constitutes a justifiable public interest. The analysis examines:
- Policy drivers: Which EU or national policies create demand (e.g., renewable energy targets, defence strategies)?
- Pressures: What are the consequences of supply dependence (e.g., price volatility, geopolitical leverage, supply disruption risk)?
- States: What is the current and projected supply-demand balance? Can demand be met through recycling, substitution, or secure imports?
- Impacts: What are the consequences of not developing domestic sources (e.g., stranded clean energy targets, strategic vulnerability)?
- Responses: What policy options exist beyond domestic extraction? Are they sufficient and timely?

This analysis must project 10-15 years forward, acknowledging uncertainty while identifying robust demand scenarios. The output is a defensible public interest case—or its absence.



Conceptual DPSIR-framework for understanding the need for domestic extraction.

Decision Point: If no overriding public interest can be demonstrated, exploration ceases. If public interest is established, proceed to Tier 2.

Tier 2: Economic Feasibility Assessment

Question: Can extraction be economically viable under enhanced environmental protection requirements?

Economic assessment uses industry-standard tools—CRIRSCO-compliant resource assessment for investors and UNFC (United Nations Framework Classification) for strategic evaluation at Member State or EU level. Critical considerations include:

- Resource characterisation: Geological setting, deposit geometry, ore grade, mineralogical complexity.
- Technical feasibility: Mining methods appropriate to geology and protection requirements.
- Additional costs: Enhanced environmental protection, monitoring, rehabilitation, and long-term stewardship.
- Market conditions: Price projections, competing supply sources, demand volatility.
- Social license costs: Community benefit-sharing, local economic participation, extended stakeholder engagement.

This assessment is inherently iterative. Initial economics may be unfavourable, but adjustments to mining methods, processing strategies, or benefit-sharing arrangements may create viability. The question is not "Is this profitable under normal conditions?" but **"Can this be profitable while meeting exceptional protection standards?"**

Decision Point: If no economically viable scenario can be identified even with iterative optimisation, extraction is not justified. If viable scenarios exist, proceed to Tier 3.

Tier 3: Environmental Compatibility Assessment

Question: Can extraction be conducted in a manner compatible with the protected status of the area?

This tier examines whether technical solutions exist to reconcile extraction with environmental protection objectives. It systematically assesses:

Protection Requirements:

- Level and type of protection (IUCN category, Natura 2000 designation, cul-

tural heritage status).

- Specific conservation objectives and protected features.
- Ecological sensitivity and vulnerability to disturbance.
- Cultural and social values requiring preservation.

Technical Solutions:

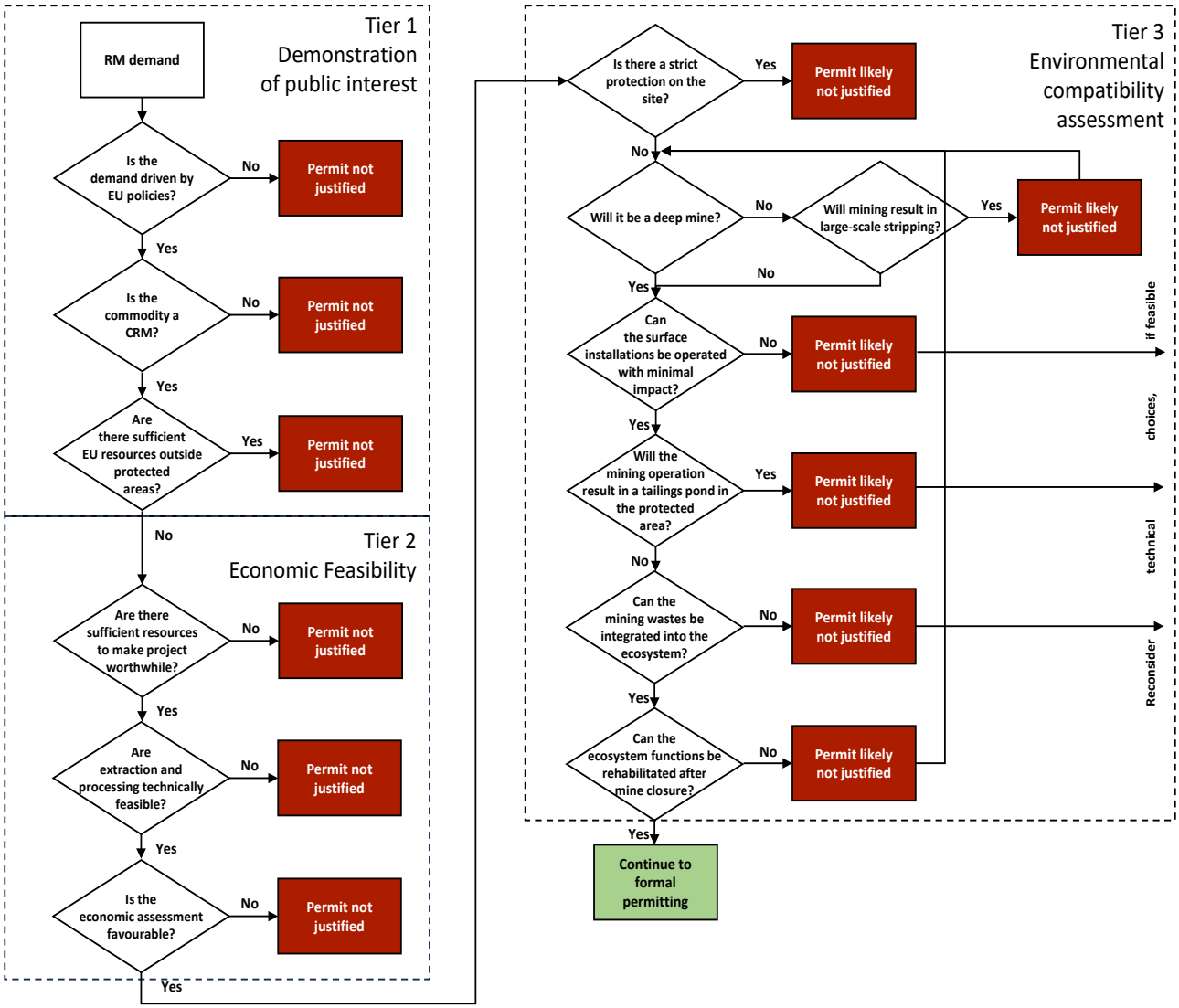
- Low-impact mining methods: Underground mining, minimal surface footprint, underground waste disposal.
- Low-visibility approaches: Subsurface infrastructure, rehabilitated surface features, visual screening.
- Extractive waste management: Underground backfill, processed waste reduction, secure tailings storage.
- Water management: Closed-loop systems, groundwater protection, zero-discharge strategies.
- Biodiversity protection: Avoidance measures, buffer zones, habitat corridors, net positive outcomes.

Mitigation and Compensation:

- On-site mitigation reducing impacts to acceptable levels.
- Off-site compensation creating equivalent or superior conservation value elsewhere.
- Habitat restoration extending beyond project boundaries.
- Long-term stewardship extending beyond mine closure.

The compatibility assessment is not pass/fail but a negotiated optimisation. It may conclude that extraction is compatible only with specific technologies, operational constraints, enhanced monitoring, or compensatory measures. It may also conclude that no technical solution can adequately protect the site's values.

Decision Point: If compatibility can be achieved, proceed to permitting with binding conditions. If not, extraction is refused.



Graphical representation of the decision-making tree.

Integration Across the Tiers

The three tiers are not strictly sequential. Information from Tier 3 (technical solutions) may affect Tier 2 (economics), which may influence Tier 1 (public interest if costs become prohibitive). The framework explicitly accommodates iteration:

- Initial assessments may show economic or technical obstacles,
- Adjustments to mining methods, waste management, or benefit-sharing are explored,
- Revised scenarios are reassessed for viability and compatibility,
- Stakeholder input informs which trade-offs are acceptable,
- Documentation captures the decision path and alternatives considered.

This iterative process increases the likelihood of finding solutions where they exist while providing clear documentation when they do not.

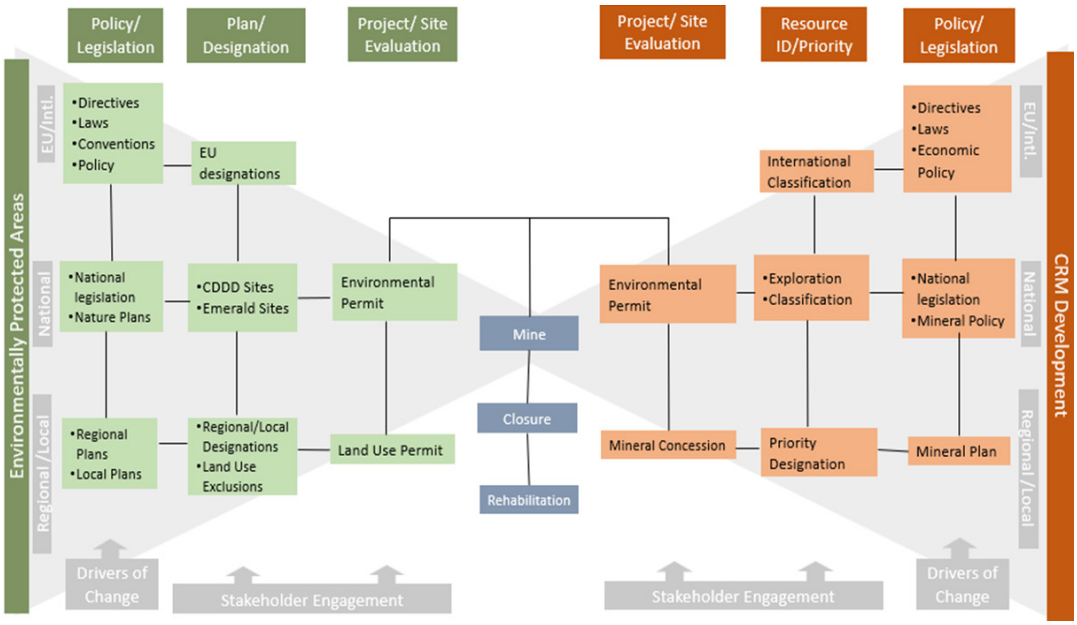
Addressing Regulatory Complexit and Coordination

The Multi-Regulator Challenge

Decision-making about extraction in protected areas occurs within multiple, sometimes competing, regulatory frameworks. Depending on the Member State, authority may lie at national, regional, provincial, or municipal levels. Relevant regulatory domains typically include:

- Mining and extractive industries (licensing, safety, technical standards),
- Environmental protection (nature conservation, pollution control, EIA),
- Water management (surface water, groundwater, quality standards),
- Land use planning (zoning, spatial development, infrastructure),
- Cultural heritage (archaeological sites, historical buildings, landscapes),
- Labour and occupational health and safety,
- Economic development and regional policy.

These regulatory bodies may have divergent mandates, priorities, and institutional cultures. An environmental regulator's mission is protection; a mining regulator's mission includes enabling responsible resource development; an economic development agency prioritises job creation and investment.



Bow-tie diagram illustrating the complex and sometimes competing realms of different regulators.

Integrated Decision-Making Mechanisms

The decision-making protocol cannot function effectively without coordination mechanisms that:

- Establish clear lead authority for coordinating the assessment process,
- Create inter-agency working groups with representatives from all relevant regulators,
- Define information-sharing protocols ensuring all bodies access the same evidence base,

- Specify consultation requirements and timelines preventing sequential delays,
- Establish dispute resolution procedures when regulatory bodies disagree,
- Ensure community stakeholders can engage with the integrated process rather than navigating multiple agencies.

Some Member States have established "one-stop-shop" permitting systems for major projects. Where these exist, they provide natural homes for the integrated decision-making protocol. Where they do not, implementing the protocol may require establishing coordination mechanisms.

Maintaining Regulatory Independence

Coordination does not mean subordinating environmental protection to economic objectives, or vice versa. Each regulatory body retains its statutory mandate and independence. The framework provides a structured process for:

- Making each regulator's concerns and requirements explicit and transparent,
- Identifying where requirements conflict and exploring whether technical solutions exist,
- Documenting trade-offs and their justifications when conflicts cannot be fully resolved,
- Elevating unresolvable conflicts to appropriate political decision-makers rather than leaving them to administrative deadlock.

The outcome may be that environmental protection requirements make a project economically unviable—this is a legitimate result. The outcome may be that public interest in resource security justifies carefully managed impacts—this too is legitimate if transparently reasoned. What the framework prevents is decisions made by default through regulatory dysfunction.

Policy Recommendations & Next Steps

For EU Institutions

Integrate Decision-Making Frameworks into CRMA Implementation

Consider incorporating systematic decision-making protocols as a criterion for Strategic Project designation under the Critical Raw Materials Act. Projects demonstrating transparent assessment of public interest, economic viability, and environmental compatibility should receive prioritised consideration for EU support and streamlined permitting.

Develop EU-Wide Guidance Documents

Create comprehensive best practice guidelines for implementing the decision-making protocol across diverse Member State contexts. Guidance should address:

- Adaptation to different legal and institutional frameworks,
- Methodologies for public interest assessment using DPSIR,
- Economic evaluation standards for projects with enhanced protection requirements,
- Technical standards for low-impact and low-visibility mining,

- Stakeholder engagement processes ensuring meaningful community participation,
- Inter-agency coordination mechanisms and dispute resolution,
- Monitoring and enforcement throughout project lifecycle.

Establish Funding Mechanisms

Create dedicated funding streams within the European Competitiveness Fund or similar instruments to support:

- Development and testing of decision-making protocols in pilot regions,
- Technical studies assessing low-impact mining feasibility for specific deposits,
- Community engagement processes and capacity building for stakeholder participation,
- Independent monitoring and verification of environmental commitments,
- Research into emerging technologies enabling reduced environmental impacts.

Support Knowledge Exchange and Capacity Building

Facilitate sharing of experience across Member States through networks, workshops, and peer learning programmes. Many Member States have limited recent experience with mineral permitting in complex regulatory environments. Collective learning will accelerate implementation and improve decision quality.

For Member States

Adopt the Decision-Making Protocol

Integrate the three-tier framework into national mining permitting processes for all projects potentially affecting protected areas. This requires:

- Designating lead authorities responsible for coordinating the assessment,
- Establishing inter-agency coordination mechanisms,
- Developing national guidance consistent with EU best practices,
- Training regulatory staff in the protocol's application,
- Creating transparent documentation and public reporting systems.

Launch Pilot Programmes

Test the framework in 3-5 diverse regional contexts to identify implementation challenges and refine approaches. Pilot sites should vary in:

- Protection designations (IUCN categories, Natura 2000, national parks),
- Mineral types (various CRMs with different extraction requirements),
- Institutional structures (national vs. regional authority, single-window vs. multiple regulators),
- Stakeholder contexts (urban vs. rural, economically developed vs. peripheral regions).

Improve Spatial Data Infrastructure

Invest in GIS capabilities implementing the INSPIRE Directive requirements. Ensure that protected area boundaries, mineral occurrence data, infrastructure, and other relevant spatial information are:

- Digitally mapped with appropriate precision,
- Interoperable across different regulatory agencies,
- Accessible to project developers and stakeholders for transparent plan-

ning,
- Updated regularly to reflect new information,
- Capable of three-dimensional visualisation for subsurface mining contexts.

Strengthen Stakeholder Engagement Capacity

Provide resources and training for meaningful community participation throughout the decision process. This includes:

- Early engagement before formal permitting applications,
- Accessible information about projects, impacts, and alternatives,
- Independent technical support enabling communities to evaluate complex proposals,
- Structured consultation processes with genuine influence on outcomes,
- Grievance mechanisms and conflict resolution procedures,
- Long-term community monitoring and oversight roles.

Establish Independent Monitoring Frameworks

Create monitoring systems tracking protocol implementation effectiveness, including:

- Decision timelines and predictability,
- Environmental outcomes (compliance, ecosystem health, biodiversity trends),
- Economic outcomes (investment, employment, regional development),
- Social outcomes (community satisfaction, benefit distribution, conflict resolution),
- Lessons learned and continuous improvement.

Implementation Timeline

Phase 1: Foundation (2026-2027)

- Q1 2026: Complete EU guidance document development.
- Q2 2026: Member States designate lead implementation agencies.
- Q3-Q4 2026: Launch pilot programmes in selected regions.
- Q1-Q2 2027: Develop national guidance documents adapted to Member State contexts.
- Q3-Q4 2027: Train regulatory staff and establish inter-agency coordination mechanisms.

Phase 2: Testing and Refinement (2028-2029)

- Q1-Q4 2028: Implement pilot projects testing the framework in real-world contexts.
- Q1 2029: Evaluate pilot outcomes, identify challenges, refine procedures.
- 2027-2029: Develop case study library demonstrating framework application.
- 2029: Scale successful models across additional Member State regions.
- 2029: Integrate lessons learned into revised guidance documents.

Phase 3: Full Implementation (2030-2031)

- 2030-2031: Mainstream adoption across EU mining permitting systems.
- 2031: First review of framework effectiveness and outcomes.
- Ongoing: Continuous improvement based on monitoring data and stakeholder feedback.

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