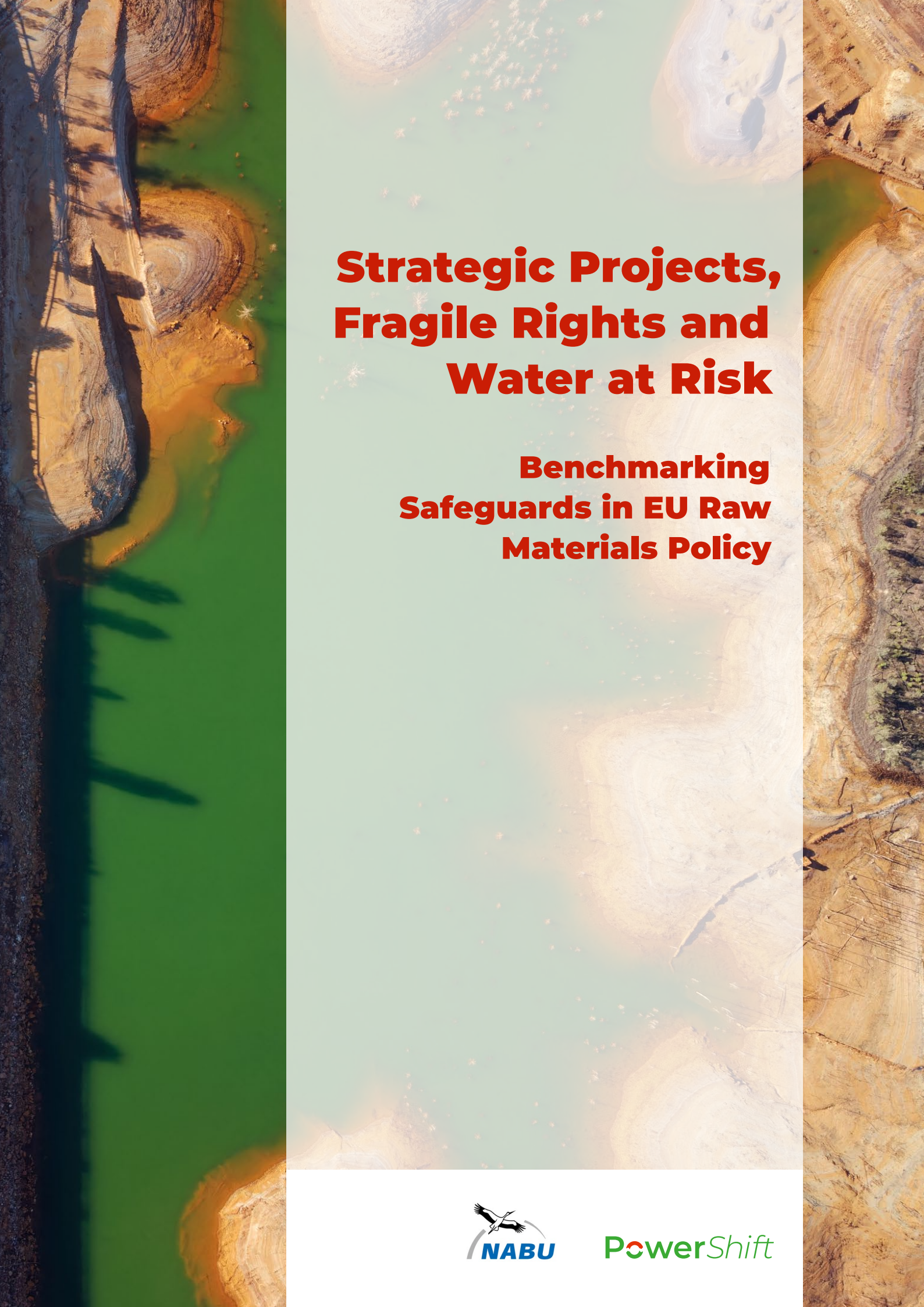


Strategic Projects, Fragile Rights and Water at Risk

Benchmarking Safeguards in EU Raw Materials Policy

NABU

PowerShift

Impressum

Strategic Projects, Fragile Rights and Water at Risk

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PowerShift e.V.
Greifswalder Str. 4
10405 Berlin, Deutschland
+49 30 42805479
info@power-shift.de
https://power-shift.de/impressum

Registered with the Registry Court
AG Charlottenburg, VR 29859 B

NABU-Bundesverband
NABU (Naturschutzbund Deutschland) e. V.
Charitéstraße 3
10117 Berlin
NABU@NABU.de
www.NABU.de

Registered with the Registry Court
AG Stuttgart, VR 2303

Authors:
Roberto Stefani, Anna Schönwald, Maja Wilke

Contributors:
Steven Emerman, Joám Evans, Nik Völker, Helen Levine, Jules Strahlmann

Editors:
Michael Reckordt, Maike Buckemüller, Adrian Bornmann

Layout:
Tilla Balzer-Nadolny I buk.design

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PowerShift – Verein für eine ökologisch-solidarische Energie- & Weltwirtschaft e. V.

We want to see an ecologically and socially fairer world economy. To achieve this, we use our expertise in trade, raw materials, and climate policy: With comprehensive research we question political processes, identify the problems of an unjust global economic system, and develop alternative courses of action. To realise our objectives, we formulate political demands, inform and educate, and forge strong alliances – with other organisations, social movements, and citizens. Together we take action!

NABU (Nature And Biodiversity Conservation Union)

Founded in 1899, NABU (Nature And Biodiversity Conservation Union) is one of the oldest and largest environmental associations in Germany. The association encompasses about 960,000 members and sponsors. NABU's most important tasks are the preservation of habitat and biodiversity, the sustainability of agriculture, forestry and water management, and last but not least, climate protection. The communication of nature experiences and the promotion of natural history knowledge are among NABU's central concerns. About 70,000 volunteers play an active role in practical nature conservation work, with great success: this is something that is unique to NABU. These active NABU members look after more than 110,000 hectares of valuable protected reserves in Germany. NABU also has volunteer groups working on an international level to conserve nature and combat poverty in Africa, Eurasia, and the Caucasus. This work is supported by professionals at our regional offices and at our national headquarters in Berlin, who take care of public relations, project development and management, and political lobbying. NABU is part of BirdLife International.

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List of Abbreviations

AA:	Annual average
ACCC:	Aarhus Convention Compliance Committee
APA:	Agência Portuguesa do Ambiente (Portuguese Environmental Agency)
BAT:	Best Available Techniques
BBergG:	Bundesberggesetz (German Federal Mining Act)
BNatSchG:	Bundesnaturschutzgesetz (German Federal Nature Conservation Act)
CBAM:	Carbon Border Adjustment Mechanism
CETA:	Comprehensive Economic and Trade Agreement
CRIRSCO:	Committee for Mineral Reserves International Reporting Standards
CRMA:	Critical Raw Materials Act
CSR:	Corporate Social Responsibility
DGEG:	Direção-Geral de Energia e Geologia (Portuguese Directorate-General of Energy and Geology)
DG GROW:	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
EIA:	Environmental Impact Assessment
EID:	Environmental Information Directive
ELD:	Environmental Liability Directive
EPA:	Environmental Protection Agency
EPPO:	European Public Prosecutor's Office
EQS:	Environmental Quality Standards
ESIA:	Environmental and Social Impact Assessment
Espoo:	Convention on Environmental Impact Assessment in a Transboundary Context
ESPR:	Ecodesign for Sustainable Products Regulation
EU ETS:	European Union Emissions Trading System
EWD:	Extractive Waste Directive
FAO:	Food and Agriculture Organization of the United Nations
FPIC:	Free, Prior and Informed Consent
GIAHS:	Globally Important Agricultural Heritage System
ICCPR:	International Covenant on Civil and Political Rights
ICESCR:	International Covenant on Economic, Social and Cultural Rights
ICSID:	International Centre for Settlement of Investment Disputes
ILO:	International Labour Organization
IRMA:	Initiative for Responsible Mining Assurance
LKAB:	Luossavaara-Kirunavaara Aktiebolag (Swedish state-owned mining company)
MAC:	Maximum allowable concentrations
MINOB:	Observatorio Ibérico de la Minería (Iberian Mining Observatory)
OECD:	Organisation for Economic Co-operation and Development
PPD:	Public Participation Directive
RBSP:	River basin specific pollutants
SLAPP:	Strategic Lawsuits Against Public Participation
SRM:	Strategic Raw Material
UDHR:	Universal Declaration of Human Rights
UICN/IUCN:	International Union for Conservation of Nature (if Spanish/French quotes appear)
UNDRIP:	UN Declaration on the Rights of Indigenous Peoples
UNECE:	United Nations Economic Commission for Europe
UNEP:	United Nations Environment Programme
UNFCCC:	UN Framework Convention on Climate Change
UNGPs:	UN Guiding Principles on Business and Human Rights
UNRMS:	United Nations Resource Management System
UNFC:	United Nations Framework Classification for Resources
USEPA:	United States Environmental Protection Agency
UVPG:	Umweltverträglichkeitsprüfungsgesetz (German Environmental Impact Assessment Act)
WFD:	Water Framework Directive
WHO:	World Health Organization

Preface



Mining leaves deep scars, as can be seen in this murial in Covas Do Barroso, Portugal. Photo: Michael Reckordt

This work is grounded in the ongoing defense of land, water, and community rights across Europe. It recognizes that these are not isolated local disputes, but connected responses to a fast-tracked rush to extract, now unfolding across multiple EU countries under the banner of Strategic Projects under the *EU Critical Raw Materials Act*.

It also stands on the shoulders of a huge amount of work done by others, and was only possible thanks to the research, fieldwork and long-term commitment of organizations in the EU Raw Materials Coalition, especially the European Environmental Bureau, European Friends of the Earth network, Iberian Mining Observatory, Mining Watch Portugal, Global Witness, the Business and Human Rights Center, the organizations of the German network AK Rohstoffe, Earthworks, Transport and Environment, and, above all, thanks to the resistance and testimony of affected communities and Indigenous Peoples defending their lands and territories. Bringing this evidence together, the study is directed at policy makers and public authorities: it shows why the current course is putting rights at risk, and what must change to ensure the CRMA is implemented with stronger safeguards and real democratic legitimacy.

Context and Rationale



Around 70 per cent of global mining is open-pit mining, which poses significant risks for water and land use, as can be seen in Bor, Serbia. Photo: Maja Wilke

When drafting the *Critical Raw Materials Act*, the then EU Commissioner Thierry Breton (DG GROW) promised that the expansion of the resilient supply chain would take place under conditions that "ensure the highest social and environmental standards – the European way."[1] Strategic Projects are at the heart of fulfilling the CRMA's objectives to reduce the dependencies on geopolitical rivals. At the same time, Strategic Projects increase the pressure on mining-affected communities and timelines are compressed. In addition, as part of efforts to secure raw materials for the EU, legislations protecting environmental aspects, such as the Water Framework Directive, are being revised, which could lead to a weakening of limit values, for example. This research shows that the gaps in safeguards might stop being "technical issues" and start becoming predictable pathways to harm.

What emerges from the analysis is straightforward: while some industry players are collaborating with conservatives and right-wing politicians to push for the deregulation of standards and their implementation in Europe, the current legal framework is not strong enough to withstand the political and procedural pressure that comes with "strategic" status and accelerated decision-making. Even where rules exist on paper, rights too often become fragile in practice: communities face consultations that come too late, deadlines that are too short, information that is inaccessible or incomplete, and remedies that are too slow or too expensive to be effective. In that setting, "public acceptance" risks being treated as a communications exercise, while the underlying questions of consent, risk, and long-term impacts remain unresolved.

This is the critical warning for policy makers: a transition built on weakened safeguards will not be faster in the end. It will be more contested, more litigated, and more socially divisive, because people will defend what they rely on when institutions fail to do so. The EU's raw materials strategy therefore faces a choice. It can repeat the old extractive pattern of sacrifice zones, community conflict, and environmental decline dressed up as "green necessity." Or it can prove that the transition can be democratic, rights-based, and resilient.

The good news is that the route to a better outcome is known, and it is achievable. It does not require inventing new principles; it requires the EU and Member States – as former EU

Commissioner Bretton said – to carry out the "European way" of applying higher standards in practice and ensuring that safeguards are not undermined by fast-track procedures. A rights-based implementation of the CRMA should start with a short list of non-negotiables:

- **Protect meaningful participation from Day One.** Engagement must begin at the earliest stages (including exploration), with adequate time, accessible information, and a clear duty for authorities to show how public input shapes decisions, and to do so through transparent influence logs, not vague summaries.

- **Make impact assessment a real safeguard, not a hurdle.** Strategic Projects should never mean thinner scrutiny. Assessments must cover social and human rights impacts, cumulative effects, and cross-border implications, with independence and credibility built in.

- **Maintain existing legislations and achievements.** The CRMA should not undermine the prohibition of deterioration under any circumstances. The Water Framework Directive must be given clear priority over the planned acceleration of mining projects in the EU. Instead of taking steps backward, for example with regard to the regulation of environmental quality standards for water, the EU must recognize potential for improvement.

- **Treat consent and community power as central, not optional.** Where Indigenous Peoples are affected, Free, Prior and Informed Consent (FPIC) must be understood as a right with real consequences, not a checkbox. For all affected communities, decision-making must reflect genuine options, not a pre-decided "yes" followed by mitigation talks.

- **Guarantee access to justice and remedy that people can actually use.** Standing, timing, and cost barriers must be reduced so that rights can be enforced before harm becomes irreversible.

- **Plan closure and long-term responsibility from the start.** Projects must be required to provide credible financing for closure, rehabilitation, and monitoring so that communities and future generations are not burdened with the costs of contaminated sites.

These are pro-democracy, pro-rule-of-law safeguards – the minimum required for any transition that claims to be just. Sometimes they are labeled as "anti-mining" demands, but, as NABU and PowerShift, we are aware that a society without raw materials is impossible. For years we have been advocating for a raw materials transition, because the path that best respects rights begins even earlier: the greenest ton of metal is the one we never have to mine. The EU should therefore focus on solutions for reducing demand and promoting the circular economy, smart product design, repair, reuse, and high-quality recycling, so that the demand for transition minerals remains within safe planetary boundaries. That includes setting ambitious recycled-content requirements, serious investment in collection and recycling capacity, and policies that cut waste and overconsumption, particularly where new extraction would involve high consumption of fossil fuels and be socially contested.

At the same time, climate action and security priorities cannot be used as an excuse for causing harm, either in Europe or anywhere else. No "strategic" label can legitimize the erosion of Indigenous and community rights, intimidation of defenders, the pollution of water resources, or the creation of new sacrifice zones. The priority must be to find and fund solutions that minimize the need for raw material extraction, and then ensure that any mining that remains genuinely necessary is carried out under strict safeguards, in a sustainable, just, equitable, and fully rights-respecting manner.

We take former EU Commissioner Breton and all politicians claiming that Europe has the highest and best standards for protecting the environment and its people at their word. There is still a long way to go to achieve the highest standards in the world, but this study offers concrete suggestions on how to proceed. Further deregulation and a "race to the bottom" will not increase the competitiveness of the EU industry, as the current Commissioner for Clean, Just and Competitive Transition Teresa Ribera highlighted in January 2026: "If we lose our identity, our values, the confidence of our people, we will not be in a position to negotiate anything or to bridge anything."[2]

Introduction



Copper is soon to be mined where there is still a settlement today. A large proportion of the inhabitants have already left their village which is to make way for the expansion of the Bor copper mine in Serbia. Photo: Maja Wilke

Mining for critical raw materials holds a pivotal place in Europe's energy transition and digital ambitions, but the governance of strategic mining projects is fraught with complex questions about balancing industrial interests, community rights, and environmental protection. Transparency, public involvement, accountability, and robust enforcement of environmental and social standards are not mere procedural requirements, they shape outcomes for affected communities and ecosystems and underpin trust in democratic decision-making. The governance framework must be anchored in human rights, with particular emphasis on sustainable development, community well-being, protection of the environment and the ensuring of collective and individual rights.

Recent EU instruments, such as the CRMA, push to fast-track projects by granting "overriding public interest"[i] status. While working on the CRMA, then EU Commissioner Thierry Breton (DG GROW) promised to "ensure the highest social and environmental standards – the European way."[3] Unfortunately, this promise does not represent the current reality in Europe. This additional pressure on weak or outdated mining laws, as well as under-resourced regulatory agencies combined with industry lobbying creates real risks: corporate misconduct, diluted safeguards, destruction of the environment and local well-being sacrificed for industrial targets.[4] These failures threaten both individual rights – such as the rights to health, water, property, life, and a healthy environment (now recognized as a universal human right by the UN General Assembly[ii]) – and collective rights, including cultural self-determination, land rights, and the right to participate in decision-making processes that shape communities' futures.

i In the CRMA, a project classified as strategic can be declared to be in the "overriding public interest," and can thereby receive exemptions from existing environmental, nature conservation, and participation regulations.

ii On 28 July 2022, the UN General Assembly affirmed that everyone has the right to a healthy environment. The move – built on years of mobilization and a 2021 Human Rights Council resolution – calls on states, international organizations, and companies to step up efforts to protect that right (UN News, 2022).

All this, while international conventions continue to apply in full.[5] At the same time, despite various shortcomings, the EU emphasizes that it sets the highest environmental and social standards in mining worldwide.[6]

A human rights perspective on mining governance means operationalizing the principle that all individuals and communities possess inalienable rights that must be respected, protected, and fulfilled by states and corporations. This requires integrating substantive human rights and environmental standards into laws and regulatory frameworks, conducting robust Environmental and Social Impact Assessments,[iii] ensuring meaningful participation of affected stakeholders, and guaranteeing access to justice and remedy.[7] In this context, it is also important to take a closer look at the regulations surrounding water resources in particular, as water pollution can have especially serious consequences for the environment and living conditions, and is therefore often a major concern for the affected population. This is also important in light of the fact that the European Commission itself has concluded that there is still considerable potential for improvement in the protection of water resources: in its *Report on the implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC)*, the Commission concluded in 2024 that so far only 39.5% of surface water bodies in the EU had achieved good ecological status and only 26.8% of EU surface waters met chemical quality standards, which even represented a deterioration compared to 2015.[8]

Neglect of transparency, accountability, and rights-based approaches transforms strategic mining zones into sacrifice zones – areas where environmental and social harms are traded for supply security. This model endangers not only the resilience of local communities and ecologies but also undermines the promise of a just transition for Europe. The planetary boundaries framework underscores how unchecked resource extraction risks Earth's biophysical systems and humanity's future.

This publication therefore focuses on the following research questions: How strong are selected EU mining legislations regarding environmental due diligence and participation compared to selected international conventions, legislations and mining standards? How strictly do EU regulations enforce threshold values for substances that occur in connection with mining and can impair water quality, and does the EU live up to its own claim of having the strictest standards?

To answer these questions, the study first presents a brief overview of international conventions on human rights and environmental due diligence applicable for mining operations and introduces current binding primary and secondary legislation in the mining sector. This is followed by an in-depth analysis with in-country examples comparing national legislation and case studies with conventions and standards on environmental due diligence and participation.

The study then takes a closer look at the environmental aspects: focusing on drinking water and surface waters as examples, it examines how strict the EU's environmental quality standards and pollutant limits are in international comparison and whether the EU lives up to its own claim of setting the highest standards in primary sourcing of metallic raw materials. It also briefly touches on regulations concerning mine waste as well as the protection of air and soil quality in connection with mining. Finally, recommendations for closing the identified gaps are given and suggestions for legislation and mining practices in line with environmental principles and human rights are presented.

iii An Environmental and Social Impact Assessment (ESIA) is a crucial, systematic process used to identify, predict, evaluate, and mitigate the potential environmental and social consequences of a proposed project before a final decision is made to proceed.

International Conventions, Mining Standards, and Benchmarks regarding Transparency, Participation and Accountability

This chapter introduces and reviews key international frameworks for transparency, participation, accountability, and responsible mineral production. In this paper, Aarhus, Escazú and *Initiative for Responsible Mining Assurance (IRMA)* are used as main benchmarks because they form a logical "ladder" of standards on transparency, participation and accountability in environmentally risky projects, with Aarhus as the key binding EU benchmark, Escazú as its more protective evolution, and IRMA as the strongest miningspecific standard translating many of these principles into detailed practice. The frameworks provide normative reference points for assessing the alignment of national mining legislation with internationally recognized principles. They will serve as the basis for the gap analysis presented later in the study.

International Conventions

The UN Guiding Principles on Business and Human Rights (UNGPs)[13] – endorsed by the UN Human Rights Council in 2011 – establish a global framework on duties and responsibilities of states and businesses in relation to human rights. They rest on three pillars: (1) States' duty to protect human rights through appropriate policies, legislation, regulation, investigation, enforcement, and adjudication, (2) Corporate responsibility to respect human rights through risk-based due diligence, and (3) The need for access to effective remedy for affected individuals and communities. The UNGPs serve as the foundational reference for most international standards and emerging mandatory due-diligence legislation.

The **Escazú Agreement** – adopted by countries in Latin America and the Caribbean in 2018 – has set an even higher bar for environmental democracy by explicitly recognizing environmental defenders and providing specific protections for those who risk their lives defending environmental rights.[9] While the Escazú Agreement does not apply directly to the EU, it represents an evolution in international norms compared to the Arhus Convention, establishing the first legally binding treaty worldwide that includes provisions on the protection of environmental human rights defenders and that specifically mandates access to information in local languages, meaningful participation, and access to justice.[10]

The **Aarhus Convention** – ratified by the EU and its Member States and in force since 2001 – establishes three pillars: (1) access to information, (2) public participation in decision-making, and (3) access to justice in environmental matters.[11] It requires that key project information, including Environmental Impact Assessments (EIAs), permitting documents, details about company ownership and financial relationships, be publicly accessible to enable meaningful and timely participation, particularly for directly impacted communities.[12]

The OECD Guidelines for Multinational Enterprises on Responsible Business Conduct provide a comprehensive set of recommendations for companies operating across borders to prevent and address impacts linked to activities in their supply chains. The Guidelines outline expectations on human rights, labor rights, environment, disclosure, consumer interests, and anti-corruption, and require companies to conduct risk-based due diligence in line with the framework. They are supported by National Contact Points, which promote the Guidelines and offer a non-judicial grievance mechanism to address non-compliance.

Despite their normative importance, the Aarhus Convention and the Escazú Agreement[i] have proven far from sufficient to guarantee environmental democracy in practice. Persistent and well-documented patterns of non-compliance show that the three pillars of access to information, participation and justice are routinely restricted by narrow standing rules,[ii] high litigation costs, weak oversight and limited remedies: the EU itself has been found in breach of Aarhus access-to-justice requirements multiple times and remains in ongoing non-compliance in key cases.[14] Under Aarhus, the Compliance Committee continues to receive a steady stream of communications alleging failures to disclose information, to consult affected communities, or to provide effective review procedures, indicating that implementation gaps are systemic rather than exceptional. In Latin America and the Caribbean, Escazú has faced slow and contested ratification, and where it is in force, weak institutional capacity, entrenched economic interests and lack of political will undermine its transformative potential.[15] Taken together, these trends underscore that high-level conventions, while essential, do not by themselves constrain harmful practices in resource-intensive sectors such as mining. They need to be operationalized and reinforced through more detailed standards, robust sector-specific legislation and binding due-diligence obligations for companies, against which concrete compliance gaps can be systematically assessed.

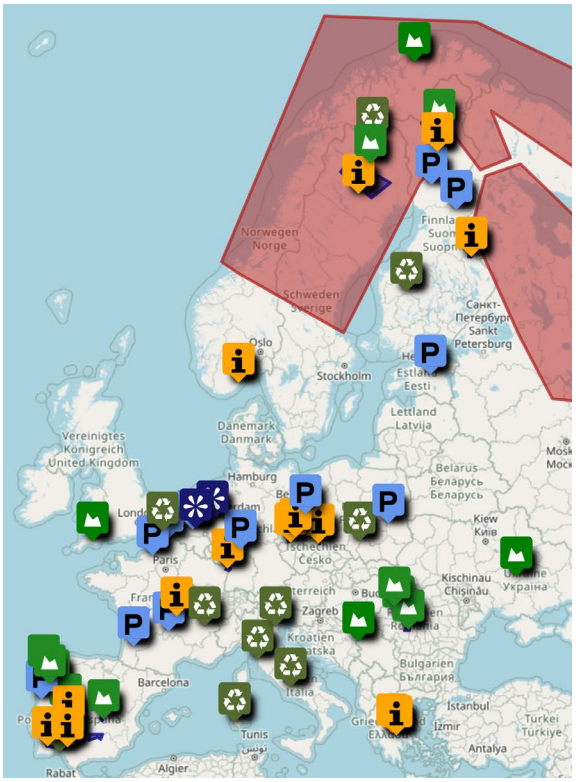


Figure 1: Maps with all European Strategic Projects announced in March 2025. Source: PowerShift, https://umap.openstreetmap.de/de/map/eu-crma-strategic-projects_85410#4/53.282589/8.119970

- integrated (extraction + processing)
- processing
- extraction
- recycling
- indigenous land

Mining Standards

In addition to international conventions and state-based regulations, a range of voluntary certification standards and industry initiatives have emerged to set benchmarks in the raw materials sector. The various standards define different due diligence obligations and the application in the supply chains varies widely. Comparative studies describe IRMA as one of the most comprehensive and ambitious frameworks in the raw materials sector.[16] A broad number of civil society organizations confirm this and highlight the standard as setting the "best-in-class" benchmark in terms of scope and rigor compared to other initiatives.[17] Because the IRMA standard also relies on international best practice in national mining laws and is the only standard equally governed (including consensual decision making) by affected communities, civil society organizations, organized workers, mining companies, purchasing companies and investors,[18] the IRMA standard is being used as a benchmark for the gap analysis in this study.

i The Aarhus Convention and the Escazú Agreement are often described as "sister" treaties because both establish the same three procedural environmental rights (access to information, public participation and access to justice) in different world regions, with Aarhus covering the UNECE region since 1998 and Escazú translating and expanding this model to Latin America and the Caribbean under UN auspices from 2018 onwards, including stronger provisions on environmental human rights defenders (ClientEarth, 2018).

ii Standing rules determine who is legally entitled to challenge decisions, file lawsuits, or participate in proceedings.

The Initiative for Responsible Mining Assurance (IRMA) is a multi-stakeholder scoring system that declaredly establishes comprehensive best-practice requirements across business integrity, social responsibility, environmental responsibility, and planning for positive legacies.[42] IRMA's Standard for Responsible Mining integrates leading international frameworks – including the UNGPs, OECD Guidelines, ILO conventions, and performance standards from international financial institutions. IRMA's core instrument is the Standard for Responsible Mining (first published in 2018), which can be applied to all industrial-scale mines of minerals and metals. Assessment is realized through independent third-party audits, requiring public disclosure of results and thereby fostering transparency and accountability. The second version just went through a consultation period and will be published soon. More than 400 requirements are applied covering a wide range of environmental, social, and governance issues, including human rights due diligence, labor rights, grievance mechanisms, the rights of Indigenous Peoples, community health and safety, environmental protection, mine closure and rehabilitation.

While IRMA is often recognized as the most comprehensive standard for responsible mining, there are limits to it regarding its design and implementation. Despite its broad scope, IRMA applies only to large-scale industrial mining operations, excluding artisanal and small-scale mining (ASM), where many of the most severe human rights and environmental risks occur. Its applicability to certain extraction methods, such as lithium from brine deposits, also remains uncertain. The implementation and adoption process further limits IRMA's effectiveness. The standard was first released in 2018 and the uptake among mining companies has been slow, with only a small number of mines undergoing audits to date. This limited coverage reduces its immediate impact on global mining practices. IRMA states to have 82 mining companies with 104 sites engaged in the standard. However, 61 of the sites are only in the phase of self-assessment under the standard and only 39 of those made the results public. Only 19 sites are in the independent assessment system. It is understandable to have a gradual system for meeting the requirements of the assessment. However, only with the achievement level of 100% of the requirements and minor nonconformities limited to non-critical requirements, the standard lives up to its promises. There is currently no mine that has reached this level. While IRMA-50 or IRMA-75 might be a starting point for the highest assessment status it cannot be viewed as sufficient for "responsible mining" under the IRMA standard. The mines are only required to meet a set of 40 critical requirements but are allowed minor nonconformities for critical requirements if a timely corrective action plan is in place. IRMA expects operators to work toward full achievement of all critical requirements and to draw their own conclusions about the mine's performance and impacts. Reality shows that to date there are only vague and generic statements by industry actors on improving operations, but no explicit public statements or detailed roadmaps on how to actually do so. Thus, while IRMA represents a comparatively ambitious framework, its reach, uptake, and ability to drive systemic changes in the sector remain limited. Furthermore, standards like IRMA are valuable tools, but they cannot replace robust state regulation and enforcement, as representatives of IRMA also publicly highlighted in the past, nor can they ensure compliance with national and local regulations on human rights and environmental due diligence.[19]

Due Diligence Benchmark

Based on the review of the conventions and standards described above, a set of five assessment categories emerged: (1) Public participation, (2) Environmental and Social Impact Assessment, (3) Community support and benefits, (4) Access to justice and remedy, and (5) Mine Closure and rehabilitation. Together they capture the most critical safeguards in relation to participation and environmental due diligence. Following, each category will be described, including relevant aspects from all three previously described frameworks.

Public Participation

The Aarhus Convention establishes foundational requirements for public participation in environmental decision-making through Articles 6, 7, and 8. Article 6 applies to specific activities with potential environmental impact, requiring early and effective notification of the "public concerned,"[i] reasonable timeframes for participation at early stages, access to relevant

i The term "public concerned" is an official and central concept used in the Aarhus Convention. It is explicitly defined in Article 2(5) that states: "The public concerned" means the public affected or likely to be affected by, or having an interest in, the environmental decision-making; for the purposes of this definition, non-governmental organizations promoting environmental protection and meeting any requirements under national law shall be deemed to have an interest.



Local shop-owners protest against huge open-pit mines in Didipio, Philippines. Photo: Michael Reckordt

information free of charge, and obligations on decision-making bodies to take due account of public participation outcomes.[20] The "public concerned" encompasses those affected or likely to be affected by environmental decision-making, explicitly including environmental NGOs.

The Escazú Agreement advances these provisions significantly. Article 7 requires open and inclusive participation in environmental decision-making processes from early stages, ensuring meaningful contribution by all persons.[21] Notably, it mandates special attention to vulnerable groups and local communities, requiring States Parties to identify and support vulnerable persons and groups and eliminate barriers to their participation.[22] The Agreement also ensures communication through appropriate means including written, electronic, oral, and customary methods, recognizing diverse communication needs of affected communities.[23] Article 7(16) expressly requires States to identify the public directly affected by activities with significant environmental impacts, while ensuring compliance with national and international legal frameworks governing the rights of Indigenous Peoples and local communities.[24]

IRMA's Chapter 1.2 on Community and Stakeholder Engagement[25] establishes detailed operational requirements for mining companies. Requirement 1.2.1.1 mandates comprehensive stakeholder mapping and analysis identifying all groups potentially affected by or interested in mining operations. Companies must develop stakeholder engagement plans scaled to project risks and impacts, designed through consultation with stakeholders to ensure processes are accessible, inclusive, and culturally appropriate.[26] Requirement 1.2.2.2, designated as a critical requirement, requires companies to foster two-way dialogue and meaningful engagement by providing timely information, including participation by site management, ensuring engagement is conducted in good faith with genuine intent to address adverse impacts, and demonstrating responsiveness to stakeholder input.[27]

Environmental and Social Impact Assessment (ESIA)

The Aarhus Convention's participatory requirements extend to impact assessment processes, though it does not mandate specific ESIA procedures.

The Escazú Agreement similarly focuses on procedural rights rather than detailed assessment methodologies, ensuring public participation in decision-making processes regarding projects with significant environmental impacts.

IRMA's Standard Chapter 2.1[28] establishes comprehensive ESIA requirements aligned with international best practice. It requires an ESIA before any site-disturbing operations (2.1.1.1) and a new assessment if the proposal is significantly revised (2.1.1.2). The ESIA must include scoping with stakeholder participation (2.1.3), baseline studies sufficient to predict impacts (2.1.4), impact analysis covering direct, indirect, and cumulative effects with significance determination, mitigation options following the

mitigation hierarchy with priority on avoidance, and assessment of residual impacts (2.1.5). IRMA also requires comprehensive ESIA reports (2.1.6) and associated monitoring and management plans (2.1.7–2.1.8).

Community Support and Benefits

While neither the Aarhus Convention nor the Escazú Agreement contains specific provisions on community benefit-sharing, IRMA Chapter 2.3 establishes robust requirements for obtaining community support and delivering benefits.[29] Requirement 2.3.2 requires companies to demonstrate that broad community support has been obtained through processes that were undertaken in good faith, transparent, free from coercion or manipulation, and included meaningful input by all potentially affected community members including women, vulnerable groups, and marginalized members.

Requirement 2.3.3 mandates collaborative development of participatory planning processes to guide company contributions to community development initiatives and benefits. The planning process must ensure local participation, social inclusion of both women and men and vulnerable groups, good governance, and transparency. This approach recognizes that meaningful community benefits require genuine participation in defining priorities rather than top-down imposition of corporate social responsibility (CSR) programs.

Additionally, the OECD Guidelines for Multinational Enterprises on Responsible Business Conduct, updated in 2023, emphasize stakeholder engagement and consultation throughout due diligence processes, including identification of impacts, development of risk-mitigation measures, ongoing monitoring, and design of grievance mechanisms.[30] The Guidelines explicitly recognize enhanced due diligence requirements in relation to marginalized and vulnerable individuals and in situations of armed conflict or increased risk of gross human rights abuse.[31]

Access to Justice and Remedy

Article 9 of the Aarhus Convention establishes access to justice requirements in three contexts: review procedures for information requests, review procedures for decisions subject to public participation requirements, and challenges to breaches of environmental law generally.[32] Article 9(3) provides the broadest access, requiring Parties to ensure members of the public have access to administrative or judicial procedures to challenge acts and omissions that contravene national environmental law.[33] All procedures must be fair, equitable, timely, and not prohibitively expensive.

The Escazú Agreement strengthens these provisions significantly in Article 8, guaranteeing the right of access to justice in environmental matters in accordance with due process guarantees. Article 8(2) ensures access to judicial and administrative mechanisms to challenge decisions, actions, or omissions related to access to environmental information, public participation, and any matters that affect or could affect the environment adversely or violate environmental laws and regulations.[34] Article 8(3) specifies that access to justice must include competent State entities with environmental expertise, effective and timely procedures that are not prohibitively expensive, broad active legal standing in defense of the environment, possibility of ordering precautionary and interim measures, measures to facilitate evidence production including potential reversal of burden of proof, and mechanisms to execute and enforce decisions in a timely manner.[35] Critically, Article 8(5) requires States to establish support mechanisms for persons or groups in vulnerable situations, including free technical and legal assistance.

Additionally, the UNGPs third pillar emphasized exactly this point, stipulating that victims must have access to effective remedies that are legitimate, accessible, predictable, equitable, transparent, rights-compatible, and based on genuine engagement and dialogue with affected stakeholder groups.

IRMA Chapter 1.4[36] on Complaints and Grievance Mechanisms operationalizes these principles, requiring companies to establish operational-level grievance mechanisms accessible to all potentially affected stakeholders, designed with stakeholder input, and providing for fair, transparent, and timely resolution of complaints. The mechanism must ensure non-retaliation against complainants, protection of confidentiality where requested, and tracking and public reporting of complaints and resolutions.

Mine Closure and Rehabilitation

IRMA Chapter 2.6[37] establishes comprehensive requirements for planning and financing reclamation and closure throughout the mine lifecycle. Requirement 2.6.2.1 mandates preparation of reclamation and closure plans prior to commencement of mine construction, demonstrating how affected areas will be returned to stable landscapes with agreed post-mining end uses



Protest denouncing the collapse of a tailing dam in Brumadinho, Brazil, in 2019, which demonstrated that tailings present a perpetual risk to communities. Photo: Rodrigo S Coelho, Shutterstock

compatible with protection of human health and the environment. Plans must include descriptions of reclamation objectives developed with stakeholder participation, baseline environmental conditions, predicted environmental impacts, proposed reclamation and closure activities, post-closure land use proposals, post-closure monitoring and maintenance, cost estimates, and closure schedules. Requirement 2.6.2.4 requires plans to be reviewed and updated regularly with stakeholder participation, ensuring adaptive management as site conditions change and learning from past reclamation activities informs future approaches.

IRMA requires financial surety instruments to ensure funds will be available for government or designated entities to execute closure activities if companies fail to fulfil obligations. This addresses the pervasive problem of abandoned mines where cleanup costs fall on public authorities and affected communities rather than the companies that profited from extraction.

Limitations on Public Interest and Security Grounds

Both the Aarhus Convention and Escazú Agreement recognize limited exceptions to access rights based on public interest and security concerns but require restrictive interpretation of these exceptions. The Aarhus Convention Article 4 permits refusal of information requests only under limited circumstances including national security or commercial confidentiality, which must be interpreted restrictively and weighed against public interest in disclosure.[38] Similarly, the Escazú Agreement allows exceptions but emphasizes the principle of maximum disclosure and requires that refusals be justified with reasons and be subject to challenge and appeal.[39]

The increasing invocation of security concerns to restrict environmental rights and criminalize environmental defenders represents a dangerous trend.[40] The Escazú Agreement's explicit recognition and protection of environmental human rights defenders addresses this concern directly, requiring States to guarantee a safe and enabling environment for defenders and to take appropriate measures to recognize, protect, and promote their rights.[41] This represents a critical evolution beyond earlier frameworks that, while establishing procedural environmental rights, did not adequately address the systematic threats faced by those exercising these rights against powerful extractive interests.

Alignment of EU Legal Framework regarding Transparency, Participation and Accountability with International Standards

The EU's legal framework governing mining and extractive activities is founded upon the Aarhus Convention's three pillars: (1) Access to information, (2) Public participation in decision-making, and (3) Access to justice in environmental matters.[53] While EU legislation incorporates these foundational principles, to date the EU is in ongoing noncompliance in two cases. In the first instance (ACCC/C/2010/54) the EU is not fulfilling all requirements regarding public participation in the adoption of National Energy and Climate Plans. The second instance (ACCC/C/2015/128) concerns inadequate access to justice of decisions on state aid taken by the European Commission.[54] Significant gaps also emerge when compared to the enhanced protections offered by the Escazú Agreement and the operational requirements of IRMA standards. Following, the most important regulations related to mining are being analyzed and compared to the previously described conventions and standards.

The Critical Raw Materials Act: Regulation (EU) 2024/1252

The Critical Raw Materials Act (CRMA) – adopted by the European Union in 2024 – establishes a binding framework with the aim to strengthen the EU's security of supply for critical and strategic raw materials by 2030. It sets quantitative benchmarks requiring that at least 10% of annual EU consumption of strategic raw materials is to be sourced from domestic extraction, 40% from EU processing, and 25% from EU recycling, while limiting reliance on any single third country to no more than 65% of annual supply for each strategic material. The CRMA also introduces accelerated permitting timelines for mining projects classified as Strategic Projects – up to 27 months for extraction and 15 months for processing and recycling.

Aarhus Convention
The CRMA explicitly references Articles 6 and 7 of the Aarhus Convention regarding public participation, requiring Member States to ensure early and effective opportunities for the public to participate in environmental decision-making for Strategic Projects. Article 13 mandates that permitting authorities provide public access to relevant documentation and establish reasonable timeframes for comment submission.[52]

Escazú Agreement
Article 7 specifically mandates identification and support for vulnerable groups and marginalized communities, requires communication in accessible formats including Indigenous languages, and ensures early-stage participation when all options remain open.[50] Article 9's explicit protection of environmental human rights defenders – requiring States to guarantee safe and enabling environments free from threats, restrictions, and insecurity – has no equivalent in EU law.[51]

IRMA
Chapter 1.2 exceeds both frameworks by requiring companies to conduct comprehensive stakeholder mapping identifying potentially affected groups,[46] develop culturally appropriate engagement processes through consultation with stakeholders themselves and demonstrate continuous two-way dialogue with genuine intent to address adverse impacts.[47] Chapter 2.2 further mandates Free, Prior and Informed Consent (FPIC) for Indigenous Peoples, requiring acknowledgment that communities can approve or reject projects and that companies will abide by their decisions[48] – a standard absent from the CRMA's language of "facilitating public acceptance."[49]

Gaps and Higher Standards: The CRMA's accelerated permitting timelines risk undermining meaningful participation guaranteed under Aarhus.[43] The designation of Strategic Projects as having "overriding public interest" enables potential derogations from the Water Framework Directive, Habitats Directive, and Birds Directive, weakening environmental safeguards.[44] Civil society organizations have documented how these compressed timelines, combined with thousands of pages of technical documentation, make genuine public review practically impossible ("Citizenwashing").[45]

The Environmental Impact Assessment Directive (2011/92/EU)

The Environmental Impact Assessment (EIA) Directive – first adopted in 1985 and subsequently revised, most recently through Directive 2014/52/EU – establishes the EU-wide framework requiring that certain public and private projects undergo an Environmental Impact Assessment before receiving approval. It obliges project developers to identify, assess, and report likely significant environmental effects, including impacts on biodiversity, water, soil, climate, human health, and cultural heritage, and to propose measures to avoid, prevent, or mitigate adverse outcomes. The Directive also mandates early public participation, transparent disclosure of assessment documentation, and reasoned decisions by competent authorities, ensuring that environmental considerations are integrated into project planning and permitting processes.

Aarhus Convention

The EU EIA Directive operationalizes Aarhus public participation requirements, mandating early and effective notification of the public concerned,[i] reasonable timeframes for consultation, and obligations on authorities to take due account of public input in decision-making.

Article 6 establishes minimum 30-day consultation periods and requires that assessments cover population health, biodiversity, water, air, climate, and cultural heritage.[57]

Escazú Agreement

The agreement strengthens procedural rights by requiring states to eliminate barriers to participation for persons and groups in vulnerable situations, mandate communication through written, electronic, oral, and customary methods recognizing diverse needs, and ensure participation influences final decisions rather than serving merely consultative purposes.[56]

IRMA

IRMA explicitly requires ongoing monitoring with stakeholder involvement and facilitation of independent monitoring, and mandates revision of management plans based on monitoring results, creating more robust accountability mechanisms than the EU EIA Directive's monitoring provisions.

Chapter 2.1, establishes comprehensive ESIA requirements that exceed EU Directive 2014/52/EU in several respects, including mandatory scoping with stakeholder participation, baseline studies adequate to predict impacts, detailed impact analysis following the mitigation hierarchy with priority on avoidance, assessment of cumulative impacts, analysis of alternatives including no-action scenarios, and full public disclosure of ESIA reports.

Gaps and Higher Standards: The EIA's requirements for (early) public participation, transparent disclosure of documentation, and integration of environmental considerations into the planning and permitting process do not diverge strongly from the recommendations and requirements from Aarhus, Escazú and IRMA. However, implementation quality varies significantly across Member States, with climate impact analysis often inadequate and consultation periods sometimes manipulated to minimize meaningful review.[55]



In the fertile Jadar Valley in western Serbia, lithium mining could take place, which has been the subject of protests for years. Rio Tinto's planned mining activity here had been selected as a Strategic Project by the EU, but is currently on hold. Photo: Maja Wilke

i The Public Participation Directive (2003/35/EC) amended the Environmental Impact Assessment Directive (85/337/EEC) to require early and effective public involvement in environmental decision-making and to grant the public, including NGOs, access to judicial review procedures that are fair, timely, and not prohibitively expensive, thereby aligning the EIA process with the participation and access-to-justice provisions of the Aarhus Convention.



Indigenous protest against mining at Repparfjord in Norway. Photo: Hannah Pilgrim

The Water Framework Directive (2000/60/EC)

The Water Framework Directive (WFD) – adopted in 2000 – establishes the overarching EU framework for the protection and sustainable management of all surface waters and groundwater. It requires Member States to achieve good status for all water bodies, develop river basin management plans based on ecological and chemical assessments, and implement measures to prevent deterioration and restore impaired waters. The WFD also mandates public participation in the preparation of basin plans, coordination across sectors and borders, and systematic monitoring and reporting, ensuring that water resources are managed through an integrated, ecosystem-based approach.

Aarhus Convention

The WFD incorporates Aarhus requirements through mandatory public consultation on river basin management plans and programs of measures, ensuring stakeholders can access draft plans and submit comments.[62] The non-deterioration principle and "one-out-all-out" approach[i] establish robust environmental standards protecting water quality.[63]

Escazú Agreement

While neither Escazú nor the WFD contains specific mining-related water provisions, Escazú's requirement for maximum disclosure and restrictive interpretation of exceptions provides stronger protection against systematic exemption abuse.

Article 5(7)-(9) of the Agreement states that exceptions must be legally defined in advance, interpreted restrictively, and subject to a public interest test, with the burden of proof on the competent authority.

IRMA

Chapter 4.2 on Water Management operationalizes best practices by requiring demonstration that mining will not impair water quality or availability for other users, implementation of water stewardship approaches considering cumulative impacts from multiple users, and financial assurance for long-term water treatment if required post-closure.[61] Chapter 5 of this publication deals in more detail with IRMA limit values for the protection of water quality.

i This is the rule used to classify the "status" of a water body (e.g., a river, lake, or coastal water). It mandates that the overall status of a water body is determined by its lowest-performing quality element.

Gaps and Higher Standards: Mining industry lobbying has resulted in excessive application of Article 4(7) exemptions, undermining the Directive's core protections[58] and the extensive Article 4(5) exemptions for lignite mining – covering roughly 8,000 km² in Germany and Poland – illustrate further a systematic weakening of WFD objectives.[59] The CRMA's designation of certain projects as being of "overriding public interest" may ease future and harmful derogations.[60]

The Extractive Waste Directive (2006/21/EC) and Environmental Liability Directive (2004/35/EC)

The Extractive Waste Directive (EWD) – adopted in 2006 – establishes the EU framework for the safe management of waste from extractive industries, including tailings and waste rock. It requires operators to develop waste management plans, ensure the structural stability and monitoring of waste facilities, and implement measures to prevent major accidents, particularly for "Category A" sites. The Directive also mandates financial guarantees to cover closure and aftercare, ensuring that long-term environmental and safety risks are properly managed.

The Environmental Liability Directive (ELD) – adopted in 2004 – establishes a cross-sector EU framework based on the polluter pays principle[i] to prevent and remedy environmental damage. It defines liability for harm to protected species and habitats, water bodies, and contaminated land, and obliges operators to take preventive and remedial actions when damage occurs or is imminent. The Directive enables competent authorities to recover costs from responsible parties, ensuring that environmental impacts are addressed and not shifted to the public.

i The polluter pays principle requires those who cause environmental damage to bear the costs of preventing, controlling, and remedying that damage, rather than shifting these costs to the public or the state.

Aarhus Convention

The EWD and ELD incorporate Aarhus principles by requiring public access to waste management plans and establishing polluter pays obligations. However, there are no comprehensive mine closure and post-closure requirements aligned with lifecycle thinking.[68] Aarhus does not specifically mention mine closure.

IRMA

Chapter 2.6 establishes comprehensive requirements for planning and financing reclamation and closure throughout the mine lifecycle, mandating preparation of closure plans before construction begins, regular review and updating with stakeholder participation, demonstration of stable post-mining landscapes with agreed end uses, and financial surety instruments ensuring funds will be available if companies fail to fulfil obligations.[67] These requirements operationalize polluter pays principles more effectively than current EU law, addressing the pervasive problem of abandoned mines where cleanup costs fall on public authorities and affected communities.

Gaps and Higher Standards: Despite these regulatory frameworks, significant shortcomings persist in the EU. Historic mining waste is largely unaddressed by current directives, leaving thousands of legacy sites with unmanaged environmental risks.[64] Financial guarantees intended to secure remediation and closure frequently prove inadequate, as there is little harmonization or robust enforcement of guarantee calculations and their periodic updates across Member States.[65] Moreover, diffuse pollution – such as long-term contamination of water or soil – often escapes liability due to challenges in attributing responsibility under existing EU frameworks.[66] These gaps result in uneven protection for communities and the environment and highlight the need for EU-wide standards that mandate best available techniques, clarify responsibilities for mine closure and post-closure management, and strengthen liability and financial mechanisms for both legacy and ongoing mining activities.



Due to substances released in connection with copper mining, the water contains high concentrations of metal and turns bright blue, as can be seen in Bor, Serbia. In many cases, these contaminated waters are heavily polluted and pose an ecological problem. Photo: Maja Wilke

National Legal Framework Gap Analysis and Cases

Table 1: Benchmarking of Various Aspects of Transparency, Participation, and Accountability of Regulations in Germany, Spain, Portugal, and Sweden against the Aarhus Convention, the IRMA Standard, and the Escazú Agreement.

Simplified representation. For more detailed information, see annex (p. 69 ff.).

Assessment Area	Germany	Spain	Portugal	Sweden
Public Participation, Meaningful Engagement and the Right to Say No	High	High	High	High
Environmental and Social Impact Assessment (ESIA)	Medium	High	High	Medium
Obtaining Community Support and Delivering Local Benefit	High	High	High	High
Access to Justice and Remedy	High	High	High	High
Mine Closure ad Rehabilitation Guarantees	High	High	High	High

Gap Analysis: Low · Medium · High · Critical

Spain

Spain's mining regulatory framework represents a complex amalgamation of historic mining traditions, modern EU requirements, and decentralized regional governance that creates both opportunities and significant gaps when measured against international human rights and environmental protection standards.[69] While Spanish law incorporates EU directives and Aarhus Convention principles, implementation reveals systematic failures in community engagement, environmental assessment, and justice access –particularly evident in contested projects like the Mina Doade lithium initiative in Galicia.[70]

Context and Post-CRMA Developments

The adoption of the EU CRMA in 2024 has positioned Spain as a central player in European mining strategy, with the country receiving seven Strategic Project designations, more than most other EU countries. Six out of these seven projects are centered on extraction.[71] The total investment foreseen for Spanish Strategic Projects is estimated at €22.5 billion and these projects include lithium extraction in Galicia (Mina Doade) and Extremadura (Las Navas and La Parilla), and nickel extraction in Extremadura (Aguablanca).[72]

This strategic positioning reflects Spain's critical mineral resources, including copper, fluorspar, feldspar, strontium, tungsten, and tantalum. The Spanish government has responded with the *National Subsurface Exploration Program 2025-2029*, the country's first systematic mineral exploration campaign since 1970, and a comprehensive Road Map for sustainable management of mineral raw materials.[73]

Legal Framework Gap Analysis

The Spanish mining law *Ley 22/1973*[74] was established during the Franco era and reflects a centralized, state-centric approach to mineral resource governance. While it provides the core rules for access to and use of mineral resources, environmental protection and public participation requirements are largely addressed through subsequent environmental legislation rather than the Mining Law itself. Despite repeated amendments, the law retains its core structure, creating tensions with modern democratic participation and environmental protection requirements.

§ **Mining Law 22/1973:** Spain's 1973 Mining Law already contained some limited provisions on environmental protection – likely making it the first such mining statute in Europe to do so. Nevertheless, in the past energy crisis shifted priorities toward securing supply for development, and mining activities still caused environmental harm.[81] The law supports strategic resource designation and secures long-term permits but does not strictly require early community engagement[82] or detailed social safeguards. It also enshrines the right of mining companies to obtain land through forced expropriation, despite landowners' opposition.

Multi-authorization System: Spain's mining regulation operates through multiple levels of government – national, regional (Autonomous Communities), and local – each with distinct responsibilities and timelines. This fragmented approach creates jurisdictional conflicts and delays, with regional authorities having primary responsibility for mining permits since 1993.[83]

Environmental Assessment Law (Ley 21/2013): Translates EU EIA and Strategic Environmental Assessment Directives into Spanish law, requiring Environmental Impact Assessments for significant mining projects. However, implementation varies significantly across Spain's 17 regions, creating regulatory heterogeneity that complicates compliance and enforcement.[84]

Public Participation

Spanish mining law provides formal mechanisms for public participation through the Mining Law 22/1973 and Environmental Assessment Law, incorporating Aarhus Convention obligations. However, timing and scope of participation remain problematic, with meaningful engagement often occurring only after critical project decisions have been made. The Catalan environmental justice organization CICrA Justicia Ambiental: "The omission of information and public participation procedures during the processing and approval of projects is also one of the most denounced negligence by the residents of areas affected by mining projects, as well as environmental entities that oppose them. In some of the cases studied, affected people report that they learned from the press. Once the public information period had ended, a new mining project intends to be installed in their locality."[75]

Environmental and Social Impact Assessment

Implementation failures are systematic and documented: Project splitting is commonly used to avoid full EIA requirements, artificially fragmenting large projects into smaller components. Spanish ESIA practice suffers from critical gaps documented by the European Court of Justice, including properly evaluating cumulative environmental impacts. [i] Access to information is systematically restricted, with authorities and companies denying environmental NGOs and communities' access to crucial project documents.[76] The Environmental Assessment Law requires comprehensive Environmental Impact Assessments for mining projects above specified thresholds, with regional variation creating significant inconsistencies.[77]

Community Support and Benefits

Spanish mining law does not require demonstration of community support or binding benefit-sharing arrangements as conditions for project approval. Provisions for project approval are procedural notification and comment periods with no requirements for community consent or any binding, negotiated benefit-sharing.[78] Therefore, while consultation is mandatory, community opposition cannot legally prevent project advancement if technical and environmental requirements are met.

The Mining Law 22/1973 includes provisions allowing authorities to grant temporary occupation orders (similar to expropriation) to ensure mining companies access to required lands for exploration work.[79] Revenue flows primarily benefit national and regional governments through taxation and royalties, with limited guaranteed local benefits. Mining companies benefit from a special tax regime that allows reduced taxation through the so-called "depletion factor" which enables them to claim the loss in value of raw materials for tax purposes, as the deposit is "depleted" with every ton extracted. According to the *Observatorio Ibérico de la Minería* (MINOB), unlike in other countries, the Spanish state does not raise any form of royalty as compensation for extracted mineral wealth. MINOB argues that the state effectively authorises the plundering of inherited mineral wealth, allowing a small number of companies to generate astronomical profits while disregarding the principle of intergenerational equity.[80]

i In European Commission v. Kingdom of Spain (ECJ C-404/09), the ECJ found that Spain had approved coal-mining projects without properly evaluating cumulative environmental impacts. The Court emphasized that cumulative effects analysis is mandatory, not discretionary, and must be conducted before project authorization (ELAW, 2023).



The toxic and polluted Rio Tinto River in Huelva, Spain, contains a lot of heavy metals. Photo: jarcosa, iStock

Case Evidence:

Mina Doade Lithium Project[85]

The Doade lithium project in South Galicia demonstrates systematic failures in Spanish mining regulation, where Recursos Minerales de Galicia (RMG), a SAMCA Group subsidiary, seeks to extract lithium across 1,700 hectares covering six municipalities. Located between protected Natura 2000 areas and other environmentally sensitive zones, the project received Strategic Project status under the CRMA in 2024 despite widespread opposition, conflicts of interest concerns,[i] and unresolved technical issues. Public participation has been severely constrained throughout the process. The company proceeded without a comprehensive Environmental Impact Assessment, initially barred NGOs from authorization procedures, and conducted largely closed-door community meetings. In 2023/2024, attempts to force access to communal lands through "temporary occupation" were withdrawn due to resistance. A contractor accused of gathering personal data on opponents ran flawed consultation rounds while withholding project details.

The company employed a project-splitting strategy, advancing only one of six deposits to avoid comprehensive cumulative impact assessment across the 12-kilometer belt. Critical environmental risks including acid mine drainage, radioactive minerals, and water table impacts remain unaddressed. The Miño-Sil Water Authority issued a negative report in 2019, and required hydrogeological studies were never provided. Local assemblies on ancestral communal lands have rejected the project, citing threats to water supplies, biodiversity, and rural livelihoods. Social cohesion has deteriorated due to alleged social engineering campaigns[ii] and surveillance of opponents. Governance transparency remains problematic, with exploration rights irregularly extended for approximately 22 years beyond statutory limits. Communities and NGOs have pursued administrative and legal remedies, though information asymmetries and non-disclosure of critical studies continue to complicate access to justice.

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i The appointment of Mr. Carlos Martínez Torres as an "independent expert" for the European Commission's assessment of Strategic Projects under the EU Critical Raw Materials Act (CRMA) in late 2024–early 2025 raised serious conflict of interest concerns: Mr. Martínez had previously directed the Mina Doade project for Recursos Minerales de Galicia (European Parliament, 2025).

ii The term refers to strategic influence and acceptance campaigns used by mining companies to specifically control or manipulate social perceptions and decision-making processes in affected communities in order to minimize resistance to mining projects.

Access to Justice

Spain provides judicial and administrative review mechanisms for environmental decisions, consistent with Aarhus Convention Article 9 requirements. This includes legal aid for environmental NGOs, removing significant barriers for litigation. However, other practical barriers significantly restrict access to justice.[86] In this regard, MINOB states: "While it is not uncommon for the administration to formally deny requests for access to information, it is common to use dilatory and obstructionist strategies such as delaying the procedure through third-party hearings, formally allowing partial access, but censoring or excluding key documents, obstructing the execution of resolutions (the resolution is transferred but not the documentation), refusing to provide a digital copy and imposing high fees for the delivery of paper copies, forcing in-person visits located far from the places of residence of the petitioners and at limited times or days, not issuing express resolutions (administrative silence), etc."[87]

Closure and Rehabilitation

Spanish mining regulation requires closure planning and financial guarantees and implementing regulations. However, systematic deficiencies persist despite legal requirements.[88] The *EU General Court case T-257/18* (Iberpotash) found that Spain had provided illegal state aid by allowing inadequate financial guarantees for mining operations. This case demonstrates systematic failures in the calculation and oversight of financial guarantees, with them being significantly lower than necessary to cover restoration costs.[89] A report by MINOB documents numerous cases where mining companies fail to fulfill restoration obligations or provide insufficient financial guarantees for mine closure and rehabilitation. Specific cases include mines that operated for decades and were abandoned without proper environmental restoration, leaving toxic legacies for future generations.[90]

Systemic Gaps

- Historic legal framework is incompatible with modern democratic participation.
- Regional fragmentation creating jurisdictional conflicts and inconsistent implementation.
- Project splitting tolerance allowing artificial fragmentation to avoid assessment requirements.
- Limited accountability with weak enforcement mechanisms and restricted information access.

Portugal

Portugal's mining sector has gained strategic prominence within European resource policy following the EU CRMA, particularly through the controversial Mina do Barroso lithium project. This designation has intensified debates about balancing resource security with community rights and environmental protection, especially in regions of exceptional cultural and ecological significance.[91]

Context and Post-CRMA Developments

The presence of lithium-bearing spodumene and lepidolite at existing feldspar quarries in the Northern and Central Regions made the country relevant to European strategic mineral supply. Together with the neighboring Mina do Romano lithium project, Mina do Barroso received Strategic Project status under the CRMA, granting it "overriding public interest" designation that allows preferential treatment in permitting, environmental assessment, and access to financing.[i] This development has occurred despite the project's location in the Barroso region, recognized by the Food and Agriculture Organization of the United Nations (FAO) as a *Globally Important Agricultural Heritage System* (GIAHS).[92] The CRMA's fast-tracking provisions have raised fundamental concerns about the weakening of environmental and social safeguards, particularly given Portugal's history of mining-related environmental damage and the unique cultural values of affected regions. The conflict between strategic mining interests and agricultural heritage protection exemplifies the tensions inherent in current European resource policy.[93]

i "Strategic Projects in the Union shall be considered to be of public interest or serving public health and safety, and may be considered to have an overriding public interest provided that all the conditions set out in those Union legislative acts are fulfilled" Article 10(2) of Regulation (EU) 2024/1252 (the CRMA) (European Union, 2024; European Environmental Bureau, 2024).

Legal Framework Gap Analysis

Portugal operates under a dual legislative framework combining mining law with environmental protection requirements.

§ **Basic Law on Geological Resources (Lei n.° 54/2015):** Maintains traditional mineral rights structures where the state holds ownership of all subsurface minerals, requiring concessions for extraction activities. The code supports strategic resource designation and provides broad discretion to authorities but does not mandate early community engagement or detailed social safeguards.

Mineral Deposits Regulation (Decreto-Lei n.° 30/2021): The decree regulating the Basic Law came into force in 2021 and defines concrete rules and procedures for the exploration and exploitation of mineral resources.

Environmental Framework Law (Lei de Bases do Ambiente) and EIA Decree-Law 151-B/2013 (Decreto-Lei n.° 151-B/2013): Mandates Environmental Impact Assessments for larger mining operations, administered by the Portuguese Environmental Agency (APA).[102] The system incorporates EU environmental directives including the EIA Directive (2011/92/EU) and Extractive Waste Directive (2006/21/EC). However, practice reveals systematic gaps between legal requirements and meaningful implementation.[103]

"One-Stop-Shop" permitting system: Aims to streamline authorization procedures through coordinated review by multiple agencies including APA, Regional Coordination and Development Commissions (CCDR), and the mining authority Directorate General of Energy and Geology (DGEG).[104] While aiming for fast permitting timeframes, efficiency has come under scrutiny as projects face increased environmental and social challenges.[105]

Public Participation

Portuguese mining law formally provides for public participation in permitting via the mining regulation and EIA legislation, and incorporates Aarhus Convention principles, requiring public notification, 30-day comment periods, and mandatory municipal consultation.[94] However, mid 2025 the UN Aarhus Convention Compliance Committee (ACCC) found that Portuguese authorities, including the Environmental Agency APA, failed to comply with the Convention's standards on public consultation in the case of Mina do Barroso, as well as Portuguese legislation as such needing improvement to be compliant.[95] The Portuguese Commission for Access to Administrative Documents (CADA) issued definitive rulings urging APA to provide environmental documents to civil society organizations, yet authorities repeatedly refused compliance. During 2023 public consultation on the revised Barroso EIA, APA required stakeholders to review 1,776 documents within only ten working days, clearly insufficient for meaningful analysis.[96]

Environmental and Social Impact Assessment

The EIA *Decree-Law 151-B/2013* requires comprehensive Environmental Impact Assessments covering direct and indirect impacts on humans, fauna, flora, soil, water, air, climate, landscape, material assets, and cultural heritage. Projects must undergo planning approval procedures with public participation, including document disclosure and objection periods.[97] In the case of Mina do Barroso, however, systematic weaknesses include initial EIA exemption attempts despite significant environmental risks, including weaknesses associated with tailings dams design and proximity to residential areas. Inadequate cumulative impact assessment remains persistent, with failures to assess effects on GIAHS designation and traditional farming systems.[98] In September 2025, the UN Aarhus Convention Compliance Committee officially ruled that the Portuguese Environmental Agency APA and other authorities failed to guarantee the rights to environmental information and public participation by withholding documents and giving unreasonably short deadlines during the 2023 licensing process under investigation for its refusal to disclose information related to mining projects.[99] This adds to issues such as at least one of the meetings held with community members not being carried out in Portuguese.[100]

Community Support and Benefits

Portuguese mining law does not require demonstration of community support or binding benefit-sharing arrangements as conditions for project approval.[101] Community consultation is mandatory under the EIA regime, but community opposition is not sufficient, under mining law alone, to legally hinder project approval provided statutory technical, environmental and permitting criteria are met. Residents in Barroso, a study reports, "feel disregarded in voicing their opposition" and that "the company openly told the community that they would move ahead with the project irrespective of their views and preferences,"



No to mining, yes to life says this protest banner in Covas do Barroso. Photo: Vanessa Fischer

Case Evidence:

Mina do Barroso Lithium Project[106]

"We will never sell. We live off the land. No amount of money can buy what I inherited from my parents and my grandparents."
Maria Loureiro, local farmer [107]

Mina do Barroso lithium project is a proposed lithium mining operation by the British company Savannah Resources Plc to develop four open-pit lithium mines across 593 hectares in the Barroso region of northern Portugal. The project location is of exceptional environmental and cultural significance, recognized by the FAO as a Globally Important Agricultural Heritage System (GIAHS), one of only eleven such sites in Europe.[108] Local communities in Barroso, northern Portugal, have faced major barriers to participating in decisions over the Mina do Barroso lithium project. Authorities initially allowed only ten days to review over 1,700 EIA documents, withheld key information, and were later sanctioned by courts. The project's Environmental Impact Assessment was twice rejected for severe and irreversible impacts on landscape, water, and biodiversity before being conditionally approved in 2023 under political pressure. Portugal's Public Prosecutor has since supported its annulment, citing legal and environmental violations. The mine lacks a public acceptance: residents, the common lands board as majority landowner, local and municipal councils, and national political parties have all opposed it, warning of irreversible harm to Barroso's UN-recognized agro-pastoral heritage. Despite company promises of economic benefits, protests and petitions continue. Governance has been marked by opacity and political interference, with decisions overriding environmental agencies and consultation duties ignored. Communities have pursued multiple legal challenges nationally and internationally, including before the UN Aarhus Convention Committee, while also facing SLAPP-style[i] lawsuits by Savannah Resources. The Barroso case exposes systemic flaws in Portugal's mining governance – weak transparency, constrained participation, and limited access to justice – raising doubts about the country's capacity to uphold EU and international environmental and human rights standards in the context of the energy transition.

i Strategic Lawsuits Against Public Participation (SLAPP) are legal proceedings typically used by powerful actors such as corporations against weaker actors such as environmental and human rights activists or NGOs to intimidate, delay, or silence criticism.

revealing that community benefits are conditional upon acceptance rather than genuine compensation for harms.[109] Since 2012, the Portuguese government has announced a royalties policy under which up to about 25% of mining royalties *may* be directed to local/regional social, environmental or heritage programs.[110] However, this is a discretionary policy mechanism rather than a fixed obligation for all projects. A study by Dunlap & Riquito from 2023 reveals how the company systematically worked to "infiltrate rural social bonds, exploit psycho-social vulnerabilities and attempt to disable anti-mining organizing and unity within the region" in Barroso, suggesting that benefit-sharing proposals were part of a counterinsurgency strategy ("social warfare") rather than genuine community partnership.[111]

Access to Justice

Portugal provides judicial and administrative review mechanisms for environmental decisions, consistent with Aarhus Convention Article 9 requirements. Citizens and environmental NGOs can challenge mining permits through administrative courts, though practical barriers restrict effective access.[112] Information restrictions create fundamental obstacles to legal challenge, with documented refusal of authorities to provide environmental information despite court rulings. Cost barriers remain prohibitive for rural communities challenging major international mining projects.[113]

Closure and Rehabilitation

Portuguese mining regulation requires closure planning and financial guarantees under the Mining Code and Environmental Framework Law. Mining operators must submit closure plans and provide financial assurance through bonds, insurance, or other approved mechanisms.[114] However, chronic underfunding of guarantees and inadequate long-term planning persist, with numerous examples of underfunded closure measures from previous mining activities: According to official sources "since 2001, EDM, S.A. [*Empresa de Desenvolvimento Mineiro, S. A.*], has inventoried 199 former mining areas that are degraded and considered abandoned, including 62 areas related to the exploitation of radioactive mineral deposits and 137 areas related to the exploitation of polymetallic mineral deposits, in which the polluter pays principle could not be applied, or where there was proven lack of capacity to internalize costs,"[i] 88 of those former mining areas had not being remediated by 2020.[115] Other related issues include the long-term sustainability challenge of remediation measures, which often require post-remediation monitoring, maintenance and (in some cases) ongoing mine-water treatment because remedy performance can degrade over time and residual contamination may remain.[116]

Systemic Gaps

- Information restrictions violate Aarhus Convention obligations and prevent meaningful participation.
- Technocratic decision-making emphasizes procedural compliance over community engagement.
- Strategic Project designation overrides community concerns and environmental protection.
- Fragmented regulatory system creates confusion and limits accountability.
- Limited enforcement mechanisms for environmental and social compliance.

Sweden

Sweden's mining regulatory framework presents a particularly complex intersection of industrial development priorities, environmental protection goals, and Indigenous rights obligations in European mining governance. As a Nordic welfare state with strong environmental credentials, Sweden might be expected to exemplify best practices in mining regulation. However, when measured against international human rights and sustainability standards - particularly regarding the rights of the Sámi Indigenous People – Swedish mining law reveals profound structural gaps that systematically undermine meaningful participation, environmental justice, and cultural protection.[117]

Context and Post-CRMA Developments

The adoption of the EU CRMA in 2024 has positioned Sweden as a central player in European mining strategy, with the country possessing substantial reserves of critical minerals including lithium, rare earth elements, phosphorus, and tungsten. Sweden is currently developing a new national minerals strategy to align with CRMA requirements, representing the first

i Portugal, Resolução do Conselho de Ministros n.º 70/2023, describing EDM's inventory of 199 abandoned/degraded mining areas since 2001 (including 62 radioactive and 137 polymetallic) and their contamination/quality-of-life impacts (Diário da República, 2023).



Life on the edge of destruction – old copper mining in Falun, Sweden. Photo: falun, iStock

comprehensive update to Swedish minerals policy since 2013.[123]

The CRMA requires Sweden to complete initial permit reviews for Strategic Projects within 27 months and mandates the creation of national exploration programs for critical raw materials.[124] However, civil society organizations have raised significant concerns about the compatibility of CRMA fast-tracking with existing environmental protection and Indigenous rights obligations.[125] The Swedish Environmental Protection Agency has acknowledged that current environmental assessment timelines already create tensions with community consultation requirements, and the CRMA's compressed timelines risk further undermining meaningful participation.[126]

Between ten and 20 advanced mining projects are directly linked to lower-carbon energy technologies, with most located in northern Sweden in Sámi territory. The Swedish geological survey forecasted the possibility of increasing the number of mines to 30 in 2020 and 50 in 2030, though several mine bankruptcies and resistance against mining projects have delayed these projections.[127]

Legal Framework Gap Analysis

Swedish mining law is built around three fundamental statutes: the *Minerals Act (Minerallagen 1991:45),* the *Environmental Code (Miljöbalken 1998:808),* and the *Planning and Building Act (Plan- och bygglagen 2010:900).* This tri-partite system reflects Sweden's approach of separating mineral rights administration, environmental assessment, and spatial planning into distinct regulatory tracks.

Minerals Act: Grants the state exclusive ownership of all mineral resources and requires concessions for extraction, administered by the Mining Inspectorate.[118] The act supports strategic resource designation and secures long-term permits but does not strictly require early community engagement or detailed social safeguards.[119]

Environmental Code: Requires comprehensive environmental assessments for mining operations, handled by regional Land and Environment Courts.[120] Sweden's EIA system is generally considered robust in terms of biophysical environmental assessment but suffers from critical gaps in cumulative effects assessment.[121]

Planning and Building Act: Governs spatial planning and municipal consultation processes.[122] Since 2022, Sweden has also implemented the *Consultation Law (2022:66)* specifically addressing state obligations to consult the Sámi people on matters affecting their interests though it does not recognize Sámi's right for Free Prior and Informed Consent.

Public Participation and FPIC

Swedish mining law provides formal mechanisms for public participation through the Environmental Code, Minerals Act, and Planning and Building Act. The 2022 Consultation Law specifically requires state authorities to consult with the Sámi Parliament and affected Sámi communities before making decisions that may affect Sámi culture, livelihoods, or land use. However, Swedish law does not recognize Free, Prior, and Informed Consent (FPIC) as a binding legal requirement.[i] The Sámi Council considers the Act insufficient to ensure meaningful participation. Instead, Sámi consultation rights remain severely limited, and the absence of Free, Prior and Informed Consent is viewed as a major shortcoming, as stated by Eirik Larsen of the Sámi Council.[128]

Environmental and Social Impact Assessment

The Environmental Code Chapter 6 requires comprehensive Environmental Impact Assessments for mining projects, covering direct and indirect impacts on humans, animals, plants, soil, water, air, climate, landscape, and cultural environment.[129] Despite formal requirements, Swedish ESIA practice suffers from critical gaps in cumulative effects assessment.[130] This gap is particularly problematic in Sámi territories, where multiple industrial activities create cumulative pressures on reindeer herding systems.[131] Swedish authorities apply an a priori assumption that reindeer herding and mining can generally co-exist, despite substantial evidence that mining activities disrupt traditional land use patterns and cultural practices. The weak recognition of Sámi reindeer herding as a "property right" during permit review processes means that cultural impacts are consistently undervalued in decision-making.[132]

Community Support and Benefits

Swedish mining law does not require demonstration of community support or binding benefit-sharing arrangements as conditions for project approval. Mining companies in Sweden typically engage in corporate social responsibility initiatives but are not legally bound to secure documented community consent or negotiate binding benefit-sharing agreements. Revenue flows from mining operations primarily benefit national and regional governments through taxation and royalties, with limited guaranteed local benefits. Research demonstrates that Sámi reindeer herding communities face systematic barriers in protecting their traditional land use rights when these conflict with mining interests. The Swedish legal system applies a balancing test between competing land uses that consistently favors mining over traditional Sámi livelihoods, despite international obligations to protect Indigenous cultural rights.[133]

Access to Justice

Sweden provides comprehensive judicial and administrative review mechanisms for environmental decisions through the Environmental Code and administrative court system. Environmental NGOs and affected parties can challenge mining permits through Land and Environment Courts, though procedural barriers and resource constraints limit effective access.[134] Standing requirements remain restrictive for Indigenous communities challenging mining permits, and resource constraints particularly affect Sámi communities, who often lack the technical and legal expertise necessary to effectively challenge complex mining applications. The UN Committee on the Elimination of Racial Discrimination has repeatedly criticized Sweden for failing to ensure meaningful Sámi participation in decision-making and inadequate protection of traditional territories.[135]

Closure and Rehabilitation

Swedish mining regulation requires closure planning and financial guarantees under the Environmental Code and Minerals Act, implementing EU requirements under the Extractive Waste Directive and Environmental Liability Directive. Despite legal requirements, Swedish mine closure regulation suffers from inadequate guarantee amounts, with Swedish authorities themselves acknowledging that the overall sum of guarantees is too low according to official assessments.[136]

Community involvement in closure planning is minimal, with technical decisions dominated by industry and regulatory authorities without meaningful input from affected communities, including Sámi communities whose traditional territories may be affected. Long-term monitoring of environmental and cultural impacts after closure is particularly problematic in Sámi territories, where traditional land use systems require intact ecosystems over extended periods.[137]

i Sweden has not ratified ILO Convention 169 concerning Indigenous and Tribal Peoples, despite significant international pressure and repeated recommendations from UN human rights bodies. This non-ratification has created a fundamental gap in Sweden's legal framework regarding Indigenous consent and consultation obligations since domestic law does not operationalize FPIC principles as legally enforceable rights.

Systemic Gaps

- Non-ratification of ILO 169 creates legal vacuum regarding binding Indigenous rights obligations.
- Technocratic bias emphasizes scientific-technical assessment over cultural and social impact.
- Assumption of co-existence presumes mining and traditional land use can co-exist without adequate assessment.
- Narrow property rights recognition limits recognition of Indigenous land rights as property rights.
- Weak cumulative assessment systematically fails to assess cumulative impacts across multiple projects.

Case Evidence:
ReeMAP Project

"If a mine is established at the deposit of rare-earth minerals called Per Geijer it could completely cut off the migration routes used by the Sami village of Gabna. That would be the end of the Indigenous way of life."
Lars-Marcus Kuhmunen, Sami reindeer herder[138]

The ReeMAP (Rare Earth Elements and Phosphorus) project by Swedish state-owned mining company LKAB transforms iron ore mine waste into critical raw materials. The initiative extracts phosphorus for fertilizers and rare earth elements for electric vehicles and wind turbines from approximately 6 million tons of annual tailings. The project comprises three EU-designated Strategic Projects under the CRMA: an apatite extraction plant in Gällivare, a processing industrial park in Luleå, and the massive Per Geijer rare earth deposit in Kiruna containing 1.7 million tons of REE oxides. LKAB began constructing an 800 million SEK demonstration plant in Luleå in January 2025, targeting operational status by end of 2026. The project has generated controversy with the Sámi Council opposing development on Indigenous ancestral lands and criticizing expedited permitting processes. While LKAB has held consultations and dialogues with some Sámi communities, affected parties – including the Sámi Council and Gabna Sámi village – have consistently raised concerns over the adequacy and meaningfulness of participation. Many Sámi stakeholders argue that project decisions were rushed under the EU CRMA's Strategic Project expedited processes, limiting opportunities for genuine input and failing to ensure Free, Prior, and Informed Consent as required by international norms.[139] ESIA processes for ReeMAP have involved baseline biodiversity studies and some dialogue with herders. However, independent reviews reveal gaps: Swedish EIAs often underestimate cumulative and culturally specific impacts on reindeer herding, cultural heritage, and Sámi youth livelihoods. Sámi organizations highlight that EIAs rarely address all their identified harms, including access disruptions and increased psychosocial stress.[140] Sámi communities most impacted by the mine expansion express strong opposition, citing threats to their culture and livelihoods. Compensation frameworks remain contested, and prior cases saw LKAB reportedly refusing to recognize Sámi consultation costs or provide adequate financial redress.[141] Sámi representatives, rights advocates, and several community organizations have criticized gaps in disclosure regarding the basis for key decisions, risk management strategies, and specific mitigation plans aimed at protecting Indigenous interests. Critics have highlighted that the expedited permitting timelines and the designation of «overriding public interest» can marginalize Sámi and local perspectives in decision-making forums, diminishing their influence over project outcomes. Legal channels such as environmental appeals and court processes are available in Sweden, but the Sámi argue that the short timeline and overriding public interest principle tied to the status as Strategic Project under the EU's CRMA undermine meaningful access to justice. Challenges before national courts and the European Court of Human Rights remain ongoing, highlighting persistent gaps in redress and enforcement of Indigenous rights.[142]



Exploration for lithium in Zinnwald, Germany. Photo: Sylvio Dittrich, imageBROKER.com

Germany

Germany's mining regulatory landscape represents a complex interweaving of federal and state law, EU directives, and international commitments. While comprehensive on paper, it reveals significant gaps when measured against the highest global standards for human rights and environmental protection. The *Federal Mining Act* (Bundesberggesetz - BBergG), *Environmental Impact Assessment Act* (UVPG), and related frameworks provide the legal backbone for mining governance, yet their implementation often falls short of the transformative engagement and justice principles embodied in leading international frameworks such as the Aarhus Convention, IRMA Standard, and Escazú Agreement. Germany's mining sector, particularly in Saxony, is seeing renewed strategic interests following the EU CRMA.[143] The application of projects like Zinnwald as a Strategic Project under the CRMA for lithium extraction has prompted policy debates about resource security, community rights, and environmental risks.

Context and Post-CRMA Developments

The CRMA with its EU-wide lists of critical and strategic raw materials obliges Member States to draw up national exploration programs and enable Strategic Projects, but it applies as an EU regulation rather than by amending the BBergG itself.

Driven by EU supply targets, Saxony has positioned Zinnwald as one of Europe's flagship lithium mining sites.[144] Local authorities and developers have sought streamlined permitting for Zinnwald Lithium Plc, with growing concern about how BBergG's resource security clause (*Rohstoffssicherungsklausel*)[145] may override environmental and social protections.[i] This clause prioritizes supply certainty for critical raw materials, at times limiting the leverage of other regulatory frameworks, especially on Natura 2000 conservation areas and community consultation.[146]

i Although the German Federal Mining Act (BBergG) does set forth the possibility for the authorities to "restrict or deny exploration or extraction, if they oppose overriding public interest" [Section 48 (2)], it also clearly states that "when applying these provisions it is important that exploration and extraction are impaired as little as possible" [Section 48 (1)]. See also: Federal Constitutional Court's 2013 judgment (1 BvR 3139/08 and 1 BvR 3386/08), which addressed the constitutionality of expropriations under the Federal Mining Act (BBergG) and the overall balancing of interests.

Federal Mining Act (BBergG):[151] Enacted in its current form in the 1980s and has gone through a series of amendments. The BBergG governs exploration and extraction nationally and establishes the fundamental rights and obligations for mining operations, distinguishing between "freely mineable" resources[i] subject to state mineral rights, and "owner-bound" resources that belong to landowners. It has been criticized, both by civil society[152] and the German Environment Agency (Umweltbundesamt),[153] [ii] for lacking early community engagement or detailed social safeguards.

Environmental Impact Assessment Act (UVPG):[154] Translates EU EIA Directive (2011/92/EU) into German law, legally mandating an EIA for projects that are conclusively listed in its Annex 1, which includes certain large-scale projects like those for the extraction of minerals (e.g., specific mining projects). For other, smaller projects, a preliminary assessment (screening) is done to determine if "ESIAs are already mandatory only for very large and extensive raw material projects, and not for so-called 'smaller ones,' which can also have considerable negative climate and environmental impacts."[155] In practice, the depth and scope of impact review are variable, and public involvement often occurs late.

Federal Nature Conservation Act (BNatSchG):[156] Provides a comprehensive legal basis for habitat and species protection and sets requirements for projects in Natura 2000 areas. Tensions arise in practice, as current mining proposals, including Zinnwald, risk contravening these standards due to the prioritization of raw material supply. According to the German NGO working group on raw materials AK Rohstoffe: "there is tension between BBergG and BNatSchG: in principle, mining projects cannot ultimately be refused if all conditions are met (e.g., proper operating plans, assurance of post-mining re-usability)" even as the BNatSchG provides that "significant adverse effects on nature and landscape must be avoided as a priority."[157]

i "Bergfreier Bodenschatz", a mineral subject to federal mining law, such as hard coal, crude oil, and metal ores

ii In this document, Germany's Environment Agency (UBA) urges the overhaul of mining governance to align raw-material supply with sustainability – integrating mining rights into a full plan-approval process, tightening environmental criteria and operator duties, strengthening public participation and legal remedies, and revising royalties, expropriation, and "resource-security" clauses.

Public Participation

The Federal Mining Act (BBergG) and Environmental Impact Assessment Act (UVPG) mandate hearings and disclosure, but participation usually occurs late, with limited influence on fundamental project decisions. According to AK Rohstoffe: "Citizen participation in the Federal Mining Act is only partially regulated for the operating plan procedure. Operating plan procedures are overall non-transparent. Early and comprehensive citizen participation is often not provided for."[147] Community concerns are frequently sidelined, with restricted access to technical data and invitation-only consultations.[148] The mining companies stake their claims and, by submitting an application, generally acquire a right to be granted exploration permits, extraction licenses, or the conferment of mining ownership.[149]

Environmental and Social Impact Assessment

German law requires EIAs for certain mining projects based on type, size, and potential impacts. Water, soil, air, biodiversity, climate and human health are to be assessed. Major consequences are being assessed as part of the process if they are of public interest, but smaller impacts are not an estoppel in the process. Furthermore, cumulative and strategic assessments are weak, transboundary impacts addressed only as a consequence on behalf of foreign authorities, and social and health impacts underexplored. Studies have shown that the effectiveness of Strategic Environmental Assessments in Germany is found to be limited to moderate, primarily in procedural aspects: the procedure is often not fully integrated or timely, with late and limited public participation.[150] Independent verification and ongoing monitoring are not mandatory, leaving gaps compared with higher standards, such as IRMA's.

Community Support and Benefits

Community consent and the Right to Say No, which are widely recognized prerogatives for including rights-holders in mining decisions, is not a legal requirement. While companies may pursue voluntary CSR measures, there is a lack of explicit provisions in the BBergG for community benefit-sharing. Compensatory measures are developed at the permitting level in collaboration with the relevant conservation authorities for each project, but the handling of compensation measures in Germany is frequently subject to criticism.[158] Opposition cannot stop projects if technical standards are met, as seen in the Zinnwald lithium project. The public was involved at an early stage through a voluntary process by the company. This resulted in numerous objections to the project being submitted to the Saxony Mining Authority, the agency responsible for reviewing and approving the project. However, these objections did not lead to the process being suspended, as individuals must demonstrate that they are personally affected by the project in order for their objections to be considered, which does not include, for example, simply rejecting the project or expressing concern about the clearing of forests.

Access to Justice

Judicial and administrative review mechanisms exist, but costs, restrictive standing, and lengthy proceedings limit their effectiveness. A recent report by the European Environmental Bureau shows that Germany has taken important steps to open its courts to environmental challenges, especially by granting NGOs standing through the *Environmental Remedies Act* (UmwRG) and nature conservation law. Yet, the persistence of the "impairment of rights" doctrine,[i] the exclusion of certain administrative acts from review, high litigation costs, lengthy proceedings, and patchy transparency in publishing judgments mean that access to justice remains narrower than the Aarhus Convention envisions. In practice, progress is visible, but significant barriers still prevent truly wide public access.[159]

Closure and Rehabilitation

Operators must submit closure plans already during the first official approval of plans. However, for closure only the reclamation of the land is binding, making the disturbed land usable (safe, stable, functional) again. This does not necessarily return it to its original condition, neither guarantee rehabilitation or restoration resulting in a land with high environmental quality. Financial guarantees are also set during the approval of plans, but securities are often underfunded, creating future liabilities for the public. The process of closure and rehabilitation lacks sufficient community involvement and independent oversight is weak.[ii]

Systemic Gaps

- Participation often occurs too late to shape outcomes.
- Regulation emphasizes technical compliance over rights-based engagement.
- The Federal Mining Act can be applied, even when overwriting some of the Federal Nature Conservation Act's priorities on nature protection.
- Communities have little leverage, while companies enjoy legal privilege.
- Oversight is fragmented, with limited accountability for companies.



To be mined in Zinnwald & Cinovec: Zinnwaldite, also known as lithium iron mica. Photo: László Maráz

i Government decisions or business activities can be considered unlawful if they effectively impede the exercise of existing rights, even without formally revoking them, for example by making their actual exercise impossible or unreasonable.

ii In the case of closure of lignite plants in Germany, a relevant precedent, ClientEarth had submitted detailed observations expressing "strong doubts that the financial securities provided by the mines operators until now, under their current permits and agreements ... have been proportionate to their foreseeable future rehabilitation liabilities; ... This is because the level of financial securities have been set by the authorities relying only on data provided by the operators themselves" (ClientEarth, 2021).

Case Evidence:

Zinnwald Lithium Project[160]

"If you've got something to hide, you schedule public participation when most people are on holiday."
Citizens' Initiative Bärenstein[161]

The Zinnwald Lithium Project represents a proposed underground mine and processing facility by Zinnwald Lithium Plc in Altenberg, Saxony, demonstrating critical gaps in transboundary mining governance. The project aims to produce battery-grade lithium hydroxide across 256 hectares overlapping UNESCO Erzgebirge mining landscape and Natura 2000 sites, with significant cross-border implications for the Czech Republic. Public participation has been restricted by focusing rather on one-way informative events than a reciprocal exchange. Most meetings have been invitation-only and early interactions selective, which prompted the formation of citizens' initiatives in Bärenstein and Liebenau. Cross-border coordination between German and Czech groups has intensified, with appeals to the European Commission and Germany's Environment Ministry demanding proper transboundary assessment. Residents report persistent information gaps, shifting project parameters, and minimal opportunity for meaningful early-stage dialogue. Despite the project's scale and tight interdependence with the parallel Cínovec project across the Czech border, authorities have failed to announce formal transboundary Environmental Impact Assessment procedures. Critical project elements including processing facilities, tailings management, waste rock pilings, and water use remain undefined, preventing comprehensive cumulative effects assessment and risking major decisions advancing without proper cross-border evaluation. While the company promises approximately 400 jobs over 35 years, communities face significant trade-offs including potential resettlement, property devaluation, and disruption of tourism-dependent economies tied to the UNESCO-listed cultural landscape. Public surveys in Liebenau indicate strong local opposition to proposed processing and waste facilities. The project's bid for designation under the EU CRMA raises concerns that streamlined permitting could bypass due diligence on unresolved technical and environmental questions. Communities are mobilizing formal channels and cross-border advocacy, though information asymmetries persist until full project details undergo integrated, transboundary assessment, complicating timely legal challenges.



The sun sets over the historic mining town of Altenberg, Germany, in which Zinnwald is located, where lithium could soon be mined. Photo: BeckArt, iStock



Unsecured legacy of old mining in Roșia Montană, Romania. Photo: Michael Reckordt

Broader EU Context: Comparative Insights from France, Finland, Czech Republic, and Romania

Across the European Union, formal transparency and consultation mechanisms have advanced in recent years through the implementation of the Aarhus Convention and successive transpositions of environmental directives.[162] Yet comparative analysis of France, Finland, the Czech Republic, and Romania, where a significant number of Strategic Projects are also planned, reveals recurring gaps between legal requirements and higher international benchmarks – especially in enforcement depth, meaningful early participation, community benefit-sharing, and effective access to remedy. While these four countries have active or emerging strategic mining sectors and evolving regulatory frameworks, practical implementation often lacks normative commitments, with the scale and nature of gaps varying by country and project – echoing patterns observed in Spain, Portugal, Sweden, and Germany.

Public Participation

France has undertaken significant reforms to its Mining Code, with four decrees adopted in August 2025 introducing mandatory public consultations prior to permit issuance and requiring consideration of environmental and social interests alongside economic factors.[163] Nevertheless, critics warn that for some critical-mineral projects proactive early-stage consultation remains limited, information disclosure can arrive late in EIA timelines, and allegations of "project-splitting" persist in certain cases to narrow the scope of EIA.[164] Local administrative discretion and fragmented permitting chains can further hinder meaningful involvement from project inception.

Finland amended its Mining Act in 2023, strengthening resident influence and environmental aspects while maintaining consultation and assessment obligations under sectoral and EIA frameworks.[165] However, Sámi Indigenous communities and local populations regularly challenge projects over insufficient engagement, late information disclosure, and transparency gaps. In October 2024, UN treaty bodies found that Finland violated Sámi rights in exploration decisions that proceeded without adequate cultural impact assessment and without obtaining Free, Prior, and Informed Consent[166] – highlighting systemic shortcomings in practice despite formal frameworks.

The **Czech Republic's** Mining Act and EIA Law establish formal requirements for consultation, transparency, and legal challenge. In practice, however, in some Strategic Projects designated as "of strategic importance," civil society reports selective stakeholder engagement, delayed or incomplete publication of technical documents, and limited opportunities for early participation by affected regional populations.[167]

Romania's mining and environmental legislation reflects EU transposition, formally securing channels for public input and legal redress.

Yet controversial projects – most notably the Roșia Montană gold mining proposal – have repeatedly tested these safeguards through fragmented procedures and attempts to rely on "overriding national interest."[168] In 2024 the International Centre for Settlement of Investment Disputes (ICSID) tribunal rejected the investor's multibillion-euro claim, underscoring the long-running governance contestation around the project.[169]

Environmental and Social Impact Assessment

Across all four jurisdictions, EIA processes are legally mandated but show recurrent weaknesses in cumulative-impact evaluation, the integration of social dimensions, and consideration of long-term legacy risks.[170] **France's** recent reforms aim to strengthen integration between EIAs and mining authorizations, yet practical fragmentation risks remain.[171] **Finland's** EIA practice has been criticized for insufficient attention to cumulative effects on Indigenous reindeer-herding territories and limited incorporation of traditional knowledge.[172] In the **Czech Republic**, in the Cínovec/Zinnwald strategic lithium case, NGOs report that public participation in the EIA has been largely formalistic and that no Convention on Environmental Impact Assessment in a Transboundary Context (Espoo) transboundary procedure has been initiated despite probable cross-border impacts.[173] **Romania's** EIA processes, though formally robust, have at times been constrained by exemptions and institutional fragmentation that limit comprehensive risk evaluation.[174]

Community Support and Benefits

Benefit-sharing mechanisms and community-support frameworks remain underdeveloped or weakly enforced in all four countries. In **France**, monitoring/liaison bodies (e.g., commissions de suivi de site) and the 2025 decrees reinforce local information and oversight, but civil society has been critical of the reforms.[i] Furthermore, systematic, statutory benefit-sharing arrangements with affected communities are not established nationwide (benefits go to Municipalities and Departments).[175] **Finland** lacks a dedicated statutory community benefit-sharing scheme for mining (e.g., mandatory local benefit agreements), although a nationwide mining tax introduced in 2024 allocates 60% of revenues to host municipalities.[176] UN bodies and Sámi representatives have criticized inadequate safeguards and participation in several exploration cases within the Sámi Homeland.[177]

In the **Czech Republic** there is literature noting that while mining law and environmental law exist, issues remain around local community engagement, benefit distribution and social tensions in extraction-areas.[178] In **Romania** there is empirical work showing that revenue sharing and local benefit-distribution from mining is weak and it has failed to generate local economic diversification.[179]

Access to Justice and Remedy

Legal remedies are formally available in all four jurisdictions but can be costly, protracted, and impeded by procedural hurdles. In **France**, judicial processes are accessible, yet time and cost can deter affected communities and NGOs.[180] **Finland** provides avenues for redress, yet the 2024 UN findings demonstrate failures to uphold Indigenous rights in practice despite available mechanisms.[181] In the **Czech Republic**, formal avenues for appeal and NGO standing exist under environmental and administrative law, but documentation gaps, procedural complexity, and restrictive interpretations by authorities and courts often constrain effective access to justice in practice.[182] **Romania** presents a particularly visible case: although legal avenues exist, discretionary exemptions and administrative opacity have created barriers to remedy in high-profile disputes.[183]

Mine Closure and Rehabilitation

Legislative and regulatory frameworks addressing mine closure and financial guarantees vary significantly. In **France**, recent reforms (2021–2025) have strengthened financial-guarantee and post-closure obligations under the Mining Code.[184] Environmental organizations have long criticized mining regulations for overlooking the long-term environmental damage left behind by mining operations – such as the uranium, zinc, and lead mines abandoned decades ago that continue to pollute soil and water and it's not clear whether this concern has been sufficiently addressed by the recent reform.[185] **Finland** requires rehabilitation planning and financial sureties under the Mining Act, supported by official guidance on closure-cost estimation and acceptable instruments.[186] The **Czech Republic's** Mining Act mandates reserve funds for land rehabilitation; the adequacy and modalities of these reserves have been debated in practice.[187] **Romania's** framework formally requires closure planning, but enforcement is inconsistent, with legacy sites demonstrating insufficient provisioning and inadequate long-term stewardship.[188]

i Civil society denounces a broader deregulatory push that undermines environmental democracy safeguards, which is consistent with concerns about weakening participatory and oversight structures.

Benchmarking EU Environmental Threshold Values Associated with Mining Against Other Regulations



Pollutants in water can affect fishing and thus also people's livelihoods, as is the case with pollution from nickel mining in the Philippines. These pollutants can also be ingested by humans through other living organisms.
Photo: Michael Reckordt

Mining activities can cause significant harm to the environment if not properly regulated and managed. Key impacts include the use and pollution of water resources, the generation and long-term risks associated with extractive waste, the contamination and loss of soil, and the release of pollutant affecting air quality.[189] Since water pollution associated with mining represents an especially severe problem because it is often irreversible and affects large, interconnected ecosystems, many submissions in the public participation process for mining projects focus on water supply and pollution. In addition, there are concerns that legislation protecting water quality could be weakened in order to facilitate new mining projects.[190] As this is directly related to human rights as well as environmental and participatory issues, the following chapter places a particular focus on water.

To assess whether the EU lives up to its own claim of applying the highest standards in relation to mining, this analysis examines EU limit values for several particularly relevant pollutants that can impair water quality in connection with mining. These limits are compared with other international water quality standards. This gap-analysis regarding key threshold values for water quality will be described in the next chapter. This is then followed by a brief summary on air, soil and waste in the subsequent chapter.

Assessment of EU Environmental Quality Standards for the Protection of Drinking Water and Surface Waters

Acid mine drainage and/or the leaching of heavy metals (e.g. arsenic, mercury, lead) can lead to permanent contamination of rivers, groundwater, lakes, and sometimes even entire watersheds, meaning that even regions far away from mining sites can be affected. When water bodies become unusable for long periods due to such contamination, this often results in the loss of habitat for humans and other species, as well as the loss of livelihoods, for example through diminishing food security.

The existence of conservative pollutant limit values for water quality is important because:

- They protect the health of people because they can prevent (chronic) diseases caused by water pollutants taken in directly through drinking water or indirectly via other organisms. Even in low concentrations, they can have a long-term negative impact on health, for example, in the form of cancer, neurological damage, and reproductive disorders.

- They protect ecosystems by maintaining the functionality and resilience of water bodies, as many pollutants are toxic to aquatic organisms even in very low concentrations, endangering particularly sensitive species and potentially disrupting food chains.

- They translate the precautionary principle[i] and polluter pays principle into verifiable practice: if the limits are strict enough, complied with and effectively enforced, they can minimize damage and follow-on costs associated with mining and effectively protect water resources.

- They create legal certainty by providing authorities, mine operators and other stakeholders, such as local communities, with a clear framework for permitting, monitoring, enforcement and liability.

- They make trust and acceptance possible. Only with transparent, measurable requirements can communities adequately assess projects and participate in consultation processes.

Water can be assessed across multiple use- and protection-based categories, reflecting both human and ecological needs. For the following analysis, the categories (1) drinking water and (2) surface water will be used as reference. They have been selected as mining activities can have strong impacts on both and they are usually subject to the strictest pollutant limits. High quality expectations for drinking water are necessary due to direct risks to human health.[ii] A strong regulation of surface water on the other hand is important for the protection of aquatic organisms and ecosystems.

Depending on the intended use of the water, the limit values for different pollutants vary, as they depend on the protection goals, exposure, and sensitivity. For substances that pose a high risk to humans even at very low, lifelong doses, drinking water limits tend to be particularly low. For substances to which ecosystems respond particularly sensitive, the environmental quality standards (EQS) for the protection of aquatic organisms are usually lower than for other types of water use. For example, arsenic is typically subject to stricter drinking water limits, whereas cadmium is regulated more stringently to protect aquatic organisms.[191] This can be explained by arsenic being highly toxic to humans and increasing cancer risk, even at very low doses taken over a long period. Therefore, particularly strict drinking water limits usually apply. Cadmium also poses a significant health risk to humans, as it accumulates in the liver, kidneys and bones and increases cancer risk with long-term exposure. However, many fish and invertebrates are extremely sensitive to cadmium, which is why EQS designed to protect aquatic organisms are particularly strict here. Other categories of water use – such as agricultural, recreational or industrial use – tend to be based on weaker limit values and are therefore not the focus of this assessment.[192] In addition to the limit values themselves, other aspects must be considered in order to evaluate whether adequate protection of surface waters and drinking water is ensured in the EU. These include the frequency of sampling, whether appropriate corrective measures must be taken in the event of exceedances with negative environmental impacts, and under which circumstances exceptions to compliance with limit values may be permitted. Similarly, quantitative aspects of water usage must also be considered alongside quality. However, the present analysis primarily focuses on comparing qualitative limit values.

EU Legal Framework for the Protection of Water Quality

The limit values for the two water categories on which the following analysis focuses – drinking water and surface waters – are set out in the EU in three legal frameworks.

i The precautionary principle requires serious or irreversible damage to be prevented, even when scientific uncertainties exist. Not the ones potentially affected have to prove the risks, but rather companies and governments must prove that a project is safe.

ii However, there are also drinking water standards, such as the Secondary Drinking Water Standard in the USA, which refer to taste, color, odor, and the technical characteristics of water (such as tendency to corrode pipes) without referring to direct risks to human health (USEPA, 2025).



River contaminated with nickel in Santa Cruz, Zambales, Philippines. Photo: Michael Reckordt

§ **EU Drinking Water Directive:** *Directive 2020/2184 on the quality of water for human consumption*.[193] It establishes binding quality standards for drinking water in the EU. It requires Member States to ensure that drinking water does not pose a risk to human health, set parametric values for key pollutants, and introduces risk-based monitoring and information obligations. In Germany, for example, it was translated into national law through the *Drinking Water Ordinance* (*Trinkwasserverordnung*).

EU Water Framework Directive (WFD): *Directive 2000/60/EC establishing a framework for Community action in the field of water policy*.[194] As described in Chapter 3, the directive regulates the protection of surface waters and sets the objective of achieving good ecological and chemical status[i]. With regard to the setting of limit values, it is important to note here that the Directive requires Member States to take measures to progressively reduce pollution from priority substances and to cease or phase out discharges, emissions and losses of priority hazardous substances. It also obliges Member States, in addition to the EU-wide list of priority substances, to identify river basin specific pollutants (RBSP) and to set their own EQS for them.[ii] In Germany, the WFD has been translated into national law through the *Water Resources Act* (*Wasserhaushaltsgesetz*).[195]

EU Environmental Quality Standards Directive (EQS Directive): *Directive 2008/105/EC on environmental quality standards in the field of water policy*.[196] It establishes binding environmental quality standards for priority substances and priority hazardous substances in surface waters. It sets concentration limits to achieve good chemical status under the WFD, including annual average values (AA-EQS) and maximum allowable concentrations (MAC-EQS). In 2013, it was updated through Directive 2013/39/EU.[197] Annex II of the latter contains an overview of the specific limit values/EQS for the priority substances and priority hazardous substances. In Germany, the EU EQS Directive has been translated into national law through the *Surface Waters Ordinance* (*Oberflächengewässerverordnung*).[198] Member States are required to monitor, control, and progressively reduce pollution from posing risks to aquatic ecosystems and human health.

i The chemical status of water bodies in the EU is assessed on the basis of the selected substances for which the EU WFD defines limit values. When none of these are exceeded, good chemical status is achieved. The ecological status is assessed by comparing the organisms living in the water with the population that should naturally be present there (Umweltbundesamt, 2022 and 2023).

ii The RBSP are determined by the respective responsible national or regional water authorities, varying between EU Member States. Annex VIII of the WFD contains an indicative list of the main pollutants (including arsenic, cyanides and metals).

After the EU Commission made a proposal to revise the list of priority substances in surface water in 2022,[199] an agreement was reached at the end of September 2025. This agreement has faced criticism from both industry and civil society. For instance, the lowering of the nickel limit value is described by the industry association Nickel Institute as "regulatory overreach."[200] From a civil society perspective, the revision was welcomed as long overdue and important, but criticism was voiced, for example, about the EU granting itself a highly unambitious timeline: Member States will be required to comply with all new standards only by 2039, with options to extend until 2045, while only for a few substances will the new requirements have to be met by 2033.[201]

Comparison of EU Limit Values and EQS for Selected Common Mining-related Contaminants

Selection of Substances Examined and Methodological Approach

The impact of mining on surface water and drinking water depends strongly on the location and the extraction technology used. Depending on the location, the chemical elements in the ore that are introduced into water bodies differ. Depending on the technology applied as well as the acids and other chemicals used, geogenic pollutants[i] can be released. In addition to the release of geogenic substances, the extraction chemicals used (among others cyanide) must be critically examined.

In order to comprehensively assess water quality in connection with mining, many factors must be considered. In the draft for the revised IRMA Standard v2.0, published in 2025,[ii] IRMA includes 50 parameters for water quality in relation to mining in its comparison table – among them 30 metals/metalloids as well as 20 additional parameters, which also include water hardness, temperature and pH[iii].[202]

National frameworks for the protection of water quality usually list more substances, of which only a fraction are related to mining.[iv] This also applies to the EU EQS Directive. Annex 1 defines



Open-pit copper mining in Peru. Among others, the limits for pollutants for water protection in Peru are compared with those of the EU in this study.
Photo: tifonimages, iStock

45 priority and priority hazardous substances for assessing chemical status. However, only a few of these substances are relevant in the context of mining. In German law, the priority and priority hazardous substances are listed in Annex 8 of the *Surface Waters Ordinance*. In addition, its Annex 6 also contains EQS values for RBSP used to assess ecological status and ecological potential. These are not set at EU level but are determined for specific river basins. In Germany for example, they additionally include limit values for arsenic, copper and zinc which are also relevant substances in the context of mining.

For the following analysis of EU's performance in setting water limit values, not all pollutants will be looked at. The following comparison focusses on a selection of particularly relevant substances in connection with mining. For this purpose, 15 common mining-related contaminants were selected.[v] This selection is based on the *WHO Guidelines for Drinking Water Quality*[203] from 2022 as well as Primary Drinking Water Regulation[204] of the *United States Environmental Protection Agency (USEPA)* and

i Geogenic pollutants are naturally occurring substances such as arsenic, lead, and mercury that are the result of geological processes, and can become environmental or health hazards when released into soil, water, or air at elevated concentrations.

ii The draft for the revised IRMA Standard v2.0 was published in the summer of 2025. According to IRMA, the final revised standard could be published or adopted in 2026, but this depends on the pace and complex structure of the board's decision-making processes.

iii Temperature, pH value, and water hardness are key parameters for assessing water quality because they have a significant influence on chemical processes, ecological effects, and the toxicity of pollutants. For example, they influence solubility and chemical reaction rates as well as bioavailability (i.e., the proportion of a substance that can actually be absorbed by organisms and has a biological effect). In hard water, for example, many metals are less bioavailable and therefore less toxic.

iv For example, the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2026).

v Supported by the expertise of hydrologist and expert on groundwater and mining Dr. Steven Emerman and colleagues.



The Amazon in Brazil. Mining can pose significant risks for water quality. Photo: Neil Palmer, Flickr
https://www.flickr.com/photos/ciat/5641587148/
CIAT FlickrFlickr CC BY-SA 2.0CC BY-SA 2.0

its Aquatic Life Criteria.[205] Both the WHO Guidelines and the USEPA standards are widely recognized.

The following substances were selected as the 15 most relevant ones for assessing the water quality of drinking water and surface waters in connection with mining:

- **Aluminum:** When consumed in high doses, it is often suspected of causing neurological problems such as dementia, yet its toxicity to humans appears to be low.
- **Arsenic:** Associated, for example, with cancer (bronchial, bladder, and skin).[206]
- **Antimony:** Similar carcinogenic effects to arsenic, and in particular can cause liver and kidney damage. Acute poisoning causes skin irritation, stomach cramps, and diarrhea, as well as cardiovascular problems.[207]
- **Cadmium**: As a cumulative toxin, it accumulates in the kidneys and can lead to bone damage. Acute poisoning is rare, but chronic toxicity leads to iron deficiency and vertebral pain.[208]
- **Chromium**: Can occur in water in different oxidation states. While chromium (III) appears to be harmless to health, chromium (VI) is suspected of being carcinogenic and damaging to DNA. The oxidation state of chromium depends on various factors, such as the oxygen content of the water.[209]
- **Copper:** At elevated levels, gastrointestinal problems, liver and kidney damage may occur.[210]
- **Cyanide**: In high doses, the substance blocks hemoglobin in the blood, restricting oxygen transport and leading to shortness of breath, unconsciousness, and, in extreme cases, death.[211]
- **Iron**: Elevated levels can cause cloudiness, rust spots, and a metallic taste in the water, as well as gastrointestinal problems.[212]
- **Lead**: Even at low intake levels, this heavy metal causes damage to the nervous system and intellectual development, especially in young children, infants, and unborn babies.[213]
- **Mercury**: Highly toxic to all living organisms, damages cells, and inhibits enzyme activity. For example, it can damage the kidneys and nervous system, leading to coordination problems and memory loss.[214]
- **Nickel**: Toxic at elevated exposure levels. Repeated intake of small doses can have adverse effects on body and organ weight, bone growth, the gut microbiome, and neurological functions. Chronically elevated nickel intake may have negative effects on reproduction.[215]
- **Nitrate**: Newborns in particular are at risk from high nitrate levels in water during their first few months of life, as this can impair their blood's ability to transport oxygen (through the oxidation of hemoglobin to methemoglobin, which cannot transport oxygen). This increases the risk of oxygen deficiency and can even lead to life-threatening conditions.[216]
- **Selenium**: High doses can cause gastrointestinal problems, neurological damage and, in extreme cases, cirrhosis of the liver and death. In soluble form, it accumulates in the body tissue of small organisms and can impair reproduction.[217]
- **Uranium**: Suspected of causing kidney damage and of being carcinogenic.[218]
- **Zinc**: Although human toxicity is relatively low and high zinc concentrations mainly affect the taste of drinking water, an environment with high zinc levels appears to reduce species diversity.[219]

Based on this selection, a comparative table was created to show how strictly these 15 common mining-related contaminants are regulated in the EU – on the one hand in terms of drinking water protection, and on the other hand in terms of the protection of aquatic organisms and surface waters. For this purpose, the EU values are compared with various other national regulatory frameworks[i] and with the *WHO Guidelines for Drinking Water Quality* and the IRMA limit values, in order to determine whether a given value is average or particularly strong or weak. For the detailed comparison table, see annex, table 8. Table 2 shows a simplified representation of this table.

IRMA limit values provide a good comparative framework, as they set limit values for many mining-relevant substances and are determined by comparing limit values of different countries. In most cases, they are based on the limit values in the USA, Canada or Australia and New Zealand, but in some cases also on those of the EU, China, Peru, the Philippines and South Africa. However, the IRMA limit values are often not based on the strictest value in comparison of the selected regulations.[ii]

However, it is important to bear in mind, that compliance with the IRMA-defined water limit values does not constitute a critical criterion for the specific mining project that seeks to obtain an IRMA achievement level, meaning that non-compliance does not necessarily lead to a mine not being able to achieve any IRMA level.[iii] A mine could still receive an IRMA 50 or 75 achievement level even if the limit values for the identified uses (e.g. use as drinking water) are exceeded. However, monitoring of water quality and quantity, as well as the implementation of measures to mitigate negative effects on water quality, constitute critical criteria. Accordingly, measures would have to be taken to counteract the exceedances of the limit values if the mining company intends to maintain or increase its IRMA score.[iv]

i Namely those of Canada, the USA, Australia, New Zealand, Peru, the Philippines, China, Brazil, and South Africa. This list represents a mix of countries from different regions of the world where mining is prevalent and which have established comprehensive limits for mining-related substances. For example, the US, Canada, Australia and New Zealand have determined their own limits through testing and laboratory examinations which is why they are considered particularly relevant and other countries and the IRMA also refer to them (IRMA, 2026).

ii According to IRMA, their water quality criteria are based on a comparative analysis of international standards and are intended to provide universally applicable, ambitious threshold values. Since water ecosystems vary around the world, IRMA uses the most widely recognized limits from mining-related countries as orientation for each pollutant. Particular weight is given to the criteria of the USA, Canada, and Australia/New Zealand, as they are based on extensive testing and often used as a reference by other countries. Criteria from other countries were also taken into account, particularly where specific ecological or usage-related sensitivities exist.

iii IRMA awards different achievement levels based on a scoring system that draws on the results of independent third-party audits (IRMA Transparency, IRMA 50, IRMA 75, IRMA 100). The first level, IRMA Transparency, can be achieved once a mine site has completed a full audit and the audit report has been published. For IRMA 50 and IRMA 75, all critical requirements applicable to the site must be at least substantially met, and the site must achieve a score of at least 50% (IRMA 50) or 75% (IRMA 75) of the total possible score, respectively, for each of the four Principles of the IRMA Standard: Business Integrity, Positive Legacies, Social Responsibility, and Environmental Responsibility. To achieve IRMA 100, a site must fully meet all critical requirements applicable to the site, and all other relevant requirements of the IRMA Mining Standard must be fully or substantially met (this means, there are only minor nonconformities, and the number of minor nonconformities does not cause the score in any of the four principles to be below 90%).

iv IRMA Standard v1.0 does not require blanket compliance with all water quality limits for affected waters. Instead, requirement 4.2.3.3 allows two approaches: On the one hand, the preservation of natural baseline or background values, provided that these are verified by methodologically sound basic data. On the other hand, compliance with IRMA water quality criteria. While this requirement 4.2.3.3 is not a "critical requirement," requirement 4.2.4.4 is. It requires mines to develop and implement an adaptive water management plan. As a result, this means that a mining site that causes water pollution cannot achieve IRMA 100. For IRMA 50 or 75, at least substantial compliance is required, as well as an action plan to fully implement the requirements by the next audit.

Table 2: EU Environmental Quality Standards for Surface Water and Limit Values for Drinking Water in International Comparison

Simplified representation. For more detailed information and sources, see annex (p. 74 ff.).

Substance	Uniform EU EQS for Surface Water	Countries/ standards with stricter EQS for Surface Water than the EU in this comparison**	Assess-ment of EU EQS for Surface Water in comparison	Uniform EU limit value for Drinking Water	Countries/standards with stricter limits for Drinking Water than the EU in this comparison**	Assessment of EU limits for Drinking Water in comparison
Aluminum		South Africa (10 µg/L)	●	200 µg/L	Canada (100 µg/L), South Africa (150 µg/L)	●
Antimony			●	10 µg/L	Australia (3 µg/L), China (5 µg/L), USA, Canada, Brazil (each 6 µg/L)	●
Arsenic	No uniform value but regulated in some of the selected EU member states*	Canada (5µg/L)	●	10 µg/L	5 µg/L in specific US states such as New Jersey and New Hampshire	●
Cadmium	0.08 µg/L (Water Hardness Class 1), 0.09 µg/L (Water Hardness Class 3) (AA); classified as a priority hazard-ous substance		●	5 µg/L	Australia (2 µg/L), Peru, Philippines, Brazil, WHO (each 3 µg/L)	●
Chromium	No uniform value but regulated in some of the selected EU member states		●	25 µg/L		●
Copper	No uniform value but regulated in some of the selected EU member states		●	2000 µg/L	USA (1300 µg/L), South Africa, China (each 1000 µg/L), Philippines (200 µg/L)	●
Cyanide	No uniform value but regulated in some of the selected EU member states	Canada, Brazil (each 5 µg/L), South Africa (4 µg/L), USA, Peru (each 5,2 µg/L), Australia, New Zealand (7 µg/L)	●	50 µg/L		●
Iron			●	200 µg/L	South Africa (100 µg/L)	●
Lead	1.2 µg/L (AA); classified as a priority hazardous substance	South Africa (0.5 µg/L)	●	5 µg/L		●
Mercury	0.07 µg/L (MAC); classified as a priority hazardous substance	Canada (0.026 ug/L), Australia, New Zealand (0.06 ug/L), IRMA (draft for v.2.0)	●	1 µg/L		●

Substance	Uniform EU EQS for Surface Water	Countries/ standards with stricter EQS for Surface Water than the EU in this comparison**	Assess-ment of EU EQS for Surface Water in comparison	Uniform EU limit value for Drinking Water	Countries/standards with stricter limits for Drinking Water than the EU in this comparison**	Assessment of EU limits for Drinking Water in comparison
Nickel	2 µg/L (AA); 8.2 µg/L (MAC)			20 µg/L		
Nitrate	No uniform value but regulated in some of the selected EU member states			11.3 mg/L	South Africa (6 mg/L)	
Selenium	No uniform value but regulated in some of the selected EU member states	Canada (1 µg/L)		20 µg/L	Australia, China (each 10 µg/L)	
Uranium	No uniform value but regulated in some of the selected EU member states			30 µg/L	Australia, Canada, Peru (each 20 µg/L)	
Zinc	No uniform value but regulated in some of the selected EU member states					

The following color scale indicates how strict the EU values are in comparison:

- Green: The EU sets relatively strict or the strictest limit value/EQS in the comparison.
- Yellow: The EU limit value/EQS is in the middle range of the limit values examined.
- Orange: The EU limit value/EQS is rather weak compared to the other values examined.
- Grey: There are no uniform limit values/ EQS for this substance at EU level.

EQS: Environmental Quality Standard
AA: Annual average
MAC: maximum allowable

* *Selcted EU member states in comparison: Germany, Portugal, Spain, Sweden*

** *The following countries and standards were compared: Australia & New Zealand, Brazil, Canada, China, IRMA, Peru, Philippines, South Africa, USA, WHO*

Approach to the analysis and legend

For the comparison table, the 15 substances examined were assessed to determine whether there are uniform EU values for the protection of drinking water and surface waters. This was based on the legal frameworks EU WFD, EQS Directive, and EU Drinking Water Directive. Where there are no uniform EU values, the limit values in the four selected Member States Germany, Sweden, Spain, and Portugal were used as a basis for comparison, if available. These were then compared with the IRMA limit values, the *WHO Guidelines for Drinking Water Quality*, and the limit values and EQS in other countries.

The detailed comparison table on which this simplified version is based can be found in the annex on page 74 ff.

Limit Values for Drinking Water

Of the 15 relevant substances considered here, the EU sets uniform limit values for 14 substances to protect drinking water quality. Compared with other regulations, these are in some cases relatively strict (for arsenic, chromium, iron, lead, mercury, nickel, nitrate, cyanide[i]) and in other cases middle range (for aluminum, cadmium, copper, selenium, uranium[ii]). Although antimony is mined in some EU countries such as Slovakia and Greece,[220] it is the only substance for which the EU has a comparatively weaker drinking water limit value.[iii] For zinc, there is no uniform EU limit value for drinking water quality. This is because water with an elevated zinc concentration has a very metallic taste. At zinc concentrations where water would be harmful to human health, people would not drink the water in the long term because of its strong metallic taste.

Compared with the *WHO Guidelines for Drinking Water Quality* from 2022,[221] the EU values for drinking water are usually equal to or (significantly) stricter than those of the WHO. Only for cadmium the EU limit value of 5 µg/L is weaker than the WHO's limit of 3 µg/L. Compared to the IRMA limits for drinking water, the EU generally sets stricter limits or values that correspond to those of IRMA. Only for aluminum and antimony is the IRMA value stricter than the value set by the EU (see annex, table 8).[iv]

Environmental Quality Standards in Surface Waters for the Protection of Aquatic Organisms

In the EU, uniform EQS only exist for very few substances that pose particular risks to surface water quality in connection with mining. Of the 15 selected relevant substances, binding EQS are set under the EU EQS Directive for four substances only – namely cadmium, lead, mercury and nickel, which are categorized as priority and/or priority hazardous substances.[222] There are no uniform EU-wide limit values for the other eleven substances.[v] The WFD requires Member States to identify river basin specific pollutants (RBSP), set EQS for them, and monitor them. However, some countries do not seem to comply with this requirement for substances that are relevant there (e.g. in case of mining of this substance in the region).

With regard to the eleven substances compared here that have no EU-wide regulation, Member States take different approaches as to whether and how to regulate them. In **Germany,** for example, the *Surface Waters Ordinance* sets river basin specific limit values for arsenic, chromium, copper, selenium, zinc and cyanide. For aluminum, antimony, iron, uranium and nitrate, however, no limit values with regard to the protection of surface waters are set at either EU level or German federal level. For the substances that are regulated as river basin specific at German federal level, there are often no limit values for the concentration in the water (measured in µg/L) but rather limit values for suspended particles or sediment (measured in mg/kg). This makes it more difficult to compare them with EQS for surface waters in other countries and regulations.

For the substances which are not regulated, there is currently no commercial mining in Germany. However, aluminum, antimony, iron, and uranium can occur as associated minerals in geological deposits where lithium or tin, for example, are to be mined (e.g., in pegmatites and sulfide deposits, which are typical of the Erzgebirge region (Ore Mountains)).[223] For example, in the case of uranium, which was historically mined on a larger scale and whose mining residues in Saxony/Thuringia continue to pollute water bodies, there are no EQS for surface waters in the German Surface Water Protection Ordinance *(Oberflächengewässerverordnung OGewV)*, but the federal states

i For arsenic, chromium (total), lead, mercury, nickel, and cyanide, no other country applies stricter limits than the EU. However, several countries set equally strict limits (see annex, table 8). For iron, the EU standard is among the strictest in international comparison carried out here, only South Africa applies an even stricter limit value. For nitrate, the limit value in the EU is aligned with that of most other countries, although South Africa sets a stricter limit value.

ii Aluminum: The EU limit value is aligned with those of China, Australia, and Brazil, while Canada and South Africa apply stricter limit values.
Cadmium: The EU limit value is aligned with those of IRMA, the United States, and China, while Australia, Peru, the Philippines, and Brazil apply stricter limit values.
Copper: The EU limit value is aligned with those of Brazil, the WHO, and IRMA (draft of revised standard v2.0), whereas the United States, South Africa, China, and the Philippines apply stricter limits.
Selenium: The EU limit value is stricter than those in many countries in the comparison as well as the ones set by IRMA and WHO. However, Australia and China apply even stricter limit values.
Uranium: The EU limit value is aligned with those of IRMA, the WHO, China, the United States, and Brazil, while Australia, Canada, and Peru apply stricter limit values.

iii IRMA and some countries (such as China and Australia) have stricter limits than the EU for antimony in drinking water.

iv In its original 2018 v1.0 standard, IRMA also set a stricter limit for copper in drinking water than the EU. However, this is expected to be weakened from 1000 to 2000 µg/L with the revision of the standard, which will then correspond to the EU limit.

v Although nitrate is regulated across the EU for groundwater: The WFD also refers to the Nitrates Directive (91/676/EEC), which does not set specific EQS for nitrate in surface waters, but determines that nitrate concentrations in groundwater may not exceed 50 mg/l. However, nitrate concentrations in surface waters are to be monitored.

concerned are implementing remediation measures, in the course of which uranium levels in surface waters, among other things, are being tested and monitored.[224]

When looking at the other three EU member states that are examined in more detail in this publication, it can also be observed that not all of the eleven substances for which there are no uniform EQS at EU level are regulated on national level. Whether this represents a relevant gap depends on whether these substances occur/are used in connection with mining in the various countries and could therefore potentially pollute surface waters:

- In **Sweden,** relevant EQS for surface waters are regulated by the Swedish Agency for Marine and Water Management in *HVMFS 2019:25* (as amended by *HVMFS 2025:23*).[225] This regulation also does not contain EQS for all the eleven substances considered here that are not uniformly regulated as priority substances at EU level. It sets EQS for arsenic, chromium, copper and zinc, and includes values for uranium, taking natural background concentrations into account. For other substances, including aluminum, antimony, iron, selenium and cyanide, there are no EQS within this framework.[i] As of 2024, Sweden mainly mines iron, lead, gold, copper, silver, and zinc.[226] Since cyanide is mainly used for leaching in gold mining and gold mining takes place in Sweden, it is unclear why cyanide is not included in the Swedish regulation for EQS in surface waters. Aluminum, antimony, and selenium occur in Sweden in connection with other metallic raw materials, but do not appear to be actively mined.[227] Iron, however, is mined on a large scale in Sweden, for example in the LKAB mines in Kiruna/Malmberget, making Sweden the largest iron ore producer in the EU (93% share of total EU iron ore production in 2023).[228] The lack of EQS for iron in surface waters, in particular, therefore represents a regulatory gap here.

- In **Spain**, *Real Decreto 817/2015*[229] forms the central legal framework for EQS for substances in surface waters and defines specific pollutants. In its Annex V, arsenic, copper, chromium, cyanide, selenium and zinc[ii] are regulated, whereas aluminum, antimony, iron, uranium and nitrate are not. However, substances that are not regulated may still occur in Spain in connection with the mining of other substances: for example, iron may occur in connection with tungsten and copper mining in Spain, antimony may also occur in connection with copper mining, and uranium may occur as a by-product of rare earth mining (contained as a trace element in monazite).[230]

- In **Portugal,** *Decreto-Lei 236/98*[231] sets limit values for different uses of water. These include the protection and preservation of aquatic communities. Although parts of the regulatory areas covered by *Decreto-Lei n° 236/98* have been complemented or reformed by other, more recent laws, it is still the applicable legal act regulating various EQS for surface waters that are not uniformly regulated by the EU WFD and EQS Directive. EQS for the quality of freshwater for aquaculture – fish waters are regulated in its Annex X. There are varying limit values depending on different fish species, with a distinction made between waters for salmonids/trout and waters for cyprinids, as these fish communities have different ecological requirements. Of the eleven substances examined here that are not classified as priority substances by the EU, this annex contains EQS only for zinc and copper. This means that Portugal does not set EQS for surface waters for aluminum, antimony, iron, arsenic, chromium, selenium, cyanide, nitrates, or uranium. At least arsenic, antimony, and uranium, which are not actively mined in Portugal, can occur as accompanying elements in the mining of other substances. In addition, there are iron ore deposits in Portugal, and in the past, various regions have also been investigated to determine whether aluminum can be extracted.[232]

When looking at the national regulations of the Member States examined here, it becomes clear that in each country there are substances from the list of 15 substances that have been classified as particularly relevant in connection with mining and the impairment of drinking water and surface water quality that are not regulated either uniformly at EU level or nationally. However, this varies from country to country: while in Germany, Sweden, and Spain, one-third of the 15 substances are not regulated, in Portugal, no EQS are set for surface waters

i Table 1 of *HVMFS 2019:25* lists the limit values as total concentrations in the entire water sample, with the exception of copper, zinc, chromium, arsenic, and uranium, which refer to the dissolved concentration (i.e., the dissolved phase in a water sample obtained by filtration through a 0.45-µm filter or equivalent pretreatment). For the metals copper and zinc, the limit value is given in terms of bioavailable concentration. Accordingly, the water authority may take into account water hardness, pH value, dissolved organic carbon content, or other parameters that influence the bioavailability of these substances in water.

ii For example, the EQS for copper and zinc depend on water hardness and are therefore more difficult to compare with other EQS.



Copper mine in Arizona, USA. In the USA, the Environmental Protection Agency regulates the limits for protecting drinking water quality and sets National Recommended Aquatic Life Criteria. Photo: docentjoyce, flickr

for a higher number of the substances considered here. In Spain, the EQS for the substances for which they exist tend to be rather weak in comparison. The limit values in Germany and Sweden, on the other hand, are rather difficult to compare with the values of other national/international standards, as they are often given as concentrations in sediment, dissolved concentrations[i] or bioavailable concentrations.[ii] However, in all four EU member states considered here, there appears to be the potential for a number of substances for which there are no EQS for surface waters to be released in connection with current or potential mining and to pollute the environment. This means that, particularly with regard to new mining projects, it should be re-examined for which additional substances EQS for surface waters should be established.

When comparing the four priority substances cadmium, lead, mercury, and nickel with other countries and regulations, the EU limits for these substances tend to be very strict:

- The EQS for **cadmium** in surface waters for the protection of aquatic organisms is very strict compared with other countries. Depending on water hardness, the EU sets different limits. These are, for example, stricter than the limit in the United States (1.8 µg/L). Even in other countries that have comparatively strict cadmium limits, including Australia and New Zealand with 0.2 µg/L, Peru with 0.25 µg/L, and South Africa with 0.3 µg/L, these are higher than the strict EU EQS of 0.09 µg/L.[iii]

- The EU has also set a comparatively strict limit for **lead** at 1.2 µg/L as an annual average. This is below the levels in many countries, including the US (2.5 µg/L), Canada (3.2 µg/L), Australia, and New Zealand (3.4 µg/L). In the comparison table 2, only South Africa has a stricter limit than the EU, at 0.5 µg/L.

i Dissolved concentrations refer to concentrations measured in water samples that were filtered prior to analysis, while total concentrations refer to water samples that were not filtered prior to analysis. Dissolved and total concentrations cannot be used interchangeably, as the values can vary significantly since the total concentration is always equal to or greater than the dissolved concentration (Emerman, 2024).

ii Where national values exist, they are sometimes difficult to compare with each other due to various factors, including specific usage categories (e.g., in Portugal), measurement of concentration in water or sediment (e.g., Germany), dependence on water hardness and other water quality parameters, and whether the limit value refers to MAC or AA (e.g., in Spain, limit values are mainly specified in AA).

iii In water hardness class 3 (100-200 mg/L $CaCO_3$), which corresponds to medium or medium-hard water and is very common in the EU. However, water hardness varies greatly depending on geology and region. In many parts of Central and Southern Europe, medium-hard to hard water (class 3-4) is common because limestone and carbonate rocks prevail. In Scandinavia, Ireland, and alpine regions, water is often softer (class 1-2) because silicate rocks predominate there. Hardness can also vary significantly within individual countries (e.g., in Germany).

- The EQS for **nickel** in surface waters in the EU is also at a comparatively very strict limit of 2 µg/L as an annual average and 8.2 µg/L as a maximum value.[i] The values in other countries, which also tend to be rather strict – for example, Australia and New Zealand with 11 µg/L and China with 20 µg/L – are still much higher than in the EU. In contrast, the limits in the US (52 µg/L) and Canada (95.6 µg/L) are significantly weaker.

- The EU has also set a relatively strict, albeit not the strictest, EQS for **mercury** in surface waters with a maximum allowable value of 0.07 µg/L. This value is stricter than in some countries, such as the Philippines with 2 µg/L, the US with 0.77 µg/L, and Peru and China with 0.1 µg/L each. However, Australia and New Zealand have set a slightly stricter limit of 0.06 µg/L, and Canada has an even stricter limit of 0.026 µg/L. Although the current IRMA v1.0 limit of 0.1 µg/L is weaker than that of the EU, the draft for the IRMA v2.0 standard also provides for a stricter limit than that of the EU (0.06 µg/L).

The EU values are strict for all four substances. For cadmium, lead, and nickel, the uniform EU limits are very strict and stricter than the limits in the US, Canada, Australia, and New Zealand, which are generally considered to be widely recognized. For cadmium and nickel, the EU values are even the strictest in the global comparison of the countries examined here.

Contrary to the claim that the EU has the strictest standards surrounding mining, the following can be concluded after evaluating the comparison of EU limit values with other limit values: there are gaps, in the EQS and limit values for water quality – although the four substances considered here, which are regulated as priority substances in the EU EQS Directive, have (very) strict limit values for surface water quality. While no other value in the comparison carried out here is stricter than the EU's EQS for cadmium and nickel, South Africa has regulated the limit value for lead more strictly, and Australia, New Zealand, and Canada have set stricter values for mercury.

For drinking water quality, the EU regulates a large number of substances with harmonized limit values. Here, too, it can be observed that the EU sets very strict limit values for several of the selected substances. However, for some substances, it falls only within the middle range in comparison with other countries and regulations, so there is still some room for improvement. In addition, there appear to be gaps regarding substances for which there is no harmonized limit value at EU level, but which should instead be regulated at Member State level because they occur or are even mined in the country, but this is not the case.

Gaps, Challenges, and Areas for Improvement

For some pollutants that can occur in connection with mining and impact water quality, the EU does not set uniform limit values. Instead, individual Member States decide for themselves whether to set limit values for these substances. This means that there are sometimes no limit values for relevant substances at either EU or national level. Where limits do exist at national level, they are sometimes not easily comparable. Either way, there is potential for improvement, as for several substances there are countries setting stronger limits than the EU. Thus, it is simply not accurate to claim that the EU has the highest standards surrounding mining. Given that the EU is planning numerous new mining projects, it would be important to acknowledge this and view these shortcomings as areas for improvement, drawing on the experience of other countries such as Canada, Australia or South Africa.

A major challenge in protecting water quality lies in maintaining and protecting the rather strict limit values set by the EU in the future. The WFD, which aims at comprehensively protecting surface waters and groundwater, is intended to ensure that in all Member States of the EU, by 2027 at the latest, good ecological and chemical status is to be achieved in surface waters, and that water in sufficient quantity and of high quality as well as good living conditions for all terrestrial and aquatic plants and animals are guaranteed.[233] However, there have already been delays in the implementation of the WFD, especially due to delays in the submission and adoption of the third river basin management plans, as highlighted by the European Commission. As a result, in the beginning of 2025 the Commission initiated legal proceedings against Bulgaria, Cyprus, Greece, Malta, Slovenia, Ireland and Portugal for not yet submitting their documents.[234]

As of 2024, only 39.5% of surface water bodies in the EU have achieved good ecological status and only 26.8% of EU surface waters meet chemical quality standards. The latter

i This refers to the new EQS from 2025, which must be implemented in the national law of the Member States by 2027. Prior to this, the EQS for nickel is 4 µg/L, which is still the strictest value in comparison.

represents a deterioration compared to 33.5% in 2015. In its 2024 report, the European Commission found that one of the reasons why the EU was still far from achieving the WFD objectives was the slow adoption of measures by various Member States. This was attributed to a lack of financing, delays in implementing measures, lack of adequate national mechanisms, such as regulations or other measures not adopted, as well as governance problems.[235]

Instead of striving to close the gaps in the implementation of the WFD, the WFD could now be scaled back. In December of 2025, the European Commission presented its *RESourceEU Action Plan*, in which the Water Framework Directive comes under pressure.[236] It states: "By Q1 2026, the Commission will issue a guidance on the Water Framework Directive" and "In addition to the guidance, by Q2 2026 the Commission will review and revise the Water Framework Directive building on stakeholders' input and experiences in Member States, paying particular attention to simplification and the need to address potential bottlenecks, in order to promote circularity and access to critical raw materials in the EU."[237]

This clearly responds to pressure from the industry, as several major industry associations such as Euromines had already called in early 2025 for adjustments to the WFD in order "to ensure that water management practices do not hinder essential industrial activities." They formulated recommendations calling for deadlines for achieving good water status to be extended, "non-deterioration" clauses to be adjusted, and exemptions for essential industrial activities to be expanded.[238] Accordingly, the WFD appears to be on the deregulation agenda of the raw materials industry. As Germany's largest freshwater research center, the *Leibniz Institute of Freshwater Ecology and Inland Fisheries*, made clear in its analysis *Strengths and Weaknesses of the Water Framework Directive*, questioning or weakening of the WFD's principles and objectives could seriously jeopardize the effective protection of water bodies in Germany and the EU.[239]

Rather than giving in to industrial pressure and weakening the WFD, it is essential for the WFD to be strengthened and improved, specifically in the areas that the Commission itself highlighted in its 2024 report on the state of implementation of the WFD. The recommendations of the report included, among others, strengthening the monitoring and control of pollutants as well as the integration of water policy with other sectoral strategies, and securing the necessary funding for water infrastructure. These areas must now be addressed so that full implementation of the WFD in its current state becomes possible for all Member States. In the revision of the WFD, limit values should certainly not be weakened – particularly if the EU wants to continue living up to its own narrative of applying especially strict standards around mining. The WFD must be given clear priority over the acceleration of industrial and raw materials policies, as also highlighted in the *Model Guidelines on Effective Public Participation in Just Green Transitions* published by the Raoul Wallenberg Institute of Human Rights and Humanitarian Law in collaboration with EcoRight.[240]

Beyond the implementation of the WFD, there are further problems with infringements in the implementation of EU law regarding environmental protection. Numerous EU Member States have not yet (fully) translated key environmental requirements into their national law. This applies in particular to regulations surrounding the area of water quality, with Spain heading the list with eight infringements relating to water, particularly in connection with the incorrect application of EU directives. Portugal also has five infringements in this category.[241]

As industry is also pushing for a relaxation of water limits, another challenge lies in setting and maintaining strong limits for pollutants. This is also one of the reasons why limits vary from country to country. For example, it seems that intensive lobbying by the nickel industry in the US and Canada is one reason why nickel limits there are much lower than in the EU.[242] At the same time, however, there is also pressure from industry in the EU to prevent or weaken limits, as is currently the case, with the International Lithium Association pushing to prevent water quality standards for lithium in France and the EU.[243]

Overview of EU Regulations Relating to Air and Soil Quality and Waste Management in Connection with Mining

Air Pollution in Mining

Air pollution from mining arises mainly from dust generation, particulate matter, and emissions from processing and transport activities. These impacts can affect local air quality, human health, and surrounding ecosystems. Compared to water, air impacts tend to be more localized and reversible, and regulatory requirements are often focused on operational controls rather than long-term environmental degradation.



Dust pollution along railway lines caused by manganese and iron mining and ore transport generates high emissions in Dust pollution along the Sishen-Saldanha railway line in South Africa, caused by manganese and iron mining and ore transportation. Photo: Horst Mahr, picture alliance / imageBROKER

EU policies aim to improve air quality to protect human health and the environment.[244] Within the EU legal framework in the context of mining, air pollution is mainly considered via EIA and through compliance with horizontal air-quality and emission frameworks,[i] rather than through dedicated mining legislation. Additionally, the *EU Industrial Emissions Directive (Directive 2010/75/EU)* regulates emissions from large industrial installations, including certain mining and mineral processing activities[ii], through permits and Best Available Techniques (BAT), which also provide numeric emission limits.[iii]

EU legislation provides a solid baseline for regulating point-source emissions but is less robust in addressing diffuse, indirect, cumulative, and community-level air impacts from mining. The IRMA standard, by contrast, translates environmental protection objectives into operational, mine-specific expectations covering prevention, monitoring, mitigation, and rehabilitation.[245] This comparison highlights that, while EU law establishes important minimum requirements, it does not consistently reach the level of detail and lifecycle coverage required to ensure best practice air protection in the mining sector.

Soil Pollution in Mining

Soils are a key environmental protection concern in mining, as they can store, transmit, or release pollutants and are therefore directly linked to water quality, ecosystem functions, and human health. Heavy metals such as cadmium, mercury, lead, chromium, or antimony can accumulate in soils, become mobilized, and enter the human body via different pathways. Whether local exposure and risks exist varies depending on the mining site. The degree of hazard of these substances depends on concentration, bioavailability, pH value, soil texture, and existing background contamination. In mining regions, natural baseline levels are sometimes elevated, which makes the derivation of measures complex and requires site-specific assessments.[246]

At the EU level, the new *EU Directive on Soil Monitoring and Resilience (2025/2360)* was adopted in October 2025. For the first time, it establishes a binding framework for the monitoring, comparison, and assessment of soils. The directive must be transposed by the Member States within three years and aims to

i These are are cross-sectoral regulations for air pollution and emission control. They apply horizontally, i.e. to all industry sectors, and are not specific to mining.

ii Notable mining activities that fall under the IED are ore roasting/sintering, smelting/refining, and metallurgical processing.

iii For example: For the issue of dust/particulate matter in non-ferrous metals processing the defined BAT are bag filters for channelled dust sources in several steps and the BAT-associated emission level cannot exceed the average of ≤ 5 mg/Nm³ over the sampling period (European Union, 2016).



Disastrous management of nickel ore awaiting transport to China. Here in Santa Cruz, Zambales, Philippines, the storage areas are not adequately protected against wind or groundwater contamination. Photo: Michael Reckordt

achieve healthy soils[i] across the EU by 2050. Core elements include EU-wide standardized methodologies, monitoring networks, and the obligation for regular reporting. However, it is explicitly a monitoring directive without uniform numerical limit values. Assessment remains with the Member States, which apply a risk-based system and define trigger values themselves.[247]

Since soils are extremely heterogeneous and natural background concentrations of metals and other substances vary greatly depending on geology, soil type, land use, climate, and hydrology, and potential pollutant mobility is also site-specific (i.e., identical concentrations do not imply the same risk everywhere), it is contentious whether uniform limit values, for example at the EU level, would considered plausible.[248] For example, IRMA does not set limit values for soils and sediments either.

Mine Waste Management

Improper management of mine waste represents a significant environmental and safety risk in the mining sector. In particular, water contamination and the failure of mine waste storage facilities, especially tailings dams, can cause far-reaching, often irreversible damage and therefore require strict regulation, monitoring, and risk management.

Typically, a large portion of the extracted material remains permanently as waste at a mining site. This waste primarily occurs in two forms: as waste from ore processing (e.g. tailings), and as overburden waste rock and ore rejects that are removed during mining, but not further processed. These materials may contain sulfide- and other metal-bearing minerals, process chemicals plus their degradation and reaction products, as well as residues from explosives. Where contaminated mine water or process water requires treatment, highly contaminated sludges are generated that also require disposal. These mining wastes have the potential to contaminate water, air, and soils. Large volumes of waste are often stored behind dams or in retention basins. Failure of these structures can endanger people, ecosystems, infrastructure, and entire regions. In particular, tailings storage facilities have repeatedly failed, releasing large quantities of often toxic waste.[249]

In the EU, the management of mine waste is primarily regulated under the EU Extractive Waste Directive (EWD) from 2006. While there have been several amendments since then, the directive has not been comprehensively updated.[250]

In their report *Driving best practice in mining waste management*[251] published at the end of 2025, Earthworks and Transport & Environment (T&E) compared EU regulations on mining

i Accordingly, healthy soils are soils that fulfill ecological functions, are resilient to stress and pose no risks to humans, the environment or the climate.

Table 3: A Comparison of Mining Waste Legislation (T&E, 2025)

Safety First Guideline	EU	US	Montana	Brazil	Indonesia	China	South Africa
Ban upstream dams at new mines	✗	✗	✗	✓	✗	Limited	✗
Mandate Best Available Technology	✗	✗	Some	✗	✗	✗	✗
Require Adaptive Management Plans (AMP) for monitoring tailings	✗	✗	Most	✓	✗	Some	✗
Require an Independent Tailings Review Board (ITRB)	✗	✗	✓	Most	Some	✗	✗
Make information publicly available	EIA only	✗	Some	Most	✗	EIA only	✗
Ban new tailings facilities where inhabited areas are in the path of a failure	✗	✗	Limited	✓	✗	✓	✗

Source: Consultant analysis of legislation governing mining waste on behalf of T&E.
Original table: https://www.transportenvironment.org/articles/driving-best-practice-in-mining-waste-management

waste and tailings with those in other world regions and with *Safety First: Guidelines for Responsible Tailings Management*,[i] which are promoted as best practice by Earthworks and partner organizations, among others, and supported by numerous scientists, civil society organizations, and Indigenous communities. The study concludes that EU regulations on mining waste and tailings are outdated and do not represent global best practice.[ii] In some respects, they are even weaker than regulations in other regions, such as Brazil[iii] and China (see Figure x). Although the EWD sets out general requirements for the management of waste from the extractive industries, it has significant shortcomings. These include the fact that it does not ban upstream tailings dam constructions for new or proposed facilities. In addition, it is noted that the document with the Best Available Techniques (BAT) to which the EWD refers needs to be updated. Further shortcomings are described in detail in the section on *Global Benchmarking of Mining Waste Rules – EU* of the T&E study.[252]

Accordingly, adjustments at the EU level are needed, including a transformation of the EWD into a regulation in order to ensure harmonized implementation across all Member States. This is also reflected in T&E's 2025 position on the proposed *EU Circular Economy Act*, which further calls for the EWD to be aligned as far as possible with the *Safety First* guidelines, including stricter requirements for safe mine closure and independent oversight.[253]

In its original 2018 version v1.0, the IRMA standard addressed only waste and materials management. In the currently ongoing development of IRMA v2.0, however, an additional chapter on tailings and mine waste storage management could be included. Among other references, this chapter's draft refers to the *Safety First* guidelines V2.0 (2022). Overall, it sets out comprehensive requirements, although only a limited number of these are critical requirements which must be complied with in order for a mine to be able to obtain an IRMA achievement status at all.[254]

i Safety First is a set of protective guidelines for the management of tailings storage facilities, developed in response to the globally increasing number of tailings dam failures and aimed at minimizing negative impacts on communities, human rights, and the environment, and supported by many scientists, organizations, Indigenous communities, and Tribal Nations (Earthworks, 2022; T&E, 2025).

ii Similarly, in 2021, expert Dr. Steven Emerman stated during his testimony to the European Parliament Public Hearing on Environmental and Social Impacts of Mining in the EU that the EU is failing to live up to its own narrative of "highest environmental and social standards worldwide" with regard to tailings management (Yes to Life No to Mining network, 2021).

iii In T&E's comparison, Brazil is the only country to ban upstream dams. It also has particularly strict regulations regarding monitoring requirements and the distance that a tailings facility must be located from a populated area.

Recommendations to Policy Makers[i]



Polluted landscape of the Rio Tinto River with contaminated water in Huelva, Spain.
Photo: Diogo Pereira and Sanja Vrzic, iStock

Participation

1. Recognize Rights-Holders, Enable Safe Participation, and Protect Defenders

Recognize the legal standing and human rights of affected local communities and Indigenous Peoples and understand them as "rights-holders," differentiating them from broader stakeholders. Establish proactive measures to identify and support Indigenous Peoples, ethnic groups, women, youth, and economically disadvantaged communities through free technical and legal assistance, interpreters, and culturally and linguistically accessible procedures. Guarantee substantive Aarhus rights by requiring decision-makers to demonstrate how public input influenced outcomes through publishing influence logs. Guarantee that environmental defenders, affected community members, and civil society organizations can engage in decision-making on mining free from violence, threats, intimidation, and restriction.

2. Guarantee Access to Information in Usable Formats

Publish all relevant information: studies, raw data, Environmental and Social Impact Assessments, financial and benefit-sharing agreements, corporate compliance records, and project documents in open, machine-readable formats. Provide plain-language summaries translated into all local languages spoken by affected communities. Fund independent expert support and capacity-building to ensure communities have the technical knowledge to interpret complex technical data and engage effectively in decision-making.

3. Mandate Early and Iterative Engagement with Adequate Time

Require engagement from exploration and prospecting phases onward, not merely upon approval. Mandate iterative consultation rounds at each project stage to ensure communities can shape developments as they evolve. Extend consultation periods beyond regulatory minimums when documents are voluminous or technically complex and pause procedural clocks when new material is added to allow meaningful review.

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i These recommendations draw largely on those of international human rights institutions and prominent international and European civil society organizations and coalitions, including (among others) members of the EU Raw Materials Coalition.

Environmental & Social Impact Assessment (ESIA)

4. Require Comprehensive and Independently Verified Assessment

Require full ESIA for all CRMA-related extraction and processing, eliminating exemptions through standards shortcuts or streamlined procedures. Make Social Impact Assessment and Human Rights Impact Assessment mandatory components, including cumulative and transboundary impacts, assessment of alternatives, and comprehensive closure planning. Require third-party verification of ESIA data inputs and conclusions with published reviewers' credentials and conflict-of-interest statements.

5. Align Standards and Prohibit Fast-Track Compromises

Incorporate baseline monitoring, cumulative impact analysis, and include alternatives assessment such as IRMA to follow stronger criteria than legislation alone. Prohibit shortened assessment timelines that undermine analysis quality or participation opportunities. Ensure that parallel procedures for transboundary cases comply with international obligations.

Community Support & Benefits

6. Embed Binding Consent Rights into Law and Permits

For projects affecting Indigenous Peoples, make Free, Prior and Informed Consent (FPIC) a legal prerequisite and a non-negotiable right that includes the right to refuse such consent. Tie permit validity to ongoing consent throughout the project lifecycle, allowing communities to withdraw consent. Require operators to implement corrective action plans in order to avoid suspension of operations.

7. Guarantee the Right to Say No

Affected communities must have a binding Right to Say No to any mining project that endangers their well-being or risks ecological harm, with such decisions halting permitting and investment. Vague "social license to operate" narratives must be replaced by legal guarantees of community veto rights, backed by protections against coercion, retaliation, and displacement. Institutionalize multi-stakeholder/rights-holder platforms with shared decision-making authorities, including representatives from affected communities and independent experts.

8. Ensure Fair Benefit-Sharing and Value Addition

Require public disclosure of contracts, taxes, and royalties. Mandate community-negotiated benefit agreements with independent monitoring mechanisms and accessible grievance procedures. Broaden "value addition" beyond economic measures to include protection of cultural heritage, traditional livelihoods, and ecosystem services, and require commitments to local employment, supplier development, skills transfer, and post-mine economic diversification strategies.

Access to Justice & Remedy

9. Remove Legal Barriers and Strengthen Accountability

Guarantee broad legal standing for NGOs and community organizations to challenge mining decisions and corporate conduct without proving individual harm. Ensure that communities and civil society can effectively exercise their right to a fair and equitable trial by limiting or eliminating adverse-cost risks (fee-shifting) in public-interest litigation, removing financial barriers that would otherwise prevent access to courts. Create or empower environmental ombudspersons and independent complaint mechanisms with investigatory powers to provide accessible pathways to remedy.

10. Make Due Diligence Enforceable with Fair Procedures

Impose civil liability for supply chain harms across all project sizes. Shift evidentiary burdens so that companies must prove compliance rather than communities proving violations. Establish realistic litigation timeframes that allow proper case preparation. Make legal aid available for communities challenging mining decisions and avoid summary proceedings that override due process protections.

Mine Closure & Rehabilitation

11. Plan Closure from Day One with Community Oversight

Require draft closure and post-closure plans at the exploration stage, which must be updated and subject to public consultation at each subsequent stage. Establish multi-stakeholder bodies that include community representatives in reviewing and validating closure plans. Ensure long-term closure obligations are not diluted by the designation as Strategic Project or fast-track procedures.

12. Secure Credible Financial Assurance and Insurance and Progressive Rehabilitation

Ban self-guarantees and parent company guarantees. Require third-party-backed surety instruments based on independent cost estimates reviewed together with the communities affected. Mandate progressive rehabilitation with concurrent restoration activities throughout the operational phase. Maximum backfilling of open pits, underground galleries, and other excavations must be the default requirement. Any deviation from full backfilling may only be permitted if evidence demonstrates that alternative waste storage would result in significantly lower risks of groundwater contamination and long-term environmental harm.

13. Resource Long-Term Accountability and Address Legacy Sites

Adequately fund inspectorates to conduct audits, certify completion, and enforce long-term monitoring requirements. Define operators' after-closure responsibilities for the duration of the environmental hazard, potentially spanning decades or centuries. Establish a fund, at a national or EU-level, for addressing abandoned and orphaned mines and to remediate sites lacking responsible operators, with community oversight built into governance structures.

Protection Against Potential dverse Environmental Impacts from Mining

14. Consider Shortcomings in the Protection of Drinking and Surface Water as Opportunities and Follow the Example of Countries with Stricter Limits

Although the drinking water and surface water limits are relatively strict for substances that are regulated uniformly at EU level, the EU needs to acknowledge that the claim of setting the highest standards surrounding mining is not accurate and there is potential for improvement. The EU must instead examine where the harmonization of limits would be valuable, which substances should generally be included in the lists of substances to be monitored, and where limits need to be stricter.

15. Include Voices of the Public and Civil Society Organizations and Prevent Deregulation

The existing limit values must not be weakened when the WFD is opened. Instead of bowing to pressure from the industry, the EU must listen to the public and civil society organizations that repeatedly raise their voices against the weakening of environmental laws. The CRMA should not undermine the prohibition of deterioration, and the WFD must be given clear priority over the acceleration of industrial and raw materials policies.

16. Strengthen Public Participation in Connection with Environmental Protection and Monitoring

Recognize the need for systematic and comprehensive integration of water impacts into EIAs, including cumulative effects, long-term consequences, and risks to drinking water and ecosystems. Water-related information (e.g., on pollution, risks, monitoring data) must be accessible at an early stage, in a complete and comprehensible form, and free of charge. Similar considerations apply to air and soil. Here too, cumulative air impacts should be included in EIAs. Overall, a stronger integration across environmental media, ensuring that EIAs systematically assess cumulative impacts on water, waste, air, and soil rather than treating them in isolation, is necessary.

17. Improve Mine Waste Management

The EU should update its Extractive Waste Directive in order to represent global best practice and transform it into a regulation in order to ensure harmonized implementation across all Member States. The EWD should be fully aligned with the *Safety First* guidelines, including stricter requirements for safe mine closure and independent oversight.

Picture Credits and Sources

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Drone footage of mining activities in Minas de Riotinto, Spain.
https://www.istockphoto.com/de/foto/drohnenaufnahme-der-bergbauaktivitäten-in-minas-de-riotinto-in-spanien-verschmutzter-gm1441143477-480920362
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"Amazon 11", https://flic.kr/p/9AwBiW, Photo: Neil Palmer, Alliance of Bioversity International and CIAT, Flickr, CC BY-SA 2.0,

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Annex

Comparison Tables of Aspects of Transparency, Participation, and Accountability

The overall ratings in the tables were produced through a consistent aggregation method. For each assessment area (each row), the table compares the country's legal and procedural compliance/alignment[i] against three reference frameworks: the **Aarhus Convention**, the **IRMA Standard**, and the **Escazú Agreement**. For each framework, the table assigns a qualitative judgement (e.g., *Compliant / Partially Compliant / Not Compliant* for Aarhus; *Aligned / Partially Aligned / Not Aligned* for IRMA and Escazú).

These qualitative judgements are then converted into a **numeric score** on a shared 0–2 scale. The three scores are added to obtain a **total score** (0–6). That total score is then translated into the table's **Framework – Status** (the overall rating) using fixed thresholds. This is what ensures that identical patterns of alignment (e.g., "partially" in one framework and "not" in two others) always generate the same overall rating across all country tables.

Benchmark ratings in the columns

Aarhus Convention – Assessment:
COMPLIANT = 2 points
(meets Aarhus baseline requirements in law and, in general, in practice)
PARTIALLY COMPLIANT = 1 point
(some Aarhus elements exist, but material gaps/weak implementation)
NOT COMPLIANT = 0 points
(fails Aarhus baseline or systematic practice failures)

IRMA Standard / Escazú Agreement – Assessment:
ALIGNED = 2 points (national framework aligns with the higher-standard benchmark)
PARTIALLY ALIGNED = 1 point (partial alignment, but significant gaps remain)
NOT ALIGNED = 0 points (key requirements absent / not operationalized)

Framework – Status
(overall rating per assessment area)
Framework – Status is derived from a simple composite score:
Total score = Aarhus (0–2) + IRMA (0–2) + Escazú (0–2) → range 0–6

Mapping from total score to Framework – Status:
0–2 points → Major Gaps
3–4 points → Partial Compliance/ Alignment
5–6 points → Strong Compliance/ Alignment
(not used in current country tables unless reached)

Note: The narrative text in each cell explains the qualitative reasons behind the rating (laws on paper and practice/case evidence).

i **"Compliance"** (Aarhus) is used because Aarhus is treated as the applicable binding legal baseline for the countries assessed. The question is whether national law and practice comply with these obligations. **"Alignment"** (IRMA / Escazú) is used because these are applied as reference/benchmark frameworks rather than directly applicable legal obligations in this context (IRMA is a voluntary standard; Escazú is used as a comparative good-practice benchmark). The question is therefore how far the national framework aligns with these higher-standard expectations.

Table 4: Benchmarking of Various Aspects of Transparency, Participation, and Accountability in Germany against the Aarhus Convention, the IRMA Standard, and the Escazú Agreement.

Assessment Area	Germany Framework - Status	Germany Framework - Description	Germany Framework - Key Gaps	Case Study: Zinnwald Lithium Project	Aarhus Convention - Assessment	IRMA Standard - Assessment	Escazú Agreement - Assessment	Gap Analysis - Priority Level
Public Participation, Meaningful Engagement, and Right to Say No	**Major Gaps**	Federal Mining Act (BBergG), Environmental Impact Assessment Act (UVPG), Federal Nature Conservation Act. Aarhus Convention compliance. No binding Right to Say No mechanism.	Late-stage participation after key decisions made; No community veto power or Right to Say No; Limited early engagement; Invitation-only meetings exclude broader public; Weak enforcement of participation rights	Community engagement limited to invitation-only meetings. Project scope changes outpaced environmental review updates. Overwhelming community opposition expressed through surveys and citizen initiatives, yet project continues to advance without binding community consent or Right to Say No.	PARTIALLY COMPLIANT: Germany is party to Aarhus and meets minimum procedural requirements for participation and information access. However, late-stage participation and invitation-only meetings undermine meaningful engagement. No community veto mechanism as Aarhus does not require binding consent. Zinnwald demonstrates procedural compliance without substantive influence.	NOT ALIGNED: No continuous dialogue mechanisms beyond formal procedures. No independent grievance systems. Late-stage participation contradicts early engagement requirements. Invitation-only meetings do not align with inclusive participation standards. Zinnwald demonstrates systematic gaps in meaningful engagement.	NOT ALIGNED: Germany does not align with Escazú enhanced participation and defender protection requirements. No environmental defender protection framework. Late participation contradicts early engagement provisions. Invitation-only meetings do not align with broad accessibility standards. No community consent mechanism. Zinnwald demonstrates gaps in meaningful participation protection.	**HIGH: Fundamental reform needed to implement binding Right to Say No and early engagement**
Environmental and Social Impact Assessment (ESIA)	**Partial Compliance/ Alignment**	UVPG transposes EU EIA Directive (2011/92/EU). Comprehensive assessment required for major mining projects. Transboundary assessment gaps. Poor cumulative impact analysis.	Limited cumulative assessment across projects; Weak social and health impact focus; Inadequate transboundary procedures (Zinnwald-Czech border); Outdated scoping when project scope changes; No strategic assessment at regional level	Enlarged project scope not matched by updated ESIA scoping. No proper assessment of cumulative impacts with adjacent Czech mining project. Transboundary assessment between Germany-Czech inadequate despite interconnected ore bodies. 10 protected Natura 2000 areas threatened but impacts inadequately assessed.	PARTIALLY COMPLIANT: Germany meets formal EIA requirements through UVPG implementation. However, cumulative impact assessment inadequate despite Convention requirements. Transboundary procedures insufficient as demonstrated by Zinnwald-Czech case. Strategic assessment at regional level absent.	PARTIALLY ALIGNED: Germany meets basic ESIA requirements but does not fully align with IRMA standards. No mandatory strategic or cumulative impact assessment at regional scale. No independent expert verification requirement. Transboundary assessment gaps (Zinnwald-Czech) contradict comprehensive assessment standards. Social and health impacts inadequately integrated.	PARTIALLY ALIGNED: Germany meets basic EIA requirements but does not fully align with Escazú comprehensive assessment standards. Cumulative impact assessment gaps contradict thorough assessment requirements. Health impact focus inadequate. Transboundary procedures insufficient. Strategic regional assessment absent contrary to comprehensive protection principles.	**MEDIUM: Strengthen cumulative and strategic assessment; ECJ cases show inadequacies**
Obtaining Community Support and Delivering Local Benefit	**Major Gaps**	Consultation required under BBergG and UVPG but not binding. No benefit-sharing requirements. Compulsory purchase powers available for mining projects.	No consent requirement despite community opposition; Limited guaranteed local economic benefits; Override of community opposition possible; No mechanism for community Right to Say No	Overwhelming majority of residents oppose project in public surveys. Company promises of local employment and economic benefits remain non-binding. Community concerns about water resources, property values, and tourism economy unaddressed. No benefit-sharing agreements despite project advancement.	COMPLIANT: Germany provides consultation mechanisms required by Aarhus. However, systematic override of community opposition through compulsory purchase powers exceeds normal balancing. Aarhus does not require binding consent or benefit-sharing, so Germany meets minimum obligations despite community concerns.	NOT ALIGNED: Germany completely fails to align with IRMA community support requirements. No proactive efforts to obtain demonstrated community support. No documented benefit-sharing agreements required. Compulsory purchase powers directly contradict anti-coercion provisions. Company promises non-binding contrary to IRMA accountability standards. Zinnwald community opposition ignored.	NOT ALIGNED: Germany fails to align with Escazú community benefit and territorial rights provisions. No binding benefit-sharing requirements. Compulsory purchase powers contradict community territorial protection. No accountability mechanisms for broken company promises. Community opposition systematically overridden contrary to community rights protection.	**HIGH: Establish binding consent mechanisms and benefit-sharing requirements**
Access to Justice and Remedy	**Partial Compliance/ Alignment**	Administrative and judicial review available through administrative courts. Standing requirements create barriers. Cost and procedural hurdles limit effective access.	Limited standing rights for communities; Cost barriers for public interest litigation; Narrow scope of judicial review (procedural vs substantive); Time delays favor project proponents; Impairment of rights principle limits broader interests	Community groups have taken legal action but outcomes favor project advancement. Administrative decisions prioritize technical compliance over community grievances. Time delays and procedural complexity favor project proponents. Limited scope for substantive review of project merits.	PARTIALLY COMPLIANT: Germany provides formal access to administrative and judicial review consistent with Aarhus Article 9. However, cost barriers and restrictive standing requirements limit effective access. Time delays favor project proponents. Narrow procedural review scope falls short of ensuring environmental protection.	PARTIALLY ALIGNED: Germany provides formal court access but does not fully align with IRMA remedy standards. No independent complaint mechanisms outside courts. Cost barriers contradict accessible remedy requirements. Narrow procedural review scope does not align with substantive protection standards. Time delays favor proponents contrary to timely remedy principles.	PARTIALLY ALIGNED: Germany provides formal court access but does not fully align with Escazú expanded justice provisions. No environmental defender protection framework. Cost barriers contradict accessible justice requirements. Standing restrictions do not align with broad access provisions. Information barriers limit effective remedy contrary to Escazú transparency standards.	**HIGH: Remove barriers and establish independent mechanisms; cost protection needed**
Mine Closure and Rehabilitation Guarantees	**Partial Compliance/ Alignment**	BBergG requires closure planning and financial guarantees. Extractive Waste Directive (2006/21/EC) mandates financial security. Chronic underfunding issues documented.	Inadequate funding of guarantees creating long-term public liabilities; Limited community involvement in closure planning; Weak independent oversight of closure activities; Long-term liability arrangements unclear; Legacy environmental issues from past mining	Risk assessment and ecological restoration planning weakly enforced. Legacy pollution concerns in Zinnwald region. ECJ rulings against Germany for Natura 2000 conservation failures reinforce concerns. Underfunded closure measures create long-term public liability risks.	PARTIALLY COMPLIANT: Germany has formal restoration and closure requirements under BBergG. However, chronic underfunding of guarantees creates public liabilities. Limited community involvement in closure planning falls short of Aarhus participatory principles for ongoing environmental decisions.	PARTIALLY ALIGNED: Germany has formal closure requirements but does not fully align with IRMA standards. Chronic underfunding contradicts adequate guarantee requirements. No transparent, independently managed closure funds. Limited community oversight contrary to IRMA participatory closure planning. Long-term liability arrangements unclear.	PARTIALLY ALIGNED: Germany has formal closure requirements but does not align fully with Escazú comprehensive protection standards. No community oversight boards. Underfunding contradicts long-term protection requirements. Limited community involvement in closure decisions. Legacy issues unresolved contrary to comprehensive accountability.	**HIGH: Ensure adequate funding and community control; address systematic underfunding**

Table 5: Benchmarking of Various Aspects of Transparency, Participation, and Accountability in Spain against the Aarhus Convention, the IRMA Standard, and the Escazú Agreement.

Assessment Area	Spain Framework - Status	Spain Framework - Description	Spain Framework - Key Gaps	Case Study: Mina Doade Lithium Project	Aarhus Convention - Assessment	IRMA Standard - Assessment	Escazú Agreement - Assessment	Gap Analysis - Priority Level
Public Participation, Meaningful Engagement, and Right to Say No	**Major Gaps**	Mining Law 22/1973 (Franco-era) & EIA Law Ley 21/2013 provide formal hearings. No Right to Say No mechanism. Project splitting common to avoid EIA requirements.	Late consultation after key decisions; Project fragmentation to avoid assessment; Information restrictions; COVID-19 suppression of community meetings; Guardia Civil deployed against opposition	Community assemblies unanimously rejected project. Project artificially fragmented (6 sites) but only 1 presented to avoid comprehensive EIA. Company described activities as "scientific research" rather than mining permit preparation. COVID-19 restrictions used to suppress opposition meetings; Guardia Civil deployed to break up gatherings.	NOT COMPLIANT: Spain is party to Aarhus but systematically fails requirements. Project splitting used to avoid comprehensive assessment and participation. Information systematically restricted despite Convention obligations. COVID measures weaponized to suppress participation. Implementation gaps documented in Doade case.	NOT ALIGNED: No continuous dialogue mechanisms. No independent grievance systems. Guardia Civil deployment and COVID suppression directly contradict anti-coercion provisions. Project splitting contradicts transparency requirements. Doade demonstrates systematic failure across all IRMA participation standards.	NOT ALIGNED: Spain completely fails to align with Escazú defender protection requirements. Guardia Civil deployment and surveillance directly contradict anti-intimidation provisions. COVID restrictions weaponized contradicts participation protection. Information restrictions do not align with enhanced transparency requirements. Project splitting contradicts meaningful participation standards. Community assembly override does not align with community consent provisions.	**HIGH: Franco-era Mining Law 22/1973 incompatible with democratic participation**
Environmental and Social Impact Assessment (ESIA)	**Major Gaps**	EIA Directive implementation through regional variation. Project splitting systematically used. ECJ found cumulative assessment failures (C-404/09). Weak transboundary procedures.	Systematic project splitting (ECJ C-404/09 ruling); Inadequate cumulative assessment; Weak social/health impact focus; Poor transboundary coordination; Regional regulatory heterogeneity	Company sought EIA exemption despite acid mine drainage, radioactive minerals, proximity to homes. No assessment of cumulative impacts from wider 6-mine project. Biodiversity threats to protected habitats inadequately assessed. Expert Steven Emerman called approach "technically impossible."	PARTIALLY COMPLIANT: Spain meets formal EIA requirements but systematic project splitting undermines substance. ECJ ruling (C-404/09) found Spain failed cumulative assessment obligations. Regional heterogeneity creates inconsistent implementation. Initial exemption attempts violate Convention principles.	NOT ALIGNED: Spain does not align with IRMA requirements for strategic and cumulative ESIA. Project splitting directly contradicts IRMA prohibitions on fragmentation. ECJ ruling confirms systematic failures. No independent expert verification mandate. Regional heterogeneity contradicts consistent standards requirement. Expert "technical impossibility" determination ignored contrary to IRMA precautionary principles.	NOT ALIGNED: Spain does not align with Escazú mandatory thorough ESIA requirements. Project splitting contradicts no-exemptions principle and comprehensive assessment standards. ECJ ruling confirms systematic violations. Health impacts inadequately assessed. Regional heterogeneity contradicts consistent protection standards. Cumulative impacts systematically ignored contradicts comprehensive assessment requirements.	**HIGH: Project splitting systematic despite ECJ ruling (C-404/09); illegal practice continues**
Obtaining Community Support and Delivering Local Benefit	**Major Gaps**	Consultation required but not binding. No benefit-sharing requirements. Temporary occupation orders (similar to expropriation) available to override community opposition.	No consent requirement; Override of community opposition via temporary occupation; Limited local economic benefits; Social engineering campaigns documented; Propaganda in schools targeting children	Community land assembly (ancestral tenure) unanimously opposed but overridden. Temporary occupation procedures (expropriation) attempted when voluntary access denied. Pro-mining propaganda distributed in local schools. Surveillance activities compiling names/addresses of opponents. False flag operations suspected.	PARTIALLY COMPLIANT: Spain provides consultation mechanisms but systematic override through temporary occupation exceeds normal balancing. Ancestral land assembly decisions ignored suggests procedural participation is rendered meaningless. No binding consent as Aarhus does not require this.	NOT ALIGNED: Spain completely fails to align with IRMA community support requirements. Ancestral land assembly decisions overridden contradicts consent principles. No documented benefit-sharing agreements. Temporary occupation use does not align with anti-coercion provisions. Social engineering campaigns and school propaganda directly contradict IRMA good faith engagement requirements.	NOT ALIGNED: Spain fails to align with Escazú community benefit and accountability provisions. Ancestral land tenure systems systematically overridden contradicts traditional governance protection. No binding benefit-sharing does not align with explicit benefit provisions. Social engineering and school propaganda contradict good faith engagement principles. Temporary occupation contradicts community territorial rights protection.	**HIGH: Ancestral land rights and community assembly decisions systematically violated**
Access to Justice and Remedy	**Major Gaps**	Administrative and judicial review available through multi-authorization system. Systematic information access restrictions documented. Fast-tracked authorizations face procedural hurdles.	Systematic information denial; Complex multi-authorization procedures; COVID restrictions weaponized against opposition; Limited standing rights; Surveillance of community activists	Environmental NGOs initially denied participation in administrative procedures. Authorities attempted to prevent NGO legal aid intervention. COVID pandemic measures used to limit community meetings. Surveillance and intimidation of local leaders documented. Information access systematically restricted.	NOT COMPLIANT: Spain provides formal access to courts but multi-authorization complexity and information restrictions undermine effective justice. COVID restrictions weaponized against legal organizing. Surveillance of activists demonstrates systematic violations. Standing requirements restrictive.	NOT ALIGNED: Spain does not align with IRMA access to remedy requirements. No independent complaint mechanisms. Information access systematically restricted contrary to transparency requirements. Surveillance of activists contradicts defender protection provisions. Multi-authorization complexity creates barriers. Doade demonstrates complete absence of effective remedy systems required by IRMA.	NOT ALIGNED: Spain comprehensively fails to align with Escazú access to justice requirements. Surveillance and intimidation of activists directly contradict defender protection framework. COVID restrictions weaponized contradicts access protection. Information restrictions do not align with expanded transparency provisions. Multi-authorization complexity creates systematic barriers contrary to Escazú accessibility standards.	**HIGH: Environmental defender persecution documented; COVID weaponization; surveillance activities**
Mine Closure and Rehabilitation Guarantees	**Major Gaps**	Mining Law 22/1973 requires closure planning and financial guarantees. EU General Court case T-257/18 (Iberpotash) found inadequate guarantees constituting illegal state aid.	Chronic underfunding of guarantees; Iberpotash illegal state aid case (T-257/18) demonstrates systematic failures; Limited community involvement; Legacy environmental issues unresolved	Misleading reserve claims (17.4 Mt refers to all 6 deposits; Doade site only 3.4 Mt). Marginal ore grades (1.2% Li2O) undermine viability. Presence of radioactive materials and acid-generating sulfurs creates contamination risks. No adequate long-term remediation plans.	PARTIALLY COMPLIANT: Spain has formal restoration requirements but Iberpotash case (T-257/18) demonstrates systematic underfunding constituting illegal state aid. Limited community involvement in closure planning falls short of Aarhus participatory principles.	NOT ALIGNED: Spain fails to align with IRMA closure standards comprehensively. Iberpotash case demonstrates systematic underfunding contrary to adequate guarantee requirements. No transparent closure fund management. No independent verification. No community oversight despite IRMA requirements. Legacy contamination issues unresolved contradict accountability principles.	NOT ALIGNED: Spain does not align with Escazú community oversight and comprehensive protection requirements. No community oversight boards despite requirement. Iberpotash illegal state aid finding demonstrates accountability failures. Legacy contamination issues unresolved contradicts comprehensive protection. Technical expert rejection ignored contradicts precautionary approach required by Escazú.	**HIGH: EU Court found illegal state aid (Iberpotash T-257/18) due to inadequate guarantees**

Table 6: Benchmarking of Various Aspects of Transparency, Participation, and Accountability in Portugal against the Aarhus Convention, the IRMA Standard, and the Escazú Agreement.

Assessment Area	Portugal Framework - Status	Portugal Framework - Description	Portugal Framework - Key Gaps	Case Study: Mina do Barroso (UNESCO GIAHS Site)	Aarhus Convention - Assessment	IRMA Standard - Assessment	Escazú Agreement - Assessment	Gap Analysis - Priority Level
Public Participation, Meaningful Engagement, and Right to Say No	**Major Gaps**	Mining Code & EIA Decree-Law 151-B/2013 provide consultation mechanisms. No Right to Say No. UN Aarhus Convention Compliance Committee opened formal proceedings in 2024 for systematic violations.	Systematic information restrictions despite CADA orders; Only 10 working days to review 1,776 documents; CADA orders ignored by environmental authorities (APA); Galician Foundation Montescola requests denied	Assembly of Baldios (representing all Covas residents) unanimously voted against project and for legal action. Galician Foundation requested documents in Jan 2021 but APA ignored request. When CADA ordered disclosure, APA released for public consultation instead of direct access (strategic control). Only 10 working days given to review 1,776 documents despite EU Directive requiring 30 days minimum.	NOT COMPLIANT: Portugal is party to Aarhus but systematically fails to meet requirements. UN Compliance Committee opened formal proceedings 2024 for information access violations. CADA orders systematically ignored. Consultation periods inadequate (10 vs 30 days required).	NOT ALIGNED: No continuous dialogue mechanisms. No independent grievance systems. SLAPP litigation directly contradicts anti-coercion provisions. Information restrictions do not align with transparency requirements. Barroso demonstrates systematic failure across all IRMA participation standards.	NOT ALIGNED: Portugal completely fails to align with Escazú defender protection requirements. SLAPP litigation against community leaders contradicts anti-intimidation provisions. Surveillance activities documented. Information restrictions do not align with enhanced transparency requirements. Consultation period (10 days) contradicts meaningful participation standards. Assembly of Baldios override does not align with community Right to Escazú community consent provisions	**HIGH: UN Aarhus Convention Compliance Committee proceedings opened 2024 for systematic violations**
Environmental and Social Impact Assessment (ESIA)	**Major Gaps**	EIA required but initial exemption attempted for Barroso project. Inadequate cumulative assessment. Independent expert Dr. Steven Emerman warned of catastrophic failure risks for tailings facilities.	Initial EIA avoidance attempts despite acid drainage and radioactive minerals; Weak cumulative impact analysis; UNESCO GIAHS impacts ignored; Water assessment failures (600,000 m^3 annual requirements)	Project attempted EIA exemption initially despite involving acid mine drainage, radioactive minerals, proximity to homes. Expert Dr. Emerman concluded tailings design "highly experimental" with "catastrophic failure" potential affecting entire Douro basin. UNESCO GIAHS designation (1 of 11 in Europe, only in Portugal) threatened. Freshwater Pearl Mussel and Iberian wolf habitats inadequately assessed.	PARTIALLY COMPLIANT: Portugal meets formal EIA requirements but implementation fails substantive standards. Initial exemption attempts undermine Convention principles. Cumulative assessment inadequate despite Convention requirements.	NOT ALIGNED: Portugal does not align with IRMA requirements for strategic and cumulative ESIA. No independent expert verification mandate. Initial exemption attempts contradict IRMA prohibitions. UNESCO GIAHS impacts inadequately assessed despite cultural heritage protection requirements. Expert warning of "catastrophic failure" demonstrates inadequate technical review contrary to IRMA standards.	NOT ALIGNED: Portugal does not align with Escazú mandatory thorough ESIA requirements. Initial exemption attempts contradict no-exemptions principle. UNESCO GIAHS designation threatened contradicts cultural heritage protection provisions. Health impacts inadequately assessed. Public review constrained (10 days) does not align with broad transparency requirements. Cumulative impacts ignored contradicts comprehensive assessment standards.	**HIGH: UNESCO GIAHS designation threatened; Expert warned of "catastrophic failure"**
Obtaining Community Support and Delivering Local Benefit	**Major Gaps**	No binding consent required. Administrative easement procedures override Assembly of Baldios (community land assembly) unanimous decisions. No binding benefit-sharing requirements.	Override of Assembly of Baldios unanimous rejection; Administrative easement powers used when voluntary access denied; SLAPP lawsuits against local leaders; Social engineering campaigns using BP Deepwater consultants	Barroso recognized by UN-FAO as Globally Important Agricultural Heritage System - agro-ecosystem with intricate community-territory relationship. Assembly of Baldios unanimous opposition overridden by administrative easement procedures. Company contracted "de-escalation consultants" from BP Deepwater Horizon and Mozambique gas projects (human rights abuses). SLAPP lawsuits pressing criminal charges against local leaders.	PARTIALLY COMPLIANT: Portugal provides consultation mechanisms but no binding consent as Aarhus does not require this. However, systematic override of community decisions exceeds normal balancing and suggests procedural participation is meaningless.	NOT ALIGNED: Portugal completely fails to align with IRMA community support requirements. Assembly of Baldios rejection overridden contradicts consent principles. No documented benefit-sharing agreements. Administrative easement use does not align with anti-coercion provisions. Social engineering campaigns directly contradict IRMA good faith engagement requirements. UNESCO GIAHS violation represents cultural heritage protection failure.	NOT ALIGNED: Portugal fails to align with Escazú community benefit and accountability provisions. UNESCO GIAHS violation demonstrates failure to protect traditional communities. Assembly of Baldios (traditional governance) systematically overridden contradicts territorial rights protection. No binding benefit-sharing does not align with explicit benefit provisions. SLAPP litigation contradicts defender protection framework. Social engineering contradicts good faith engagement principles.	**HIGH: Assembly of Baldios community land rights and UNESCO heritage systematically violated**
Access to Justice and Remedy	**Major Gaps**	Administrative and judicial review available. Systematic information restrictions despite Portuguese Commission for Access to Administrative Documents (CADA) orders. APA fined €30,000 for non-compliance.	CADA orders systematically ignored (€30,000 penalty imposed on APA); UN Aarhus compliance proceedings opened 2024; SLAPP litigation against communities; Four political parties called for project suspension	CADA issued definitive orders requiring APA to provide documents but APA repeatedly refused. September 2023: APA ordered to pay €30,000 for denying lawyers access to EIA documentation. Portuguese Public Prosecutor issued opinion in Feb 2024 recommending EIS annulment due to legal infringements, yet project continues. UN Aarhus Convention Compliance Committee opened formal proceedings 2024.	NOT COMPLIANT: Portugal provides formal access to courts but systematic information restrictions undermine effective justice access. CADA order defiance (€30,000 penalty insufficient) demonstrates fundamental violations. UN proceedings confirm systematic non-compliance.	NOT ALIGNED: Portugal does not align with IRMA access to remedy requirements. No independent complaint mechanisms. Information access systematically restricted contrary to transparency requirements. SLAPP litigation contradicts defender protection provisions. €30,000 penalty insufficient to ensure compliance. Barroso demonstrates complete absence of effective remedy systems required by IRMA.	NOT ALIGNED: Portugal comprehensively fails to align with Escazú access to justice requirements. SLAPP litigation contradicts anti-SLAPP framework provisions. Environmental defender persecution (criminal charges) contradicts protection obligations. CADA order defiance demonstrates absence of effective remedy. Information restrictions do not align with expanded access provisions. UN proceedings confirm systematic justice access failures contrary to Escazú standards.	**HIGH: International oversight required due to systematic CADA order defiance and access violations**
Mine Closure and Rehabilitation Guarantees	**Major Gaps**	Required closure plans under Mining Code. No published soil remediation regulations despite contamination risks. Chronic underfunding of financial guarantees documented.	No soil remediation safeguards published; Inadequate financial securities; Limited community involvement; Legacy mining issues unresolved; Acid-generating and radioactive materials risks unaddressed	Company has not completed Definitive Feasibility Study proving economic viability as of Oct 2024. Production repeatedly postponed. Similar Australian lithium projects with superior characteristics experienced major cuts during 2024. Expert Emerman described waste management as "technically impossible" and recommended rejection "without any further consideration." No published soil remediation regulations means no accountability safeguards.	PARTIALLY COMPLIANT: Portugal has formal restoration requirements but absence of soil remediation regulations creates accountability gaps. Limited community involvement in closure planning falls short of Aarhus participatory principles.	NOT ALIGNED: Portugal fails to align with IRMA closure standards comprehensively. No transparent closure fund management. No independent verification. No community oversight despite IRMA requirements. Absence of soil remediation regulations does not align with contamination accountability requirements. Technical impossibility determination (Emerman) ignored contrary to IRMA precautionary principles.	NOT ALIGNED: Portugal does not align with Escazú community oversight and comprehensive protection requirements. No community oversight boards despite requirement. UNESCO GIAHS restoration not incorporated as standard. Absence of soil remediation regulations contradicts contamination accountability. Technical expert rejection ignored contradicts precautionary approach. Long-term monitoring inadequate for traditional territory restoration requirements.	**HIGH: No soil remediation regulations despite radioactive and acid-generating materials contamination risks**

Table 7: Benchmarking of Various Aspects of Transparency, Participation, and Accountability in Sweden against the Aarhus Convention, the IRMA Standard, and the Escazú Agreement.

Assessment Area	Sweden Framework - Status	Sweden Framework - Description	Sweden Framework - Key Gaps	Case Study: LKAB ReeMAP Project (Sami Territory)	Aarhus Convention - Assessment	IRMA Standard - Assessment	Escazú Agreement - Assessment	Gap Analysis - Priority Level
Public Participation, Meaningful Engagement, and FPIC	**Major Gaps**	Minerals Act, Environmental Code, 2022 Consultation Law for Sami. No binding Right to Say No. ILO Convention 169 not ratified despite international pressure.	Sami communities have extremely limited influence on mining permits; 2022 Consultation Law has limited scope excluding Environmental Assessment Delegations; Resource constraints for meaningful participation; No binding consent requirements	LKAB ReeMAP rare earth element extraction in Kiruna proceeds despite Sami concerns. 2022 Consultation Law provides "more timely involvement" but limited scope and no binding consent. Resource constraints prevent meaningful Sami participation in growing consultation requests. Project advances without demonstrated Sami support or Right to Say No mechanism.	PARTIALLY COMPLIANT: Sweden is party to Aarhus and meets minimum procedural participation requirements. However, 2022 Consultation Law scope limited and excludes some processes. Resource constraints for Sami participation undermine meaningful engagement. No binding consent mechanism as Aarhus does not require this, but systematic exclusion of Sami from influence suggests procedural participation rendered ineffective.	NOT ALIGNED: Sweden does not align with IRMA requirements for binding FPIC for Indigenous Peoples. ILO Convention 169 non-ratification creates fundamental gap. 2022 Consultation Law does not provide binding consent contrary to IRMA Indigenous engagement standards. Resource constraints contradict adequate participation support requirements. LKAB ReeMAP demonstrates systematic failure to obtain Sami consent.	NOT ALIGNED: Sweden does not align with Escazú Indigenous human rights defenders protection and enhanced participation requirements. ILO 169 non-ratification contradicts Indigenous Peoples' rights framework. 2022 Consultation Law scope limitations do not align with comprehensive participation provisions. No binding Indigenous consent does not align with Escazú protections. Resource constraints contradict participation support requirements.	**HIGH: Sweden has not ratified ILO Convention 169 despite repeated international pressure and UN criticism**
Environmental and Social Impact Assessment (ESIA)	**Partial Compliance/ Alignment**	Environmental Code requires comprehensive EIA covering multiple impact areas. Weak cumulative effects assessment. Inadequate Sami cultural impact assessment.	No explicit cumulative effects requirements in legislation; A priori assumption that mining and reindeer herding can co-exist; Weak cultural heritage assessment for Sami territories; Traditional knowledge inadequately integrated	Cumulative impacts with LKAB iron ore expansion and other industrial activities inadequately assessed. A priori assumption of mining-reindeer herding co-existence applied despite evidence of disruption. Cultural impact assessment inadequate for Sami traditional territories. Traditional Sami knowledge not meaningfully integrated in technical assessments.	PARTIALLY COMPLIANT: Sweden meets formal EIA requirements through Environmental Code. However, cumulative effects assessment inadequate despite Aarhus requirements for comprehensive assessment. Cultural impact assessment for Sami territories falls short of participatory principles. A priori co-existence assumption undermines thorough impact analysis.	PARTIALLY ALIGNED: Sweden meets basic EIA requirements but does not fully align with IRMA standards for Indigenous territories. No mandatory cumulative effects assessment contrary to IRMA comprehensive assessment requirements. Cultural impact assessment inadequate for traditional Indigenous territories. A priori co-existence assumption contradicts IRMA evidence-based precautionary approach. Traditional knowledge integration insufficient.	PARTIALLY ALIGNED: Sweden meets basic EIA requirements but does not fully align with Escazú comprehensive Indigenous territory protection. Cumulative effects gaps contradict thorough assessment standards. Cultural heritage protection for Sami territories inadequate. Traditional knowledge integration insufficient contrary to Escazú Indigenous knowledge provisions. A priori assumptions contradict precautionary cultural protection.	**MEDIUM: Generally robust EIA system needs cumulative assessment and Indigenous cultural protection strengthening**
Obtaining Community Support and Delivering Local Benefit	**Major Gaps**	No binding consent required. Legal balancing test systematically favors mining over reindeer herding. No binding benefit-sharing requirements with Sami communities.	Systematic barriers for Sami communities protecting traditional territories; Legal balancing consistently favors industrial over traditional land use; Limited guaranteed local benefits; Revenue flows primarily to national/regional governments	LKAB projects proceed without securing meaningful Sami consent despite reindeer herding disruption. Balancing test systematically favors state-owned mining company over Sami traditional livelihoods. No binding benefit-sharing agreements with affected Sami communities. Revenue benefits national economy while Sami communities bear environmental and cultural costs.	COMPLIANT: Sweden provides consultation mechanisms required by Aarhus. However, systematic balancing favoring mining over Sami traditional use exceeds normal competing interests resolution. Aarhus does not require binding consent or benefit-sharing, so Sweden meets minimum obligations despite Sami concerns.	NOT ALIGNED: Sweden completely fails to align with IRMA Indigenous community support requirements. Systematic balancing favoring mining contradicts proactive consent efforts. No binding benefit-sharing agreements contrary to IRMA documented benefit requirements. State-owned LKAB projects proceed without Sami support contradicting demonstrated consent principles. Revenue flows exclude meaningful Sami benefits.	NOT ALIGNED: Sweden fails to align with Escazú Indigenous territorial rights and community benefit provisions. Systematic balancing favoring extraction contradicts Indigenous territorial protection. No binding benefit-sharing contrary to explicit Indigenous benefit requirements. State-owned company override of Sami interests contradicts accountability to Indigenous communities. Revenue exclusion does not align with fair benefit distribution.	**HIGH: Systematic discrimination against Sami traditional land use rights and livelihoods**
Access to Justice and Remedy	**Partial Compliance/ Alignment**	Land and Environment Courts provide judicial review. Barriers for Sami communities in demonstrating harm. Weak recognition of Indigenous land rights as property.	Barriers in recognizing Right to Say No as justiciable right; Weak recognition of Sami reindeer herding as property rights; Resource constraints limiting effective legal challenge; Standing requirements restrictive	Sami communities face systematic barriers challenging LKAB projects. Weak recognition of reindeer herding as property rights in judicial proceedings. Resource constraints limit technical and legal expertise access. LKAB CEO simultaneously heads Svemin and EUROMINES creating industry influence concerns.	PARTIALLY COMPLIANT: Sweden provides formal access to Land and Environment Courts consistent with Aarhus Article 9. However, weak recognition of Sami cultural rights as property limits standing effectiveness. Resource constraints create barriers to effective justice access. Procedural complexity favors well-resourced mining companies.	PARTIALLY ALIGNED: Sweden provides formal court access but does not fully align with IRMA Indigenous remedy standards. Weak recognition of cultural rights as property contradicts Indigenous rights protection requirements. Resource constraints contradict accessible remedy provisions. No independent grievance mechanisms outside courts. LKAB industry influence (CEO heads mining associations) raises independence concerns.	PARTIALLY ALIGNED: Sweden provides formal court access but does not fully align with Escazú expanded Indigenous justice provisions. Weak cultural rights recognition contradicts Indigenous rights protection framework. Resource barriers contradict accessible justice requirements. No Indigenous defender protection framework. Industry influence concerns (LKAB CEO positions) contradict independence provisions.	**HIGH: Indigenous communities face structural barriers to effective legal protection of cultural rights**
Mine Closure and Rehabilitation Guarantees	**Partial Compliance/ Alignment**	Required under Environmental Code and Minerals Act. Swedish authorities officially acknowledge overall guarantee sums are too low. Limited community involvement.	Inadequate guarantee amounts officially acknowledged by Swedish authorities; Limited community involvement in closure planning; Inadequate intergenerational timeframes for traditional territories; No Sami co-management	LKAB closure planning lacks adequate Sami involvement despite impacts on traditional territories. Closure timeframes inadequate for intergenerational Sami land management systems. No Sami co-management authority for closure oversight. Long-term restoration standards do not incorporate Sami traditional ecological knowledge.	PARTIALLY COMPLIANT: Sweden has formal restoration requirements under Environmental Code and Minerals Act. However, officially acknowledged underfunding creates accountability gaps. Limited Sami involvement in closure planning falls short of Aarhus participatory principles for environmental decisions.	PARTIALLY ALIGNED: Sweden has formal closure requirements but does not fully align with IRMA standards for Indigenous territories. Officially acknowledged underfunding contradicts adequate guarantee requirements. No Sami co-management contrary to IRMA Indigenous oversight provisions. Closure timeframes inadequate for intergenerational Indigenous land systems. Traditional ecological knowledge not integrated in restoration standards.	PARTIALLY ALIGNED: Sweden has formal closure requirements but does not align fully with Escazú Indigenous territory restoration standards. No Indigenous co-management boards contrary to community oversight requirements. Underfunding contradicts comprehensive protection obligations. Intergenerational timeframes inadequate for Indigenous land systems. Traditional knowledge exclusion contradicts Indigenous restoration participation.	**HIGH: Official acknowledgment of underfunding requires immediate remedy with Sami co-management**

Water Comparison Table

Table 8: EU Environmental Quality Standards for Surface Water and Limit Values for Drinking Water in International Comparison. Detailed Representation.

Substance	Uniform EU limit value/ EQS (if applicable)*	Limit values in the selected member states Germany, Portugal, Sweden, Spain (if available and there is no uniform EU value)**	WHO Drinking Water Guidelines	Corresponding IRMA limit value (v1.0 2018)	Countries/ standards on whose limit values the IRMA v1.0 criteria were based	Corresponding revised IRMA limit value (Draft Standard v2.0 2025) ***	Countries/ standards on whose limit values the IRMA Standard v2.0 draft's criteria are based	Countries/standards with stricter limits than the EU in this comparison****	Assessment of EU values in comparison
Aluminum									
Environmental quality standard for aluminum in surface waters for the protection of aquatic organisms	-	Not regulated in any of the four member states.		55 µg/L	Australia, New Zealand	55 µg/L	Australia, New Zealand	South Africa (10 µg/L)	No uniform EU value and no river basin-specific value in each of the four member states examined. Overall, only regulated in a few countries. Aluminium for the protection of aquatic organisms is not specified in many countries, but it is in Australia and New Zealand, for example, which IRMA uses as a reference.
Aluminum limit value for the protection of drinking water quality	200 µg/L		No health-based guideline value	100 µg/L	Canada, WHO	100 µg/L	Canada	Canada (100 µg/L), South Africa (150 µg/L)	The IRMA value and that of other countries for aluminium in drinking water is stricter than in the EU. The EU is on par with China, Australia, and Brazil (200 µg/L each).
Antimony									
Environmental quality standard for antimony in surface waters for the protection of aquatic organisms	-	Not regulated in any of the four member states.		-	-	9 µg/L	Australia, New Zealand	-	No uniform EU value and no river basin-specific value in each of the four member states examined. Overall, only regulated in a few countries. Brazil has set a stricter limit of 5 µg/L than IRMA in its draft for v2.0 and than Australia and New Zealand.
Antimony limit value for the protection of drinking water quality	10 µg/L		20 µg/L	6 µg/L	USA, Canada	6 µg/L	USA	Australia (3 µg/L), China (5 µg/L), USA, Canada, Brazil (each 6 µg/L)	IRMA and many countries have stricter limits than the EU for antimony in drinking water. For example, the limits in China and Australia are considerably stricter. However, the EU value is stricter than that of the WHO.
Arsenic									
Environmental quality standard for arsenic in surface waters for the protection of aquatic organisms	-	Germany: 40 mg/kg suspended matter or sediment (no limit value for water); Sweden: 0.5 µg/L AA and 7.9 µg/L MAC; Spain: 50 µg/L AA		24 µg/L	Australia, New Zealand	20 µg/L	South Africa, Philippines	Canada (5µg/L)	No uniform EU value, but regulated on a river basin-specific basis in three of the EU member states examined.
Arsenic limit value for the protection of drinking water quality	10 µg/L		10 µg/L	10 µg/L	Many	10 µg/L	Many	5 µg/L in specific US states such as New Jersey and New Hampshire	Here, the EU has the same value as IRMA and other countries. In the comparison here, no other country has stricter limits. However, some US states do (with 5 µg/L).
Cadmium									
Environmental quality standard for cadmium in surface waters for the protection of aquatic organisms	0.08 µg/L (Water Hardness Class 1), 0.09 µg/L (Water Hardness Class 3) (AA); classified as a priority hazardous substance			Use USEPA Hardness-based or Biotic Ligand Model (BLM) calculations for metals	USA	1.8 µg/L *****	USA	-	When it comes to protecting aquatic organisms, the EU sets very strict limits for cadmium in comparison. In Australia and New Zealand (0.2 µg/L), South Africa (0.3 µg/L), Peru (0.25 µg/L), and Brazil (1 µg/L) the values are stricter than the IRMA value (draft for v.2.0), but still less strict than in the EU.
Cadmium limit value for the protection of drinking water quality	5 µg/L		3 µg/L	5 µg/L	Many	5 µg/L	USA, EU, South Africa	Australia (2 µg/L), Peru, Philippines, Brazil, WHO (each 3 µg/L)	As far as cadmium limits in drinking water are concerned, several countries have stricter limits than 5 (e.g. Australia, Peru, Philippines; the WHO also has a stricter limit of 3 µg/L). Here, the EU is in line with, for example, IRMA, the USA and China.
Chromium (Total)									
Environmental quality standard for chromium (total) in surface waters for the protection of aquatic organisms	-	Germany: 640 mg/kg suspended matter or sediment (no limit value for water); Sweden: 3.4 µg/L; Spain: 50 µg/L AA		-	-	-	-	Many countries and also IRMA do not regulate chromium (total), but rather chromium III and, above all, chromium VI (USA, Canada, South Africa, IRMA regulate both). E.g. Brazil sets the same limit as Spain (50 µg/L).	No uniform EU value, but regulated on a river basin-specific basis in three of the EU member states examined.
Chromium (total) limit value for the protection of drinking water quality	25 µg/L		50 µg/L	50 µg/L	Many	50 µg/L	Many	In this comparison, value is nowhere stricter than in the EU	The EU value for chromium (total) is the strictest in this comparison.

Substance	Uniform EU limit value/ EQS (if applicable)*	Limit values in the selected member states Germany, Portugal, Sweden, Spain (if available and there is no uniform EU value)**	WHO Drinking Water Guidelines	Corresponding IRMA limit value (v1.0 2018)	Countries/ standards on whose limit values the IRMA v1.0 criteria were based	Corresponding revised IRMA limit value (Draft Standard v2.0 2025) ***	Countries/ standards on whose limit values the IRMA Standard v2.0 draft's criteria are based	Countries/standards with stricter limits than the EU in this comparison****	Assessment of EU values in comparison
Copper									
Environmental quality standard for copper in surface waters for the protection of aquatic organisms	-	Germany: 160 mg/kg suspended matter or sediment (no limit value for water); Sweden: 0.5 µg/L (bioavailable); Spain: between 5 and 120 µg/L AA (depending on water hardness); Portugal: 0.4 mg/L for waters for salmonids/trout and 0.04 mg/L for waters for cyprinids		Reference to USEPA Hardness-based or Biotic Ligand Model (BLM) calculations for metals	USA	2.4 µg/L *****	Canada, USA		No uniform EU value, but regulated on a river basin-specific basis in all four of the EU member states examined. Canada (1.4 µg/L) and South Africa (0.53 µg/L) have set stricter limits than IRMA (draft for v.2.0).
Copper limit value for the protection of drinking water quality	2000 µg/L		2000 µg/L	1000 µg/L	USA, Canada, Australia	2000 µg/L	Australia, Canada, EU, WHO	USA (1300 µg/L), South Africa, China (each 1000 µg/L), Philippines (200 µg/L)	For copper in drinking water, the EU value corresponds to Brazil, WHO and IRMA values, but in some countries the value is stricter.
Cyanide (Free or WAD)									
Environmental quality standard for cyanide in surface waters for the protection of aquatic organisms	-	Germany: 10 µg/L; Spain: 40 µg/L		22 µg/L	Not based on countries but Cyanide Code	5 µg/L	Canada	Canada, Brazil (each 5 µg/L), South Africa (4 µg/L), USA, Peru (each 5,2 µg/L), Australia, New Zealand (7 µg/L)	No uniform EU value, but regulated on a river basin-specific basis in two of the EU member states examined. However, IRMA (in its draft for v2.0), Canada, Brazil, South Africa, the USA, Peru, Australia, and New Zealand set (significantly) stricter limits.
Cyanide limit value for the protection of drinking water quality	50 µg/L		200 µg/L	80 µg/L	Australia	80 µg/L	USA, Canada	-	The EU limit for cyanides in drinking water is stricter than in most other countries in the IRMA comparison. The EU and China set the strictest values in the comparison here (50 µg/L).
Iron									
Environmental quality standard for iron in surface waters for the protection of aquatic organisms	-	Not regulated in any of the four member states.		1000 µg/L	USA	300 µg/L	Canada, China		No uniform EU value and no river basin-specific value in each of the four member states examined.
Iron limit value for the protection of drinking water quality	200 µg/L		No health-based guideline value	300 µg/L	Many	300 µg/L	Many	South Africa (100 µg/L)	Iron in drinking water is more strictly regulated in the EU than in other countries and IRMA. Only South Africa has stricter limits in the IRMA comparison (100 µg/L).
Lead									
Environmental quality standard for lead in surface waters for the protection of aquatic organisms	1,2 µg/L (AA); classified as a priority hazardous substance			Reference to USEPA Hardness-based or Biotic Ligand Model (BLM) calculations for metals	USA, Canada	2.5 µg/L *****	USA, Peru	South Africa (0,5 µg/L)	EU value stricter than many other countries and IRMA value. In the IRMA comparison, only South Africa has a stricter value (0.5 µg/L).
Lead limit value for the protection of drinking water quality	5 µg/L		10 µg/L	10 µg/L	Many	10 µg/L	Many	In this comparison, value is nowhere stricter than in the EU	Canada and the EU have the strictest values in comparison (both at 5 µg/L). All others in the comparison are at 10 µg/L.
Mercury									
Environmental quality standard for mercury in surface waters for the protection of aquatic organisms	0.07 µg/L (MAC); classified as a priority hazardous substance			0.1 µg/L	Peru, EU, South Africa	0.06 µg/L	Australia, New Zealand	Canada (0,026 ug/L), Australia, New Zealand (0,06 ug/L), IRMA (draft for v.2.0)	EU value slightly less strict than the proposed IRMA limit (draft for v.2.0), but stricter than other countries. IRMA is based on the value used in Australia and New Zealand. Canada has set by far the strictest value at 0,026 µg/L.
Mercury limit value for the protection of drinking water quality	1 µg/L		6 µg/L	1 µg/L	Many	1 µg/L	Many	In this comparison, value is nowhere stricter than in the EU	No stricter limits than the EU in the comparison. Many countries have a limit of 1 µg/L.
Nickel									
Environmental quality standard for nickel in surface waters for the protection of aquatic organisms	2 µg/L (AA); 8.2 µg/L (MAC)			Reference to USEPA Hardness-based or Biotic Ligand Model (BLM) calculations for metals	USA	52 µg/L *****	USA	In this comparison, value is nowhere stricter than in the EU	The EU value is the strictest in comparison. The value set by IRMA (52 µg/L) is significantly weaker than the limits set by China (20 µg/L), Australia and New Zealand (11 µg/L) and the EU (4 µg/L).
Nickel limit value for the protection of drinking water quality	20 µg/L		70 µg/L	20 µg/L	Australia, EU, China, Philippinen	20 µg/L	Australia, EU, China	In this comparison, value is nowhere stricter than in the EU	For drinking water, a few values, including that of the EU, are in line with each other and also serve as a guide for IRMA. Alongside Australia and China, the EU has the strictest value here. In some countries such as Canada, nickel in drinking water is not regulated.

Substance	Uniform EU limit value/ EQS (if applicable)*	Limit values in the selected member states Germany, Portugal, Sweden, Spain (if available and there is no uniform EU value)**	WHO Drinking Water Guidelines	Corresponding IRMA limit value (v1.0 2018)	Countries/ standards on whose limit values the IRMA v1.0 criteria were based	Corresponding revised IRMA limit value (Draft Standard v2.0 2025) ***	Countries/ standards on whose limit values the IRMA Standard v2.0 draft's criteria are based	Countries/standards with stricter limits than the EU in this comparison****	Assessment of EU values in comparison
Nitrate (NO3 as N)									
Environmental quality standard for nitrate in surface waters for the protection of aquatic organisms	-	Sweden: 2.2mg/L		13 mg/L	Canada, Peru	3 mg/L	Canada, Peru		No uniform EU value and only regulated on a river basin-specific basis in one of the EU member states examined. However, the limit in China (2 mg/L) and the one set by IRMA are stricter.
Nitrate limit value for the protection of drinking water quality	11.3 mg/L		11.3 mg/L	45 mg/L	Canada, USA, China	10 mg/L	Canada, USA, China	South Africa (6 mg/L)	The limit value is roughly the same everywhere in this comparison. Only in South Africa is it stricter, at 6 µg/L.
Selenium									
Environmental quality standard for selenium in surface waters for the protection of aquatic organisms	-	Germany: 3 µg/L; Spain: 1 µg/L AA		5 µg/L	USA, South Africa, Australia, New Zealand	1 µg/L	Canada	Canada (1 µg/L)	No uniform EU value, but regulated on a river basin-specific basis in two of the EU member states examined. The value in Germany is lower than the proposed v2.0 IRMA value as well as the ones in Canada and partly in the US (where 1.5 µg/L applies to ponds and lakes and 3.1 µg/L to streams and rivers), but it is stricter than in other countries (including Australia, New Zealand, South Africa, and Peru, each with 5 µg/L, and China with 10 µg/L). The value in Spain corresponds to the strictest limits in the comparison and is on a par with IRMA (draft for v.2.0) and Canada.
Selenium limit value for the protection of drinking water quality	20 µg/L		40 µg/L	40 µg/L	WHO, Peru	50 µg/L	USA, Canada	Australia, China (each 10 µg/L)	The EU limit for selenium in drinking water is stricter than in many countries and than the IRMA (50 µg/L) and WHO (40 µg/L). However, Australia and China have a stricter limit of 10 µg/L in drinking water.
Uranium									
Environmental quality standard for uranium in surface waters for the protection of aquatic organisms	-	Sweden: 0.17 µg/L AA and 8.6 µg/L MAC		-	-	15 µg/L	Canada		No uniform EU value and only regulated on a river basin-specific basis in one of the EU member states examined. In the comparison, only Canada has set a limit, which serves as orientation for the proposed IRMA v2.0 limit.
Uranium limit value for the protection of drinking water quality	30 µg/L		30 µg/L	30 µg/L	USA, WHO	30 µg/L	USA, EU, WHO, China	Australia, Canada, Peru (each 20 µg/L)	IRMA, WHO and other countries such as China, USA, Brazil also set a limit value of 30 µg/L for uranium in drinking water as does the EU. In other countries (Australia, Canada and Peru), the value is lower at 20 µg/L.
Zinc									
Environmental quality standard for zinc in surface waters for the protection of aquatic organisms	-	Germany: 800 mg/kg suspended matter or sediment (no limit value for water); Sweden: 5.5 µg/L (bioavailable); Spain: between 30 and 500 µg/L AA (depending on water hardness); Portugal: 0.3 mg/L for waters for salmonids/trout and 1 mg/L for waters for cyprinids		Reference to USEPA Hardness-based or Biotic Ligand Model (BLM) calculations for metals	USA	13 µg/L *****	Canada		No uniform EU value, but regulated on a river basin-specific basis in all four of the EU member states examined. Australia and New Zealand (8 µg/L) have set stricter limits than IRMA (draft for v.2.0), Spain and Portugal. South Africa (3.6 µg/L) has the strictest value, which is also stricter than the one in Sweden.
Zinc limit value for the protection of drinking water quality	-	Not regulated.	No health-based guideline value	3000 µg/L	Australia, South Africa, Peru	3000 µg/L	Australia, South Africa, Peru	-	There is no harmonised EU limit for zinc. China has by far the strictest value in the comparison with 1000 ug/L.

The following color scale indicates how strict the EU values are in comparison:

- The EU sets relatively strict or the strictest limit value/ EQS in the comparison.
- The EU limit value/EQS is in the middle range of the limit values examined.
- The EU limit value/EQS is rather weak compared to the other values examined.
- There are no uniform limit values/EQS for this substance at EU level.

EQS: Environmental Quality Standard
AA: Annual average
MAC: maximum allowable

* *Values derived from either EU WFD/EQS Directive (if substance is categorized as priority substance/priority hazardous substance) or EU Drinking Water Directive*

** *Regulated in national regulations*

*** *Protective of All IRMA Freshwater Uses: IRMA Surface Water*

**** *The following countries and standards were compared: Australia & New Zealand, Brazil, Canada, China, IRMA, Peru, Philippines, South Africa, USA, WHO*

***** *Hardness-based calculation for dissolved metals assuming medium water hardness (100 mg/L $CaCO_3$)*

In this study you will learn...

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