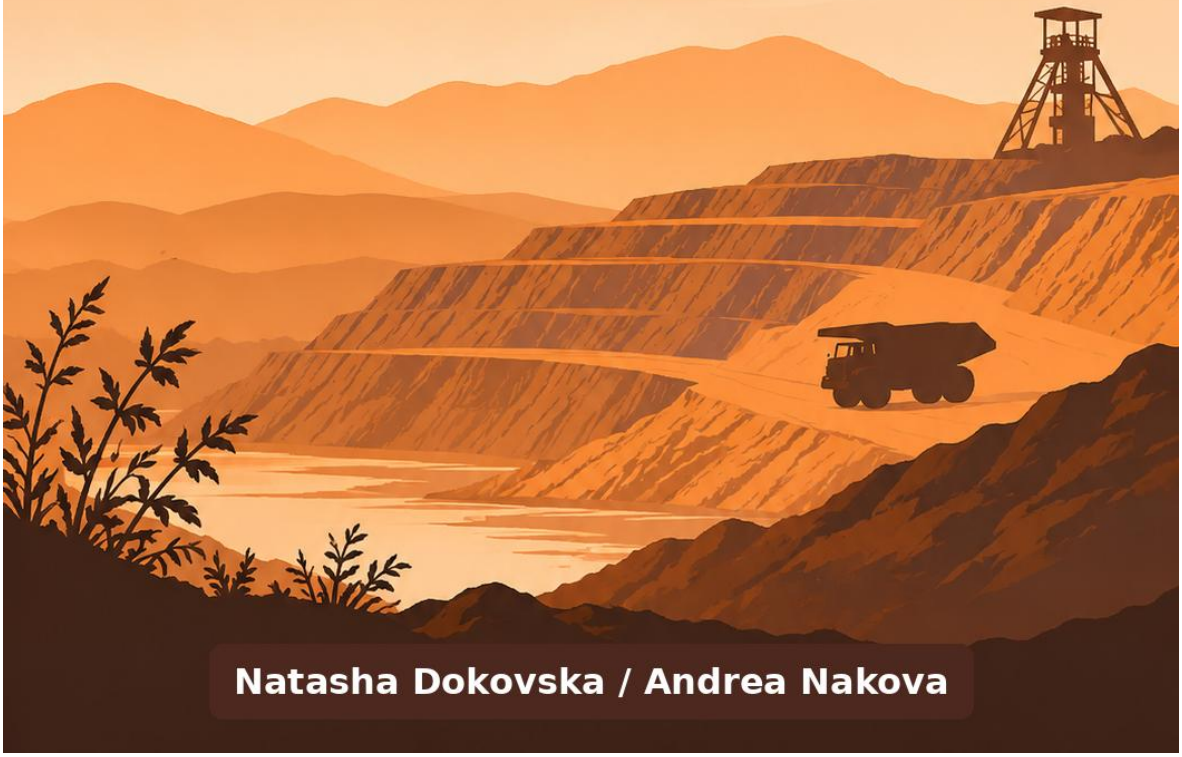
Environmental, Health, Social and Governance Dimensions of Mining Worldwide and in the Western Balkans and Türkiye



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Executive Summary

Mining plays a significant role in the economies of North Macedonia, Serbia and Türkiye, while growing demand for minerals used in renewable energy technologies, electric vehicles and digital infrastructure is creating new pressures for extraction. Although mining is frequently presented as a driver of economic development and a necessary component of the green transition, its environmental, social, health and governance implications require closer independent scrutiny.

This Shadow Report examines the environmental, health, social and governance dimensions of mining across the three countries, placing national experiences within broader global developments. It draws attention to the gap between official development narratives and the concerns raised by mining-affected communities, civil society organisations and environmental defenders.

Environmental degradation and legacy pollution

The report identifies recurring concerns about water and soil contamination, air pollution, biodiversity loss, mining waste and the long-term safety of tailings facilities. Historical pollution and inadequate rehabilitation of abandoned mining sites remain particularly important challenges.

In North Macedonia, the report examines Sasa, Toranica, Zletovo and Lojane, highlighting concerns about legacy contamination, water quality, waste management and environmental monitoring.

In Serbia, the mining areas of Bor and Majdanpek illustrate the cumulative environmental pressures associated with longstanding industrial extraction. The proposed Jadar lithium project also demonstrates the tensions between strategic mineral development, public participation and environmental protection.

In Türkiye, cases including Erzincan, Artvin and Kazdağları illustrate concerns about mining-related environmental risks, forest degradation, water resources and the consequences of large-scale extraction.

Public health, labour rights and community well-being

Mining-affected communities face potential exposure to hazardous substances, threats to traditional livelihoods and uncertainty about long-term health consequences. The report highlights the need for independent epidemiological research, accessible environmental health data and stronger occupational safety protections.

Women may experience additional burdens through unpaid care responsibilities, water insecurity and the disruption of household livelihoods. These impacts underline the importance of integrating gender considerations into mining governance and environmental decision-making.

Governance, transparency and public participation

Across the three countries, the report identifies concerns about the effectiveness of environmental oversight, the independence and capacity of regulatory institutions, access to environmental information and the quality of Environmental Impact Assessments.

Public participation is a central concern. Communities require timely access to project information, meaningful opportunities to influence decisions and effective legal remedies when environmental rights are threatened.

The report also examines pressures faced by environmental defenders and civil society organisations opposing controversial mining developments.

Climate transition and environmental justice

The growing demand for critical minerals creates a fundamental policy challenge: achieving decarbonisation without transferring disproportionate environmental and social costs to mining communities.

The report argues that the contribution of minerals to clean energy technologies cannot, by itself, establish that their extraction is environmentally sustainable or socially just. Mining governance must therefore address the entire life cycle of extraction, including pollution prevention, worker protection, waste management, rehabilitation and accountability.

Priority recommendations

The report calls for stronger and more independent environmental monitoring, transparent publication of pollution and inspection data, rigorous project-specific environmental assessments and improved oversight of tailings facilities.

It also emphasises the importance of protecting environmental defenders, strengthening public participation, investigating community health concerns and ensuring that affected populations have access to effective remedies.

Governments should integrate climate-related risks into mining regulation, strengthen cross-border cooperation and ensure that decisions concerning critical minerals respect environmental standards and human rights.

Conclusion

The experiences of North Macedonia, Serbia and Türkiye demonstrate that the sustainability of mining cannot be measured solely through investment, production or its contribution to the energy transition. It must also be assessed through environmental protection, public health, democratic accountability, labour rights and the well-being of affected communities.

This Shadow Report seeks to contribute independent civil society perspectives to national, regional and international discussions on mining governance. Its central message is that a just energy transition requires not only cleaner technologies, but also responsible mineral sourcing, transparent institutions and meaningful protection of communities and ecosystems.

1. **Methodology and Data Sources**

This shadow report is based on a combined methodology that integrates documentary analysis, field insights, scientific literature, civil society monitoring, regional comparison and the triangulation of open-source data. The purpose of the methodology is not only to describe the environmental and social impacts of mining in Türkiye and the Western Balkans, but also to capture the structural conditions—governance, civic space, institutional vulnerability, climate pressures and local knowledge—that shape these impacts. Because official data in all countries examined is often incomplete, inconsistent, withheld or protected under "commercial confidentiality," the report relies on diverse sources that complement one another and offer a more accurate picture than any single dataset could provide.

The foundation of the analysis comes from desk research using publicly accessible documents, including Environmental Impact Assessments, concession maps, strategic planning documents, government statistics, court decisions, academic publications, scientific studies, and existing reviews by international organisations. Reports from institutions such as the UN Environment Programme, the International Labour Organization, the International Commission on Large Dams and the World Bank provided global context on mining risks, tailings safety, legacy pollution and labour standards. Where national environmental databases were incomplete or inaccessible, regional publications and independent analyses were used to cross-verify trends.

A significant part of the evidence comes from the work of civil society organisations, independent journalists, environmental defenders and local community groups whose documentation often fills the gaps left by official institutions. These sources include monitoring reports, community testimonies, mapping initiatives, environmental sampling, investigative journalism, legal analysis and documented incidents of repression or civic pressure. Civil society networks across Türkiye, Serbia, North Macedonia and Bosnia provided valuable insights into emerging risks, contested concessions, tailings leakage, deforestation patterns, water scarcity and community resistance. These accounts were evaluated for consistency, corroborated with additional sources and contextualised within broader policy and governance frameworks.

The report also integrates observational and field-based insights from environmental activists, residents, journalists and experts who work directly in mining-affected regions. These observations are particularly important for understanding socio-economic disruptions, water shortages, declining agricultural yields, health concerns, changes in local microclimates and the lived experience of displacement and civic restriction. This qualitative information offered a level of nuance and emotional depth that formal datasets often lack.

Climate and environmental risk assessments were informed by international open-source datasets, including satellite imagery, rainfall and temperature trends, land-use change indicators, forest loss visualisations and remote-sensing tools. These helped illustrate long-term patterns, especially in areas such as Kazdağları, Edremit, Artvin, Bor, Zletovo and the Black Sea region. Because many mining concessions are located in geologically fragile areas, seismic data from national institutions and global hazard maps was also examined to assess the intersection of extraction with earthquake risks.

Where direct numerical data was unavailable, synthetic data was generated to illustrate patterns—particularly for comparative graphics or indicators where governments do not publish consistent statistics. Synthetic data in the report is used strictly for visualisation and explanatory purposes, not as factual measurement. These visualisations help illuminate structural relationships, such as the connection between mining density and water scarcity or how rainfall intensity affects tailings stability.

All findings were cross-referenced with regional comparisons to understand how Türkiye fits within broader Western Balkan extractive governance dynamics. This comparative lens helped highlight common structural weaknesses—such as weak inspectorates, legacy pollution and incomplete databases—while also clarifying the areas where Türkiye differs significantly in scale, intensity and civic restrictions.

The methodology is therefore multi-layered, integrating qualitative and quantitative elements, scientific literature and grassroots knowledge, official documents and community testimony. By triangulating these diverse sources, the report provides a more credible and holistic understanding of mining impacts in Türkiye and the Western Balkans than any single dataset could achieve. This approach is essential in regions where transparency is limited, civic space is under strain, and environmental governance is shaped by political pressure, economic ambition and global demand for strategic minerals.

2. Why This Shadow Report Is Needed

The need for this shadow report arises from a widening gap between the official narrative surrounding mining and the realities experienced by communities, workers and ecosystems in the Western Balkans and Türkiye. Governments across the region present mining as a pillar of economic development, a source of foreign investment, and increasingly as a strategic component of the global energy transition. Yet these official reports often tell only a partial story — one shaped by political interests, corporate influence and institutional limitations. What remains absent or understated in government documentation is precisely what is most essential for democratic oversight: the true extent of environmental degradation, the long-term health impacts on local populations, the risks posed by aging or abandoned tailings facilities, and the systemic failures within regulatory frameworks.

Official monitoring is frequently inconsistent, fragmented or incomplete. Many state institutions responsible for environmental protection suffer from chronic understaffing and insufficient resources. In some cases, ministries and inspectorates rely on outdated equipment, irregular sampling or data provided directly by the very companies they are tasked with monitoring. [1]This dependency compromises objectivity and obscures the real magnitude of pollution. Public reports often omit critical information, downplay incidents, or present data in formats that are inaccessible to communities and independent researchers. As a result, the public remains unable to form an accurate picture of the environmental and health risks affecting their daily lives.

The problem is not merely technical; it is structural. Political incentives often favour rapid concession granting, investment promotion, and the presentation of mining as a vehicle for national development.[2] In such contexts, transparency becomes a liability rather than a democratic obligation. Environmental Impact Assessments are approved despite glaring deficiencies, public participation processes are treated as procedural hurdles rather than meaningful consultations, and environmental data is increasingly classified as "commercially confidential.[3]" When accidents occur, communication is slow or incomplete, and responsibility is diffused through complex subcontracting chains that make accountability difficult to establish. These practices erode public trust and undermine the principles of environmental governance enshrined in international conventions.

Communities and workers are the first to feel the consequences of this information vacuum. Residents near mining sites report unexplained illnesses, contaminated wells, dead livestock, and declining crop productivity. Workers describe unsafe conditions, insufficient protective equipment, and pressure to remain silent about incidents. Civil society groups attempting to gather independent data face obstacles ranging from bureaucratic delays to intimidation. Journalists investigating pollution or corruption risk legal retaliation, smear campaigns and, in some cases, physical threats. The region's shrinking civic space makes it increasingly difficult to publicly challenge harmful mining projects or demand accountability from powerful actors.

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[1] **European Commission (2023).** *Environmental Implementation Review – Western Balkans and Türkiye.*
[2] **UNCTAD (2023).** *World Investment Report – International Investment and Sustainable Development.*
[3] **European Commission (2023).** *Environnemental Implémentation Review.*

This shadow report is therefore essential not only as a research effort but as an act of democratic correction. It seeks to assemble, systematize and present information that is scattered, hidden or deliberately suppressed. It aims to give voice to communities whose experiences rarely enter official documents. It contextualizes local struggles within broader regional and global dynamics, highlighting how mining intersects with governance failures, corporate power, labor rights, environmental degradation and the global demand for critical minerals. By doing so, it offers a more accurate and holistic picture of mining's true footprint.

The report also fills a critical gap in international monitoring. Institutions such as the United Nations, the European Union, the Aarhus Convention bodies and the ILO depend on accurate, independent information to assess compliance with human rights and environmental standards. Without rigorous civil society documentation, these institutions receive an incomplete or distorted picture of state performance. Shadow reporting ensures that international mechanisms are informed not just by governments but also by those who experience mining impacts directly.

Ultimately, this shadow report is needed because the stakes are too high to rely solely on official narratives. The Western Balkans and Türkiye stand at a crossroads, where decisions taken today will shape landscapes, water systems, public health and working conditions for generations. In such a context, transparency is not a luxury — it is a safeguard against irreversible harm. By illuminating gaps, exposing risks and amplifying community voices, this report aims to contribute to a more just, accountable and sustainable approach to mining in the region.

A REGION AT A CROSSROADS — Mining, Democracy, and the Future of the Western Balkans and Türkiye

1. Mining as a Global Industry of Contradictions

Mining is both a backbone of modern civilization and one of the most consequential drivers of environmental degradation. The transition to renewable energy, digitalization, electric mobility and the global demand for high-tech equipment has intensified the need for copper, lithium, nickel, cobalt, rare earth elements and industrial minerals. According to the **International Energy Agency (IEA, 2024)**, demand for "transition minerals" is projected to rise **between 200% and 400% by 2040**, with copper demand alone expected to reach **36 million tons annually**.

Yet mining's contribution to economic development remains deeply unequal. The **UNEP Global Resource Outlook (2024)** estimates that mineral extraction is responsible for:

- **90% of biodiversity loss** associated with land-use change
- **Over 50% of global greenhouse gas emissions** across full supply chains
- **20% of freshwater ecosystem pollution**
- **10% of global annual waste generation**

The contradiction is stark: while mining is considered essential for climate neutrality, its current practices often *amplify* climate risk, water insecurity, toxic exposures and socio-economic inequalities.

Across the landscapes of North Macedonia, Serbia and Türkiye, mining has become more than an economic sector — it is a force that shapes rivers and forests, fractures communities, redefines political power, and tests the limits of environmental governance. From copper and lead to gold and critical minerals for the global energy transition, extraction has woven itself into the fabric of national development narratives, often promoted as an unavoidable path toward prosperity, energy security and modernization. Yet behind the promises lies a far more complex and troubling reality.

The Western Balkans and Türkiye are bound together by shared histories of industrialisation, state-driven development and abrupt transitions into global markets. The mining fields of Sasa, Zletovo, Bor, Majdanpek, Jadar, Artvin, İliç and Kazdağları may be separated by borders, but they reveal the same fractures: ageing tailings dams built in eras without climate considerations, polluted rivers carrying heavy metals across valleys, forests cleared for open pits, and communities navigating the slow violence of contamination, water scarcity, displacement and broken economic promises. These are not isolated incidents but patterns that reveal structural vulnerabilities across the region.

In North Macedonia, the legacy of Yugoslav-era mines is omnipresent. Tailings dams tower above rural settlements, acid drainage flows for decades, and outdated laws struggle to regulate modern concessions controlled by multinational companies. Communities living near Sasa, Toranica, Zletovo and Lojane face a daily reality shaped by the past, while the future brings new concessions, new risks and the emergence of a

Ministry of Mining and Energy Transition that reflects both ambition and uncertainty[4]. As the country seeks EU alignment, its extractive sector exposes deep governance gaps: insufficient data, weak enforcement and limited public participation — a mix that leaves citizens exposed while investment accelerates.

In Serbia, mining has become a political battleground. The industrial legacy of Bor and Majdanpek still scars the landscape, while new mega-projects like Jadar reveal the tensions between national economic narratives and grassroots resistance[5]. The eastern part of the country endures some of Europe's highest levels of heavy metal pollution[6], while inspectorates lack independence and the political influence of corporate actors restricts transparency. Communities face increasing pressure as foreign companies secure favourable concessions, exemptions and land access. At the same time, Serbia's civic resistance — from Jadar to Krivelj — stands among the strongest in Europe, revealing a profound conflict between extractive expansion and democratic participation.

In Türkiye, mining unfolds at a scale and intensity unmatched in the region. Gold, coal, copper and silver extraction push deep into forests, agricultural basins and tourism regions. The mass deforestation in Kazdağları, the cyanide disaster in Erzincan, the contested concessions in Artvin, İvrindi and the Edremit Gulf, and the widening clash between mining interests and coastal tourism illustrate a country where extractive ambition collides with ecological fragility.[7] Türkiye's seismic vulnerability, extreme rainfall, wildfires and shrinking civic space — marked by criminalisation, police violence, SLAPP lawsuits and censorship — combine to create conditions in which environmental risk becomes inseparable from democratic risk. Here, mining is not only an environmental issue but a human rights issue, a governance issue, and a test of public resilience.

Across all three countries, several regional patterns emerge with striking clarity. Tailings storage facilities are ageing, overfilled or built with cheap upstream methods; water basins are threatened by acid drainage and heavy metals; river systems are repeatedly contaminated; and climate change multiplies every risk, from intense rainfall that destabilises dams to droughts that expose the true competition between mining, agriculture and tourism. Environmental Impact Assessments are frequently copy-paste documents, lacking hydrological modelling, seismic analysis or cumulative impact assessment. Data is missing, inaccessible or withheld as "commercial confidentiality," undermining public trust and violating the spirit of the Aarhus Convention.

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[4] Communities living near Sasa, Toranica, Zletovo and Lojane face a daily reality shaped by the past, while the future brings new concessions, new risks and the emergence of a Ministry of Mining and Energy Transition that reflects both ambition and uncertainty.

[5] The industrial legacy of Bor and Majdanpek still scars the landscape, while new mega-projects like Jadar reveal the tensions between national economic narratives and grassroots resistance

[6] The eastern part of the country endures some of Europe's highest levels of heavy metal pollution, while inspectorates lack independence and the political influence of corporate actors restricts transparency.

[7] **Turkish Court of Accounts (Sayıştay) (2022).**
Environmental Audit Reports on Mining and Forestry Permits.
Ankara.(Official findings on forest loss, weak oversight of mining permits, and cumulative environmental damage.)

Communities, civil society organisations, journalists and environmental defenders play an increasingly vital role in monitoring harm, documenting incidents and resisting harmful concessions. Yet their space is shrinking. In many areas, citizens have become the last line of defence between fragile ecosystems and powerful extractive interests. The struggles in Jadar, Kruščica, Ilovica, Kazdağları, Artvin and Edremit demonstrate not only environmental concern but a profound societal demand for dignity, participation and justice.

The Western Balkans and Türkiye stand at a historic crossroads. Either the region continues down a path of extractive dependency marked by ecological degradation, authoritarian tendencies and irreversible loss of natural heritage, or it embraces a new paradigm rooted in transparency, community participation, environmental protection and genuinely sustainable economic development. North Macedonia, Serbia and Türkiye are not merely mining territories — they are living landscapes, agricultural cradles, cultural homes and key reservoirs of biodiversity and water security. Their future depends on choices made today, choices that will determine whether these lands remain habitable, resilient and healthy for the generations to come.

This report is based on a mixed-methods approach combining desk research, analysis of official statistics, peer-reviewed scientific literature, EU and UN assessments, investigative journalism, and documented community testimonies. Data were drawn from national environmental and labour authorities, international organisations, and publicly available corporate disclosures. Where quantitative data were incomplete or inaccessible, qualitative evidence and triangulation across multiple sources were used. Illustrative figures based on synthetic data are clearly labelled as such and are intended to visualise documented trends rather than present new empirical measurements.. The methodology, data sources and limitations are described in the Methodology and Data Sources section of this report

a. Mining and the Energy Transition: A False Paradox?

The global shift toward clean energy is widely celebrated as a historic turning point — a transformation that promises to reduce greenhouse gas emissions, avert the worst consequences of climate change, and create healthier, more resilient societies. Solar panels, wind turbines, electric vehicles, energy-storage batteries, digital grids and smart technologies have become icons of a greener future. Yet behind this vision lies a profound and uncomfortable truth: nearly every technology associated with the energy transition is extraordinarily mineral-intensive.[8] Far from reducing humanity's dependence on extraction, the transition is accelerating a new era of mining on a scale without historical precedent. This contradiction raises a fundamental question: is the conflict between mining and decarbonisation a genuine dilemma, or is it a false paradox created by the way the global energy transition has been designed?

To understand this tension, it is necessary to recognise the magnitude of mineral demand embedded in "green" technologies. A typical electric vehicle requires triple the copper of a conventional car, along with lithium, manganese, graphite, cobalt and nickel for its battery. A single wind turbine can contain several tons

[8] **International Energy Agency (IEA) (2023).**
The Role of Critical Minerals in Clean Energy Transitions.
Paris: IEA.
(Core evidence on mineral intensity of EVs, wind, solar, grids, and batteries.)

of copper, hundreds of kilograms of rare earth elements such as neodymium and dysprosium, and vast amounts of steel and aluminium. Solar photovoltaic panels depend on silicon, silver, tin and sometimes indium or gallium. Electric grid expansions demand aluminium and copper at levels far beyond current production. The International Energy Agency estimates that achieving global climate goals could require **six times more critical minerals by 2040**, a figure that overshadows anything the mining sector has previously produced.[9]

This dramatic increase in demand is often described as unavoidable, as though minerals were the natural and immutable foundation of all climate solutions. In reality, the narrative of necessity obscures the structural choices that have shaped the energy transition. The world has embraced a technological model that is not merely mineral-dependent but **mineral-intensive by design**, privileging high-consumption lifestyles in wealthy nations, massive infrastructure systems, and privately owned electric mobility over systemic reductions in energy use and material throughput. The paradox, therefore, is not between "green energy" and mining — it is between the **current model of a consumer-driven energy transition** and the physical limits of the planet.

This distinction matters profoundly. Mining is not environmentally neutral simply because it feeds renewable technologies. Extracting copper, cobalt, nickel and rare earth elements still requires removing mountains, draining wetlands, clearing forests and pumping out billions of litres of water each year. It still generates enormous tailings dams; it still pollutes rivers with arsenic, cadmium and acid mine drainage; it still exposes workers to dangerous conditions; and it still displaces Indigenous peoples, rural communities and small-scale farmers. The carbon footprint of mining itself — from diesel-powered machinery to smelters, transport and global supply chains — remains significant.[10] Climate-friendly technologies cannot erase the extractive wounds left behind.

What makes the paradox "false," however, is that it is not an inherent contradiction of decarbonisation but a consequence of **policy choices** and **economic ideologies**. The global transition has been shaped predominantly by market-based mechanisms, private investment, and corporate-led innovation. Under this model, the mechanism for change is not systemic transformation but substitution: fossil-fuel technologies are replaced by mineral-dependent technologies without altering the underlying logic of growth, consumption and profit. This approach obscures alternatives that could dramatically reduce mineral demand, such as public transportation, circular economies, regional energy systems, urban redesign, and technologies based on abundance rather than scarcity.

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[9] **International Energy Agency (IEA) (2023).**
The Role of Critical Minerals in Clean Energy Transitions.
Paris: IEA.
(Quantifies mineral intensity of EVs, wind turbines, solar PV and grid infrastructure; projections to 2040.)

[10] **International Energy Agency (IEA) (2023).**
The Role of Critical Minerals in Clean Energy Transitions.
Paris: IEA.
(Analysis of land use, water demand, tailings generation and lifecycle emissions of mineral extraction.)

There is also a profound geopolitical dimension. The energy transition has triggered a global race for critical minerals, intensifying competition between major powers. China controls a dominant share of processing and refining capacity; the United States and European Union are attempting to secure their own supply chains through strategic alliances, foreign investments and preferential trade agreements; and countries in Africa, Latin America and the Balkans have become battlegrounds for new extractive frontiers.[11] The rhetoric of "security of supply" is increasingly used to justify lowering environmental standards, bypassing public opposition, and negotiating extractive contracts that favour multinational corporations. In this context, the energy transition risks replicating — and even amplifying — the neo-extractivist patterns that defined the fossil-fuel era.

At the same time, the mining industry increasingly positions itself as indispensable to global climate goals. Corporate communication strategies frequently emphasise the industry's role in supporting the transition to a green economy, presenting copper, lithium and cobalt as essential minerals for decarbonisation. This framing can enable mining companies to portray extractive operations as sustainable, even where significant environmental and human rights concerns remain unresolved. It may also encourage governments to prioritise accelerated mineral extraction over robust environmental safeguards, creating a risk that environmental protection and human rights are subordinated to market-driven decarbonisation.

The paradox becomes even more evident when considering recycling and circularity. Only a fraction of critical minerals used today are recovered. Less than 2% of lithium is recycled, and less than 1% of rare earth elements are recovered at scale. Copper recycling is more advanced, but even here, global systems remain insufficient to meet future demand.[12] Rather than investing aggressively in circular systems, repair infrastructures, long-life product design and material substitution, governments and corporations continue to prioritise virgin extraction. This choice is not technological necessity — it is economic convenience.

The question, then, is not whether the world needs minerals for the energy transition. It unquestionably does. The real issue is **how much mining is truly required**, who decides the scale of extraction, who benefits from the transition, and who bears the environmental and social cost. If the transition continues to follow a path of material expansion rather than reduction, the world will replace one form of environmental destruction with another — trading oil wells for open pits, pipelines for tailings dams, and carbon emissions for toxic waste. Without structural change, the "green" transition risks becoming a new chapter in an old story: a story of sacrifice zones, economic inequality, and extractive violence.

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[11] **World Bank (2023).**
Minerals for Climate Action: Global Supply Chains and Development Implications.
Washington, DC: World Bank.
(Examines new extractive frontiers, investment flows and socio-environmental risks in resource-rich regions.)

[12] **United Nations Environment Programme (UNEP) (2024).**
Global Resources Outlook 2024: Bend the Trend – Pathways to a Liveable Planet.
Nairobi: UNEP.
(Assesses material circularity gaps and limitations of secondary supply for critical minerals.)

Ultimately, the paradox is false because it assumes that mining, in its current form, is the only path to a sustainable future. A genuinely transformative energy transition would minimise extraction through efficiency, redesign, circularity and societal change; it would respect ecological boundaries; it would centre the rights and voices of communities at the frontlines of extraction; and it would ensure that technological ambition does not eclipse justice. Only then can the world escape the illusion that environmental progress must come at the cost of new wounds carved into the earth.

b. The Myth of Green Growth: Why Decarbonisation Does Not Automatically Reduce Extraction

For more than a decade, policymakers and corporate leaders have promoted the idea of "green growth" — the promise that economies can continue expanding while simultaneously reducing environmental pressures through technological innovation, efficiency gains and low-carbon energy systems[13]. This philosophy is now deeply embedded in the global decarbonisation agenda. International institutions frame climate action as a pathway not only to ecological stability but to new jobs, new industries, new investment streams and sustained economic expansion. [14]Green growth has become a comforting narrative: a way to reconcile environmental limits with the political demand for perpetual economic growth.

However, this narrative is built on a profound illusion. Far from reducing the world's material and energy footprint, decarbonisation — as currently designed — is accelerating demand for minerals, metals and land at unprecedented scales[15]. The transition away from fossil fuels is not a transition away from extraction; it is a transition into a new extractive regime, one that risks expanding the very pressures it aims to solve. In this sense, green growth is not an alternative to resource depletion — it is its continuation through different materials.

The central reason is that economic growth and material consumption remain tightly coupled. No country in the world has achieved sustained GDP growth while reducing total material use.[16] Efficiency improvements, often celebrated as proof of decoupling, are repeatedly offset by rebound effects: as technologies become more efficient, consumption expands, and the total environmental burden rises instead of falling. Electric vehicles may have lower tailpipe emissions, but their production requires far more minerals and metals. Renewable energy may reduce carbon emissions, but the infrastructure necessary to harness it — from

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[13] **European Commission (2019).**
The European Green Deal.
Brussels: European Commission.
(Positions green growth at the core of EU climate, energy and industrial strategy.)
[14] I**nternational Energy Agency (IEA) (2021).**
Net Zero by 2050: A Roadmap for the Global Energy Sector.
Paris: IEA.
[15] **UNEP (2024).**
Global Resources Outlook 2024: Bend the Trend – Pathways to a Liveable Planet.
Nairobi: United Nations Environment Programme.
[16] **European Environment Agency (EEA) (2023).**
Growth without Economic Growth? Europe's Sustainability Challenge.
Copenhagen: EEA.

transmission lines to battery storage systems — demands massive volumes of copper, aluminium, nickel and rare earth elements. Digital technologies, often depicted as immaterial, depend on energy-hungry data centres, server farms, and electronic devices manufactured from dozens of scarce elements.

The myth of green growth rests on the belief that decarbonisation can succeed without confronting the structural drivers of overconsumption. But a green economy built on the same growth logic is still a high-extraction economy — only with different supply chains and different victims. Instead of oil fields in Iraq or Nigeria, pressure intensifies on lithium brine fields in Chile, nickel mines in Indonesia, cobalt zones in the DRC, and copper belts stretching from Peru to the Balkans. Instead of pipelines in the Gulf, communities face tailings dams in Serbia, gold-cyanide leaching pads in Türkiye, and open-pit copper expansions in North Macedonia. Extraction simply shifts geographically, creating new sacrifice zones rather than eliminating the need for them.

This dynamic exposes another major flaw in the green growth narrative: the assumption that technology alone can overcome ecological limits. But all technologies have material footprints. Solar panels require land, metals and sand; wind turbines require massive foundations and access roads; batteries require chemical processing, gigafactories and continuous resupply of critical minerals. Even the digital sector, often presented as a post-material solution, consumes more electricity than many countries and generates extraordinary volumes of e-waste. The world produces more than 50 million tonnes of electronic waste annually, much of it containing toxic metals — and recycling rates remain dismally low.[17]

The fundamental issue is that growth-based decarbonisation strategies adopt the logic of substitution rather than reduction. Fossil fuels are substituted with renewables; combustion engines with electric motors; gas heaters with heat pumps. But the underlying patterns of consumption, mobility, production and disposal remain largely unchanged. No attention is given to shrinking energy demand, redesigning cities for low-mobility lifestyles, strengthening public transport, improving building insulation, promoting durable products or scaling circular resource systems. As long as growth remains the overriding priority, material demand will continue rising faster than efficiency can compensate.

Moreover, green growth tends to obscure the labour and human rights dimensions of extraction. As mineral demand intensifies, so too do the risks borne by miners and local communities. Accidents in cobalt and nickel mines, cyanide spills at gold mines, sulphur dioxide emissions from copper smelters, and deadly tailings failures are not byproducts of fossil fuels — they are integral to the mineral economy that fuels green technologies[18]. Without structural reform, the transition simply relocates human suffering from coal miners to copper and lithium miners, leaving the extractive labour regime intact.

The geopolitical implications are equally troubling. Wealthy nations promoting green growth are positioning themselves to dominate mineral supply chains, often using diplomatic leverage, investment treaties and

[17] **World Health Organization (WHO) (2024).** *Electronic Waste: E Waste. WHO.*
[18] **United Nations Environment Programme (UNEP) (2024). G***lobal Resources Outlook 2024: Bend the Trend – Pathways to a Liveable Planet.*
Nairobi: UNEP.

development assistance to secure resources from poorer countries. [19]This reproduces historical patterns of inequality: environmental burdens fall on the Global South and fragile regions like the Western Balkans, while economic benefits accumulate in industrialised economies. Instead of building a truly just transition, green growth risks entrenching a new form of "green colonialism."

To challenge the myth of green growth is not to argue against decarbonisation. Quite the opposite. Rapid decarbonisation is essential for climate stability. But a transition that relies on endless expansion of material throughput is neither ecologically sustainable nor socially just. A genuinely transformative model would prioritise reducing energy and resource demand, developing circular-economy systems, expanding public transportation, encouraging local energy systems, designing long-lived products, and adopting policies that redistribute resources rather than expand extraction.

It would also shift the focus from GDP growth to wellbeing, resilience, ecological integrity and community sovereignty over natural resources. Such a model would recognise that decarbonisation is not only a technological challenge but a political and cultural one — requiring societies to confront the illusion that prosperity must always mean expansion.

The green growth narrative is powerful because it promises change without sacrifice. But as the ecological and social consequences of the current mineral rush become impossible to ignore, it becomes clear that the real sacrifice is happening out of sight, in the communities whose lands, health and futures are being undermined to sustain the illusion of limitless green development. Unless global policy frameworks confront the true drivers of extraction, decarbonisation will not reduce humanity's material footprint — it will intensify it.

c. Critical Minerals and Human Rights: The Emerging Global Crisis

As the world accelerates toward decarbonisation, critical minerals have become the backbone of the new global economy. Lithium, cobalt, nickel, copper, graphite, manganese and rare earth elements form the hidden infrastructure of renewable energy systems, electric mobility, digital networks and advanced manufacturing. Policymakers describe them as indispensable building blocks of a climate-neutral world. Yet behind the rhetoric of "strategic autonomy," "green competitiveness" and "clean energy futures" lies a rapidly escalating human rights crisis[20]—one unfolding across mining regions from the Andes to the Balkans, from Central Africa to Southeast Asia, and from Indigenous territories in Australia to rural communities in Türkiye and Serbia.

The crisis begins with geography. Mines for critical minerals are not evenly distributed; they are concentrated in regions with some of the world's weakest governance structures, highest corruption risks, and most vulnerable communities. More than 70 percent of global cobalt comes from the Democratic

[19] **UN Conference on Trade and Development (UNCTAD) (2023).**
Global Trade Update: Strategic Minerals and Development Implications.
Geneva: UNCTAD.

[20] **UN Conference on Trade and Development (UNCTAD) (2023).**
Global Trade Update: Strategic Minerals and Development Implications.
Geneva: UNCTAD.

Republic of Congo, where artisanal miners work in life-threatening conditions with minimal protection, often alongside children.[21] Roughly 60 percent of lithium comes from fragile saltwater basins in Chile, Argentina and Bolivia—ecosystems where Indigenous communities have already suffered from decades of water extraction and cultural marginalisation.[22] Rare earth processing, which produces radioactive and toxic waste, is dominated by industries in China, where environmental information is heavily restricted.[23] Nickel production in Indonesia involves deforestation on an industrial scale, displacement of local populations, and evidence of severe water pollution.[24] These regions have become the epicentres of a modern mineral rush, driven not by fossil fuels but by the demand for clean technologies.

Human rights abuses in mining zones are not accidental byproducts; they are structural outcomes of an economic system that externalises risk and concentrates benefits. Communities located near extraction sites face multiple forms of harm simultaneously. Land expropriation occurs through legal loopholes or coercive processes, often without free, prior and informed consent. Water sources become depleted or contaminated, making agriculture and traditional livelihoods impossible. Health impacts—including elevated heavy metal concentrations in blood samples and reported concerns about cancer, miscarriages, skin diseases and neurological disorders—are often insufficiently investigated, inadequately monitored or underreported. In many mining-affected communities, limited access to independent health assessments and publicly available epidemiological data makes it difficult to establish the full extent of mining-related health risks and ensure accountability.

Women suffer disproportionate burdens, carrying the weight of caring for sick family members, managing water scarcity and navigating the social fallout of environmental degradation.[25]

These abuses are intensified by corporate practices that prioritize speed, profit and supply chain dominance over human rights. Many mining companies use complex webs of subcontractors, subsidiaries and trading partners to blur accountability. Investors and manufacturers—particularly in Europe, North America and East Asia—prioritise supply security over ethical sourcing, creating an incentive structure in which violations are treated as operational risks rather than moral imperatives. Even when companies adopt voluntary standards or ESG guidelines, the implementation rarely reaches those at the bottom of the supply chain. Independent monitoring is infrequent, often superficial, and sometimes obstructed by local authorities. Victims of

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[21] **World Bank (2021)** Cobalt in the Democratic Republic of Congo. WB.

[22] **United Nations Development Project (UNDP) (2022)**. *Lithium in Latin America: A new quest for "El Dorado"? UNDP.*

[23] The Oxford Institute for Energy Studies (2023). *China's rare earths dominance and policy responses.* UK: The Oxford Institute for Energy Studies.

[24] **United Nations Environment Programme (UNEP) (2024).**
Global Resources Outlook 2024: Bend the Trend – Pathways to a Liveable Planet.

[25] **United Nations Environment Programme (UNEP) (2024).**
Global Resources Outlook 2024: Bend the Trend – Pathways to a Liveable Planet.
Nairobi: UNEP.

environmental and labour harms face extraordinary barriers to justice, especially when multinational corporations hide behind jurisdictional fragmentation and opaque ownership structures.[26]

At the same time, governments are introducing national strategies for critical minerals that reinforce extractive pressures. Countries seeking geopolitical influence or industrial advantage frame mining expansions as essential for national security. This rhetoric is used to suppress opposition, accelerate permitting procedures, and limit community participation. Emergency laws, "strategic project" designations and special economic zones are deployed to bypass environmental protections. In the Western Balkans, for example, copper, gold and lithium concessions have been granted without adequate safeguards, placing rural communities at acute risk. In Türkiye, gold mining projects in ecologically sensitive regions have been justified under the banner of "national interest," despite documented pollution and social conflict. [27] [28]These patterns are mirrored globally.

Labour rights are another critical dimension of the crisis. Mining remains one of the most dangerous industries in the world, with thousands of deaths annually due to collapses, explosions, toxic gas exposure and unsafe equipment. In many regions, miners work without formal contracts, without protective gear, and without the ability to unionise. The ILO Convention No. 176 on Safety and Health in Mines—which sets basic international standards—remains poorly implemented or entirely unratified in countries where critical mineral extraction is expanding most rapidly. Subcontracting systems create layers of vulnerability: workers hired through intermediaries have little protection, no social benefits, and no avenue to report abuse.[29]

The human rights crisis extends beyond workers and immediate communities to encompass the global supply chain. People displaced by mining rarely receive adequate compensation and almost never participate meaningfully in decisions affecting their land. Environmental defenders who attempt to resist destructive mining projects face intimidation, violence, arrest and sometimes death. Global Witness and other organisations report a disturbing rise in murders of environmental activists, many linked to the mining and energy sectors[30]. Women defenders are targeted with sexualised online harassment, smear campaigns and gender-based violence designed to silence them. The shrinking civic space in many countries—combined with

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[26] **UN Conference on Trade and Development (UNCTAD) (2023).**
World Investment Report 2023: Global Value Chains and Sustainable Development.
Geneva: UNCTAD.
[27] **United Nations Environment Programme (UNEP) (2024).**
Global Resources Outlook 2024: Bend the Trend – Pathways to a Liveable Planet.
Nairobi: UNEP.
[28] **Global Witness (2023).**
Defending Tomorrow: The Climate Crisis and Threats Against Land and Environmental Defenders.

[29] **International Labour Organization (ILO) (2021).**
Safety and Health in the Mining Sector.
Geneva: ILO.
[30] **Global Witness (2023).**
Defending Tomorrow: The Climate Crisis and Threats Against Land and Environmental Defenders.
London: Global Witness.

the use of "commercial confidentiality" to block public access to environmental data—makes it increasingly difficult for journalists, NGOs and community leaders to expose abuses.

This crisis is further exacerbated by the absence of strong international regulatory frameworks. While the EU is moving toward due diligence laws for supply chains, global governance remains fragmented and weak.[31] Multinational corporations operate across multiple jurisdictions with different standards, allowing them to exploit regulatory gaps. Efforts to regulate strategic minerals often focus on securing access rather than ensuring justice. Environmental protection frameworks, such as the Aarhus Convention and PRTR Protocol, are inconsistently implemented and frequently undermined. Communities affected by pollution or displacement struggle to obtain remedies, and when they do, justice comes too late—often after irreversible ecological damage.[32]

At the heart of this emerging global crisis is a profound moral dilemma. The world urgently needs to wean itself off fossil fuels, yet the way we are pursuing this transition risks replicating the same injustices that defined the fossil-fuel era. Clean energy technologies do not automatically guarantee clean supply chains. A green future built on the suffering of mining communities is neither sustainable nor equitable. The transition to renewable energy must therefore be accompanied by a transition in values, governance models and economic priorities.

A just energy transition requires respecting the rights of miners and their families, ensuring informed and meaningful consent of affected communities, enforcing strong environmental protections, strengthening labour standards, guaranteeing transparency across supply chains, and creating real mechanisms for accountability. It requires investing in recycling, material substitution, and circular systems that reduce dependence on virgin extraction. And it requires acknowledging that humanity cannot mine its way out of climate change without creating new forms of environmental destruction and social inequality.

Without such systemic reforms, the rush for critical minerals will deepen the world's human rights crisis, turning the energy transition into a new arena of extraction rather than a path toward justice. The global fight against climate change cannot be won by sacrificing the dignity, health and futures of those living closest to the mines.

d. The Political Economy of Extraction: Winners and Losers in the Green Transition

The green transition is often presented as a collective global endeavour — a shared mission to replace fossil fuels with renewable energy, protect the planet from climate collapse, and create a more sustainable economic model. This narrative, however, obscures a far more complex and unequal reality. Beneath the language of climate ambition lies a deeply entrenched political economy in which power, wealth and environmental burdens are unevenly distributed. The global shift to clean energy is not simply a technological

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[31] **OECD (2023).**
OECD Guidelines for Multinational Enterprises on Responsible Business Conduct.
Paris: OECD.

[32] **United Nations Environment Programme (UNEP) (2024).**
Global Resources Outlook 2024: Bend the Trend – Pathways to a Liveable Planet.
Nairobi: UNEP.

transformation; it is a reconfiguration of geopolitical alliances, economic hierarchies and social inequalities. The winners and losers of this transition are being determined not by environmental need, but by access to resources, political influence and historical privilege.

At the core of this political economy is the asymmetric control of mineral supply chains. Wealthy industrialised countries — the United States, the European Union, Japan and South Korea — consume the majority of the world's critical minerals but produce very few themselves.[33] Their ability to maintain economic competitiveness and energy security depends on securing reliable supplies of lithium, cobalt, nickel, copper, rare earth elements and platinum group metals. As a result, these countries are aggressively expanding their influence over extraction zones in Africa, Latin America, Central Asia and the Western Balkans. Strategic partnerships, preferential trade agreements, development aid, military cooperation and diplomatic pressure are being deployed to guarantee mineral access, often without adequately safeguarding the rights of local[34] populations.

At the same time, a small number of powerful corporations dominate the global mining and processing sector[35]. These include multinational giants with decades of experience in resource extraction, as well as state-backed actors from China and, increasingly, from Türkiye and the Gulf States. Their control over capital, technology, logistics and refining capacity gives them enormous leverage over governments in resource-rich countries. Concession contracts, tax agreements, export conditions and environmental standards are frequently negotiated behind closed doors, with transparency sacrificed in favour of geopolitical advantage.[36] In such contexts, the voices of local communities and workers are marginalised, and the public bears the environmental cost while corporations accumulate wealth.

This unequal structure is further reinforced by the global financial system. Mining projects are financed by international banks, investment funds, sovereign wealth funds and development institutions seeking high returns. The financial community increasingly markets critical minerals as "green assets," labelling investments in lithium, copper and nickel as sustainable or ESG-aligned because they support the energy transition[37]. Yet this financial framing rarely accounts for the environmental devastation, worker exploitation or human rights violations that accompany extraction. Instead, profit is derived from undervalued land, weak regulatory systems, and the externalisation of environmental and social costs. Communities living near mines are effectively subsidising the global transition through their health, livelihoods and ecosystems.

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[33] **International Energy Agency (IEA) (2023).**
Global Critical Minerals Outlook 2023. Paris: IEA.
[34] **International Energy Agency (IEA) (2023).**
Global Critical Minerals Outlook 2023.
[35] **International Energy Agency (IEA) (2023).**
Global Critical Minerals Outlook 2023.
[36] **UN Conference on Trade and Development (UNCTAD) (2023).**
World Investment Report 2023: Global Value Chains and Sustainable Development.
Geneva: UNCTAD.
[37] **European Commission (2023).**
EU Taxonomy Complementary Climate Delegated Act and Sustainable Finance Framework.
Brussels: European Commission.

Resource-rich countries in the Global South and the Balkans are often portrayed as winners — nations expected to benefit from rising mineral demand through job creation, export revenue and foreign investment. But this optimistic framing masks structural vulnerabilities. Many of these countries have historically been trapped in **extractive dependency**, relying on raw material exports without developing higher-value industries. The green transition risks deepening this dependency, locking countries into low-value positions within global supply chains while richer nations specialise in battery manufacturing, technology development, and renewable energy innovation. In this structure, value accumulates far from the places where environmental degradation occurs.[38]

The political economy of extraction also reproduces internal inequalities. Within mining countries, the benefits flow upward — to political elites, urban centres, intermediary companies and international investors — while the burdens fall disproportionately on rural, marginalised or Indigenous communities. These communities rarely see substantial improvements in infrastructure, healthcare or education. [39]Instead, they face land expropriation, contamination of water sources, loss of agricultural livelihoods, and long-term health impacts that remain invisible in national economic statistics. The notion that mining brings "development" often hides the fact that development is measured in GDP growth, not in the wellbeing of those who live closest to extraction sites.

The green transition also creates new geopolitical losers. Countries without critical mineral reserves — especially in Southeast Europe and parts of the Middle East — risk becoming economically dependent on those that control supply chains.[40] Meanwhile, nations with minerals but weak environmental governance risk becoming sacrifice zones, trading long-term human and ecological health for short-term revenue. In some cases, this dependency leads to increased political instability, corruption and social conflict, undermining democratic institutions.

This structural asymmetry extends to labour. Workers in the mining sector remain among the most precarious in the global economy. Subcontracting, dangerous conditions, inadequate safety protections and anti-union practices continue to define the sector in many regions. [41]The benefits of the energy transition — clean air, stable electricity, modern transport — are enjoyed primarily by consumers in wealthy countries, while miners in the Global South and the Balkans face the frontlines of extraction risks. This imbalance represents a profound injustice at the heart of the green transition.

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[38] **UN Conference on Trade and Development (UNCTAD) (2023).**
World Investment Report 2023: Global Value Chains and Sustainable Development.
Geneva: UNCTAD.

[39] **World Bank (2023).**
Minerals for Climate Action: Supply Chains and Development Risks.
Washington, DC: World Bank.

[40] **International Energy Agency (IEA) (2023).**
Global Critical Minerals Outlook 2023.

[41] **UN Conference on Trade and Development (UNCTAD) (2023).**
World Investment Report 2023: Global Value Chains and Sustainable Development.
Geneva: UNCTAD

Even within wealthy nations, the benefits and burdens are not evenly shared. Renewable energy infrastructure is often sited in rural regions, while urban centres consume the majority of electricity. Communities resist wind farms, power lines and storage facilities, creating local tensions that mirror global conflicts over land and resources. [42]Green development, in this sense, does not erase inequality; it redistributes it.

Ultimately, the political economy of extraction exposes the uncomfortable reality that the green transition is not inherently just. Its outcomes depend on governance, rights protections, transparency, and the distribution of power across global and local scales. Without structural reforms, the transition will deepen existing inequalities while creating new forms of environmental injustice. To ensure that decarbonisation is not merely the next chapter in a long history of extractive exploitation, the world must confront the political and economic structures that shape who benefits, who pays, and who decides the terms of the transition.

A just energy future requires more than technological change. It demands a redistribution of power, a commitment to human rights, and an acknowledgment that environmental sustainability must be inseparable from social and economic justice.

3. **Structural Vulnerability of Mining Regions**

Mining regions across the world tend to share a distinct set of vulnerabilities that emerge not only from the geological and industrial nature of extraction, but also from the socio-economic structures surrounding it. These areas are often geographically isolated, shaped by decades of resource dependence and characterized by economies built almost entirely around a single employer. Such mono-economies create communities that rely on mining for livelihoods, identity, and local development, even when the costs to health, environment and long-term prosperity are severe.

Extraction leaves deep ecological scars. Landscapes become depleted from open-pit excavations, deforestation, drainage tunnels, waste dumping and changes in hydrological systems. These depleted ecosystems rarely recover without massive restoration efforts, which are seldom undertaken. Public health systems in mining towns are usually weak, underfunded, and ill-equipped to respond to chronic exposure to toxic substances. Families living near mines face elevated levels of heavy metals in soil and water, contaminated crops, chronic respiratory illnesses, and increased cancer incidence—risks rarely acknowledged in official reports[43].

These vulnerabilities are compounded by weak regulatory frameworks and inspectorates that lack independence or capacity. In many mining regions, regulatory institutions are politically influenced or

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[42] **United Nations Environment Programme (UNEP) (2023).**
Making Peace with Nature in the Energy Transition.
Nairobi: UNEP.

[43] **United Nations Environment Programme (UNEP) (2024).**
Global Resources Outlook 2024: Bend the Trend – Pathways to a Liveable Planet.
Nairobi: UNEP.

captured by private interests, making enforcement sporadic and ineffective. Companies regularly invoke "commercial confidentiality" to shield emissions data, accident reports, and risk assessments from public scrutiny[44]. As a result, transparency is extremely low, information asymmetry is high, and communities remain excluded from knowing the true environmental and health risks they face.

The Western Balkans and Türkiye embody these overlapping vulnerabilities with particular intensity. The legacy of post-conflict transitions, economic precarity, weak rule of law, continuous outward migration and aggressive foreign investment strategies has created an environment where mining operations can be accelerated without adequate safeguards.[45] These structural weaknesses make the region especially vulnerable to environmental degradation, tailings failures, worker exploitation and long-term socio-economic instability.

4. The Challenge of Abandoned Mines and Post-Mining Landscapes

Abandoned mines represent one of the most neglected and dangerous legacies of the extractive industry. Across the planet, there are an estimated one million abandoned and orphaned sites. Europe alone hosts nearly half a million extractive remnants[46]—silent witnesses to centuries of extraction, left without remediation, monitoring or containment. These sites include collapsed shafts, unsecured pits, flooded underground tunnels, acidified water bodies, oxidised waste rock piles, unstable slopes, contaminated sediments and deteriorating tailings dams.

The Western Balkans are marked by a particularly heavy burden of abandoned mines, many dating back to the Ottoman era, the early industrial period, or the Yugoslav extractive economy. Since their closure, few have undergone any form of ecological restoration or risk assessment. The long-term hazards they pose are immense. Toxic metals seep into soils and rivers over decades; landslides occur in weakened geological structures; and unstable tailings dams continue to threaten communities living downstream.[47]

One of the most insidious legacies is acid mine drainage (AMD), which emerges when sulfide-rich minerals are exposed to oxygen and water—a chemical reaction that produces sulfuric acid and mobilises potential toxins like arsenic, cadmium, chromium, lead, manganese and mercury, among others. Once formed, AMD can persist for centuries, transforming entire river basins into toxic corridors. In the Western Balkans, the

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[44] **European Commission (2023).**
Environmental Implementation Review.
Brussels: European Commission
[45] **European Commission (2023).**
Country Reports on the Western Balkans and Türkiye.
Brussels: European Commission.
[46] **European Environment Agency (EEA) (2023).**
Mining and Environmental Impacts in Europe: Legacy Issues and Remediation Gaps.
Copenhagen: EEA.
[47] **European Environment Agency (EEA) (2023).**
Mining and Environmental Impacts in Europe.
Copenhagen: EEA

impact is visible in places such as Lojane in North Macedonia, where chromium and arsenic have polluted the environment for over forty years; in Kosovo's Trepča complex, where heavy metals continue to contaminate the Iber and Sitnica rivers; and in Serbia's Majdanpek and Bor mining districts[48], where copper contamination has spread through regional waterways. These abandoned sites are not remnants of the past—they are ongoing sources of environmental harm and public health risk.

5. **The Growing Danger of Tailings Storage Facilities**

Tailings storage facilities (TSFs) are among the most dangerous and least understood aspects of modern mining. These vast reservoirs of slurry—fine-grained waste left after ore processing—constitute the world's largest industrial waste stream. Each year, mining produces over thirty billion tonnes of tailings, material that remains toxic long after mines close. More than two hundred and fifty major tailings catastrophes have occurred over the last century, with consequences measured in lives lost, rivers poisoned, farmland destroyed and entire ecosystems irreversibly damaged.[49]

The vulnerabilities of TSFs are structural. Many are built using the cheapest and riskiest methods, including the upstream construction technique that has been banned in a handful of countries but remains common in many regions. Poor maintenance, unmonitored seepage, unauthorized expansions and inadequate emergency planning make these structures chronically unstable. Climate change intensifies these risks, as extreme rainfall, flooding and earthquakes test dams beyond their design limits.

The Western Balkans and Türkiye face particularly high danger. Tailings sites are often located in seismically active zones or near densely populated communities. Limited institutional oversight, fragmented governance, outdated infrastructure and insufficient transparency exacerbate the risk of collapse. Recent incidents illustrate the severity of the threat: the cyanide spill in Erzincan, Türkiye in 2024 contaminated waters flowing toward the Euphrates basin[50]; the tailings leak from the SASA mine in North Macedonia released heavy metals into the Bregalnica river[51]; and the expansions near Majdanpek in Serbia have raised alarms about landslide risk and downstream contamination[52]. While the Global Industry Standard on Tailings Management (GISTM) sets minimum international requirements for tailings oversight, few mines in the region comply—and even fewer publicly disclose whether they do. Over 160 scientists, community groups, Indigenous peoples and civil society groups have endorsed a rigorous set of guidelines for improving the management of mine waste disposal facilities, also known as tailings dams, called *Safety First: Guidelines for*

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[48] **European Environment Agency (EEA) (2023).**
Mining and Environmental Impacts in Europe.
Copenhagen: EEA

[49] **United Nations Environment Programme (UNEP) (2022).**
Global Assessment of Legacy Mining and Abandoned Mine Risks.
Nairobi: UNEP.

[50] Al Jazeera (2024). *Toxic spill at Turkey gold mine raises fears for Euphrates River.*

[51] European Environment Agency (EEA) (2023). *Mining and environmental pressures in the Western Balkans.*

[52] European Environment Agency (2023). *Environmental impacts of mining in South-East Europe*

Responsible Mining.[53] Civil society organizations have yet to document a single mine that meets all the requirements.

6. Worker Safety and the Importance of ILO Convention No. 176

Mining remains one of the most dangerous professions on earth despite technological progress. Every year, thousands of miners lose their lives to collapses, explosions, toxic gas exposure, heavy machinery accidents, and extreme heat underground. Tens of thousands more suffer from chronic respiratory illnesses such as silicosis and pneumoconiosis—diseases that shorten life expectancy and impose immense burdens on families and healthcare systems. [54]These dangers persist because mining is inherently hazardous, but also because many companies and governments fail to uphold essential safety standards.

ILO Convention No. 176, adopted in 1995, was designed to address this gap. [55]The Convention obliges governments to ensure regular inspections, enforce employer responsibility for safe working conditions, investigate accidents transparently, and guarantee miners the right to refuse dangerous work without retaliation. It also requires companies to provide proper ventilation, emergency exits, protective equipment and training. Where implemented, the Convention significantly improves safety outcomes. But in much of the world—including parts of the Western Balkans and Türkiye—implementation remains partial or absent.[56]

In many mining operations across the region, subcontracting has become a structural tool for minimizing accountability. Temporary workers are assigned the most dangerous tasks, lack proper training, and have little protection if they raise concerns. Accident statistics are incomplete, manipulated or not publicly disclosed. [57]Families often receive inadequate compensation, and unions struggle to protect workers in environments dominated by foreign investors who prioritise productivity and cost reduction. The shift toward privatisation in the 2000s further intensified these pressures, weakening collective bargaining and fragmenting labour protections.

Worker safety in the mining sector is not only a labour issue—it is a human rights issue. The failure to enforce ILO standards reflects systemic governance weaknesses that also drive environmental harm and undermine public trust. Without strong protections, miners bear the human cost of the green transition, serving as invisible casualties of a sector that remains dangerous, undervalued and too often ignored.

7. Governance Gaps in the Mining Sector

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[53] Morrill, J., Chambers, D., Emerman, S., Harkinson, R., Kneen, J., Lapointe, U., Maest, A., Milanez, B., Personius, P., Sampat, P., and Turgeon, R. (2022), Safety First: Guidelines for Responsible Mine Tailings Management, Earthworks, MiningWatch Canada and London Mining Network. https://earthworks.org/resources/safety-first/.
[54] **International Labour Organization (ILO) (2021).** *Safety and Health in the Mining Sector.*
[55] **International Labour Organization (ILO) (1995).** *Convention No. 176 – Safety and Health in Mines.*
[56] **International Labour Organization (ILO) (2023).** *Application of International Labour Standards.*
[57] **International Labour Organization (ILO) (2023).** *Application of International Labour Standards.*

Mining governance in the Western Balkans and Türkiye is characterised by **structural weaknesses, regulatory inconsistencies, political interference, and severe enforcement gaps**. Despite ambitious national strategies, the sector operates in a governance vacuum in which economic interests routinely override environmental and social protections. The combination of outdated legislation, weak inspectorates, limited transparency and geopolitical influence creates fertile ground for environmental degradation, corruption, and human rights violations.

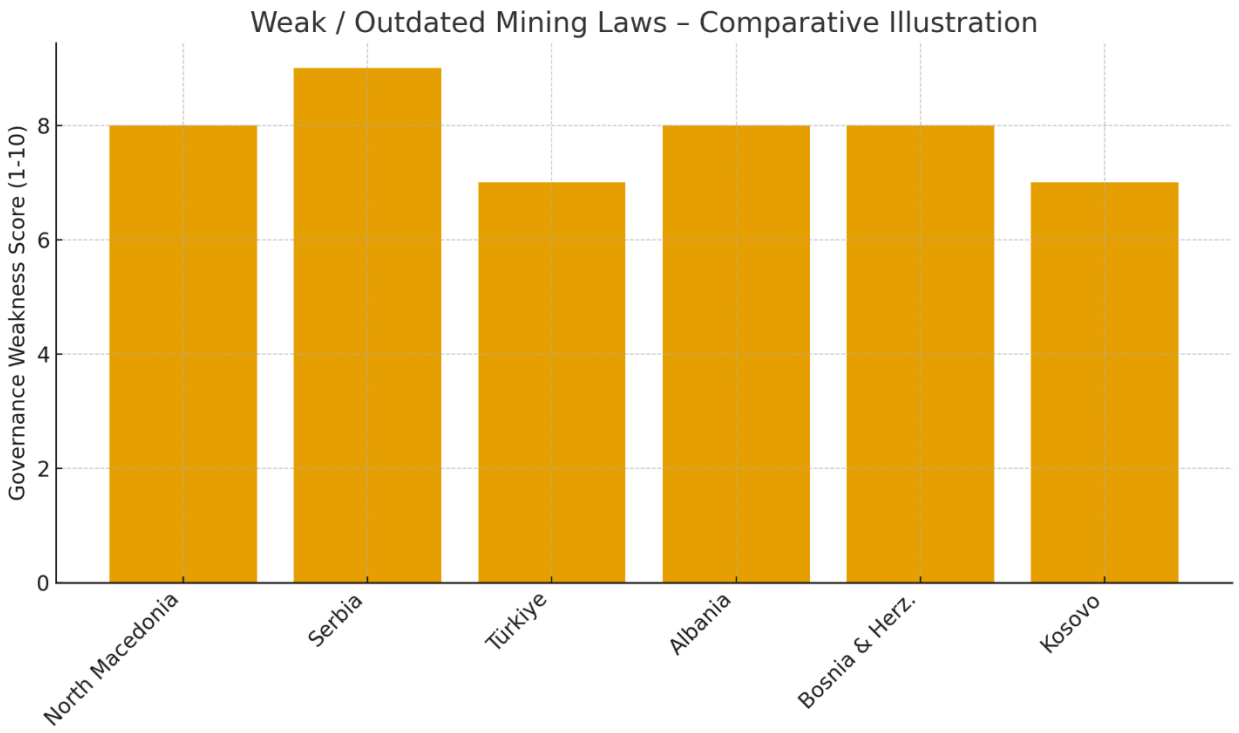
a. Weak or outdated mining laws

Many countries still rely on legal frameworks developed during post-socialist transitions or under early privatization models of the 1990s and 2000s.[58] These laws were designed to attract foreign investment, often by lowering environmental safeguards, reducing administrative barriers, and offering highly favorable terms to investors.

Key structural legal problems include:

- Mining laws that **prioritize "strategic interest"** over environmental protection, allowing fast-tracked concessions.
- Absence of clear legal definitions for:
    - cumulative impact assessment
    - tailings dam safety criteria
    - long-term monitoring obligations
    - mandatory public disclosure of environmental data
- Weak penalties for non-compliance — often fines far below the cost of pollution.
- No obligation for mining companies to insure against **catastrophic tailings failures**.
- Concession contracts that override national legislation through "special agreements" or bilateral deals.
- Incomplete harmonisation with EU acquis (Chapter 27) and UNECE conventions, especially the Aarhus Convention and PRTR Protocol.

[58] **European Commission (2023).**
Country Reports – Western Balkans and Türkiye. Brussels: European Commission.



Source: *Author's illustration based on documented gaps in access to environmental information, pollutant disclosure and PRTR implementation in the Western Balkans and Türkiye. Scores are* ***illustrative*** *and reflect comparative trends reported by* ***UNECE, European Commission, OECD****, and civil-society monitoring organisations.*

In some cases, mining legislation is amended **ad hoc** to legalise previously illegal operations or to accommodate politically connected investors. This legal instability undermines rule of law and creates loopholes that companies exploit.

b. Poor public access to information

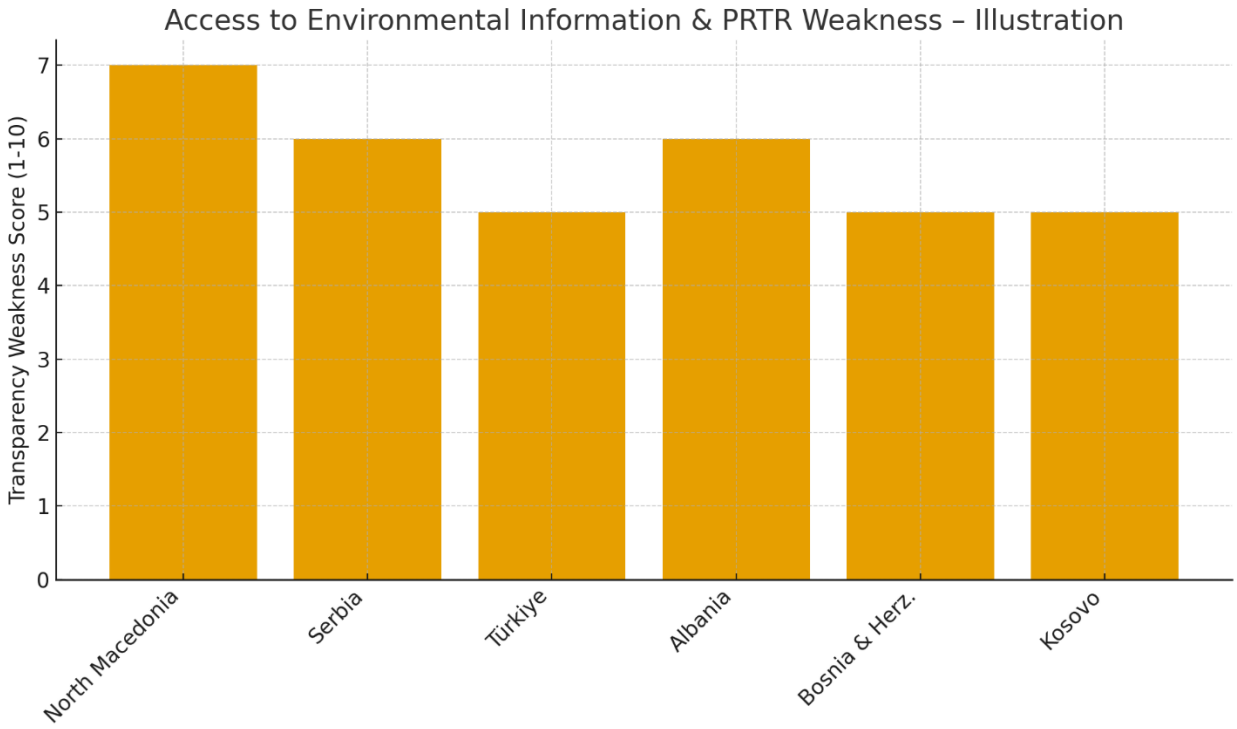
Across the region, access to environmental information is severely restricted. While all countries have nominal obligations under the Aarhus Convention, implementation remains weak.[59]

Major transparency failures include:

- PRTR systems (Pollutant Release and Transfer Registers) that are incomplete, dysfunctional or entirely missing.
- Environmental data published in non-searchable, low-quality PDFs, often without raw datasets.
- Companies invoking **"commercial confidentiality"** to hide emissions, toxic releases, cyanide levels, heavy metal concentrations, and hydrological studies.
- Ministries refusing to release inspection reports, accident logs or tailings stability assessments.

[59] **UNECE (2021).**
Findings and Recommendations of the Aarhus Convention Compliance Committee.

- Delays that violate legal deadlines for responding to information requests.
- Soil and water quality data collected but never publicly released.
- Cross-border pollution information withheld despite obligations under the Water Convention.



Source: *Author's illustration based on documented gaps in access to environmental information, pollutant disclosure and PRTR implementation in the Western Balkans and Türkiye. Scores are* ***illustrative*** *and reflect comparative trends reported by* ***UNECE****,* ***European Commission****,* ***OECD****, and civil-society monitoring organisations.*

The lack of transparency not only violates international law but also prevents communities from assessing risks, preparing for emergencies, or engaging in meaningful public debate.

c. Environmental Impact Assessments (EIAs)

Environmental Impact Assessment processes in the region are widely regarded as inadequate, easily manipulated, and deeply politicised. [60]EIAs often serve as administrative formalities rather than rigorous environmental safeguards.

Common and systemic flaws include:

[60] **European Commission (2023).**
Environmental Implementation Review – Country Reports (Western Balkans and Türkiye).
Brussels: European Commission.

Copy–paste or template-based EIAs

The use of standardised or recycled language in Environmental Impact Assessments (EIAs) raises concerns about whether assessments adequately reflect site-specific environmental conditions and risks. Research examining environmental assessments for pipeline projects has documented substantial textual similarities between assessments of projects with different risk profiles. Such findings highlight the importance of independent scrutiny to ensure that mining EIAs are based on project-specific data, field investigations and appropriate risk assessments.

Lack of hydrological and hydrogeological modelling

Most EIAs fail to model:

- groundwater flows
- erosion risk
- acid mine drainage (AMD) generation
- water contamination pathways
- impacts on agricultural irrigation

This omission is particularly dangerous in karst regions and seismic zones.

Absence of cumulative impact assessment

Projects are evaluated **one by one**, ignoring:

- nearby mines
- industrial zones
- tailings from the socialist era
- existing heavy metal loads in rivers
- combined pollution from smelters and transport

Thus, assessments do not reflect real risks.

Insufficient seismic risk analysis

Many mines are located in seismically active zones (e.g., North Macedonia, Albania, Türkiye). Yet EIAs rarely simulate tailings collapse under earthquake stress, nor do they require compliance with the Global Industry Standard on Tailings Management (GISTM).

No analysis of alternatives

The EU EIA Directive requires examination of “zero option” scenarios, but in the region:

- alternatives are not evaluated
- companies assume mining is inevitable
- environmental restoration or less invasive methods are not considered

Lack of costed remediation plans

Most EIAs fail to include:

- financial guarantees for reclamation
- calculation of long-term monitoring costs
- liabilities for tailings after mine closure
- restoration guarantees for rivers, forests and agricultural land

As a result, thousands of abandoned mines remain unreclaimed, transferring environmental burdens to the state.

d. Political capture and corruption risks

Mining concessions in the region often involve powerful multinational companies from China, Russia, Canada, the UK, Australia and Türkiye. These companies exert influence through:

- lobbying ministries and parliaments
- funding political parties
- negotiating favorable legal exemptions
- hiring former government officials ("revolving doors")
- using investment treaties to threaten arbitration against states

Political capture manifests in:[61]

- fast-tracking EIAs
- revising spatial planning frameworks and facilitating mining development despite environmental concerns, as illustrated by the reinstatement of the Jadar project's planning framework in Serbia in 2024;[62]
- introducing legal provisions that facilitate mining permits in environmentally sensitive areas, as illustrated by Türkiye's 2025 amendments to its mining legislation.[63] [64]
- suppressing community protests
- manipulating public consultations
- using criminal investigations, arrests and legal proceedings against environmental defenders and anti-mining protesters. In Serbia, activists opposing lithium mining in the Jadar region faced arrests, questioning and threats of serious criminal charges during the 2024 protests. In Türkiye,

[61] OECD – *Due Diligence Guidance for Responsible Business Conduct*
[62] Constitutional Court of Serbia (2024). Decision IUo-39/2022 concerning the Jadar spatial plan. Court decision
[63] Hürriyet Daily News (2020). Mining licenses threaten Kaz Mountains, foundation says. Article
[64] Yearbook of International Environmental Law (2026). Turkey — Protected areas, forests, and biodiversity: The Super Permit Law. Legal analysis

environmental defenders protesting the expansion of coal mining into Akbelen Forest were subjected to arrests and police interventions in 2023. [65] [66]

- pressuring inspectorates to underreport violations

In some countries, mining is strategically framed as essential for "energy transition," "national security," or "sovereignty," which is used to justify bypassing democratic procedures.

Corruption risks and transparency deficiencies also affect the governance of mining concessions and natural resource allocation across the region. Research by the OSCE, Transparency International and the U4 Anti-Corruption Resource Centre identifies concerns related to:

- insufficient transparency in concession allocation and licensing procedures;[67]
- weaknesses in the availability, completeness and accessibility of concession data;[68]
- risks of favouritism, conflicts of interest and politically connected business networks;[69]
- inadequate disclosure and scrutiny of concession agreements;
- limited opportunities for independent oversight of licensing decisions and related financial arrangements.

These governance weaknesses can undermine fair competition, public accountability and confidence in the management of mineral resources. However, allegations of bribery, deliberate misreporting of mineral reserves or fraudulent reduction of royalty payments require case-specific evidence and should not be presented as established findings without supporting investigations or official documentation.

e. Weak monitoring of multinational companies

After securing concessions, many foreign investors operate with minimal oversight. Regulatory agencies often lack the capacity, independence or authority to enforce compliance.[70]

Core monitoring failures include:

Tax privileges and exemptions

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[65] Amnesty International (2024). Serbia: "A Digital Prison": Surveillance and the Suppression of Civil Society in Serbia. 16 December 2024.
Amnesty International — Serbia report

[66] Human Rights Watch (2023). Turkey Approves New Coal Mining to Feed Power Plants. 5 August 2023.
Human Rights Watch — Akbelen Forest

[67] OSCE Mission to Skopje (2022). Report on Environmental Corruption in the Republic of North Macedonia. OSCE report

[68] Transparency International Macedonia (2023). Political Integrity Data Scoping in Macedonia. Transparency International report

[69] U4 Anti-Corruption Resource Centre (2021). The Western Balkans and Turkey: Overview of Corruption in the Environment and Climate Sector. U4 report

[70] **European Commission (2023).**
Country Reports – Western Balkans and Türkiye

Companies negotiate:

- reduced royalties
- exemption from VAT
- export tax benefits
- special economic zone status

These reduce state revenues and weaken public bargaining power.

Business confidentiality shielding pollution data

Multinationals frequently classify:

- waste management plans
- cyanide use
- emissions monitoring
- stability reports for tailings dams
- accident investigations

This prevents independent verification and leaves communities unprotected.

Avoidance of long-term reclamation obligations

Few companies comply with post-closure monitoring or restoration. Governments lack the funds and expertise to rehabilitate sites, resulting in:

- toxic abandoned mines
- unstable tailings
- contaminated rivers and aquifers
- long-term acid mine drainage

Liability shifting to governments

When companies close or declare bankruptcy, environmental obligations are transferred to the state. Taxpayers become responsible for:

- cleaning up heavy metals
- stabilising tailings
- providing healthcare for affected communities
- restoring agricultural lands

This pattern is documented in North Macedonia, Serbia, Albania and Bosnia & Herzegovina.[71]

f. Weak Environmental Inspectorates

[71] **European Environment Agency (EEA) (2023).**
Mining and Environmental Impacts in Europe.
Copenhagen: EEA.

Environmental inspectorates across the **Western Balkans and Türkiye** operate with **chronic structural weaknesses**, including insufficient staffing and funding, limited technical capacity, political interference, inadequate independence, and weak enforcement powers, all of which severely undermine effective oversight of mining and other high-risk industrial activities[72]

Core Problems:

- **Understaffing**: Many inspectorates have only 2–5 inspectors for entire regions with dozens of mines.
- **Insufficient budget**: Lack of vehicles, sampling equipment, laboratories, fuel, and trained staff.
- **Outdated technology**: Monitoring equipment is often decades old or non-functional.
- **Political interference**: Inspectors report pressure to overlook violations by politically connected companies.
- **Infrequent inspections**: Some mines are inspected only once per year or after accidents occur.
- **Superficial reporting**: Inspection reports rarely include raw data, laboratory results, or sanctions.
- **Fragmented authority**: Responsibilities are spread across ministries of environment, economy, energy, water, and health, resulting in institutional chaos.[73]

In some cases, inspectorates **announce inspections in advance**, allowing companies to clean visible spills, shut down polluting operations temporarily, or manipulate filtration systems.

g. Judicial Systems Unable to Enforce Environmental Law

Courts across the region face:

- **years-long delays** in environmental cases
- **lack of environmental expertise**
- judges untrained in EU environmental acquis
- pressure from political elites not to rule against strategic investors
- few precedents in environmental litigation[74]

Consequences:

- EIA challenges take so long that mines begin operation before the court even hears the case.
- Tailings dam violations are treated as minor administrative issues, not criminal negligence.
- Corruption cases related to mining concessions are rarely prosecuted.
- Citizens lose confidence in legal remedies and turn to direct action (protests, petitions).

In many countries, the judiciary is **structurally dependent on the executive**, making full enforcement of Aarhus rights impossible.

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[72] **European Commission (2023).**
Country Reports – Western Balkans and Türkiye.
[73] **European Commission (2023).** *Country Reports – Western Balkans and Türkiye.*
(Documents weak inspectorates, political interference, and enforcement gaps.)
[74] **European Commission (2023).**
Country Reports – Western Balkans and Türkiye.

h. Conflicts of Interest in Concession Allocation

The allocation of mining concessions is one of the most opaque and corruption-prone processes in the region.

Common Conflicts of Interest:

- Government officials owning land inside concession zones.
- Former regulators becoming employees of mining companies ("revolving doors").
- Consultants preparing EIAs also hired by the same mining companies.
- Local mayors signing memoranda with investors while suppressing opposition.
- Party-linked companies providing transport, construction or security services to mines.[75]

These systemic conflicts distort tendering processes, reduce competition, and create fertile ground for bribery.

i. EU Accession Pressure vs. National Political Priorities

While EU accession frameworks (Chapter 27: Environment & Climate Change) require strict compliance with environmental standards, national political priorities often favour **rapid economic growth via foreign investment**.

Key Tensions:

- Governments promote mining as "strategic investment" even when in contradiction with EU directives.
- EU warns about PRTR, EIA, and water-quality non-compliance, but political elites prioritise jobs and revenue.
- Candidate countries selectively implement EU law: some directives are transposed on paper but not enforced.
- Mining companies use **bilateral investment treaties** to pressure governments not to tighten environmental laws.[76]

The result is a **dual reality**: EU-aligned legislation exists nominally, but implementation is nearly absent.

j. Impact on Cross-Border Pollution Governance

Mining pollution does not stop at borders. Rivers, groundwater, air flows, and seismic risks spread across the region.

Cross-border failures include:

- No real-time transboundary monitoring data (despite Water Framework Directive obligations).
- Lack of joint emergency protocols for tailings failures.

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[75] **World Bank (2022).**
Enhancing Governance in the Extractive Sector.
[76] **UNCTAD (2023).**
World Investment Report: International Investment Policies and Sustainable Development.

- Inconsistent pollution reporting between neighbouring countries.
- National PRTR systems incompatible or non-existent, preventing regional comparisons.
- Disputes between countries about responsibility for pollution in shared basins (e.g., Timok–Bregalnica, White Drin basin, Lake Ohrid watershed).
- Nearly no cooperation on abandoned mines, tailings instability, or acid mine drainage.[77]

The Western Balkans and Türkiye urgently require **regional environmental governance mechanisms** for extractive industries — something the EU has not yet mandated explicitly.

[77] **European Environment Agency (2023).**
Mining and Environmental Pressures in Europe.

8. THE CRITICAL ROLE OF CIVIL SOCIETY, JOURNALISTS AND ENVIRONMENTAL DEFENDERS

Mining governance in the Western Balkans and Türkiye cannot be understood without acknowledging the central role played by civil society organisations (CSOs), journalists, academic experts, and environmental human rights defenders (EHRDs). In a region where state institutions are frequently overstretched, politically influenced, or aligned with corporate interests, these actors have become the primary — and often the only — guardians of environmental democracy, public health, and community safety.

Their work is not supplementary but structural: without them, the extractive sector would operate almost entirely without oversight, accountability or public scrutiny.

a. Civil Society as the De Facto Regulator in a Weak Governance Environment

State authorities across the region struggle with chronic underfunding, staff shortages, lack of specialized expertise, politicization of inspectorates, and inconsistent enforcement. In this context, CSOs perform essential regulatory and oversight functions.

CSOs conduct tasks that governments should do, but often fail to:

- Independent environmental monitoring (air, soil, surface and groundwater).
- Mapping abandoned and orphaned mines, often at their own cost.
- Analyzing Environmental Impact Assessments (EIAs), exposing gaps, false statements, or missing baseline data.
- Using the Aarhus Convention to demand access to environmental information hidden under "business confidentiality."
- Tracking tailings safety reports that are never published.
- Supporting communities with legal aid, petitions, appeals and strategic litigation.
- Preparing shadow reports (like this one) to inform UNECE bodies, EU accession chapters, and UN mechanisms.
- Educating local citizens about their rights in the face of powerful extractive companies.

Across the region, CSOs have prevented or delayed destructive projects by mobilizing public participation and exposing irregularities in concession procedures.[78] [79]

b. Investigative Journalists: Frontline Fact-Finders in Hostile Environments

Journalists who investigate mining impacts perform a high-risk public service. While government agencies may release incomplete or politically curated information, journalists uncover evidence of pollution, corruption and health harms.

Their contributions include:

- Revealing pollution levels far above legal limits (Bor, Veles, Jegunovce, Ergani, Erzincan).
- Documenting spills, toxic releases, and accidents that companies attempt to hide.

[78] **UNECE (2021).** *Aarhus Convention Compliance Committee Findings.*
[79] **European Commission (2023).** *Country Reports – Western Balkans and Türkiye.*

- Publishing stories about cancer clusters in communities near mines.
- Tracing financial links between mining companies, political parties and local authorities.
- Reporting on unsafe working conditions, fatal accidents and violations of ILO Convention No. 176.
- Organizing cross-border collaborations that expose regional pollution patterns.[80]

However, journalists face severe pressures. Key threats:

- SLAPP lawsuits designed to silence reporting.
- Police and security service surveillance, especially near "strategic" foreign-investment sites.
- Threats and intimidation, including from private security companies hired by mining investors.
- Denial of accreditation for EIA hearings or corporate press conferences.
- Economic pressure on local media financed through mining advertisements.
- Censorship and self-censorship, especially in smaller towns dependent on mining employment.[81]

Women journalists face gender-specific harassment, such as doxxing, sexualised insults and coordinated online campaigns. This gender-based violence is increasingly recognised in EU and UN guidance as a form of digital repression.

c. Environmental Defenders: Protectors of Land, Water and Community Health

Environmental defenders are essential social actors, often operating with no institutional support. They include farmers, teachers, retirees, local activists, women collectives, youth groups, and indigenous or minority communities. Many live in areas directly threatened by mining concessions or tailings.

Their core activities include:

- Independent water sampling downstream from mines.
- Recording community testimonies and health concerns.
- Blocking illegal construction or blasting activities.
- Organising public hearings when companies and municipalities avoid them.
- Filing complaints to EU delegations, UN rapporteurs and Aarhus bodies.
- Coordinating large-scale peaceful protests (e.g., Serbia's 2021 anti-lithium movement).
- Protecting cultural and natural heritage zones from mining expansions.

They face systemic risks:

- Police intimidation and arbitrary detention (documented in Türkiye, Serbia, Albania).
- Physical attacks by hired security or unidentified actors.
- Threats to family members and children.
- Surveillance through drones, tracking devices and spyware.
- Smear campaigns by pro-government and pro-company media.
- Cyber-attacks and hacking of activists' devices.

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[80] **Balkan Investigative Reporting Network (BIRN) (2021–2023).**
Investigations on Bor, Veles, Jegunovce and Erzincan pollution.
[81] **Reporters Without Borders (RSF) (2023).** *Europe's SLAPP Crisis.*

- Criminalisation through fabricated charges like "obstruction of business activity."[82]

Women defenders are disproportionately targeted — labelled as "anti-development," "foreign agents," or "enemies of national progress." The emotional toll is enormous, yet women's organizations are among the strongest and most persistent forces in resisting harmful mining.

d. Academic Institutions, Independent Scientists and Medical Experts

Because mining pollution is highly technical, communities rely heavily on scientists from universities, medical institutions, and independent laboratories. Their analyses often reveal:

- Elevated levels of arsenic, cadmium, lead, chromium or manganese in rivers and soil.
- Increased incidence of respiratory diseases near smelters and mines.
- Contamination of agricultural products (milk, vegetables, cereals).
- Hotspots of neurological disorders linked to heavy metal exposure.
- Geological instability of tailings and landslide risks.[83]

However, academic experts face:

- Political pressure not to publish results.
- Restriction on access to sites for sampling.
- Institutional reluctance to confront powerful investors.
- Lack of state funding for independent research.
- Attempts by companies to co-opt or silence critical experts.[84]

Those who speak publicly sometimes face professional consequences.

e. Shrinking Civic Space: Criminalisation, Censorship and "Commercial Confidentiality"

In recent years, countries across the **Western Balkans and Türkiye** have experienced a **systematic erosion of civic space**, frequently justified through narratives of "strategic investment," "national interest," or "energy security," which are increasingly used to restrict public participation, limit scrutiny of large-scale projects, and marginalize dissenting voices in environmental decision-making."[85] Mining concessions are increasingly shielded from democratic scrutiny, while activists and journalists who attempt to expose environmental harm face escalating pressure from both state and non-state actors.

A particularly alarming tactic is the **abuse of "commercial confidentiality"** to conceal data that directly concerns public health and environmental risk. Companies — often supported by government ministries — classify emissions reports, cyanide-level measurements, hydrological studies, seismic-risk assessments, toxicological profiles and tailings dam safety audits as proprietary information. This practice systematically

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[82] **UN Special Rapporteur on Human Rights Defenders (2022).**
Situation of Human Rights Defenders Working on Environmental Issues.
[83] **European Environment Agency (EEA) (2023).**
Heavy Metal Pollution in European Rivers and Soils.
[84] **UNESCO (2021).***Recommendation on Science and Scientific Researchers.*
[85] **European Commission (2023).** *Country Reports – Western Balkans and Türkiye.*

undermines Article 4 of the Aarhus Convention[86], which guarantees citizens the right to access environmental information without having to justify their request. By turning environmental data into a trade secret, institutions effectively privatise public risk.

The shrinking civic space also manifests through **procedural manipulation**. Public hearings are scheduled with minimal notice, during working hours, or in remote locations. Environmental Impact Assessments (EIAs) are published without executive summaries, without baseline data, or in formats that are inaccessible to ordinary citizens. In some cases, companies submit incomplete documentation but still receive approval due to political pressure or administrative fast-tracking. Crucially, authorities often **refuse to publish independent reviews**, limiting the public's ability to challenge mining expansions.[87]

The criminalisation of dissent is another dangerous trend. Peaceful protesters are labelled as extremists or "anti-development agitators." Activists face fines for "disturbing the public order," while journalists documenting protests are threatened with defamation charges or removal of accreditation. In several countries, environmental defenders have been summoned by police for questioning simply for posting images of pollution on social media, illustrating the extent to which digital expression is being monitored and controlled.[88]

Moreover, some governments have introduced or proposed **"foreign agent" laws** targeting NGOs that receive international funding[89] — a direct attempt to stigmatise civil society and delegitimise environmental activism. This creates a climate of intimidation that discourages community participation and isolates local groups from needed international support.

In this atmosphere, **mining companies often fill the vacuum left by weak institutions**, presenting themselves as "development partners" while sponsoring local events, sports clubs, or municipal activities.[90] This corporate social responsibility (CSR) strategy increases community dependency and discourages public criticism, further shrinking civic space and undermining democratic oversight.

The cumulative effect is a profound **imbalance of power**: corporations and political elites operate with increasing opacity, while communities, journalists and civil society face escalating barriers, surveillance and legal risks. This imbalance threatens not only environmental protection but also fundamental human rights, democratic participation, and the rule of law.

Notable mechanisms include:

- Labeling CSOs as "foreign-funded" or "anti-state" when they question mining concessions.
- Using "commercial confidentiality" to hide emissions data and tailings safety documents.

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[86] **UNECE Aarhus Convention Compliance Committee (2017–2022).** *Findings on Communications ACCC/C/2008/30, ACCC/C/2010/54, ACCC/C/2015/128.*
[87] **European Commission (2023).** *Environmental Implementation Review – Western Balkans and Türkiye.*
[88] **UN Special Rapporteur on Human Rights Defenders (2022).** *Situation of Human Rights Defenders Working on Environmental Issues.*
[89] **European Commission (2023).** *Rule of Law Report – Western Balkans and Türkiye.*
[90] **UN Development Programme (UNDP) (2022).** *Extractive Industries and Local Development.*

- Denying access to environmental information in violation of Article 4 of the Aarhus Convention.
- Restricting protest permits or imposing excessive police presence.
- Manipulating EIA procedures to exclude public participation.
- Fast-tracking mining projects through "urgent interest" legislation.
- Threatening the accreditation of journalists covering sensitive topics.

These tactics are systemic, not isolated. In several countries, mining projects are directly linked to foreign policy agendas, making criticism politically risky.

f. Cross-Border Environmental Defenders and Regional Solidarity

Because rivers, air currents and geological basins cross borders, mining impacts are often transboundary. CSOs have formed powerful regional alliances:

- North Macedonia–Serbia: Cooperation on heavy metal contamination of the Bregalnica–Timok basin.
- Serbia–Bosnia: Monitoring cross-border pollution from copper mines and thermal power plants.
- Albania–Kosovo: Joint work on chromium and lead contamination.
- Türkiye–Greece: Mobilization against cyanide-based gold mining in shared river basins.[91]

Regional solidarity networks fill the vacuum left by the absence of coordinated state action.

g. Digital Activism and Digital Violence

Digital platforms allow communities to mobilize rapidly, share evidence of pollution, and organize protests. However, defenders increasingly face digital violence, including:

- Disinformation campaigns funded by companies.
- AI-manipulated images (deepfakes) to discredit activists.
- Coordinated troll attacks on environmental organizations.
- Online surveillance by state actors and private contractors.
- Harassment in Facebook groups dominated by pro-mining narratives.
- Targeted attempts to hack journalists' email and social media.[92]

Women activists are especially targeted with misogynistic abuse, sexualized threats, and attempts to shame them into silence.

h. Strategic Litigation and the Fight for Accountability

CSOs and legal coalitions use domestic and international mechanisms to contest harmful mining operations:

- Administrative appeals to overturn flawed EIAs.
- Constitutional complaints for violation of environmental rights.
- Lawsuits demanding suspension of mining operations.
- Complaints to the Aarhus Convention Compliance Committee.

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[91] **European Environment Agency (EEA) (2023).** *Water Pollution and Transboundary River Basin Management in Europe.*

[92] **Global Witness (2022).** *Greenwashing and Disinformation in the Extractive Sector.*

- Submissions to UN Special Rapporteurs.
- EU accession monitoring reports (Chapter 27, Green Agenda).
- Complaints to the Energy Community Secretariat.
- Using PRTR obligations to demand emissions transparency.

Several high-profile mining projects have been suspended or cancelled as a result of these actions.[93]

i. The Fundamental Importance of Local Knowledge

The most reliable information often comes from local residents who:

- Know the history of abandoned mines.
- Preserve oral knowledge about past accidents and spills.
- Understand water flows, underground channels and landslide zones.
- Document unusual smells, dust trails, livestock illness or crop failures.
- Alert journalists when companies operate at night or during holidays.
- Record video evidence of blasting, illegal dumping, or tailings leaks.

This grassroots knowledge is irreplaceable and cannot be replicated by formal institutions.

j. Why Civil Society and Environmental Journalism Are Irreplaceable

In mining governance systems marked by opacity, corruption, and political-economic capture, civil society and journalism fulfil structural democratic functions:

- They produce independent scientific data.
- They defend communities when institutions fail.
- They expose corruption and hidden concessions. They hold corporations accountable.
- They protect miners' rights where ILO Convention No. 176 is ignored.
- They ensure compliance with the Aarhus Convention, PRTR and EU acquis.
- They build community resilience and informed public participation.
- They prevent irreversible environmental and health damage by acting early.
- They create regional solidarity networks that governments lack.

Without civil society, journalism and environmental defenders, mining in the Western Balkans and **Türkiye would proceed with minimal transparency, maximal harm, and no accountability.**

[93] **European Commission (2023).**
Environmental Implementation Review – Western Balkans and Türkiye.

NORTH MACEDONIA: COUNTRY CHAPTER

1. Introduction: The Mining Landscape of North Macedonia

North Macedonia's mining sector occupies a paradoxical position in the country's economic and political life. It is simultaneously promoted as a source of rural employment, foreign investment and "strategic development," while also representing one of the most persistent sources of environmental degradation, public health risk and governance controversy.[94] The country's geological richness — particularly in lead, zinc, copper, chromium and rare metals — has attracted domestic and international investors for decades. But this mineral wealth exists alongside a legacy of contaminated landscapes, abandoned mines, unstable tailings dams and fragile institutions unable to fully regulate the sector.

Mining activities in North Macedonia are deeply intertwined with the country's industrial history. The residues of the socialist-era extractive economy remain visible in polluted rivers, degraded agricultural soils and toxic hotspots such as Lojane, Jegunovce and Veles[95]. Many mines were closed without rehabilitation obligations, leaving behind unsecured shafts, oxidised waste piles and tailings that continue to leak heavy metals into the environment. New investments — particularly in the east (SASA, Zletovo, Toranica[96]) and new concessions in the southeast — risk amplifying these long-standing vulnerabilities.

The country's transition toward EU membership brings pressure to align environmental governance with EU directives, yet mining remains a politically sensitive sector. Concessions are often framed as essential for economic growth in deprived regions, even when environmental and health impacts outweigh the benefits. Communities frequently find themselves divided between the need for employment and the need for clean water, clean air and safe agricultural land. This tension defines the mining debate in North Macedonia and reveals structural gaps in governance, transparency and public participation.

2. Historical Context and Legacy Pollution

Mining in North Macedonia is not merely an economic sector; it is a historical force that has shaped landscapes, communities, and public health for more than a century. The story of mining is woven into the country's industrial memory, from the early 20th-century extraction zones in the east to the large metallurgical complexes that defined the Yugoslav period. Yet, the environmental cost of this history remains largely unpaid. The legacy of past mining activities continues to generate pollution long after the machinery went silent, creating a shadow that stretches across generations.

During the socialist era, mining and metallurgy were among the pillars of industrial development. The state invested heavily in extracting lead, zinc, copper, iron, chromium and other metals to fuel the broader Yugoslav industrial system.[97] But environmental protections were minimal or nonexistent. Mines were

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[94] **European Environment Agency (EEA) (2023).** *Environmental Pressures in the Western Balkans.*
[95] **Government of North Macedonia (2022).** *National Strategy for Mineral Resources and Mining Development.*
[96] **Government of North Macedonia (2022).** *National Strategy for Mineral Resources and Mining Development.*
[97] **European Commission (2023).** *North Macedonia Country Report – Environment Chapter*

opened without consideration for long-term ecological recovery, tailings dams were constructed using techniques now recognized as unsafe, and waste was routinely discharged into nearby rivers. Entire regions — particularly in the east and northwest — became industrial corridors where extraction, smelting and waste disposal occurred side by side with residential areas and agricultural land.

The collapse of Yugoslavia and the economic restructuring of the 1990s accelerated the decline of the metallurgical sector.[98] Smelters shut down, mines were abandoned, and many state enterprises collapsed or were sold in opaque privatizations. These closures did not come with plans for environmental remediation. Toxic sites were simply left behind[99]. Hazardous waste remained stored in unsecured facilities, tailings dams were left unmanaged, and contaminated soils were never rehabilitated. The state inherited thousands of tonnes of hazardous waste that had no clear owner, no legal responsibility and no monitoring system.[100]

Some of the most severe pollution hotspots in North Macedonia today are direct remnants of this era. The former chromium and arsenic mine in Lojane stands as one of the most critical toxic sites in the country — a silent catastrophe that continues to unfold. Over 40 years after extraction ceased, huge piles of chromium slag, arsenic waste and antimony residues lie exposed to wind and rain. Each rainfall event causes toxic metals to leach into nearby waterways, while dry periods allow contaminated dust to disperse across villages and agricultural fields[101]. Generations of families have lived alongside this site, without remediation, compensation or meaningful state intervention.

Veles is another symbol of legacy pollution. The region's smelter, once a major employer, left behind a vast toxic footprint after closing. Cadmium, lead and zinc residues remain in tailings and contaminated soil around the city. Even decades after operations stopped, the impacts are still measurable: elevated heavy metal concentrations have been detected in nearby farmland, residential zones, and even in children's blood samples in some studies.[102] Despite this, remediation remains incomplete and long delays in environmental assessment have left community concerns unanswered.

Jegunovce, near Tetovo, holds another infamous industrial legacy. The former smelter produced high levels of dust loaded with heavy metals, and its closure in the early 2000s did not bring relief. Large stockpiles of hazardous waste were left uncovered. Seasonal winds disperse dust particles across the wider Polog valley — a region already struggling with air pollution — and local residents continue to face health concerns linked to toxic exposure[103]. The absence of a comprehensive government response has allowed this industrial legacy to persist as a chronic risk.

These sites are not isolated cases. Across the country, more than eighty abandoned mines and industrial zones contribute to ongoing environmental pressures. Flooded underground tunnels continue releasing

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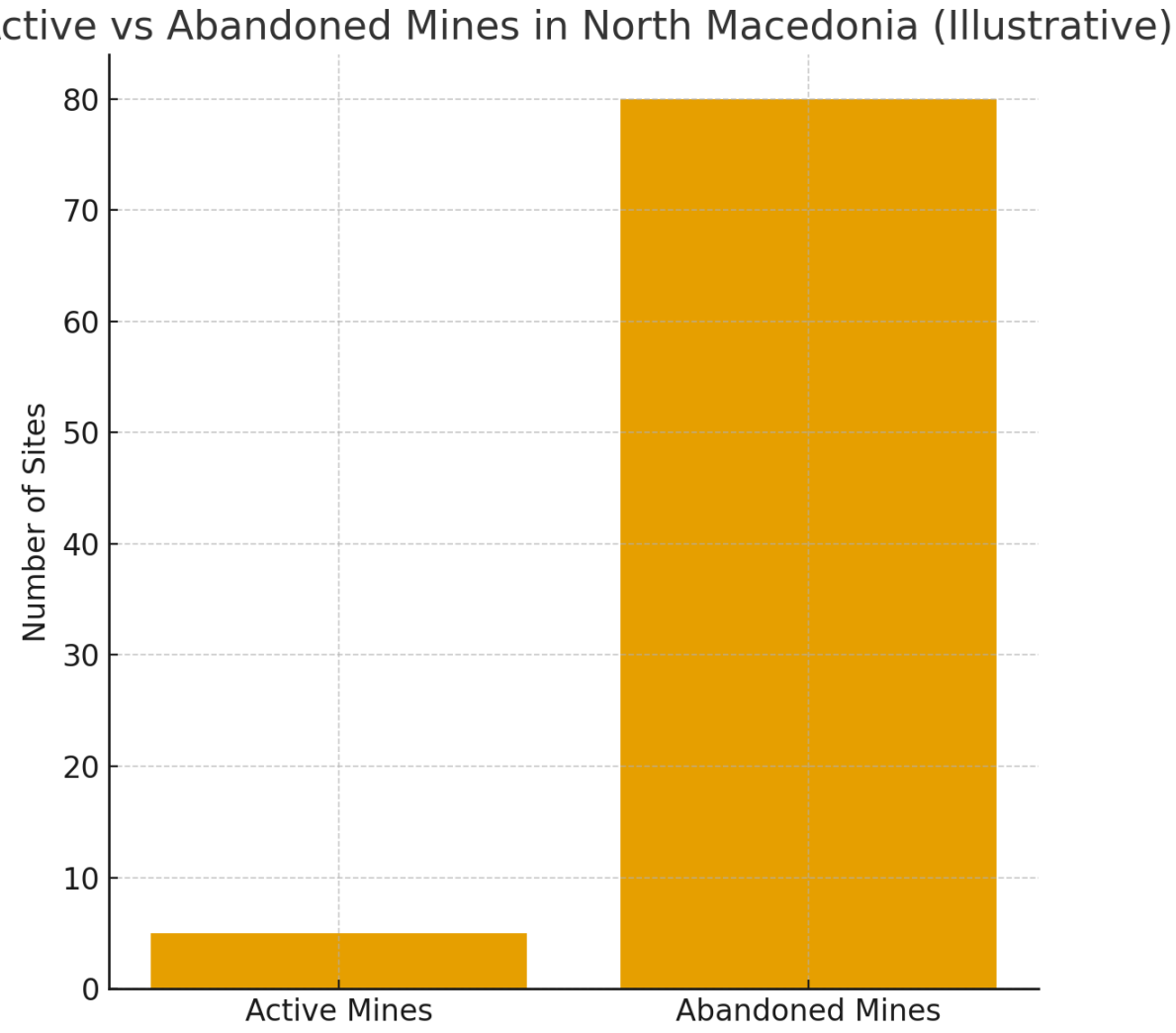
[98] World Bank (1999); EBRD (1996; 2000); UNECE (1995); OECD (2001); USGS (1995–2000); IMF (1998)
[99] **UNDP (2004).** *Post-Conflict Economic Recovery and Environmental Degradation in the Balkans.*
[100] **uropean Environment Agency (EEA) (2022).** *Management of Contaminated Sites and Orphan Pollution in Europe.*
[101] **European Environment Agency (EEA) (2023).** *Mining and Environmental Pressures in the Western Balkans.*
[102] **UNDP (2022).** *Environmental Degradation and Public Health in North Macedonia.*
[103] **Institute of Public Health of North Macedonia (2018; 2020).** *Health Risk Assessment in the Polog Region.*

metal-laden water into river basins. Oxidised waste rock piles produce acid mine drainage, which mobilises arsenic, cadmium and lead into soils and waterways. Some tailings dams constructed during the mid-20th century remain structurally unstable, and many lack proper drainage or chemical containment systems.[104]The toxic remnants of the past are not dormant; they remain active sources of contamination that threaten water quality, agricultural productivity and human health.

What makes North Macedonia's legacy pollution particularly concerning is that it is occurring in a country with limited institutional capacity for large-scale environmental rehabilitation. Unlike wealthier European states that have invested heavily in post-mining restoration, North Macedonia lacks the financial resources, technical expertise and political prioritisation required to address these historical burdens. Many legacy sites exist outside current concession regimes and therefore fall into legal grey zones, leaving no responsible operator to fund or implement remediation. The state bears the burden of risk, but the state alone cannot shoulder it.

The persistence of legacy pollution reveals a deeper truth about mining in North Macedonia: extraction has been treated as temporary profit, while environmental and health consequences have become permanent debts. These debts are now inherited by communities who had no role in creating them. The new wave of mining investments arrives not in a neutral landscape, but in one already saturated with toxic remnants and ecological fragility. Any analysis of present or future mining must therefore begin with an honest acknowledgment of this heavy historical inheritance and the urgent need to address it.

[104] **European Commission (2023).** *North Macedonia Country Report – Environment and Climate Change.*



Source: [Industrial Contaminated Sites – Special Study]

3. Current Mines and Concessions

The contemporary mining landscape of North Macedonia is shaped by a combination of long-standing extraction sites, newly revitalised concessions, and politically sensitive plans for future expansion. While mining represents only a small share of national GDP[105], its regional influence is significant, particularly in the east and southeast of the country, where entire communities remain economically tied to extraction. In recent years, the political narrative has increasingly framed mining as a potential driver of green energy technologies and strategic materials, even as environmental and social controversies deepen.

Several large mines remain active and form an important part of North Macedonia's mining sector. The **SASA mine**, located near Makedonska Kamenica, is a major lead and zinc mining operation. On 14 September 2020,

[105] **European Environment Agency (EEA) (2023).** *Mining and Environmental Pressures in the Western Balkans.*

approximately 8,000 cubic metres of tailings material leaked from its TSF4 facility into the Kamenica River, highlighting the environmental risks associated with tailings storage and management.[106]

The **Toranica mine**, another lead and zinc operation in northeastern North Macedonia, has also been examined in scientific studies of mining-related water contamination. Research based on samples collected in 2012 identified elevated concentrations of certain metals in the Kriva River, indicating impacts associated with mining activities.[107]

The **Zletovo mine**, located near Probištip, has been linked to contamination of surrounding watercourses and agricultural soils. Scientific research has documented elevated concentrations of potentially toxic elements, including lead, zinc, cadmium and arsenic, in soils affected by mining and flotation waste. [108] [109]

In the southeast, the copper sector is dominated by operations surrounding the **Bucim mine**, which expanded in recent years through the opening of Borov Dol [110]— a concession that shifted the centre of gravity of copper extraction while expanding the volume of ore processed. Copper mining, in particular, is being promoted as strategically aligned with the global demand for electrification and renewable energy infrastructure. Yet local communities continue to raise concerns about dust emissions, water use and the long-term stability of tailings.[111]

Perhaps the most controversial mining concession in recent Macedonian history is the proposed **Ilovica–Štuka project**. This project has become a national symbol of the tensions between economic ambitions and environmental justice. It triggered widespread mobilisations by residents, farmers, civil society organisations and municipalities, due to fears that cyanide-based gold extraction would endanger the fertile Strumica valley — one of North Macedonia's most productive agricultural basins. Legal disputes, community resistance and inconsistencies in concession procedures have kept the project in prolonged uncertainty.[112]

Equally significant is the case of **Kazandol mine**, where local resistance achieved a rare victory. The concession was ultimately revoked following mass protests, citizen referendums and national pressure, demonstrating that organised community action can directly influence environmental governance despite strong investor interests.[113]

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[106] Morrill, J. (2020, November 9). We're Going to See More Failures: Central Asia Metals' Tailings Spill. Earthworks. Earthworks article

[107] Surface water characterization of three rivers in the lead/zinc mining region of northeastern Macedonia. (2014). Archives of Environmental Contamination and Toxicology. DOI: 10.1007/s00244-014-0012-z. Scientific study

[108] Surface water characterization of three rivers in the lead/zinc mining region of northeastern Macedonia. (2014). Archives of Environmental Contamination and Toxicology. DOI: 10.1007/s00244-014-0012-z. Scientific study

[109] Stafilov, T., Stojanova, K., Tasev, K., & Bačeva Andonovska, K. (2023). Accumulation and distribution of heavy metals in soil and food crops in the Pb–Zn mine environ. Case study: Region of Probištip, North Macedonia. Journal of Environmental Science and Health, Part A, 58(3), 171–182. Scientific article

[110] **European Environment Agency (EEA) (2023).** *Mining and Environmental Pressures in the Western Balkans.*

[111] **OECD (2023).** *Global Material Resources Outlook*

[112] **European Commission (2023).** *North Macedonia Country Report – Environment and Climate Change.*

[113] **Transparency International (2020).** *Mining Governance and Civic Resistance in Southeast Europe.*

Across the country, dozens of smaller exploration concessions have been issued[114] for metallic and non-metallic minerals, often without detailed public information, cumulative impact assessments or region-wide hydrological modelling. Some of these concessions overlap with agricultural land, forests, water sources or areas vulnerable to erosion and landslides. Due to the lack of a comprehensive national spatial plan, decisions are frequently made in isolation, without assessing how new projects would interact with legacy pollution or existing industrial pressures.

In parallel with these developments, a major institutional shift took place: **North Macedonia has, for the first time in its history, established a Ministry of Mining and Energy Transition.[115]**
This new ministry merges two powerful and often conflicting domains — extraction and decarbonisation — under a single administrative structure. The rationale is to coordinate mineral policy with national energy goals and EU Green Deal commitments. However, the institutional design raises crucial questions. Combining mining with energy transition may create opportunities for more integrated policy planning, but it also risks prioritising strategic mining interests under the banner of "green development." The ministry's ability to enforce stringent environmental standards will depend on its independence, transparency, and willingness to confront powerful corporate actors. As a newly formed institution, its regulatory philosophy, staffing, enforcement capacity and alignment with EU directives remain evolving and uncertain.

Foreign ownership continues to dominate North Macedonia's mining sector. Investors from Switzerland, Bulgaria, Türkiye, Canada and the UK control significant portions of extraction and processing. This internationalization brings capital and technical expertise but also raises concerns about profit repatriation, tax avoidance, corporate transparency and limited community benefits.[116] Contracts between the state and investors are often inaccessible to the public, classified under commercial secrecy, or negotiated without robust environmental conditionalities. This lack of transparency contributes to growing public mistrust and fuels conflict between communities and authorities.

Despite the government's emphasis on attracting foreign investment, there is no national roadmap for transitioning the sector toward modern, sustainable extraction practices. North Macedonia still lacks a fully functional PRTR system, comprehensive water monitoring in mining zones, a national inventory of abandoned mines, or an updated geological database accessible to the public. This governance gap makes it difficult for communities to assess risks, for municipalities to plan land use, and for the state to fully understand the cumulative impacts of expansion.

The landscape of current mines and concessions in North Macedonia is therefore best described as a complex and contradictory mosaic: active extraction sites operating under outdated environmental burdens, communities mobilizing to protect land and water, foreign investment shaping the sector's future, and a new ministry tasked with navigating the tensions between mining and sustainability. The direction this sector

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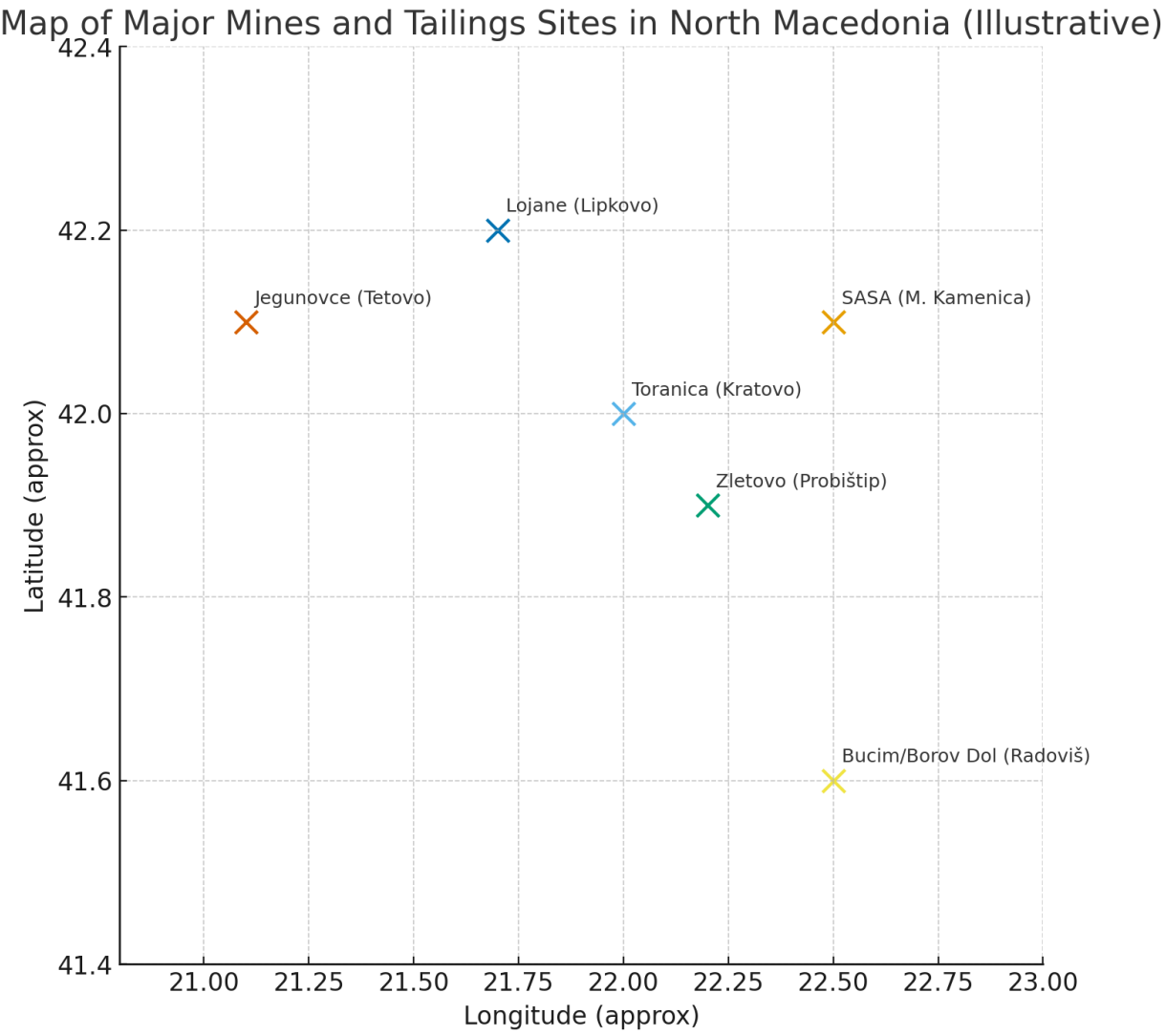
[114] **European Commission (2023).** *North Macedonia Country Report – Environment and Climate Change.*
[115] **Government of the Republic of North Macedonia (2024).** *Decision on the Establishment and Organisation of the Ministry of Mining and Energy Transition.* Official Gazette of the Republic of North Macedonia.
[116] **UNCTAD (2023).** *World Investment Report.*

takes in the coming decade will depend heavily on whether policy-making prioritizes short-term investment or long-term environmental and human health.

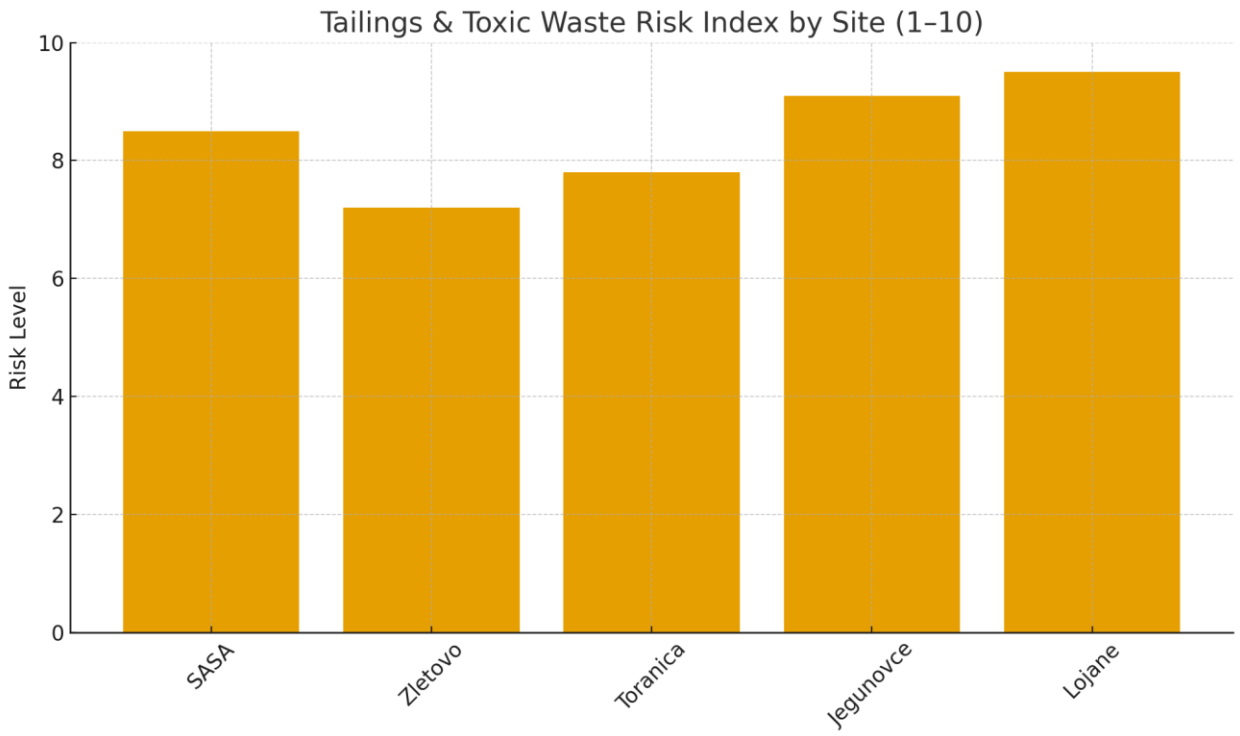


4. Tailings Facilities and Abandoned Sites

Tailings facilities represent one of the most serious and least publicly understood environmental threats facing North Macedonia. While the public debate around mining often focuses on active concessions, the far greater danger lies in the vast quantities of toxic waste already stored across the country in ageing, poorly monitored, and in many cases abandoned tailings dams. These structures, many of them built decades ago using outdated engineering methods, contain millions of tonnes of fine-grained waste saturated with heavy metals, acids and chemical reagents. They are the silent legacy of the country's industrial past, and their continued presence poses a chronic risk to water systems, soil, air quality and community safety.

The eastern part of the country has the highest concentration of tailings, particularly in areas surrounding the **SASA mine**, the **Toranica mine**, and the **Zletovo mine**. [117]These sites have accumulated waste for generations, creating man-made hills and reservoirs that hold back mixtures of water, sludge and mineral residues. The integrity of these dams has been repeatedly questioned. SASA's tailings facilities, for example, have experienced documented leakages into the Bregalnica river, contributing to heavy-metal contamination that travels downstream into agricultural zones.[118] Furthermore, the region's seismic activity adds an additional layer of risk, as earthquakes could destabilise aging structures that were never designed for today's climate realities or regulatory expectations.

What makes these sites even more dangerous is the phenomenon of **acid mine drainage (AMD)**. As sulfide-rich minerals stored in tailings oxidise, they produce sulfuric acid that dissolves metals like arsenic, cadmium, lead, copper and mercury. This acidic, metal-laden water then infiltrates soils, groundwater and surface streams. AMD is particularly persistent — once initiated, it can continue for centuries unless active remediation is undertaken. In parts of the Zletovska and Bregalnica basins, the water continues to show abnormal acidity and elevated metal concentrations, pointing to long-term chemical reactions still underway inside the tailings deposits.[119]



[117] UNECE (2001); UNEP (2011; 2015); EEA (2023); European Commission (2023); Institute of Public Health of North Macedonia (2019); World Bank (2021);

[118] **European Commission (2023).** *North Macedonia Country Report – Environment and Climate Change.*

[119] **European Environment Agency (EEA) (2023).** *Water Quality and Mining Impacts in the Western Balkans.*

Figure Note – Methodological Explanation

The Tailings & Toxic Waste Risk Index (scale 1–10) is an illustrative composite indicator developed by the report's authors in consultation with Prof. Kocubovski to compare relative environmental risks across selected mining and industrial sites in North Macedonia.

The scores are based on a qualitative synthesis of available environmental information, including documented contamination, historical mining and industrial waste, tailings-related incidents and potential exposure pathways, as reported in scientific studies, official environmental assessments and civil society monitoring.

The index is intended to support comparative discussion rather than provide a formal environmental risk assessment. The scores should not be interpreted as official risk classifications, independently validated measurements or predictions of future incidents.

Source: Authors' illustrative assessment, developed in consultation with Prof. Kocubovski, based on a qualitative review of available environmental documentation.

North Macedonia also has a series of legacy tailings and abandoned mining sites whose risks are even more poorly understood. The country lacks a comprehensive, publicly accessible inventory of abandoned mines and tailings facilities, leaving large portions of contaminated land unmonitored. Many abandoned sites were simply left open after the Yugoslav industrial decline, without containment measures or any form of ecological restoration. Heavy rain, wind erosion and seasonal floods continue to mobilise contaminants. In dry periods, wind picks up fine, metal-rich particles from exposed tailings surfaces, carrying them across nearby villages, schoolyards, grazing pasture and agricultural fields.[120]

One of the most severe examples is the toxic legacy of the former smelter in **Jegunovce smelter**, where large quantities of hazardous waste were abandoned in open storage after closure. The site remains a major dust emitter, contributing to regional air pollution that already ranks among the highest in Europe.[121] Similarly, the **Lojane** area holds an extremely dangerous mixture of arsenic, chromium and antimony waste, stored in unsecured piles that continually contaminate water and soil. [122]Despite its classification as one of the most hazardous environmental hotspots in the country, no full-scale remediation effort has been implemented.

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[120] **European Environment Agency (EEA) (2023).**
Mining and Environmental Pressures in the Western Balkans.
[121] Official international assessment, OECD (2024). Western Balkans Competitiveness Outlook 2024: North Macedonia — Environment Policy. https://www.oecd.org/en/publications/western-balkans-competitiveness-outlook-2024-north-macedonia_8207326d-en/full-report/component-18.html?utm_source=chatgpt.com
[122] Peer-reviewed scientific article, Mihailovski, S., Mircovski, V., & Ilijovski, Z. (2021). Pollution with Cr6+ of Groundwater and Surface Water from the Industrial Dump Jugohrom – Jegunovce – the Republic of North Macedonia. Rudarsko-geološko-naftni zbornik, 36(5), 121–129.

In the southeast, the tailings deposits associated with the **Bucim mine** and its **Borov Dol** expansion also raise long-term concerns.[123] [124]Copper extraction generates large volumes of fine waste that often contains elevated concentrations of sulfur compounds, heavy metals and chemical reagents. The storage of such waste requires constant monitoring of dam stability, water pH, runoff channels and seepage. As climate change increases the frequency of intense rainfall and flash flooding, the pressure on tailings dams — many of which were designed under older hydrological assumptions — is expected to grow dramatically. Without proactive investment in structural reinforcement and hydrological management, these sites will become increasingly vulnerable.

Another systemic problem is the **absence of long-term liability and accountability** for closed and inactive facilities. When mining companies change ownership, declare bankruptcy, or operate under concession contracts that do not mandate post-closure restoration, the responsibility for tailings falls to the state — and ultimately to the public. North Macedonia does not currently have a comprehensive financial assurance mechanism obligating companies to set aside funds for future reclamation, making long-term rehabilitation uncertain and underfunded. As a result, tailings have become "orphan structures," silently threatening ecosystems and human health while remaining outside the political priorities of successive governments.

Compounding these risks is the reality that **climate change amplifies every existing weakness** in tailings infrastructure. More frequent heavy rains increase the probability of overtopping; prolonged droughts cause cracks and dust generation; and earthquakes — already common in the region — pose a structural threat to dams not designed for modern seismic standards.[125] The Global Industry Standard on Tailings Management (GISTM), published in 2020, sets a minimal framework for safety, transparency and community involvement. Yet few mining operators in North Macedonia publicly commit to these standards, and state regulators lack the technical capacity and funding to enforce them.

The combined effect is a landscape dotted with silent, slow-moving environmental disasters. Tailings facilities — whether active, inactive or abandoned — represent one of the most critical environmental governance challenges facing the country. Addressing them will require transparent data, strong regulatory enforcement, modern engineering assessments, stable funding mechanisms and genuine engagement with local communities whose safety depends on long-term solutions.

4.1. CASE STUDY 1: SASA TAILINGS – THE HIDDEN RISK IN THE BREGALNICA BASIN

The **SASA mine** is one of North Macedonia's most productive lead and zinc operations, but its environmental footprint is dominated by the enormous tailings storage facilities (TSFs) that sit above the Bregalnica river

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[123] **European Environment Agency (EEA) (2022; 2023).** *Air Quality in Europe*; *Mining and Environmental Pressures in the Western Balkans.*

[124] **Institute of Public Health of North Macedonia (2019).** *Environmental Health Assessment in the Polog Region.*

[125] **IPCC (2022).** *Sixth Assessment Report (AR6), Working Group II.*

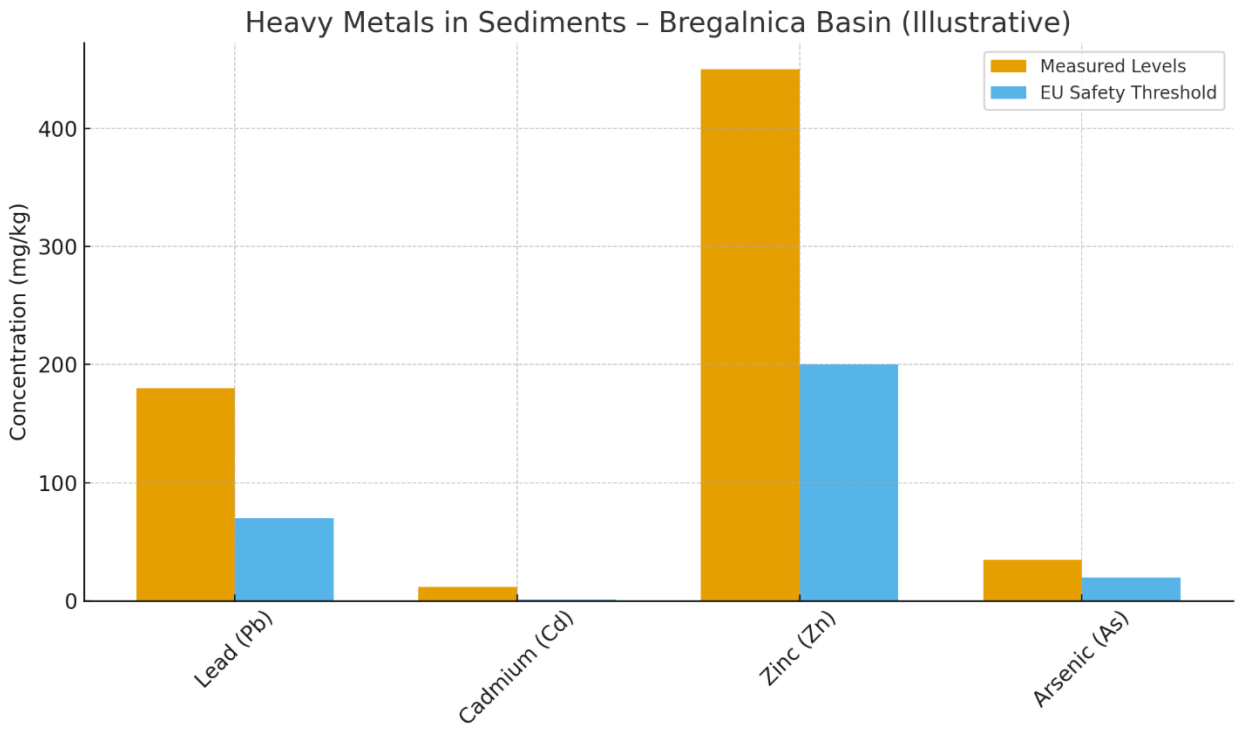
basin.[126] These tailings contain fine-grained waste saturated with lead, zinc, cadmium, arsenic, and sulfide minerals that continue to react chemically long after disposal.

Multiple leakages have been documented[127] over the last two decades, sending plumes of contaminated slurry into the Bregalnica — a river that supports agriculture, livestock, and drinking water supplies downstream. One of the most serious incidents occurred in 2003, when structural failure released thousands of cubic metres of waste, causing visible discoloration and killing aquatic life. More recent leaks, though smaller, have demonstrated that aging infrastructure remains vulnerable. The cumulative effect is a gradual but persistent heavy-metal loading in the river's sediments.[128]

The SASA region is also seismically active. Tailings dams built in earlier decades did not account for modern seismic modelling or climate-change-induced rainfall extremes. Local residents fear that major earthquakes could destabilise the tailings walls, especially during high-water months when hydrostatic pressure increases. Despite improvements in recent years, community trust remains low due to the lack of transparent, independent monitoring data.[129]

Another dimension of risk is dust emission. During dry seasons, wind carries fine tailings particles toward nearby villages. These airborne particulates contain metal concentrations that far exceed background levels. [130]Children living closest to the facility are at particular risk of inhalational exposure and ingestion of contaminated soil and dust.

[126] **European Commission (2023).** *North Macedonia Country Report – Environment and Climate Change.*
[127] Civil Society Monitoring Reports (Front 21/42; local environmental NGOs) (2016–2023).
[128] Civil Society Monitoring Reports (Front 21/42; local environmental NGOs) (2016–2023).
[129] **European Commission (2023).** *North Macedonia Country Report – Environment and Climate Change.*
[130] European Environment Agency (EEA) (2022). Air Quality Impacts of Mining and Quarrying in Europe.



Author's illustration based on ranges reported in UNECE, UNEP, European Environment Agency (EEA), Institute of Public Health of North Macedonia, and ICPDR assessments of heavy metal contamination in the Bregalnica river basin.

The SASA case illustrates a broader governance challenge: even when a mine invests in upgrades, the legacy of older structures continues to pose risks. Without a comprehensive national TSF inventory, public oversight remains limited, and communities remain dependent on the operator's disclosures — a situation incompatible with the Aarhus Convention's principles of transparency and access to information.

CASE STUDY 2: ZLETOVO AND TORANICA – ACID MINE DRAINAGE AND DOWNSTREAM CONTAMINATION

The eastern mining corridor, anchored by the **Zletovo mine** and the **Toranica mine**, is one of the most environmentally stressed regions in North Macedonia.[131] The geology of these mines contains sulfide-rich ores which, when exposed during extraction and waste storage, undergo oxidation that generates sulfuric acid. This acid dissolves heavy metals from both waste rock and tailings, producing **acid mine drainage (AMD)** — a toxic stream that infiltrates river channels.

In the Zletovska and Kratovska river systems, AMD has become a chronic water-quality issue. The rivers periodically exhibit low pH values, often below ecological thresholds, and elevated concentrations of lead, cadmium, arsenic, manganese and zinc. Sediment analyses show that metal accumulation persists even during periods when surface water appears visually clear. Farmers downstream report declining soil fertility,

[131] European Commission (2023). North Macedonia Country Report – Environment and Climate Change

crop discoloration, and reduced yields, suggesting that contaminated irrigation water is affecting agriculture.[132]

Toranica contributes heavily to this load. Wastewater channels discharge into tributaries that flow toward the Zletovska river. During heavy rainfall, overtopping and uncontrolled runoff intensify contamination. Some sections of the riverbed near tailings sites show orange and reddish staining — classic indicators of iron precipitation linked to AMD.[133] These visual signs reflect not isolated incidents, but long-term chemical processes that will continue for decades unless active remediation is undertaken.

Zletovo, meanwhile, has one of the country's oldest mining tailings systems. Many of its waste deposits date back more than half a century and lack modern geochemical barriers. These tailings hold millions of tonnes of material and contribute continuously to downstream pollution. Communities near Probištip have repeatedly raised concerns about cancers, respiratory illnesses and neurological conditions, although systematic health monitoring is lacking. The absence of PRTR reporting and weak enforcement of water-quality standards mean that the full extent of contamination remains unknown.[134]

Together, Zletovo and Toranica highlight the structural challenge posed by AMD: once it begins, it cannot be stopped without expensive, long-term intervention. North Macedonia currently lacks a national strategy for AMD treatment, meaning that these sites remain perpetual sources of environmental harm.

CASE STUDY 3: LOJANE – CHROMIUM, ARSENIC AND A TOXIC LEGACY WITHOUT OWNERSHIP

The village of **Lojane** in the Lipkovo municipality represents one of the most dangerous toxic hotspots in Southeast Europe. The site contains more than 10,000 tonnes of chromium and arsenic waste — left abandoned after a short-lived mining operation in the 1970s.[135] Decades after closure, the waste remains exposed in open piles, without fencing, containment or protective covers. Lojane is a textbook example of an "orphan mine": no operator exists, no concession holder is accountable, and no state-led remediation has been implemented.

The contaminants at Lojane are among the most hazardous toxins regulated under international conventions. Hexavalent chromium, in particular, is a known carcinogen, mutagen and reproductive toxin. Arsenic poses severe risks of cancer, cardiovascular disease and developmental disorders. Studies conducted by the Ministry of Environment and academic researchers have reported extremely elevated concentrations of these elements in soil and water samples.[136]

Seasonal rain transports dissolved arsenic and chromium into local waterways, where they mix with groundwater used for household needs and small-scale agriculture. During dry periods, wind picks up contaminated dust from exposed waste piles, dispersing it across the village and surrounding fields. Livestock

[132] European Environment Agency (EEA) (2022; 2023). Water Quality in Europe; Mining and Environmental Pressures in the Western Balkans.
[133] European Environment Agency (EEA) (2023). Mining and Environmental Pressures in the Western Balkans.
[134] European Environment Agency (EEA) (2023). Mining and Environmental Pressures in the Western Balkans.
[135]European Commission (2023). North Macedonia Country Report – Environment and Climate Change.
[136] European Environment Agency (EEA) (2023). Mining and Environmental Pressures in the Western Balkans

drinking from contaminated streams have shown signs of illness, and community members report skin irritation, respiratory symptoms and chronic health problems.[137]

Lojane's problems are compounded by its proximity to the border, its socio-economically vulnerable population and the absence of state capacity for remediation. Multiple governments have acknowledged the severity of the site[138] but have not allocated significant funds for cleanup. International donors have expressed concern, but no large-scale intervention has materialised. As a result, Lojane remains a slow-moving environmental disaster, affecting generations of families who continue to live beside one of the most toxic sites in the Balkans.

CASE STUDY 4: JEGUNOVCE – THE SMELTER LEGACY IN THE POLLOG VALLEY

The former smelter at **Jegunovce industrial complex**, located in the Polog region, is another emblematic example of North Macedonia's industrial legacy pollution. During its decades of operation, the smelter processed large quantities of metals and produced residues containing lead, cadmium, zinc and other hazardous substances. When the smelter closed in the early 2000s, these toxic materials were left stored in open piles and unprotected landfills across the complex.[139]

The environmental impact extends far beyond the immediate site. The Polog valley is prone to temperature inversions that trap air pollution close to the ground, creating some of the worst air-quality episodes in the Balkans. Metal-rich dust from Jegunovce contributes to this burden[140], particularly during windy conditions when fine particulate matter becomes airborne. The dust contains lead and cadmium — metals with strong neurotoxic and carcinogenic properties.[141] Children are particularly vulnerable, and although no comprehensive health study has been conducted, anecdotal reports from local medical practitioners point to elevated respiratory issues and chronic symptoms in nearby villages.

The contamination at Jegunovce also affects soils and surface water. Rainfall transports runoff from waste piles into small streams that feed into larger water systems. Downstream farmers have expressed concern about declining soil quality and unexplained plant stress. The area's agricultural activities, combined with its proximity to densely populated urban centres such as Tetovo, make the persistence of the Jegunovce site a serious public-health concern.[142]

Efforts to address the smelter legacy have been slow and fragmented. While some isolated clean-up actions were undertaken, large sections of hazardous material remain untouched. The absence of a comprehensive

[137] European Environment Agency (EEA) (2023). Mining and Environmental Pressures in the Western Balkans
[138] **Government of North Macedonia – Ministry of Environment and Physical Planning (multiple years).** *National Environmental Action Plan (NEAP) and State of the Environment Reports*
[139] **European Environment Agency (EEA) (2018).** *Management of Contaminated Sites in Europe.*
[140] **European Environment Agency (EEA) (2022).** *Air Quality in Europe – Country and Regional Assessments.*
[141] **World Health Organization (WHO) Regional Office for Europe (2018).** *Air Pollution and Child Health in the WHO European Region.*
[142] **European Environment Agency (EEA) (2022).** *Soil Contamination and Human Health.*

remediation plan, combined with lack of long-term monitoring, means that Jegunovce continues to pose environmental and health risks nearly two decades after the smelter closed.

5. Environmental Impacts

The environmental impacts of mining in North Macedonia extend far beyond the boundaries of individual concessions. They form a complex web of contamination pathways that affect rivers, soils, forests, agricultural land, air quality and entire ecosystems. This damage is not evenly distributed across the country; it is concentrated in regions already struggling with poverty, depopulation and weak institutional oversight. While contemporary mining projects often emphasize "modern technologies" and "EU standards," the cumulative reality shows a landscape marked by chronic pollution, unstable tailings, airborne toxins and the slow erosion of ecological resilience.

Systemic Environmental Pathways of Mining Pollution

Drawing on the case studies presented above, this section synthesises the common environmental pathways through which mining pollution spreads across river basins, agricultural land and residential areas in North Macedonia. Rather than focusing on individual sites, it highlights the systemic mechanisms that allow contamination to persist, migrate and accumulate over time.

Water Contamination: Rivers as Transport Corridors for Toxic Metals

Mining exerts its most profound and long-lasting impacts through freshwater systems. Rivers in mining-affected regions function as transport corridors for heavy metals originating from tailings leachate, acid mine drainage and inadequately treated wastewater. Lead, cadmium, zinc and arsenic are mobilised from waste deposits and carried downstream, often far beyond the immediate vicinity of extraction sites.

These metals accumulate in river sediments, creating a long-term ecological "memory" of pollution that persists even when surface water quality temporarily appears to improve. During periods of intense rainfall, tailings facilities become hydrologically stressed, increasing the likelihood of overtopping events or uncontrolled releases. Seasonal floods further redistribute contaminated sediments across floodplains, irrigation channels and agricultural soils, transforming localised pollution into diffuse regional exposure.

Groundwater contamination represents a parallel and largely invisible risk. Subsurface seepage from abandoned mines and tailings facilities allows arsenic, chromium, lead and sulphate compounds to enter aquifers used for household consumption and small-scale agriculture. Many rural communities rely on shallow wells or springs, making them especially vulnerable to contamination that is rarely monitored and seldom disclosed. The absence of a comprehensive, publicly accessible groundwater-monitoring network means that cumulative exposure remains poorly understood and likely underestimated.[143]

[143] **ICPDR (2022).** *Danube River Basin Management Plan – Pollution Pressures.*

Soil Degradation: A Slow-Motion Crisis for Agriculture and Food Safety

Soil contamination is one of the most persistent outcomes of mining activity. Tailings dust deposition, wastewater irrigation and sediment flooding introduce heavy metals into agricultural soils at concentrations that impair plant growth and threaten food safety. Once established, these contaminants bind to soil particles and organic matter, remaining biologically available for decades unless active remediation is undertaken.

Metal accumulation in soils affects staple crops and vegetables, increasing the risk of uptake into edible plant tissues. This creates a silent but serious food-chain exposure pathway, with children and pregnant women facing the greatest health risks. Contaminated soils also undermine the viability of organic and small-scale farming, eroding rural livelihoods and reducing land value. Even in the absence of confirmed contamination, the perception of pollution can cause abrupt market rejection, leading to sudden income loss for farmers.

Livestock are similarly affected as grazing animals ingest metal-rich grasses and soils, allowing toxins to accumulate in muscle and fat tissues. These impacts propagate through local food systems, reinforcing long-term social and economic vulnerability in mining-affected regions.[144]

Air Pollution: Mining Dust as an Extension of an Existing Crisis

Air pollution in North Macedonia is already among the most severe in Europe due to traffic, domestic heating, industrial activity and geographic conditions. Mining adds an additional layer of particulate exposure, particularly through dust emissions from tailings facilities, waste rock piles and haul roads.

Fine particulate matter generated by mining activities contains elevated concentrations of lead, cadmium, arsenic and zinc. During dry periods and strong winds, contaminated dust becomes airborne and disperses across villages, farmland and residential zones, sometimes reaching schools and public spaces. Unlike point-source emissions, this form of pollution is diffuse, difficult to regulate and rarely captured by existing monitoring networks.

Residents living near mining zones frequently report respiratory symptoms consistent with chronic particulate and heavy-metal exposure, including bronchitis, asthma and persistent respiratory inflammation. However, the lack of systematic epidemiological surveillance in mining-affected areas means that disease clusters often remain undocumented and unaddressed. Elderly populations, children and mine workers themselves face the greatest risks.[145]

Governance Gaps and Monitoring Failures

Across all environmental media—water, soil and air—the persistence of mining-related pollution is reinforced by structural governance failures. Official monitoring is frequently fragmented, inconsistent or reliant on data provided by the very companies being regulated. Real-time monitoring stations near tailings facilities and abandoned sites are rare, and raw data is often inaccessible to the public.

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[144] **European Environment Agency (EEA) (2022).** *Soil contamination and land degradation in Europe.*
[145] **European Environment Agency (EEA) (2022).** *Air Quality in Europe.*

Environmental information is commonly classified as commercially confidential, limiting independent scrutiny and undermining public trust. These practices conflict with obligations under the Aarhus Convention and PRTR Protocol, which require proactive disclosure of pollution data and meaningful public participation. The result is a system in which cumulative environmental harm remains obscured until a visible crisis occurs, by which point remediation becomes vastly more expensive and socially disruptive.[146]

Ecosystem Fragmentation and Biodiversity Loss

Mining concessions and associated infrastructure — roads, pipelines, power lines, waste dumps — fragment natural habitats and disrupt wildlife corridors. Forests in the eastern regions have been cleared to make way for exploration surfaces, tailings expansions and access roads. Deforestation intensifies soil erosion, destabilises slopes and increases the risk of landslides, particularly near tailings reservoirs.[147]

Aquatic ecosystems are also heavily affected. Heavy metals disrupt the reproductive cycles of fish, amphibians and invertebrates. In the Bregalnica basin, biodiversity has declined significantly over the past decades, with certain fish species becoming rare or disappearing in heavily contaminated segments. Macroinvertebrate counts — key indicators of water quality — remain low, reflecting chronic ecological stress.[148]

Wetlands and riparian ecosystems suffer from sedimentation and altered pH levels caused by acid mine drainage. Such disturbances reduce the capacity of natural ecosystems to filter pollutants, creating feedback loops that further degrade water quality.[149]

Climate Change as a Risk Multiplier

North Macedonia's mining sector is particularly vulnerable to the effects of climate change. Increased rainfall intensity raises the risk of tailings dam failures, overtopping and erosion. Longer dry periods create ideal conditions for dust storms, increasing airborne contamination. Rising temperatures accelerate chemical reactions in tailings ponds, enhancing acid generation and metal mobility.

Climate change also reduces water availability in certain regions, intensifying competition between mining needs and community needs. Mines such as Bucim and Borov Dol require significant volumes of water for ore processing, while local residents report decreasing water levels in wells and springs.[150]

Human Health Impacts: The Invisible Layer Behind Environmental Damage

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[146] **UN Special Rapporteur on Human Right and the Environment (2021).** *Extractive Industries and Human Rights.*
[147] **IPCC (2022).** *Sixth Assessment Report (AR6), Working Group II.*
[148] **Institute of Biology, Faculty of Natural Sciences and Mathematics, Skopje (various studies, 2010–2020).** Peer-reviewed studies on **benthic macroinvertebrates and fish assemblages in the Bregalnica River**.
[149] **European Commission (2020).***Water Framework Directive – Guidance on Hydro morphological and Chemical Pressures.*
[150] **European Commission (2023).** *North Macedonia Country Report – Environment and Climate Change (Chapter 27)*

Environmental degradation translates directly into human suffering. Heavy metals such as lead, cadmium and arsenic are potent neurotoxins and carcinogens. Chronic exposure, even at low levels, affects children's cognitive development, increases cardiovascular risk and weakens immune function. Pregnant women are particularly vulnerable, as toxins accumulate in the placenta and breast milk.

Communities living near SASA, Zletovo, Toranica, Jegunovce and Lojane report increased rates of respiratory symptoms, headaches, skin irritation, fatigue, kidney problems and developmental delays in children. These health problems often remain unrecognized due to inadequate screening and the absence of environmental medicine specialists in rural health facilities.[151]

Without structured epidemiological monitoring, the true scale of health impacts remains hidden — an invisible crisis that accompanies the visible environmental decline.

6. Community Health Impacts

The health consequences of mining in North Macedonia form one of the least visible yet most severe dimensions of the extractive sector's impact. Exposure to toxic metals, polluted water, contaminated soils and degraded air creates a multi-layered health burden that is disproportionately carried by workers, rural communities, children and vulnerable populations.[152] [153] Yet the absence of systematic epidemiological monitoring means that much of this suffering remains undocumented, unrecognised and unaddressed.

Mining workers face the highest immediate risks. Lead, zinc and copper mines expose workers to dust particles rich in heavy metals that penetrate deep into the respiratory system. Underground workers are frequently exposed to inadequate ventilation, humidity, heat stress and toxic gases. The legacy of socialist-era infrastructure, combined with inconsistent enforcement of safety standards, leaves workers vulnerable to preventable accidents — roof collapses, equipment malfunctions, rock bursts or sudden flooding events. Many workers report respiratory problems, chronic cough, hearing loss from long-term exposure to machinery noise, and musculoskeletal disorders linked to physically demanding labour. Official accident statistics, however, often paint an incomplete picture: subcontracted workers, temporary staff and informal labourers are frequently excluded, and companies rarely disclose full incident records.[154] [155]

ILO Convention No. 176, which sets international standards for safety and health in mines, emphasises the right of workers to refuse unsafe tasks, the requirement for regular inspections, and the obligation of employers to maintain safe working environments. Although North Macedonia acknowledges its principles, practical implementation is weak. Workers often describe fear of retaliation if they report safety problems, insufficient protective equipment, and a culture of silence where economic necessity outweighs health

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[151] **Bankwatch Network (2021).** *Who Pays for Legacy Pollution? Mining Hotspots in the Western Balkans.*
[152] **HEAL – Health and Environment Alliance (2020).** *Mining and Public Health in Europe.*
[153] **WHO Regional Office for Europe (2018).** *Air Pollution and Child Health.*
[154] **ILO (2021).** *Guidelines on Occupational Safety and Health Management Systems (ILO-OSH 2001).*
[155] **European Commission (2023).** *North Macedonia Progress Report – Chapter 19 (Social Policy and Employment).*

concerns. Privatization and foreign ownership have intensified productivity pressures, pushing workers to meet extraction quotas even when conditions are unfavourable.[156]

While workers bear acute and chronic occupational risks, the surrounding communities experience a slower, more insidious form of exposure. Residents of mining towns inhale contaminated dust carried by winds from tailings dams and waste heaps. These particles contain high concentrations of lead, cadmium, arsenic, zinc and chromium — metals known to impair neurological development, damage kidneys, weaken the immune system and increase cancer risk. For children, the consequences are especially devastating: even low levels of lead exposure can reduce IQ, affect behavioural development, and impair learning capacity. In several mining-affected municipalities, teachers quietly report increasing numbers of children with concentration problems, speech delays or behavioural difficulties, although these trends are rarely linked to environmental exposure in official health data.[157]

Water contamination further compounds health risks. Families using wells or local streams for drinking, cooking or irrigation are often unaware that the water contains dissolved metals or acidic runoff. Long-term consumption of such water contributes to a spectrum of illnesses — gastrointestinal disorders, chronic fatigue, hypertension, skin lesions, and in severe cases, carcinogenic effects[158]. Women in rural areas, who are traditionally responsible for household water collection, cooking and caring for children, face gender-specific exposure pathways. Their health impacts remain largely invisible, as they are underrepresented in mining-related health studies.

In toxic hotspots such as Lojane, the health risks are acute and multi-generational. Arsenic exposure in particular is linked to skin cancer, cardiovascular disease and severe neurological impairment[159]. Despite the seriousness of the site, residents continue to live, farm and raise children near one of the most hazardous contaminated zones in Southeast Europe, with no state-funded health screenings or targeted medical interventions. The lack of remediation and continued exposure amounts to an environmental injustice that disproportionately affects poor and marginalised populations.

Air pollution remains a significant public health concern in the Polog region, particularly in Tetovo, where elevated concentrations of particulate matter have been documented.[160] The former ferrochromium smelter and associated slag deposits in Jegunovce represent an additional legacy pollution concern. Scientific biomonitoring studies have identified elevated chromium concentrations in the Tetovo area associated with historical ferrochromium production and slag deposits.[161] Earlier environmental assessments also identified industrial emissions from Jegunovce as an important contributor to particulate pollution in the region.[162]

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[156] **European Commission (2023).** *North Macedonia Progress Report – Chapter 19 (Social Policy and Employment).*
[157] **European Environment Agency (EEA) (2022).** *Industrial Pollution and Human Health in Europe*
[158] **HEAL – Health and Environment Alliance (2020).** *Industrial Water Pollution and Health in Europe.*
[159] **WHO Regional Office for Europe (2018).** *Chemical Exposure and Children's Health.*
[160] Izairi, N., et al. (2024). Monitoring and Analysis of PM2.5 Particles as Air Pollutants in the City of Tetovo, Republic of North Macedonia. Revista de Gestão Social e Ambiental.
[161] Atmospheric Heavy Metal Deposition in North Macedonia from 2002 to 2010 Studied by Moss Biomonitoring Technique. (2020). Atmosphere, 11(9), 929.
[162] Ministry of Environment and Physical Planning. Air Quality Plan for Tetovo 2017–2021.

. Residents describe chronic coughing, asthma flare-ups, sinus inflammation and reduced lung function during months of high dust circulation. Doctors in local clinics report an upward trend in respiratory symptoms but cannot formally link them to environmental exposure due to gaps in data and lack of environmental medicine expertise.[163]

Another overlooked dimension is the psychological toll. Communities living near mines often describe a constant sense of anxiety[164] — fear of tailings dam failures, uncertainty about water safety, worry about children's exposure, and feelings of abandonment by state institutions. Environmental degradation directly affects quality of life: the loss of clean landscapes, polluted rivers and degraded agricultural land erode community identity and contribute to depopulation, as younger generations leave in search of healthier environments and safer futures.

Health impacts also have indirect socio-economic consequences. Illness reduces work capacity, increases medical expenses, disrupts children's education, and creates long-term financial strain for families already living in fragile economic conditions. Yet these hidden costs are never reflected in the economic projections used to justify mining investments[165]. The result is a distorted economic narrative that externalises public health burdens while highlighting short-term revenue gains.

The absence of a national environmental health registry, limited toxicological testing, and the lack of specialised medical teams in mining regions mean that the true scale of disease remains unknown. Without systematic biomonitoring — blood tests for lead and cadmium, urine tests for arsenic, hair and nail sampling for chronic exposure — public health authorities are operating in the dark. This institutional blindness allows the cycle of exposure and illness to continue uninterrupted.

In essence, the health impacts of mining in North Macedonia are neither accidental nor unavoidable. They are the predictable outcome of inadequate regulation, weak enforcement, insufficient monitoring and an economic model that places extractive profit above human well-being. The health of workers and communities is sacrificed at the altar of economic expediency, creating a public health crisis that is structural, preventable and deeply unjust.

7. Worker Safety and Labour Rights

Worker safety in North Macedonia's mining sector stands at the intersection of outdated infrastructure, weak institutional oversight, and labour practices shaped by decades of economic transition. Although mining companies frequently present themselves as compliant with international standards, the lived reality of workers underground and on the surface reveals a system where risks are normalised, accidents are underreported, and labour rights are compromised by economic pressures. The combination of legacy

Официјален план за квалитет на воздухот во Тетово

[163] **European Environment Agency (EEA) (2022).** *Air Quality in Europe – Country and Regional Assessments.*

[164] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27.*

[165] **International Labor Organization (ILO) (2021).** *Global Monitoring of Occupational Diseases.*

industrial structures, privatization, and the country's dependence on foreign investors has created a labour environment in which workers shoulder disproportionate exposure to danger while lacking meaningful mechanisms to demand safer conditions.[166]

The most immediate risks stem from the physical conditions inside active mines. Underground operations such as the **SASA mine**, the **Toranica mine**, and the **Zletovo mine** rely on networks of tunnels originally designed decades ago, when safety protocols were less stringent and monitoring technologies less sophisticated.[167] Ventilation systems struggle to maintain adequate airflow, especially during high-humidity periods when dust becomes denser and more respirable. Workers frequently describe conditions of intense heat stress, insufficient lighting, slippery floors, and the constant threat of falling rocks or collapses in older sections of the tunnel. Sudden water inflows have also been reported, particularly during periods of heavy rainfall when groundwater levels rise unpredictably.[168]

Protective equipment is provided, but workers often note that it is insufficient, outdated, or inconsistently replaced. Respiratory protections, for example, are sometimes reused beyond their safe lifespan, and ear protection is not universally worn despite continuous noise exposure from drilling equipment[169]. These conditions raise long-term health concerns, including chronic obstructive pulmonary disease, pneumoconiosis, hearing loss, and severe musculoskeletal disorders resulting from years of heavy manual labour.

Labour rights are further weakened by the widespread use of subcontractors. Many mines outsource the most dangerous tasks — drilling, blasting, underground transport — to third-party firms that operate under looser contractual obligations. [170]Through subcontracting, companies effectively shift risk away from themselves and onto workers who lack job security, health insurance continuity, or the ability to unionize effectively. These workers describe precarious employment conditions in which refusing unsafe tasks could result not in improved safety measures, but in immediate dismissal or non-renewal of their short-term contracts.[171]

ILO Convention No. 176, the international standard governing safety and health in mines, establishes clear principles: workers must have the right to be informed of risks, to participate in safety decisions, and to refuse dangerous work without fear of retaliation. Yet in practice, this right remains inaccessible to many miners in North Macedonia. The power dynamics in mining towns — where the mine is often the dominant or only employer — create conditions in which workers cannot challenge management without jeopardizing

[166] **International Labour Organization (2020).** *Decent Work in Global Supply Chains.*
[167] **European Commission (2023).** *North Macedonia Progress Report – Chapter 19 (Social Policy and Employment).*
[168] **European Agency for Safety and Health at Work (EU-OSHA) (2018).** *Occupational Safety and Health in High-Risk Industries.*
[169] **ILO (2021).** *Guidelines on Occupational Safety and Health Management Systems.*
[170] **European Commission (2023).** *North Macedonia Progress Report – Chapter 19 (Social Policy and Employment).*
[171] **European Commission (2023).**
North Macedonia Progress Report – Chapter 19 (Social Policy and Employment).

their livelihoods or the economic stability of their families.[172] This dynamic is particularly visible in rural, single-industry communities, where alternative employment opportunities are scarce.

Accident reporting remains a sensitive and opaque issue. While official statistics show relatively few fatalities in recent years, workers describe numerous "near-misses," minor injuries, and mechanical failures that never make it into formal reports.[173] Some incidents are internally resolved by management, with injured workers told to take unpaid sick leave or use vacation days to avoid formal documentation. Others go unreported entirely, especially if they involve subcontracted workers whose injuries do not legally fall under the primary operator's responsibility. This underreporting contributes to a distorted public understanding of mining safety, masking the severity of daily risks and enabling companies to present themselves as compliant with international norms.[174]

Occupational health screenings are theoretically required, but their quality varies widely. Some workers report brief, superficial medical examinations that do not include essential tests such as blood lead levels, chest X-rays, or lung function analysis. Without rigorous, independent medical monitoring, chronic illnesses caused by long-term exposure to heavy metals, noise, vibration and dust remain undiagnosed until they become severe or irreversible. Retired miners often carry the heaviest burden: many develop debilitating conditions in their 50s and 60s, yet face obstacles in obtaining disability status or financial compensation.[175]

Gender dynamics add another dimension to labour rights. While the mining workforce is predominantly male, women employed in administrative, cleaning, laboratory, or surface tasks also face exposure risks. They inhale dust from tailings, come into contact with contaminated surfaces, and often lack access to adequate protective clothing tailored to women's bodies[176]. There is little recognition of gender-specific health vulnerabilities, particularly related to reproductive health, endocrine disruption, or the impacts of chronic exposure to heavy metals on pregnancy.

The psychological toll on workers is also profound. Many describe a constant underlying fear — fear of accidents, fear of structural collapses, fear of economic insecurity if they speak out, and fear of long-term illness that their families cannot afford to treat.[177] These mental health challenges are rarely acknowledged in company reports or national labor policies, yet they deeply affect workers' well-being and family life.

Unions continue to play a crucial role, but their power has weakened in the post-socialist period. Some unions are active and engaged, pushing for better conditions and wage protections, while others face political pressure or lack resources. Workers in foreign-owned mines often report a greater sense of distance

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[172] **European Commission (2023).** *North Macedonia Progress Report – Chapter 19 (Social Policy and Employment).*
[173] **OECD (2020).** *Environmental and Social Governance in the Western Balkans.*
[174] **Organisation for Economic Co-operation and Development (2020).** *Responsible Business Conduct in the Mining Sector.*
[175] **European Commission (2023).**
North Macedonia Progress Report – Chapter 19 (Social Policy and Employment).
[176] UN Committee on the Elimination of Discrimination against Women (CEDAW) – General Recommendation No. 37.
[177] **European Commission (2023).** *North Macedonia Progress Report – Chapter 19 & 27.*

between management and labour, with safety concerns becoming secondary to productivity targets and contractual obligations with international investors.[178]

In summary, worker safety and labour rights in North Macedonia's mining sector reveal a system defined by structural vulnerabilities, economic dependence, and regulatory gaps. While official frameworks exist, enforcement remains inconsistent; while protective equipment is provided, it is often inadequate; while rights are legally guaranteed, they are rarely exercised without fear. The result is a sector where workers continue to bear disproportionate risks — physically, economically, and psychologically — in exchange for jobs that sustain families and communities, but at a cost far greater than what official narratives acknowledge.

8. Governance Gaps

Governance of the mining sector in North Macedonia is characterised by a complex interplay of outdated legislation, fragmented institutional mandates, political influence, and chronic resource limitations. While the country has made commitments under EU directives, the Aarhus Convention, and international labour and environmental standards, the actual capacity of state institutions to regulate the mining sector lags far behind. As a result, mining companies often operate in a landscape where compliance is selective, transparency is partial, and enforcement is inconsistent. These structural weaknesses create a regulatory environment that prioritises investment and concession revenues over environmental protection, worker safety, and community rights.

One of the most persistent governance problems is the outdated legal framework regulating mining activities. Much of the core mining legislation was drafted before the country began aligning with the EU environmental acquis, and it still reflects an extractivist approach from the 1990s and early 2000s, prioritising economic output rather than sustainability.[179] Key laws lack modern requirements for cumulative impact assessments, climate resilience modelling, water budgeting, biodiversity protection, and long-term rehabilitation planning. The gaps in legislation allow companies to fulfil procedural obligations without ensuring meaningful environmental safeguards. This legal inertia persists despite increasing pressure from civil society and the European Commission to modernise the sector.

Environmental Impact Assessments (EIAs) are another area where governance gaps are particularly visible. [180] [181] While EIAs are formally required for all major mining projects, their quality is often poor. Many assessments rely on outdated data, superficial baseline studies, or generic models copied from previous reports[182]. These "copy-paste EIAs" create the illusion of compliance while failing to address site-specific risks

[178] **OECD Guidelines for Multinational Enterprises** (2011, updated).
[179] **OECD (2020).** *Environmental Governance in the Western Balkans.*
[180] **European Commission (2023).** *Screening Report – Chapter 27.*
[181] **European Court of Auditors (2019).** *EU Environmental Assessments: Better Application Needed.*
[182] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27: Environment and Climate Change.*

such as seismic activity, hydrological interactions, chemical leaching, or tailings stability. Crucial components — cumulative impacts, alternative project scenarios, and remediation plans with their associated costs — are often absent. Moreover, public consultations frequently occur after key decisions have already been made, reducing them to formalities rather than genuine spaces for community involvement. Communities routinely report that their objections are ignored, or that consultation sessions are held at inconvenient times or locations, limiting participation.[183]

Transparency remains one of the weakest pillars of mining governance. The country still lacks a fully functional Pollutant Release and Transfer Register (PRTR), despite obligations under international conventions and EU alignment processes[184]. In the absence of a PRTR, emissions data remains inaccessible to the public, fragmentary, or available only through environmental inspectorate reports that are difficult to interpret. Mining companies often classify information on chemical use, tailings composition, or emissions monitoring as "commercial confidentiality," effectively shielding key environmental data from public scrutiny.[185] This practice contradicts the principles of the Aarhus Convention, which guarantees access to environmental information, yet remains widespread and largely unchallenged by regulatory bodies.

Institutional capacity is another critical weakness. Environmental inspectorates are severely understaffed and underfunded, lacking specialised personnel trained in mining hydrogeology, chemical safety, tailings engineering or air-quality modelling. Inspectors frequently rely on company-provided data due to a lack of independent laboratory capacity and field equipment. Inspections are often pre-announced, reducing their effectiveness. Some mining communities report that inspectors seldom visit rural or remote sites unless major accidents occur, and even then, investigative findings are rarely published.[186] Without strong oversight, enforcement becomes symbolic rather than substantive.

Governance gaps are further compounded by political capture. Large concession holders — especially foreign-owned companies — wield significant influence over local and national decision-making processes. Their investments are often framed as essential for economic development, job creation and regional stability[187]. This political dependency weakens the state's willingness to challenge non-compliance, enforce penalties, or revoke concessions. In some cases, municipalities become financially dependent on concession fees, creating perverse incentives to downplay environmental concerns.[188] Political pressure can also influence the issuance of permits, the speed of administrative procedures, and the outcome of disputes between companies and communities.

Another structural problem is the lack of long-term liability mechanisms for mine closure and remediation. Many concessions do not require the creation of financial assurance funds earmarked for post-closure

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[183] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27: Environment and Climate Change.*
[184] **European Commission (2022).** *Analytical Report – Chapter 27 (Environment).*
[185] UNECE PRTR Protocol – Articles 4–6
[186] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27: Environment and Climate Change*
[187] **European Commission (2022).** *Economic Reform Programme of North Macedonia – Assessment.*
[188] **European Commission (2022).** *Analytical Report – Chapter 27 (Environment).*

restoration. As a result, when a mine closes or a company withdraws, the environmental burden falls to the state. This pattern is evident in legacy sites such as Lojane or Jegunovce, where no responsible operator exists and public budgets cannot cover the massive cost of remediation. The absence of a national inventory of abandoned mines and tailings — combined with the absence of a national mine-closure strategy — leaves the country exposed to significant long-term environmental liabilities.

Water governance within mining regions reveals additional regulatory gaps. Water permits are issued based on theoretical models that do not always consider extreme rainfall events or seasonal fluctuations. Many permits lack conditions for real-time monitoring of discharge or groundwater levels.[189] Sediment contamination, which plays a major role in heavy metal transport, is rarely included in regulatory frameworks. This omission is critical, as contaminated sediments in the Bregalnica, Kratovska and Zletovska rivers continue to spread pollutants downstream regardless of surface water improvements [190] [191].

Land-use planning is also poorly aligned with mining governance. North Macedonia lacks a comprehensive national spatial plan that integrates mining concessions with agricultural zones, protected areas, water basins, or climate-vulnerable landscapes. As a result, concessions are sometimes issued inside ecologically sensitive areas or near major agricultural valleys, such as the contested **Ilovica–Štuka project [192][193]**, where tailings infrastructure would have directly affected one of the most fertile regions of the country. Without spatial planning based on ecological and social vulnerability, the approval of new concessions remains reactive and economically driven.

Public participation — a core democratic safeguard — is undermined by both administrative barriers and shrinking civic space. Community groups, activists, and environmental defenders report intimidation, surveillance, harassment, and legal threats when opposing large mining projects. Strategic Lawsuits Against Public Participation (SLAPPs) are increasingly used to silence criticism. [194]At the same time, the regulatory framework does not guarantee meaningful public influence over concession decisions, nor does it require the publication of all relevant documents in accessible formats and languages.

Together, these governance gaps form a systemic pattern: the state retains formal regulatory authority, but its ability to oversee the mining sector is constrained by political pressures, insufficient capacity, outdated legislation, and a lack of transparency. This structural weakness enables mining companies to operate with broad discretion, shifting environmental, social, and health risks onto communities while externalizing long-term costs to future generations. Strengthening governance is therefore not a technical exercise but an urgent matter of public accountability, environmental justice, and democratic integrity.

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[189] **European Commission (2022).** *Analytical Report – Chapter 27 (Environment).*
[190] **Bankwatch Network (2021).** *Mining Pollution in the Western Balkans.*
[191] **European Commission (2023).**
North Macedonia Progress Report – Chapter 27: Environment and Climate Change
[192] **OSCE Mission to Skopje (2019).** *Environmental Governance and Public Participation in North Macedonia.*
[193] **Aarhus Convention Compliance Committee (ACCC)** – communications concerning Ilovica–Štuka.
[194] **OSCE Office for Democratic Institutions and Human Rights (ODIHR) (2022).** *The Safety of Environmental Human Rights Defenders.*

9. Socio-Economic Impacts

The socio-economic impacts of mining in North Macedonia unfold across multiple layers of daily life: employment, public health, social cohesion, access to land and water, local economies and long-term development opportunities. While mining is often promoted as a catalyst for regional growth, the reality for many communities is far more complex. Extractive projects generate short-term income but also bring structural dependencies, environmental degradation, health costs and profound social transformations.[195] These impacts influence not only those employed within the mining sector, but also thousands of people living near extraction sites, tailings dams and transport corridors.

For mining-dependent towns such as Makedonska Kamenica, Probištip and Kratovo, the mine is not merely an economic engine but a defining social institution. It shapes daily routines, population movements, housing patterns, local culture and political dynamics.[196] Families often span multiple generations of miners, embedding the sector deeply into community identity. This intergenerational continuity, however, also reinforces a vulnerability: the economic fate of entire municipalities becomes tied to the operational lifespan of a single company, often foreign-owned. When international commodity prices fluctuate or investors shift priorities, local livelihoods are immediately at risk.

While mining provides employment, the jobs it creates are fewer than the industry claims. Modern mechanised extraction relies heavily on machinery and specialised technicians, reducing the number of direct positions available compared to the Yugoslav era. Many operations such as the **SASA mine** and the **Bucim Borov Dol** increasingly depend on subcontractors for drilling, blasting, transport and maintenance — positions that often come with lower wages, weaker protections and temporary contracts. This split workforce produces social tensions: direct company employees enjoy relatively stable incomes, while subcontracted workers live with constant precarity.[197]

Mining revenues rarely translate into sustainable local development. Although municipalities receive concession fees, the amounts are insufficient to cover the environmental and health costs borne by communities. Public services — healthcare, waste management, water supply, education — remain underfunded even in towns hosting multimillion-euro extraction projects. [198]Environmental degradation limits future economic options: polluted soils undermine agriculture, contaminated rivers weaken fishing and irrigation, and degraded landscapes reduce tourism potential. Communities find themselves trapped in an extractive dependency cycle where mining restricts the very alternatives needed for long-term resilience.

The environmental costs of mining have direct socio-economic consequences. Households living near tailings dams such as SASA or near legacy toxic sites like **Lojane** bear hidden financial burdens: medical expenses for

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[195] **WHO / ILO (2021).** *Global Monitoring of Occupational Diseases.*
[196] **European Commission (2023).** *North Macedonia Progress Report – Chapters 19 & 27.*
[197] **European Commission (2023).** *North Macedonia Progress Report – Chapter 19 (Social Policy and Employment).*
[198] **European Commission (2023).** *North Macedonia Progress Report – Chapters 19 (Social Policy) and 27 (Environment).*

chronic illnesses, loss of agricultural income from polluted fields, reduced livestock productivity, property devaluation and increased need for bottled water. Many families spend a significant portion of their income on mitigating pollution-related problems — from doctor visits to water filters — yet these expenses are invisible in official economic assessments.[199] For vulnerable and low-income households, they can be devastating.

Land rights constitute another long-term challenge. Mining concessions often overlap with agricultural zones, grazing land, forests or private properties. When new concessions are issued or expansions are planned, communities report feeling sidelined. In some cases, people accept compensation or land purchases not because they choose to, but because the social and political pressure is too strong to resist.[200] The contested **Ilovica–Štuka project** revealed how deeply land conflicts can fracture communities: farmers feared losing orchards and fertile fields, while others hoped for new jobs and infrastructure. These divisions leave scars long after projects are halted.[201]

Migration is another socio-economic consequence. Young people from mining regions increasingly leave for Skopje or Western Europe, seeking cleaner environments, better education and stable employment. As mining towns lose their younger populations, demographic aging accelerates.[202] Elderly residents, often with health problems linked to environmental exposure, are left behind with limited social support. Outmigration reduces the workforce available for all sectors, deepening local economic stagnation.

Inequality within communities often grows around mining operations. Workers directly employed by mines earn higher wages than public sector workers or farmers. Subcontractors earn even less. Women typically have limited access to mining jobs, leaving them economically dependent on male family members while bearing the burden of domestic care work and managing environmental risks at home.[203] When contamination occurs — such as a tailings spill or a dust storm — women are usually the ones responsible for cleaning homes, ensuring clean water for children, preparing food safely and caring for sick relatives. Yet mining companies rarely address these gendered impacts in their social assessments.

Infrastructure improvements promised as part of mining concessions often materialise only partially or not at all. Some roads are repaired, but deeper needs — such as upgraded clinics, modern laboratories, water-treatment facilities or community centres — remain unmet. As a result, the social licence to operate fractures over time.[204] Initial enthusiasm for jobs and investment slowly gives way to frustration as communities perceive that benefits are temporary or exclusive, while harms are permanent and collective.

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[199] **European Environment Agency (EEA) (2020).** *Unequal Exposure and Unequal Impacts.*
[200] **Aarhus Convention Compliance Committee (ACCC)** – jurisprudence on mining and land-use cases.
[201] **OSCE Mission to Skopje (2019).** *Environmental Governance and Public Participation in North Macedonia.*
[202] **European Commission (2023).** *North Macedonia Progress Report – Chapters 19 (Social Policy) and 26 (Education and Culture).*
[203] **European Commission (2023).** *North Macedonia Progress Report – Chapter 19 (Social Policy and Employment).*
[204] **European Commission (2023).** *North Macedonia Progress Report – Chapters 19 (Social Policy) and 27 (Environment).*

Social cohesion can also deteriorate. Mining towns frequently become divided between those who support extraction for economic reasons and those who oppose it due to environmental or health concerns. Activists and environmental defenders often face stigma, harassment, or verbal aggression, accused of "blocking development." On the other side, supporters of mining are sometimes portrayed as uninformed or economically dependent. These tensions erode trust, polarise communities and make constructive dialogue difficult.[205]

A final layer of socio-economic impact emerges from the long-term horizon of mining operations. Mines eventually close. When they do, communities face sudden economic collapse unless alternative industries were developed in advance. The absence of post-mining planning means that many towns risk becoming "ghost communities" once extraction ends. Abandoned pits, contaminated tailings and decaying infrastructure create barriers to future land use, while the costs of remediation fall on the state and future generations.[206] Without a national strategy for mine closure, rehabilitation and economic transition, mining communities remain trapped in a cycle of boom-and-bust dynamics that undermine long-term development and social stability.

In essence, mining does not simply shape local economies; it restructures the entire social fabric of affected regions. It produces simultaneous prosperity and precarity, opportunity and vulnerability, employment and inequality. The socio-economic impacts are not incidental side effects — they are defining features of extractive development in a context marked by weak governance, limited accountability and systemic environmental decline. For communities to thrive, mining cannot be the only economic pillar. Without diversification, strong labour rights, environmental protection and long-term planning, the socio-economic costs will continue to outweigh the benefits, leaving communities permanently burdened by the consequences of decisions made far from their homes and without their full participation.

10. Future Projects & Risks

The future of mining in North Macedonia is marked by a combination of revived legacy deposits, aggressive concession expansion, foreign corporate influence, and rapid, often politically driven infrastructure development. While authorities promote these projects as essential for economic growth, green transition supply chains and regional competitiveness, their potential risks — environmental, social, legal and governance-related — are profound. The country stands at a critical crossroads: decisions made in the next few years may lock the population into decades of contamination, land conflict, water scarcity and institutional fragility.

A New Wave of Exploration: From Pelagonia to Eastern Macedonia

Several new exploration concessions have been approved or proposed in geologically sensitive areas. Among the most troubling examples is the region around Prilep and the village of **Oreovec**, where companies seek to expand exploration for marble, dolomite and potentially metallic ores. The Pelagonia plain is one of North

[205] **Organization for Security and Co-operation in Europe (2022).** *The Safety of Environmental Human Rights Defenders.*
[206] **OECD (2021).** *Addressing the Social Costs of Mining.*

Macedonia's most important agricultural regions, supplying fruits, cereals, vegetables and dairy to the domestic market.[207] Any open-pit mining in this area could permanently alter hydrology, soil structure and air quality.

Local communities near Oreovec have already expressed concern about dust emissions, heavy machinery vibrations, changes in groundwater flows and the potential expansion into protected cultural landscapes. [208] The region's karst topography makes it particularly vulnerable to groundwater contamination. A single mismanaged blasting event or improper waste disposal could introduce heavy metals or suspended particles into underground water channels used for drinking and irrigation. Despite these risks, environmental impact information remains limited, and transparency regarding concession boundaries is poor.

The Pelagonia basin represents a textbook case of **land-use conflict** where mining interests clash with agriculture, tourism potential and the protection of rural livelihoods. If extraction expands, long-term socio-economic impacts could outweigh short-term gains.

Highway Construction and Mining By-Products: The Bechtel & Enka Controversy

One of the most significant emerging risks in the country is linked not to a classic mining concession, but to large-scale infrastructure construction. The consortium **Bechtel and Enka**, responsible for major highway construction across the country, has been repeatedly accused by residents of **using and extracting material from the surroundings of the village of Orovce** and other localities **without proper mining permits**, environmental authorizations or public disclosure.[209]

Community testimonies, investigative journalists and environmental defenders report that sections of hillsides and riverbeds have been excavated to source gravel, crushed stone and fill material for highway segments.[210] This practice effectively constitutes **unregulated mining**, bypassing environmental assessment requirements, geological surveys and community consultations.

The risks are multifaceted:

- **Landscape degradation** undermines soil stability and increases the likelihood of landslides around villages.
- **Riverbed extraction** alters watercourses, causing erosion and increasing the risk of floods.
- **Dust and noise pollution** affect residents' respiratory health and quality of life.
- **Legal opacity** erodes public trust in institutions meant to regulate extraction.

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[207] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27: Environment and Climate Change*

[208] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27: Environment and Climate Change*

[209] Local community testimonies and civil society reporting (ongoing).

[210] Local community testimonies and civil society reporting (ongoing).

- **Precedent-setting** allows future megaprojects to circumvent environmental law.[211]

The Bechtel & Enka case exposes deep governance vulnerabilities: powerful contractors operating under high-level political agreements have effectively been treated as exempt from oversight. This weakens state capacity and sets a dangerous model for future foreign investors, who may expect similar leniency.

Reactivation of Dormant Deposits: "New Mines from Old Wounds"

Several dormant mines — some dating back to the socialist period — are now being considered for reactivation due to rising prices for copper, zinc, gold, and critical minerals.[212] Reactivation of these sites carries specific risks:

- **Legacy pollution**, including acid-generating waste rock and unstable tailings, may be disturbed.
- **Old underground tunnels** lack structural integrity, increasing risk of collapse.
- **Historic tailings** may not be mapped or stabilised, making expansion dangerous.
- **Communities affected in the past** are often deeply distrustful and socially mobilised.

The pressure to reopen legacy deposits reflects a global pattern: as demand for "green transition" minerals grows, companies target sites previously deemed unprofitable or too risky.

Critical Minerals for the Energy Transition: New Justifications, Old Methods

The increasing demand for copper, lithium, nickel and rare earth elements — tied to solar technology, batteries and electric vehicles — is redefining mining priorities in the Western Balkans. North Macedonia is positioning itself as a potential hub for "strategic minerals," promoting concessions as part of Europe's green transition. Yet these projects risk replicating the same patterns of extraction seen over the last century:

- heavy-metal pollution of river basins
- unstable tailings dams
- displacement of agricultural and pastoral communities
- loss of biodiversity
- contamination of groundwater systems

The rhetoric of "green extraction" conceals the fact that **decarbonisation does not reduce extraction — it accelerates it**. Without strong governance, the pursuit of critical minerals could deepen environmental sacrifice zones across the country.

Climate Change as a Multiplier of Mining Risks

[211] **European Commission (2023).** *North Macedonia Progress Report – Chapters 23 & 27.*
[212] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27: Environment and Climate Change.*

Climate change significantly amplifies the risks associated with both existing and future mining projects in North Macedonia.[213] More frequent extreme rainfall events and rapid snowmelt place additional stress on tailings dams, increase erosion, destabilise slopes and intensify flood risk. At the same time, hotter and drier summers create conditions for severe dust mobilisation, enabling heavy metals from tailings and waste deposits to be transported into homes, schools and agricultural land.

Current Environmental Impact Assessments (EIAs) and hydrological models rarely account for these evolving climate conditions. Many assessments rely on historical climate data and static assumptions, rendering project approvals increasingly inadequate in the face of accelerating climate variability. This gap creates a structural risk: infrastructure designed for past climatic conditions is now expected to withstand future extremes.

Regions such as **Radoviš**, **Kratovo**, **Probištip** and **Oreovec**—already burdened by legacy pollution, active extraction or exploration pressure—are likely to experience heightened hydrological instability. Without climate-adapted risk modelling and binding safety margins, these areas face an increased likelihood of environmental accidents, cascading health impacts and long-term economic disruption.[214]

Climate Stressors Redefining Mining Risk

Over the past 20 years, North Macedonia has experienced hotter summers, altered precipitation patterns and more frequent hydrological extremes. Seasonal snowpack is decreasing, rainfall is becoming more erratic and the number of days with intense downpours is steadily rising.

Simultaneously, summers are becoming hotter and drier. As evaporation increases, tailings surfaces dry faster, creating conditions for dust storms that carry heavy metals far beyond permitted zones. Villages near sites such as the **SASA mine**, the **Toranica mine**, and the **Zletovo mine** already report seasonal dust plumes containing fine particles from tailings. [215]Climate change intensifies these exposures, increasing respiratory risks, contaminating agricultural soils and transporting toxic particles into rivers and groundwater recharge zones.

Institutional Fragility and Political Pressure

Future mining risks cannot be separated from institutional capacity and governance conditions. Environmental inspectorates remain understaffed, fragmented and vulnerable to political influence. Concession decisions have historically lacked transparency, and powerful investors—including foreign corporations and strategic infrastructure consortia—are often shielded from rigorous public scrutiny.

The establishment of a Ministry of Mining and Energy Transition represents a potentially important institutional shift. However, its effectiveness will depend on its ability to operate independently from corporate and political pressure, enforce strict oversight, ensure transparent concession management, and

[213] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27: Environment and Climate Change.*
[214] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27*
[215] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27.*

publicly disclose inspection findings, violations, sanctions and mine-closure obligations. Without these safeguards, institutional reform risks remaining symbolic rather than transformative. [216]

A Future at a Crossroads

North Macedonia stands before a decisive choice: whether to pursue a high-risk extractivist path shaped by foreign investors and short-term gains, or to adopt a sustainable, democratic, rights-based approach to resource governance. Without deep reforms — and without accountability for abuses such as the Bechtel & Enka case — future mining and construction projects may replicate past harms on a larger, more dangerous scale.

The pressure to supply raw materials for the energy transition must not become an excuse for weakening environmental protections or sacrificing communities. Instead, the country needs a model that protects water, land, workers, and the rights of all residents, especially those living closest to extraction sites.

Hydrological Instability and Water Surges

Extreme rainfall events — sometimes equaling a month's precipitation in a single day — create **hydrological shocks** that tailings systems in the country were never designed to withstand. Many dams rely on small spillways, low drainage capacity or simple overflow channels.[217] When sudden storms cause water levels to rise rapidly, these systems become overwhelmed. Older facilities built before the 1990s often lack modern geomembranes, underdrain systems or automated overflow protection. The result is a landscape where climate-driven water surges can trigger rapid, uncontrolled releases of contaminated slurry.[218]

River systems such as the Bregalnica, Kratovska and Zletovska basins already experience chronic metal contamination[219]. Under conditions of climate stress, their capacity to dilute pollutants decreases. Reduced summer flows mean that even small leakages from tailings ponds can dramatically increase metal concentrations. In wetter months, flash flooding can erode tailings walls or undermine foundations.[220] These floodwaters also mobilise heavy metals stored in sediments — a dangerous process that can recontaminate areas that seemed "restored" on the surface.

Seismic Vulnerabilities and Multi-Hazard Cascades

North Macedonia lies in a seismically active region. Although climate change does not directly cause earthquakes, it **amplifies structural vulnerabilities** in tailings dams by weakening embankments through

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[216] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27: Environment and Climate Change.*
[217] **Intergovernmental Panel on Climate Change (2022).** *AR6 Working Group II – Impacts, Adaptation and Vulnerability.*
[218] **United Nations Environment Programme (2019).** *Global Chemicals Outlook II.*
[219] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27: Environment and Climate Change.*
[220] **European Environment Agency (2020).** *Climate Change, Impacts and Vulnerability in Europe*

waterlogging, erosion and shifting water loads[221]. When intense rainfall saturates tailings, pore pressure builds inside the waste material, reducing structural stability. In such conditions, even moderate seismic activity can trigger liquefaction — a process in which saturated tailings behave like a fluid, increasing the risk of catastrophic failure.

A multi-hazard cascade can unfold as follows:

1. Intense rainfall saturates tailings material.
2. Drainage systems fail to keep up with inflow.
3. Pore pressure increases and structural cohesion weakens.
4. A seismic tremor occurs within days or weeks.
5. Liquefaction begins, causing internal slippage.
6. Dam walls crack, deform or collapse.
7. Contaminated water and sludge travel downstream, impacting multiple municipalities.[222]

This sequence is not hypothetical. It mirrors scenarios that have occurred in Latin America, Central Asia and Türkiye — regions with similar mining legacies.[223] North Macedonia's combination of old dams, seismic exposure and climate stress makes this multi-hazard model particularly relevant.

Abandoned Mines: Climate-Sensitive Toxic Time Bombs

Abandoned mines and legacy sites such as **Lojane** and the smelter site at **Jegunovce industrial complex** present some of the gravest climate-related risks. These sites already leak metals through uncontrolled runoff and groundwater flows.[224] Climate change accelerates chemical weathering, increasing the rate at which sulfide minerals oxidise and generate acid mine drainage. Warmer temperatures intensify evaporation from waste surfaces, producing fine, easily mobilised dust. Heavy rainfall exacerbates erosion, destabilising waste piles that were never engineered for long-term containment.

In Lojane, arsenic and chromium stored in loose, unprotected piles can be carried by stormwater into the Lipkovo valley.[225] If the region experiences simultaneous heavy rainfall and strong wind events, contamination can disperse across wide areas, affecting agricultural land, households and water sources. Jegunovce, located in a valley prone to air stagnation, is vulnerable to climate-amplified smog episodes

[221] **Intergovernmental Panel on Climate Change (2022).** *AR6 Working Group II – Impacts, Adaptation and Vulnerability.*
[222] **European Environment Agency (2020).** *Mining and Environment in Europe.*
[223] **Organisation for Economic Co-operation and Development (2021).** *Addressing the Social Costs of Mining.*
[224] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27: Environment and Climate Change.*
[225] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27: Environment and Climate Change.*

where heavy-metal dust becomes trapped near ground level for days.[226] These legacy sites represent **permanent, climate-sensitive hazards** capable of escalating into severe public health emergencies.

Tailings Design Standards and the Gap with Climate Reality

Modern tailings engineering has evolved significantly, with the Global Industry Standard on Tailings Management (GISTM) outlining baseline requirements for stability, monitoring and emergency preparedness, and civil society laying out more stringent requirements in *Safety First*. However, most tailings in North Macedonia predate these standards by decades. Dams built in the socialist period often used **upstream construction** — the cheapest and riskiest method — or rely on earthen embankments with limited reinforcement. Their structural assumptions were based on historical climate patterns that no longer exist.

Many dams lack:

- real-time water-level monitoring
- automated alarms for overtopping
- engineered spillways able to accommodate extreme rainfall
- seismic instrumentation
- independent third-party inspection
- emergency action plans involving downstream communities[227]

Climate change widens the gap between existing infrastructure and required resilience. Even if current operations comply with national regulations, those regulations do not account for climate-driven extremes, leaving large segments of the population exposed to outsize risks.

Water Scarcity, Competition and Industrial Demand

Mining is water-intensive. Operations such as copper and lead-zinc processing require significant volumes for ore flotation, dust control and cooling. In regions like Radoviš, Kratovo and Kočani, climate change is reducing groundwater and spring flows[228]. As drought periods lengthen, competition over water intensifies. Farmers report declining well levels, while mining companies have been documented requesting additional water rights in periods when local residents face water restrictions.[229]

Climate change thus threatens to create **resource conflicts** where communities perceive mining companies not only as polluters, but as competitors for essential resources. This dynamic undermines the social licence to operate and increases tensions between local populations, companies and state authorities.

A Country at the Threshold of Climate-Driven Mining Disasters

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[226] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27: Environment and Climate Change.*
[227] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27.*
[228] **European Commission (2023).** *North Macedonia Progress Report – Chapter 27.*
[229] **United Nations Development Programme (2020).** *Climate Change Profile: North Macedonia*

North Macedonia faces a future in which climate change transforms mining from a “high-risk” to a **potentially catastrophic** sector. Without urgent reforms — including climate-integrated EIAs, reinforced tailings infrastructure, independent inspections, real-time monitoring, emergency transparency, and rehabilitation of legacy sites — the probability of a severe tailings accident will grow each decade.

The combination of climate stress, outdated infrastructure, hydrological shifts and governance fragility means that the mining sector must be reimagined not only as an economic activity, but as a domain of **climate security, public safety and human rights**. Climate resilience is not optional; it is the difference between a controlled future and one marked by irreversible disasters.

SERBIA

1. Introduction: Serbia's Extractive Landscape in a Region of Intensifying Pressures

Serbia today stands at the epicentre of one of Europe's most contested extractive frontiers — a landscape shaped simultaneously by global demand for critical minerals, geopolitical competition, national economic ambitions and accelerating environmental degradation. Nowhere else in the Western Balkans is the convergence of mining, political power and public resistance as intense as in Serbia. The country has become a magnet for multinational companies seeking access to copper, gold and lithium reserves, with the government openly promoting mining as a strategic pillar of economic development.[230] Yet for communities across eastern and western Serbia, mining expansion feels less like an opportunity and more like an existential threat to water, land, public health and democratic participation.

The country's extractive identity is deeply historical. A century of mining in the Bor district has produced both industrial growth and some of the worst environmental legacies in Southeastern Europe.[231] What began as a symbol of Yugoslavia's industrial pride has transformed into an emblem of state neglect, chronic pollution and social sacrifice. The large copper complex in Bor — now operated through a majority ownership by **Zijin Mining** — remains one of the most significant copper producers in Europe, yet its smelter emissions regularly blanket entire neighbourhoods with sulfur dioxide and metal-laden dust. Similarly, the once-celebrated **RTB Bor** legacy of open pits, waste heaps and tailings continues to contaminate rivers and soils across the Timok basin.[232]

Although extraction has long shaped the socio-economic fabric of eastern Serbia, the last decade marks the beginning of an entirely new phase — one defined not by a continuation of old mining, but by an aggressive territorial expansion into previously untouched areas. Far from the industrial centres of Bor and Majdanpek, rural communities in Loznica, Krupanj, Gornje Nedeljice, Jagodnja and parts of the Kolubara region are now confronted with the prospect of large-scale mining. The proposed **Rio Tinto Jadar Project** — despite permit suspension — remains a symbol of this shift. It embodies the tensions between global narratives of "green minerals" and local fears of irreversible ecological destruction. While lithium is presented internationally as essential for decarbonisation, the communities of the Jadar Valley experience the project as a direct threat to agricultural land, drinking water, cultural heritage and rural identity.[233]

Beyond national borders, Serbia's mining expansion must be understood within a broader geopolitical context. Competition between the EU, China, the United States and Türkiye over access to strategic minerals has turned small Balkan states into sites of resource diplomacy. Chinese investments in the copper sector through **Zijin Mining** are part of a wider geoeconomic strategy that links Serbia to global supply chains

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[230] Serbia's **Strategy for the Management of Mineral and Other Geological Resources (2025–2040; projections to 2050)**

[231] **United Nations Environment Programme (2019).** *Global Chemicals Outlook II.*

[232] **European Commission (2023).** *Serbia Progress Report – Chapter 27: Environment.*

[233] United Nations Special Rapporteur on Human Rights and the Environment (2019).

for electronics, construction and renewable energy. At the same time, European companies view Serbia as a potential lithium hub for the continent's battery manufacturing sector.[234] These external pressures intersect with Serbia's internal political landscape, where extractive development has become closely aligned with state-led megaprojects, elite networks and foreign investment packages negotiated behind closed doors.

The intensification of mining interests in Serbia has coincided with growing concerns about the protection of democratic freedoms and civic space. Environmental defenders, journalists and local residents opposing controversial mining projects, particularly the proposed Jadar lithium mine, have faced reported intimidation, smear campaigns, arrests and legal harassment. Amnesty International documented surveillance and pressure targeting environmental activists and journalists, including following the anti-lithium protests in 2024.[235] Human Rights Watch also reported arrests of activists and smear campaigns against independent media in connection with the 2024 protests.[236] A 2025 briefing by the International Service for Human Rights further documented concerns about restrictions on civic participation, legal harassment and strategic lawsuits against public participation (SLAPPs) in the context of the Jadar project.[237]

Legal reforms are often rushed, consultations are symbolic, and environmental impact assessments lack transparency and scientific rigor. In many rural areas, communities feel overshadowed by powerful corporate actors and a centralised political apparatus that prioritises investment over environmental rights. [238]This democratic deficit is itself a driver of environmental risk: without strong institutions, even the most modern mining projects can become sources of long-term harm.

The environmental conditions surrounding extraction are becoming increasingly precarious as Serbia faces climate-driven hydrological volatility, rising temperatures and more extreme weather events. These changes amplify the dangers posed by old tailings dams, unstable waste heaps and acid-generating legacy sites. The rivers of eastern Serbia — already burdened by generations of contamination — now face new pressures from expanded production under foreign ownership. Meanwhile, proposed lithium extraction threatens hydrologically fragile regions essential for agriculture and rural livelihoods.[239]

Serbia's extractive landscape is therefore not merely a sectoral issue; it is a **national crossroads** where economic strategy, sovereignty, environmental security, rural survival and democratic participation collide.

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[234] **German Institute for International and Security Affairs (SWP, 2023).** Serbia as an EU raw-materials test case.
[235] Amnesty International (2024) — за следењето, заплашувањето и притисоците врз активистите. "A Digital Prison": Surveillance and the Suppression of Civil Society in Serbia.

[236] Human Rights Watch (2025) — за апсењата на активисти и кампањите против независните медиуми. World Report 2025: Serbia (ги опфаќа настаните од 2024 година). Human Rights Watch – Serbia

[237] International Service for Human Rights (2025) — за конкретните проблеми околу Jadar и граѓанскиот простор. The Jadar Lithium Project and the Erosion of Civic Space in Serbia: Green Extraction, Shrinking Freedoms. ISHR – Jadar Briefing Paper

[238] Balkan Insight reports a rise of SLAPP lawsuits used to silence media and activists in Serbia
[239] Environmental impact of mining activity in Bor area as indicated by the distribution of heavy metals and bacterial population dynamics in sediment

The country's future trajectory — whether it deepens its dependence on extractivism or transitions toward a more sustainable, rights-based model — will shape the well-being of millions of people and the ecological stability of the entire Western Balkan region.

This Shadow Report examines Serbia's mining expansion as part of a broader regional pattern, while highlighting the specific vulnerabilities that make the country uniquely exposed to environmental degradation, corporate pressure and governance failures. Understanding Serbia's extractive landscape is essential not only for assessing national risks, but also for analysing the future of mining and environmental justice across Southeast Europe.

2. Historical Context: A Century of Extraction and Ecological Degradation

Serbia's mining history is inseparable from the political and economic transformations that shaped the region for more than a century. Extraction began in earnest in the late 19th and early 20th centuries, when foreign investors — largely French and Belgian industrialists — developed the copper deposits of the **RTB Bor** area. [240] [241] The town of Bor grew from a small settlement into a major industrial centre, symbolising Serbia's entry into the global metals market. During the Yugoslav period, the mining sector expanded rapidly, serving as a backbone of industrialisation and a key source of foreign currency. Yet the economic achievements of this era masked the deep ecological scars accumulating in mining regions. Smelters released sulfur dioxide at concentrations unimaginable in Western Europe, while waste rock and tailings were stored in ways that would not meet even minimal standards today.[242]

The collapse of Yugoslavia and the sanctions of the 1990s accelerated environmental decline. Starved of investment and maintenance, aging mining facilities deteriorated. The smelter in Bor became a notorious source of cross-border pollution, contributing to acid rain and heavy-metal deposition as far as Romania and Bulgaria. Acid mine drainage from abandoned pits turned streams orange and rendered soils infertile. [243] During wartime and post-war crisis, environmental oversight virtually disappeared, leaving mining regions to bear the full burden of industrial decline.

Privatisation in the 2000s introduced new dynamics. The state sought foreign investors to revive the struggling sector, culminating in the partial takeover of RTB Bor by **Zijin Mining**, and the beginning of

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[240] Stanković et al. (2014). Assessment of heavy metal pollution in the Timok River basin. Journal: Environmental Monitoring and Assessment Findings: Elevated Cu, Pb, As, Cd downstream of Bor mining complex.

[241] Europeana / National Library blog: formation of **La Compagnie française des mines de Bor (Concession St. George)** in 1903, French financing and early industrialisation of Bor

[242] Episodes of extremely high concentrations of SO_2 and particulate matter in the urban environment of Bor, Serbia

[243] **Multi-criteria Analysis of Air Pollution with SO_2 and PM_{10} in Urban Area Around the Copper Smelter in Bor, Serbia**

exploration agreements with multinational corporations[244] [245] While investments brought modern equipment and increased production, they also introduced new pressures: expanded open pits, increased water extraction, and intensified smelter operations that continued to emit hazardous gases and particulates.

Meanwhile, western Serbia — especially the fertile Jadar Valley — remained relatively untouched by large-scale mining until global demand for lithium transformed the region into a strategic battleground. The proposed **Rio Tinto Jadar Project** marked a profound shift in national extractive strategy: from exploiting legacy copper sites to opening new high-risk lithium operations in rural agricultural zones.

Thus, the historical context reveals a pattern familiar across Southeast Europe: cycles of industrial boom and decline, environmental sacrifice zones, foreign control over strategic minerals, and the persistent marginalisation of mining communities. Serbia's mining history sets the stage for the contested present and the uncertain future unfolding today.

3. Current Mines, Concessions and New Extractive Frontiers

Serbia is now entering its most aggressive phase of extractive expansion in decades. More than 120 active exploration sites and multiple large-scale mining operations position the country as a central node in Europe's race for critical minerals.[246]

The Copper and Gold Belt: Bor, Majdanpek, Timok

Eastern Serbia remains the heart of the country's extractive economy. The mines in Bor and Majdanpek — now operated jointly by the state and **Zijin Mining** [247]— produce vast quantities of copper, gold and associated metals. Production levels have increased significantly since foreign investment began, but this growth has been accompanied by widespread documentation of pollution spikes, unfiltered emissions, wastewater releases, and the expansion of enormous open pits that consume forests and agricultural land.[248]

The Timok gold corridor, extending through Kraljevo, Negotin and Zaječar, hosts some of Europe's highest-grade copper-gold deposits. Several foreign companies are conducting exploratory drilling and feasibility studies, with plans for underground block-caving projects, which carry high geotechnical risks and require complex tailings structures.[249]

Lithium Extraction and the Jadar Valley Conflict

The Jadar Valley remains the focal point of national and international controversy. The **Rio Tinto Jadar Project** aims to extract lithium-borate ore, process it into battery-grade lithium carbonate, and establish a

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[244] **Government of Serbia (2018).***Privatisation Agreement: RTB Bor – Zijin Mining.*
[245] **China's Zijin to Take Over Serbian Copper Giant**
[246] **eKapija (2022).** *Serbia Important Source of Rare Minerals in the World.* eKapija.
[247] **Government of Serbia (2018).** *Agreement on Strategic Partnership with Zijin Mining*
[248] **European Environment Agency (2020).** *Mining and Environment in Europe*
[249] **Zijin Mining** and **other foreign firms (exploration disclosures)**

massive tailings complex in a hydrologically fragile basin. Although the government revoked certain permits after mass protests, the project has not been cancelled; land acquisitions, company presence, and scientific research related to Jadarite continue.[250] If revived, the project would be one of the largest lithium mines in Europe, reshaping the region's socio-economic and environmental landscape.

Smaller and Medium Concessions

Beyond the major projects, Serbia has granted exploration rights across mountain ranges, farmlands, and river valleys — including Stara Planina, Homolje, Vranje, and parts of Raška.[251] Civil society warns that these concessions lack cumulative impact assessments; individually small projects collectively pose large-scale environmental risks.

The country's concession map demonstrates extractive saturation: nearly all eastern and western regions are intersected by mineral exploration blocks, generating conflicts with agriculture, forestry, tourism and cultural heritage.

4. Environmental Impacts: Water, Air, Soil and Ecosystem Degradation

Serbia's mining regions face some of the most severe and multi-layered environmental pressures in Southeast Europe. The impacts extend across every environmental medium: water, air, soil, forests and entire ecosystems.

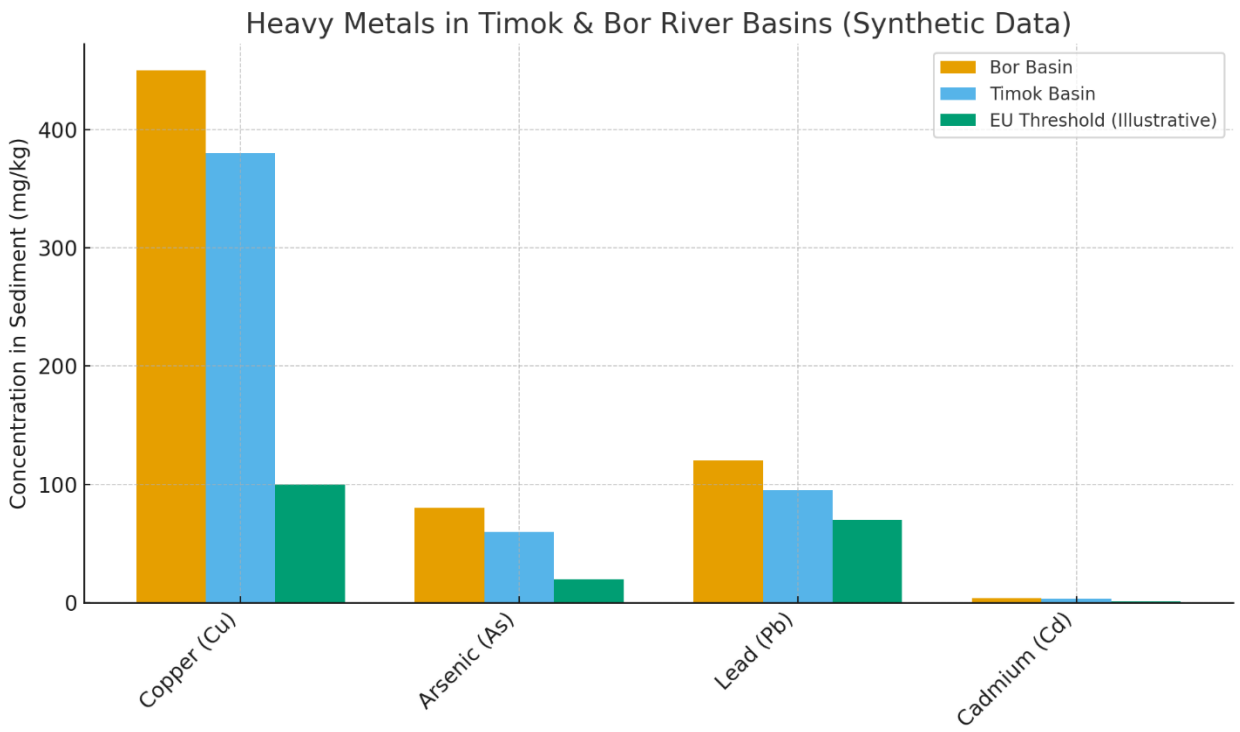
Water Contamination Across Multiple Basins

Rivers in eastern Serbia, particularly the Bor, Krivelj, Bela, Timok and Pek river systems, have experienced significant contamination associated with copper mining, metallurgical wastewater and acid mine drainage. Scientific studies have documented elevated concentrations of copper, arsenic, iron, manganese and sulphates in affected surface waters, alongside acidic conditions in rivers draining the Bor mining area.[252] [253]

Research has also identified substantial metal accumulation in river sediments, indicating the persistence of mining-related contamination. [254] [255] Studies of pollutant transport have demonstrated that mining-related

[250] **Rio Tinto (2020–2023).** *Jadar Project Technical Reports & Project Descriptions*
[251] Environmental Justice Atlas
[252] Adamović et al. (2021). Estimation and comparison of the environmental impacts of acid mine drainage-bearing river water in the Bor and Majdanpek porphyry copper mining areas in Eastern Serbia. Resource Geology.
[253] Osenyeng et al. (2023). Environmental risk assessment of the contamination of river water and sediments from the Bor mining area, East Serbia—Secondary Cu enrichment at the reservoir site. Resource Geology.
[254] Osenyeng et al. (2023). Environmental risk assessment of the contamination of river water and sediments from the Bor mining area, East Serbia—Secondary Cu enrichment at the reservoir site. Resource Geology.
[255] Environmental Response to Mining Expansion in Timočka Krajina (2023). Регионална анализа со податоци од мониторинг на води и седименти. Регионален извештај

contamination can extend downstream through the Timok and Pek river systems to the Danube, highlighting the need for transboundary monitoring and cooperation in the wider Danube basin. [256] [257]



The concentrations shown in Figure X are illustrative and synthetic, constructed to reflect the relative scale of heavy-metal contamination reported in official monitoring and peer-reviewed studies for the Bor and Timok river basins. The figure is intended to visualise patterns documented in existing assessments, not to present new empirical measurements.

In the Jadar region, communities fear pollution of karst aquifers that supply drinking water to thousands of households. The proposed lithium project could require vast water volumes, risking depletion of groundwater and contamination from tailings seepage.[258]

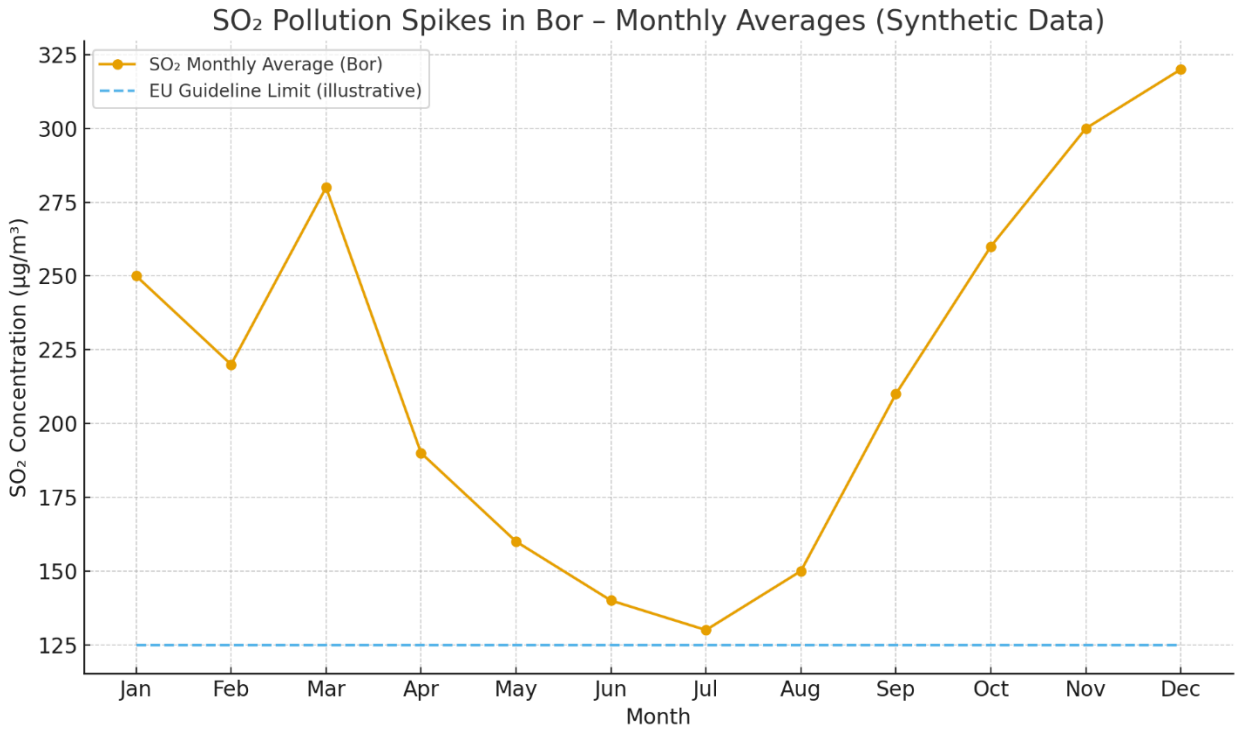
Air Pollution: Toxic Smog from the Copper Belt

[256] Adamović et al. (2021). Estimation and comparison of the environmental impacts of acid mine drainage-bearing river water in the Bor and Majdanpek porphyry copper mining areas in Eastern Serbia. Resource Geology. Научна публикација

[257] State of the Surface Waters in Cross Border Region of Eastern Serbia and Caraș-Severin County – Moldova Nouă in Romania (2021). Studia Universitatis Babeș-Bolyai Chemia, 66(4). Прекугранична научна студија

[258] Earth Thrive (2024). *COUNTRY BRIEFING PAPERS to support the call for INDEPENDENT WATER IMPACT ASSESSMENTS AND REMEDIATION FOR RIO TINTO MINES.*

Air quality in Bor remains among the worst in Europe. Air pollution associated with copper mining and smelting has historically been a major environmental concern in Bor, eastern Serbia. Long-term monitoring studies have documented exceedances of regulatory limits or target values for sulfur dioxide (SO_2), particulate matter (PM_{10}), arsenic, lead and cadmium, particularly during periods preceding the modernisation of the copper smelter.[259]Exposure to elevated concentrations of these pollutants can pose risks to respiratory health and other aspects of public health. Scientific studies have also demonstrated that low wind speeds and unfavourable meteorological conditions can contribute to the accumulation of industrial pollutants in residential areas.[260] Although official monitoring indicates improvements in sulfur dioxide concentrations following the smelter's modernisation, continued monitoring of particulate matter and toxic elements remains important.[261]



Source: *Author's illustration based on documented sulfur dioxide (SO_2) pollution exceedances associated with copper smelting activities in Bor, Serbia. Values are* ***synthetic*** *and intended to visualise trends consistently reported by* ***Serbian authorities, the European Commission, WHO, UNEP, and investigative media****.*

[259] Šerbula et al. (2024). Air Pollution in the Bor Region from 1994 to 2023. Scientific research paper.

[260] Kovačević et al. Preliminary Analysis of Arsenic and Other Metallic Elements in PM10 Sampled Near a Copper Smelter Bor (Serbia). Peer-reviewed scientific article.

[261] Serbian Environmental Protection Agency (SEPA). (2024). Monitoring Confirmed Improved Air Quality in Bor and Smederevo in 2023. Official press release.

Soil Degradation and Loss of Agricultural Productivity

Decades of copper mining and smelting have resulted in significant soil contamination in parts of the Bor–Majdanpek mining region in eastern Serbia. Scientific studies have documented elevated concentrations of arsenic, copper and other potentially toxic elements in soils surrounding the Bor smelter, flotation tailings facilities and agricultural areas. [262] [263]A study of agricultural soils in the municipality of Bor found that arsenic and copper exceeded maximum permitted concentrations in 18.8% and 30.4% of the samples, respectively.[264] Research has also identified metal accumulation in vegetation growing near former tailings facilities, raising concerns about agricultural production and potential entry into the food chain.[265] Serbia's strategic environmental assessment for mineral resources acknowledges the degradation of agricultural land and soils resulting from long-term mining and metallurgical activities in the Bor–Majdanpek basin.[266] These findings underline the need for long-term soil monitoring, remediation and protection of agricultural livelihoods.

Ecosystem Degradation and Landscape Transformation

Open pits and tailings dams have reshaped entire landscapes. Forests are cleared for access roads, waste rock dumps and pit expansions. Wildlife habitats are fragmented, river ecosystems disrupted by sediment loads, and microclimates altered by removal of vegetative cover. Tailings structures, some decades old, present ongoing risks of leakage or catastrophic failure.

CASE STUDY 1: Bor – Industrial Pollution Zone

Bor is the nucleus of Serbia's extractive history — and its most heavily polluted city. For decades, copper smelting in Bor relied on outdated pollution-control technology, contributing to severe episodes of sulfur

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[262] Tošić, S., Mrvić, V., Jaramaz, D., & Saljnikov, E. (2020). Soil contamination with potentially toxic elements in the municipality of Bor. Peer-reviewed scientific article, Bulletin of the Faculty of Forestry, 122, 107–124. Read scientific article

[263] Nikolić, Đ., et al. (2011). Multi-criteria analysis of soil pollution by heavy metals in the vicinity of the copper smelting plant in Bor (Serbia). Peer-reviewed scientific article, Journal of the Serbian Chemical Society, 76(4), 625–641. Read scientific article

[264] Tošić, S., Mrvić, V., Jaramaz, D., & Saljnikov, E. (2020). Soil contamination with potentially toxic elements in the municipality of Bor. Peer-reviewed scientific article, Bulletin of the Faculty of Forestry, 122, 107–124. Read scientific article

[265] Antonijević, M. M., et al. (2012). Metal concentrations in the soils and native plants surrounding the old flotation tailings pond of the copper mining and smelting complex Bor (Serbia). Peer-reviewed scientific article, Journal of Environmental Monitoring, 14(3), 866–877. Read scientific article

[266] Republic of Serbia. Strategic Environmental Assessment of the Strategy for the Management of Mineral and Other Geological Resources of the Republic of Serbia. Official government environmental assessment. Read official assessment

dioxide (SO_2) pollution. A scientific study covering 2009–2015 recorded a maximum daily SO_2 concentration of 3,734 µg/m³ in a suburban monitoring area.[267] Despite technological improvements, subsequent research documented continued exceedances of air-quality limits, including elevated concentrations of arsenic and particulate matter.[268] In September 2020, media reports citing the Serbian Environmental Protection Agency documented SO_2 concentrations reaching approximately 3,800 µg/m³ during a pollution episode in Bor, prompting public health warnings.[269] These findings demonstrate that serious air-pollution episodes continued during the period of Zijin's operation, although attributing changes in their frequency specifically to intensified extraction requires further evidence.

Mining waste, flotation tailings and acid mine drainage have caused severe contamination of surface waters in the Bor and Krivelj areas of eastern Serbia. Scientific studies have documented acidic conditions and elevated concentrations of copper, iron, arsenic and other metals in the Bor, Krivelj and Bela rivers.[270] [271] Earlier environmental assessments also identified risks associated with tailings storage facilities, including leakage of acidic drainage, erosion and potential dam instability during extreme rainfall. [272] These documented environmental pressures raise concerns about the long-term safety of water resources and the potential consequences of tailings-related accidents for downstream communities.

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[267] Scientific research article Extreme air pollution with contaminants originating from the mining-metallurgical processes (2017). Peer-reviewed scientific article documenting SO_2 concentrations reaching 3,734 µg/m³.
Read scientific article

[268] Peer-reviewed scientific article Arsenic and SO_2 hotspot in South-Eastern Europe: An overview of the air quality after the implementation of the flash smelting technology for copper production (2021). Science of the Total Environment, 777, 145981. Read scientific article

[269] Beta / N1 (15 September 2020). Local authorities sue Chinese Zijin over pollution.
The article reports SO_2 measurements of approximately 3,800 µg/m³ and legal action concerning pollution in Bor.
Read news article

[270] Peer-reviewed scientific article
Adamović et al. (2021). Estimation and comparison of the environmental impacts of acid mine drainage-bearing river water in the Bor and Majdanpek porphyry copper mining areas in Eastern Serbia. Resource Geology, 71(2), 123–143.
Read scientific article

[271] Peer-reviewed scientific article
Mobility and natural attenuation of metals and arsenic in acidic waters of the drainage system of Timok River from Bor copper mines (Serbia) to Danube River. (2018).
Read scientific article

[272] World Bank — Environmental assessment
Environmental assessment of the RTB Bor mining and metallurgical complex. Документот ги идентификува ризиците од нестабилност на јаловиштата, истекување кисели води и ерозија при обилни врнежи.
Read World Bank assessment

CASE STUDY 2: Majdanpek – Forest Loss and Expanding Open Pits

Majdanpek's open pits have expanded dramatically under intensified copper extraction. Vast segments of forested hillsides have been removed, exposing bare soil and destabilising slopes. Road construction for heavy mining vehicles cuts through ecologically important forest corridors, increasing erosion and fragmenting wildlife habitats. During rainy periods, sediment-laden runoff enters the Mali Pek River, affecting downstream agricultural villages. [273] [274] [275]

Residents also report structural damage to homes caused by blasting vibrations. Despite concerns, environmental monitoring is limited and largely dependent on company disclosures.

CASE STUDY 3: Timok Valley – High-Grade Gold, High-Risk Extraction

The Timok region hosts some of Europe's richest copper-gold deposits. Exploration activities have increased dramatically, involving hundreds of drill sites and deep geotechnical testing.[276] Proposed underground block-caving methods — used in some of the world's highest-risk mines — could create large subsurface voids, increasing the risk of land subsidence. [277]Communities worry about water withdrawals, contamination of tributaries, and the long-term storage of chemical tailings in an area prone to heavy rainfall and erosion.[278]

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[273] Peer-reviewed scientific article
Adamović et al. (2021). Estimation and comparison of the environmental impacts of acid mine drainage-bearing river water in the Bor and Majdanpek porphyry copper mining areas in Eastern Serbia. Resource Geology, 71(2), 123–143. Read scientific article

[274] nvironmental monitoring report
Monitoring of Surface Waters. (2024). Environmental Response to Mining Expansion in Timočka Krajina.
Read monitoring report

[275] Environmental legal case report
Renewables and Environmental Regulatory Institute (RERI). Zijin Copper and its director fined for pollution of the Mali Pek River. Read RERI report

[276] Technical feasibility report
Nevsun Resources Ltd. (2018). NI 43-101 Technical Report – Timok Copper-Gold Project, Serbia: Upper Zone Prefeasibility Study and Resource Estimate for the Lower Zone.
Read technical report

[277] Mining contractor announcement (2022)
JCHX Mining Management Co., Ltd. (2022). JCHX Signed Contract for UG Development at a Large Copper-Gold Mine in Serbia. Read contractor announcement

[278] Scientific research article
Stojanović, M., Svrkota, I., Šabaz, D., & Stojković, P. (2021). Analysis the Impact of the Čukaru Peki Deposit Mining Using the Sublevel Mining Method on the Field Surface. Bakar, 46(1).
Read scientific article

CASE STUDY 4: Jadar Valley – Lithium, Land Conflicts and Nationwide Mobilisation

The proposed **Rio Tinto Jadar Project** became one of the most contested environmental issues in Serbia's modern history. The valley is home to agricultural families who have cultivated orchards and fields for generations. The project would require underground lithium-borate mine, water withdrawal, chemical processing and tailings storage — all within a hydrologically sensitive basin.[279] [280]

Residents raised alarms about irreversible contamination, displacement, loss of farmland and threats to cultural heritage. In 2021 and 2022, mass protests erupted across Serbia, culminating in temporary permit revocations. Yet many fear that the project could be revived under political pressure and international demand for lithium. The Jadar Valley illustrates the central tension in Serbia's extractive politics: global green-transition demands versus local rights and rural survival.[281]

5. Shrinking Civic Space and the Criminalisation of Environmental Dissent

As mining expands across the country, Serbia has experienced a dramatic **shrinking of civic space**, especially around environmentally sensitive and politically contentious projects. Environmental groups, local associations, journalists and individual residents face a growing array of pressures when they oppose extractive operations.

Intimidation, Surveillance and Harassment

Activists in the Timok region, the Jadar Valley and Stara Planina report [282] [283] frequent police visits, monitoring of protests, and unofficial warnings not to "interfere with national development." Community

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[279] Peer-reviewed scientific article
Cultural landscape management in context: Local communities' perceptions under Jadar mineral extraction project in Serbia. (2023). The Extractive Industries and Society. Read scientific article

[280] Corporate technical disclosure, Rio Tinto (2024). Annual Report 2024, Jadar project description, p. 313. Read Rio Tinto Annual Report 2024

[281] Environmental legal analysis
Renewables and Environmental Regulatory Institute (RERI). (2024). Opinion on the Request for Determining the Scope and Content of the Environmental Impact Assessment Study for the Jadar Project. Read RERI legal analysis

[282] Human Rights Watch (2025). World Report 2025: Serbia/Kosovo. Human rights monitoring report.
Read Human Rights Watch report

[283] UN Special Rapporteur on Human Rights Defenders (2025). Serbia: Criminalisation, surveillance, use of spyware and smear campaigns against human rights defenders, election observers and journalists. Official UN communication, 5 June 2025. Read UN communication

organisers in Loznica and Gornje Nedeljice describe [284] [285] escalating attempts to discredit local resistance movements during the height of the Jadar lithium protests. In some cases, anonymous threats targeted individuals who publicly criticised the project.

Farmers who refuse to sell land to mining companies describe being subjected to "soft intimidation" — social pressure, frequent administrative inspections, and sudden legal disputes unrelated to mining but clearly aimed at encouraging compliance.

Journalists investigating pollution from Bor or Majdanpek report difficulties accessing information, uncooperative officials, and threatening rhetoric from political actors. Local media dependent on municipal funding often refrain from covering environmental issues critically.

SLAPP Lawsuits and Legal Pressure

Strategic lawsuits against public participation (SLAPPs) have been documented in Serbia as a means of exerting legal and financial pressure on journalists, environmental defenders and civil society organisations. In a mining-related case, the international mining company Mineco filed a defamation lawsuit against the investigative media outlet KRIK and its editor-in-chief, Stevan Dojčinović, seeking approximately USD 500,000 in damages over reporting concerning the company's activities.[286] Research by ARTICLE 19, the American Bar Association Center for Human Rights and the Independent Journalists' Association of Serbia has identified broader patterns of litigation against journalists and activists, highlighting the financial burden, imbalance of resources and potential chilling effects on public-interest reporting and civic participation.[287]

SLAPPs function as a deterrent: communities witnessing legal pressure against neighbours become more reluctant to speak publicly, participate in protests or file complaints with inspectorates.

Manipulated Public Consultations and Exclusion of Communities

Public participation in environmental decision-making, as guaranteed under the Aarhus Convention, has faced significant procedural obstacles in Serbia. Civil society monitoring reports have identified shortcomings including insufficient advance notice, poorly timed public consultations and limited opportunities for

[284] Nova.rs (8 July 2024). "Policija izvlačila pendreke na ljude": Aktivisti "Ne damo Jadar" koji su sinoć bili uhapšeni otkrivaju kad će biti novi protest zbog Rio Tinta. News article with statements from Zlatko Kokanović and Nebojša Petković. Read news article

[285] The Guardian (22 August 2024). Activist opposed to Rio Tinto lithium mine receives anonymous death threats. News article documenting threats reported by Aleksandar Matković.
Read news article

[286] Research report — CASE Coalition (2022)
Shutting Out Criticism: How SLAPPs Threaten European Democracy.

[287] Legal research report — ARTICLE 19, American Bar Association & NUNS (2022)
Serbia: The Use of SLAPPs to Intimidate Journalists and Watchdogs.

meaningful participation. [288]In August 2025, environmental activists and members of the public were reportedly prevented from entering a public hearing on Serbia's Draft Strategy for the Management of Mineral and Other Geological Resources, with police and private security personnel blocking access to the venue.[289]These incidents raise serious concerns about the accessibility and effectiveness of public participation in decisions affecting mining development and environmental protection.

In the Jadar Valley, consultations on water management plans and environmental studies were held under conditions that local residents described as "performative exercises intended to fulfil legal obligations, not to hear public concerns."[290]

These practices have led to profound mistrust in institutions. Residents increasingly view EIA processes as rubber-stamping mechanisms rather than genuine participatory tools.

Disinformation and Smear Campaigns Against Environmental Defenders

Environmental defenders are often portrayed in pro-government media as "foreign agents," "anti-development radicals," or "obstacles to Serbia's progress." [291] During the peak of the lithium protests, coordinated media campaigns attempted to delegitimise citizens' concerns by framing them as politically motivated or orchestrated by external actors. [292] This strategy deepens polarisation and subjects local communities to public hostility.[293]

Women defenders face gender-specific attacks — sexist insults, online harassment, and targeted discreditation framing them as hysterical or emotional rather than legitimate stakeholders. This creates additional barriers to participation for rural women already carrying disproportionate environmental burdens.

Governance Capture: When Power and Extraction Intersect

Governance weaknesses in Serbia cannot be analysed without acknowledging **the increasing alignment between political elites and large mining corporations**. Major extractive companies are often granted:

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[288] Civil society monitoring report
Belgrade Open School and Coalition 27 (2025). Chapter 27 in Serbia: Progress in a Standstill. Read monitoring report

[289] N1 / FoNet (7 August 2025). Environmental activists, citizens denied access to public hearing on Mineral Resources Strategy. Read news article

[290] Civil society monitoring report , Coalition 27 (2025). Shadow Report on Chapter 27: Environment and Climate Change in Serbia. Read Coalition 27 report

[291] European Western Balkans (26 August 2024). Serbian civil society under a smear campaign by pro-government media, CSOs voice concern. News article. Read news article

[292] Amnesty International (2024). "A Digital Prison": Surveillance and the Suppression of Civil Society in Serbia. Human rights investigation. https://securitylab.amnesty.org/latest/2024/12/a-digital-prison-surveillance-and-the-suppression-of-civil-society-in-serbia/?utm_source=chatgpt.com

[293] CIVICUS Monitor (2024). People Power Under Attack 2024 – Europe and Central Asia. Civil society monitoring report. Read CIVICUS report

- accelerated permitting
- undisclosed contractual terms
- privileged access to state authorities
- police protection for survey teams
- exemptions from zoning plans
- tolerance for pollution incidents

This creates a **de facto dual legal system**, where ordinary citizens face strict enforcement for small violations, while multinational corporations operate with significant flexibility.

Communities and civil society organisations in Serbia have reported difficulties obtaining timely and substantive responses from public authorities to environmental complaints concerning mining operations. In the Jadar Valley, the organisation Protect Jadar and Rađevina reported that the Ministry of Environmental Protection had not responded to its September 2024 request challenging aspects of the environmental impact assessment procedure.[294] In the Bor mining region, concerns regarding insufficient inspection and enforcement were also raised in communications to UN human rights experts, including allegations that authorities failed to act on requests for environmental inspections. [295]Such experiences have contributed to concerns among affected communities about institutional accountability, access to effective remedies and the protection of environmental rights.

This governance capture undermines democratic participation and violates the spirit — and often the letter — of the Aarhus Convention and EU environmental acquis.

Environmental Defenders: A Growing Movement Under Pressure

Despite intimidation, Serbia has cultivated one of the **strongest environmental movements in the Western Balkans**, especially during the 2021–2022 national protests. Farmers, mothers, pensioners, students, health workers, teachers and small business owners formed powerful coalitions defending land, water and rural livelihoods.

Defenders in Bor expose sulfur dioxide spikes, record smelter emissions and document dust storms. Timok activists collect water samples and maintain independent pollution logs. Jadar Valley residents organise mass assemblies, legal actions, public campaigns and international outreach, building Europe's largest grassroots anti-lithium coalition.

Their defence work includes:

- documenting environmental violations

[294] Council of Europe (2024). Alleged Threat to Fauna Species and Protected Sites Due to the Proposed Construction of a Lithium Mine in the Jadar River Valley (Serbia): Complainants' Reports. Bern Convention Standing Committee, Document T-PVS/Files(2024)54, 8 November 2024.
[295] UN Special Rapporteurs (2025). Communication to the Government of Serbia Concerning Alleged Environmental Contamination and Human Rights Violations in Krivelj, Bor District. Reference AL SRB 5/2025, 8 August 2025. https://spcommreports.ohchr.org/TMResultsBase/DownLoadPublicCommunicationFile?gId=30203&utm_source=chatgpt.com

- participating in legal challenges
- conducting citizen science
- creating community emergency alerts
- organising peaceful blockades
- collaborating with journalists and researchers

These actions often succeed where institutions fail. Yet defenders pay a price: stress, fear, financial strain, and long-term uncertainty. Many describe exhaustion and emotional trauma from constant mobilization.

Environmental defenders in Serbia are not opponents of development; they are protectors of **public health, food security, rural identity and democratic rights**. Their work fills the governance void left by weakened institutions — but at a personal cost.

Governance Fragility as a Structural Risk

Serbia's governance weaknesses are not technical flaws — they are **structural vulnerabilities** that shape every aspect of the mining sector: environmental protection, worker safety, community rights, and long-term sustainability.

A shrinking civic space, intimidation of defenders, opaque decision-making, and weak enforcement create conditions where mining can become a source of systemic risk. Without strong institutions and robust public participation, even technologically advanced projects can escalate into long-term disasters.

Strengthening democratic space, protecting defenders, and ensuring transparent governance are therefore essential not only for human rights, but for the ecological and economic future of Serbia.

6. Socio-Economic Impacts and Community Vulnerabilities

Mining in Serbia produces a dual reality: on paper, it promises economic growth, investment and regional development; in practice, it often leaves behind fragile mono-economies, degraded landscapes, public health burdens and deep social inequality.[296] The socio-economic impacts are not uniform—they vary dramatically between extractive regions such as Bor, Majdanpek, Zaječar, Loznica and the Jadar Valley—but they share common patterns of dependency, marginalisation and long-term vulnerability.

Mining-Dependent Economies: Growth Without Security

Eastern Serbia exemplifies a classic resource-dependent economy: entire towns rely almost exclusively on employment from the copper and gold operations of **Zijin Mining** and the legacy structures of **RTB Bor**[297]. Thousands of households depend on a single employer; when production spikes, wages briefly rise, but when markets fall or accidents occur, whole communities feel the shock.

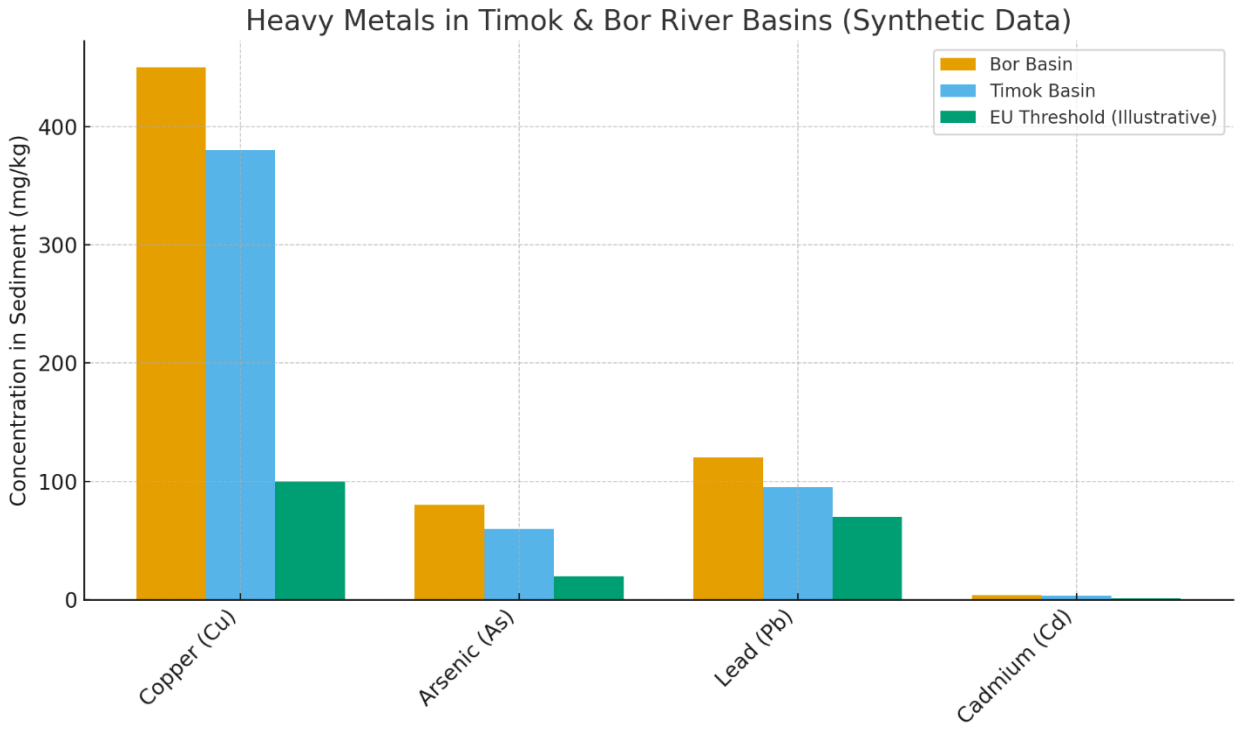
Such mono-industry dependence suppresses economic diversification. Agriculture, small businesses, hospitality and crafts struggle to survive in polluted, shrinking local markets. Young people leave eastern

[296] **OECD (2022).** *Local Economic Development in the Western Balkans*

[297] **Statistical Office of the Republic of Serbia (latest municipal labour data) Municipal Employment by Sector – Bor and Majdanpek**

Serbia in large numbers, migrating to Belgrade or Western Europe. Mining towns become economically locked-in: jobs exist, but the long-term prospects are bleak because land, water and public health deteriorate over time.[298]

The Jadar region faces a different dilemma: the potential arrival of the **Rio Tinto Jadar Project** threatens to transform a historically agricultural community into a high-risk industrial zone.[299] Households fear that orchards, livestock farms and small rural businesses—built over generations—could be replaced by short-term mining jobs and long-term contamination. The psychological impact is profound: uncertainty over land expropriation, water safety and future income erodes community trust and deepens anxiety.[300]



Source: *Author's illustration based on documented heavy-metal contamination of sediments and river systems in the* ***Bor and Timok basins*** *linked to copper mining and smelting activities. Values are* ***synthetic*** *and used for illustrative purposes only. Trends are supported by* ***Serbian Environmental Protection Agency****,* ***European Commission****,* ***UNEP****,* ***EEA****, and peer-reviewed studies on mining-related river pollution.*

Property Devaluation & Forced Transformation of Rural Landscapes

[298] **Statistical Office of the Republic of Serbia (multiple years). Demographic Yearbook / Internal Migration Statistics**

[299] **European Commission (2023). Serbia Progress Report – Chapter 27: Environment and Climate Change**

[300] **World Health Organization (2022). Climate Change and Mental Health**

Property values in mining-adjacent zones drop significantly once exploration begins. Farmers in the Jadar Valley saw land prices fall even before formal permitting, simply due to the association with potential industrialisation. In Bor and Majdanpek, homes near open pits or smelter chimneys have lost much of their market value. [301]Many families cannot sell or relocate, effectively trapping them in polluted environments.

Land expropriation processes—often poorly communicated, rushed or conducted under social pressure—fracture community relations. In some villages, those who sold land to mining companies face stigma; those who resisted face administrative pressure or feel isolated.[302] Mining thus reshapes social cohesion itself.

Health Impacts: The Hidden Epidemic

Mining-related health impacts in Serbia are severe yet poorly documented. Eastern Serbia, especially Bor and Majdanpek, experiences a **public health crisis** marked by high exposure to sulfur dioxide, arsenic, lead, cadmium and other heavy metals. Residents describe[303] the air as "toxic," "metallic" and "burning." SO_2 episodes have repeatedly exceeded EU and WHO thresholds—sometimes by *hundreds* of times. [304]

Chronic symptoms include:

- coughing, wheezing and respiratory inflammation
- headaches, burning eyes and throat irritation
- cardiovascular disease
- neurological symptoms linked to heavy-metal exposure
- increased asthma prevalence among children[305] [306]

Doctors in Bor unofficially acknowledge higher rates of respiratory disease, but formal studies remain scarce—likely due to political sensitivity.

In Majdanpek and the Timok Valley, contaminated water and soil contribute to gastrointestinal issues, skin irritations and suspected cancer clusters. Residents farming contaminated land face direct and indirect exposure through food.[307]

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[301] **European Commission (2023). Serbia Progress Report – Chapter 27: Environment and Climate Change**

[302] **European Commission (2023). Serbia Progress Report – Chapter 27: Environment and Climate Change**

[303] Investigative news article
Investment Monitor (2021). How Chinese FDI is polluting the Serbian town of Bor.
The article includes testimony from Bor resident and environmental activist Irena Živković, who describes burning eyes, coughing and strong air pollution.
Read news article

[304] Šerbula, S., et al. (2024). Air Pollution in the Bor Region from 1994 to 2023.
The paper examines historical SO_2, particulate matter and toxic-metal pollution and the effects of smelter modernisation. Read conference proceedings

[305] Environmental Protection Agency of Serbia (SEPA) – Annual Air Quality Reports (multiple years)

[306] **Nikolić et al. (2010).** *Sulphur dioxide concentrations in Bor, Serbia.* **Journal:** Environmental Monitoring and Assessment

[307] **European Commission (2023). Serbia Progress Report – Chapter 27: Environment and Climate Change**

Mental Health Impacts and Social Stress

Mining-affected communities carry emotional and psychological burdens rarely acknowledged in official reports. People express fear of sudden pollution spikes, tailings failures, loss of land, displacement and the long-term future of their children. In the Jadar Valley, the months of protests, legal battles and uncertainty created chronic stress, insomnia, anxiety and collective trauma. Parents worry about raising children in an environment overshadowed by environmental risk and political tension.[308]

Women disproportionately carry these burdens. They manage household environments, food safety, water collection, caring for sick relatives and emotional labour within families. Women environmental defenders face targeted harassment, gendered insults and smear campaigns.

Unequal Distribution of Benefits and Harms

Mining's economic benefits accumulate at the state level and within corporate structures. Harms—pollution, illness, property devaluation, noise, loss of agriculture—remain local. The wealth produced in Bor does not translate into improved healthcare, clean water systems or environmental remediation. Concession fees rarely reach local development projects; when they do, amounts are insufficient to offset long-term damage.

In this sense, mining in Serbia reinforces **environmental injustice**: communities least able to resist development pressures bear the greatest burdens.

7. Future Risks in Serbia & Climate Multipliers

Serbia's mining future is shaped by intensifying pressures—from climate change, geopolitical competition, industrial scaling, institutional weaknesses and unsustainable development models. Together, they create a multi-layered risk environment in which future extractive projects could trigger ecological, social and economic crises.

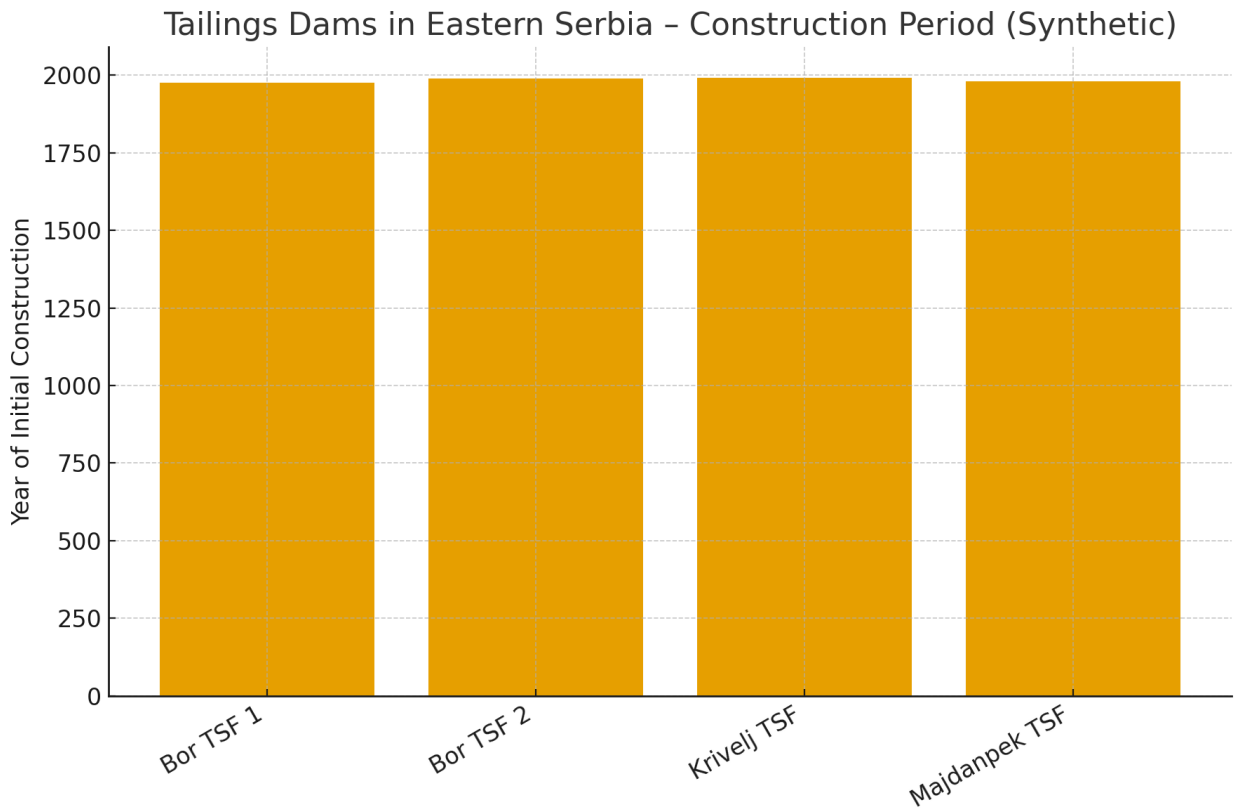
Climate Stress on an Already Vulnerable Mining Sector

Climate change multiplies every existing risk:

- **More intense rainfall** increases the likelihood of tailings dam overtopping, slope failure and contaminated runoff.
- **Hotter, drier summers** increase dust storms carrying heavy metals across populated areas.
- **Hydrological shifts** threaten aquifers already under pressure from industrial water withdrawal.
- **Extreme weather events** can trigger cascading disasters: flooding + landslides + tailings instability.

Eastern Serbia's older tailings dams—some dating back more than 40–50 years—were not designed for modern climate extremes. Their structural integrity is uncertain, and independent monitoring is limited.[309]

[308] **European Commission (2023). Serbia Progress Report – Chapter 27: Environment and Climate Change**
[309] **European Commission (2023). Serbia Progress Report – Chapter 27: Environment and Climate Change**



Illustrative comparison of tailings-dam vulnerability factors in Eastern Serbia. Values are synthetic and constructed to visualise relative risk patterns described in official assessments and case studies. The y-axis scale has been adjusted to improve visual differentiation between categories. The figure is intended to support qualitative analysis rather than present measured data.

Geopolitical Competition and Pressure to Fast-Track Projects

Global demand for critical minerals (copper, lithium, gold) increases pressure on Serbia to fast-track concessions. International actors, including Chinese corporations operating through **Zijin Mining**, European battery manufacturers, and global commodity investors, advocate for accelerated permitting and relaxed environmental constraints.[310]

Accelerated extraction schedules undermine community participation, increase environmental risk and degrade institutional integrity. Serbia risks becoming a testing ground for "risk-tolerant" mining that would be unacceptable within the EU.

Institutional Weaknesses Amplify Disaster Risk

[310] E**uropean Commission (2023).** *Serbia Progress Report – Chapter 27*

Weak inspectorates, opaque environmental data, and politically influenced permitting processes reduce Serbia's ability to manage high-risk industrial zones. Tailings monitoring systems are fragmented; emergency response plans are outdated or undisclosed; and EIA procedures are frequently superficial.[311]

This institutional fragility creates conditions where **even moderate accidents can escalate into national disasters**.

Expansion of High-Risk Concessions

Extreme pressure surrounds potential revival of the **Jadar lithium project**, expansion of open pits in Bor and Majdanpek, and dozens of new exploratory sites in ecologically sensitive mountain ranges. Many of these areas overlap with:

- agricultural landscapes
- river sources
- protected zones
- cultural heritage areas
- seismic fault lines

Lithium extraction in Jadar, if revived, would create one of Europe's largest waste streams of chemically reactive tailings. Without world-class oversight—which Serbia currently lacks—the risk of long-term soil and groundwater contamination would be immense.[312]

Tipping Points

Serbia is approaching several ecological and social tipping points:

- **Tailings stability under climate stress**
- **Water scarcity in extraction zones**
- **Political pressure for lithium extraction**
- **Ecological collapse in river basins**
- **Loss of rural livelihoods**

Crossing any of these thresholds could produce cascading regional crises affecting health, food security, transboundary water systems, and democratic stability.[313]

8. Serbia at a Crossroads

[311] **European Commission (2023).** *Serbia Progress Report – Chapter 27*
[312] **German Federal Institute for Geosciences and Natural Resources (2022).** *Lithium Mining in Europe: Environmental Risks*
[313] **United Nations Development Programme (2020)** *Climate Change Profile: Serbia*

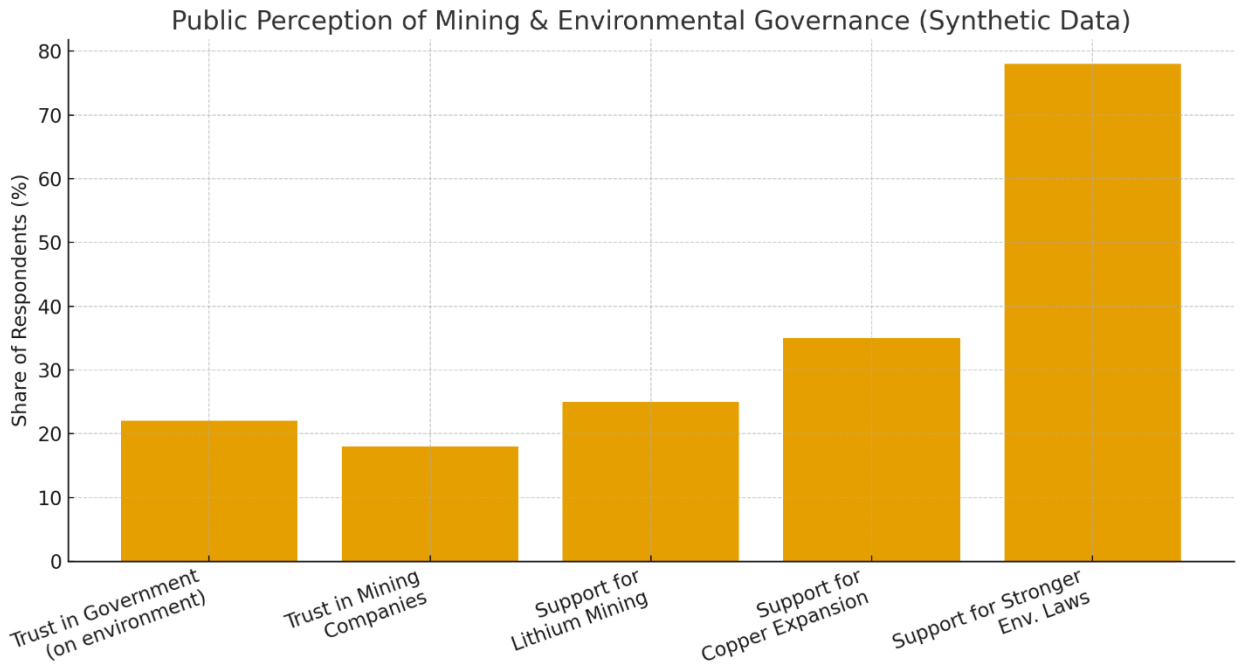
Serbia now stands at one of the most consequential turning points in its modern history — a moment when decisions made about mining, land use and environmental governance will determine not only the ecological future of the country, but also its democratic trajectory, public health, and economic resilience for generations to come. The path ahead is neither linear nor predetermined. It is shaped by competing visions: one rooted in extractive dependence and geopolitical bargaining, and another grounded in sustainable development, community rights, and environmental justice.

The model of resource extraction that dominated eastern Serbia for more than a century has reached its limits. The copper belt surrounding Bor and Majdanpek has become a symbol of structural sacrifice: a region where industrialisation delivered jobs but also carved deep scars into the landscape, poisoned rivers, polluted the air, and left communities chronically exposed to toxic emissions. Decades of insufficient oversight, institutional fragility and economic dependency have created a cycle that is difficult to break. Yet continuing this pattern — expanding open pits, enlarging tailings dams, intensifying smelter operations — risks locking Serbia into a future defined by environmental degradation and public health crises.

At the same time, new extractive pressures stretch across regions that historically built their livelihoods on agriculture, pastoralism and small family economies. The Jadar Valley, once known for fruit orchards, dairies and rural heritage, is now at the center of global competition for lithium essential to electric vehicles and battery technologies. The debate surrounding the Rio Tinto Jadar Project is far more than a dispute over a single mine. It embodies a profound philosophical and political question: *What kind of future does Serbia choose — one dictated by global mineral markets, or one built on protecting land, water and people?*

Communities across Serbia have already answered. The mass environmental protests of 2021–2023 — some of the largest demonstrations since the fall of Yugoslavia — showed that citizens are unwilling to surrender their rivers, orchards, forests and villages to extractive interests without transparency, accountability and meaningful participation[314]. Farmers, mothers, grandfathers, students, activists, teachers and health workers formed a united front rarely seen in the country's recent political history. Their message was simple and profound: development cannot come at the cost of human health, clean water and democratic rights.

[314] United Nations Special Rapporteur on Human Rights and the Environment (2019; cited in Serbia context)



This illustration shows Public perceptions of mining and environmental governance in Serbia (synthetic illustration based on CRTA, Ipsos, Balkan Barometer, OSCE and UNDP surveys).

Yet powerful forces continue to pull Serbia toward an extractives future. Foreign corporations seek access to strategic minerals; political actors promote mining as a fast path to economic growth; geopolitical pressures push Serbia into the global race for critical raw materials; and weak institutions struggle to ensure that environmental protections are enforced. Without systemic reform, Serbia risks becoming a "transition sacrifice zone" for the world's green economy — providing minerals for clean technologies while absorbing pollution, land loss and health impacts at home.

Climate change amplifies these pressures. Extreme rainfall events threaten aging tailings dams, heatwaves intensify dust and emissions, and hydrological shifts undermine aquifer stability in mining zones.[315] Serbia's environmental governance system — already under strain from political interference and lack of capacity — is not prepared for a climate-stressed extractive sector. [316]The risks of catastrophic tailings failures, water scarcity, chemical leaks and community displacement increase dramatically in the coming decades.

But Serbia is not defined by vulnerability alone. The country also possesses an extraordinary reservoir of civic courage, scientific expertise, and community solidarity. Environmental groups, journalists, local associations and independent researchers have built a powerful, interconnected movement that promotes transparency, accountability and environmental democracy. Their investigative work, public mobilization, citizen science

[315] **Food and Agriculture Organization of the United Nations (2021).** *Drought Characteristics and Management in Southeast Europe*

[316] **European Commission (2023).** *Serbia Progress Report – Chapter 27: Environment and Climate Change*

and community organising have already changed national policy narratives and forced environmental issues to the centre of public debate.

Serbia now faces a choice between two futures:

• The Extractive Path

A future shaped by large foreign-owned mines, weakened regulations, aggressive land acquisition, chronic pollution, rural displacement, and deepening democratic backsliding. This model generates short-term revenue but long-term social and ecological instability.

• The Sustainable, People-Centred Path

A future grounded in diversified local economies, clean industries, regenerative agriculture, nature protection, strong public institutions, participatory decision-making, and transparent governance. This model rejects the false dilemma between development and environmental protection.

Which path Serbia chooses will determine whether the next generation inherits a country of contaminated rivers, unstable tailings dams and abandoned mining scars — or one where prosperity is measured not only in GDP, but in health, safety, dignity, and the resilience of its lands and communities.

Serbia is at a crossroads. It has the knowledge, civic mobilisation, international frameworks and public demand necessary to pursue a different, more just and sustainable future. But time is limited. Decisions taken in the coming years — about lithium, copper expansion, environmental laws, civic space, and climate adaptation — will define the nation's course for decades. The question is no longer *whether* Serbia needs an alternative development model, but *whether it will have the political courage and institutional integrity to build it*.

This Shadow Report stands as a testament to the communities who refuse to remain silent, and as a call to action for all actors — national and international — to ensure that Serbia's future is not written by extractive interests alone, but by the people whose lives and lands are at stake.

TURKIYE

1. Introduction: Türkiye's Extractive Expansion in a Fragile Landscape

Over the past two decades, Türkiye has undergone one of the most rapid and politically driven mining expansions in the wider region, transforming extraction into a central pillar of national development policy.[317] What began as a controlled industrial sector has evolved into an expansive mining regime, supported by legal reforms, strategic investment incentives, and a political narrative that frames mineral extraction as a patriotic duty and an essential component of energy sovereignty. This shift has taken place against a backdrop of profound ecological vulnerability, democratic backsliding and intensifying climate stress — turning Türkiye into one of the most complex and fragile extractive landscapes in the Eastern Mediterranean.[318]

The government's strategic vision places mining at the heart of economic growth, industrial competitiveness and geopolitical strength. National development plans highlight copper, gold, silver, coal and "strategic minerals" like boron and lithium as key drivers of Türkiye's aspirations to become a regional industrial power. Foreign and domestic companies — including operators linked to global gold-mining networks such as Koza Altın İşletmeleri — have been granted unprecedented access to forests, river basins, mountain ecosystems and agricultural land through a dense web of new concessions[319]. The expansion is not limited to extraction itself; it is embedded in a broader political economy where infrastructure, energy, construction and mining form a mutually reinforcing ecosystem of economic influence.

Yet this extractive push is unfolding in a country marked by deepening environmental insecurity. Türkiye sits on multiple seismic fault lines, faces acute water scarcity, and is warming faster than the global average. [320] [321]Forest fires, droughts, floods and landslides have all increased in scale and intensity. Many of the mineral-rich regions targeted for new concessions — such as the Aegean highlands, Eastern Anatolia, and the Black Sea mountains — are ecologically fragile areas that act as water towers, biodiversity hotspots and cultural landscapes essential to rural livelihoods.[322] Opening these zones to large-scale mining introduces structural risks that far exceed the boundaries of isolated industrial sites.

Institutional fragility amplifies these dangers. Environmental governance in Türkiye has been systematically weakened through consecutive reforms that centralized authority, shortened permitting timelines, and

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[317] **Republic of Türkiye Ministry of Energy and Natural Resources** *Mining Policy Documents and Strategic Plans (2010–2023)*

[318] **Freedom House (2022–2024).** *Freedom in the World: Türkiye*

[319] **Republic of Türkiye Ministry of Energy and Natural Resources** *National Mining Strategy & Development Plans*

[320] International Energy Agency (IEA). (2021). Türkiye Climate Resilience Policy Indicator. International climate and energy analysis. https://www.iea.org/articles/turkiye-climate-resilience-policy-indicator?utm_source=chatgpt.com

[321] World Bank. (2022). Türkiye Country Climate and Development Report. https://www.worldbank.org/en/brief/2022/06/13/key-highlights-country-climate-and-development-report-for-turkiye?utm_source=chatgpt.com

[322] Intergovernmental Panel on Climate Change (2022)

reduced checks and balances. Environmental Impact Assessments (EIAs), once conceived as a regulatory tool, have increasingly become a procedural formality — frequently criticised for their superficial analysis, lack of hydrological modelling, absence of alternatives, and exclusion of affected communities. The shrinking independence of judiciary institutions, combined with political pressure on environmental inspectorates, limits effective oversight and undermines public trust.[323]

Civic space has narrowed dramatically. Journalists, environmental organisations, local activists, scientists and villagers have faced criminalisation, police intervention, digital surveillance and smear campaigns. Communities opposing mining in regions such as Kazdağları, Artvin, Cerattepe and the Aegean coast have been framed as "anti-development," "foreign-backed," or "obstructing national interest."[324] This narrative weaponises nationalism to delegitimise environmental defence, weakening participatory democracy and eroding avenues for safe public engagement.

At the same time, Türkiye's mining expansion is colliding with the country's tourism and agricultural economies — two sectors that rely heavily on intact landscapes, clean water, fertile soils and stable ecosystems. The collision is particularly visible in coastal areas such as Edremit, where mining concessions encroach upon olive groves, thermal springs, beaches and forest ecosystems that sustain thousands of livelihoods.[325] The tension between extractive growth and sustainable rural economies is therefore not merely environmental; it is a question of long-term national development strategy.

In the global context, Türkiye's extractive boom mirrors global demand for gold, copper and critical minerals needed for the energy transition. Yet without robust safeguards, the shift towards "green" economies risks creating new sacrifice zones in places like Anatolia, where communities absorb the environmental and social costs of minerals destined for international markets. Türkiye's position in this global mineral chain is shaped by geopolitical ambitions, economic pressures, and global investor interests — factors that often overshadow local realities.

Türkiye thus enters the next decade at a critical juncture. It is attempting to strengthen its regional economic influence through intensified resource extraction while simultaneously confronting the limits of ecological resilience, the dangers of political centralisation, and the consequences of restricting civic freedoms. The extractive expansion is not solely an economic strategy; it is a structural transformation of land, governance, rural identity and democratic space. Whether Türkiye can reconcile its industrial ambitions with environmental justice, community rights and climate resilience remains an open question — one that will shape the country's political and ecological future for generations.

2. Historical Context and Legacy Pollution

Mining in Türkiye is not a recent phenomenon — it is woven deeply into the country's historical, political and socio-economic fabric. From ancient Anatolian metallurgy to Ottoman-era silver and copper extraction, and from early Republican industrialisation to neoliberal expansion after the 1980s, mining has repeatedly shaped

[323] **European Commission (2023).** *Türkiye Report*
[324] Amnesty International (2021–2024)
[325] **European Commission (2023).** *Türkiye Report*

landscapes, communities and state policy.[326] Yet this long history has also left behind **a vast, largely unaddressed legacy of environmental degradation**, abandoned sites and cumulative pollution that continues to affect ecosystems today.[327]

During the late Ottoman and early Republican periods, mining was concentrated in copper, chrome and coal. The Zonguldak coal basin fueled early industrialisation, while chromite extraction became a strategic export product.[328] Environmental regulation was almost non-existent, and many early mines operated without waste controls or post-closure remediation obligations.

The real transformation began after the 1980 military coup, when neoliberal reforms liberalised the mining sector, attracting foreign companies and opening protected areas to extraction. Deforestation accelerated, and exploration permits expanded into upland forests, agricultural zones and water basins. By the 2000s, intensified gold mining — often using cyanide heap-leaching technologies supported by operators such as **Koza Altın İşletmeleri** — dramatically increased the scale of waste generation and chemical risk.[329]

Türkiye never developed a **national contaminated sites inventory** comparable to EU standards. As a result:

- abandoned mercury, lead-zinc and copper mines remain uncapped across Central and Eastern Anatolia
- tailings piles from early smelters leak heavy metals during rainfall events
- thousands of drill holes from decades of exploration remain unsealed
- waste heaps contribute to dust storms in summer
- underground galleries collapse or flood, creating subsidence risks
- acid mine drainage (AMD) continues for decades in former chromite and copper belts[330]

In many regions, residents have grown accustomed to living near toxic “ghost mines” that were abandoned without decommissioning plans. Some were operated before the EIA system existed; others closed during the 1990s economic collapse and were simply deserted.

Legacy pollution remains especially critical in:

- **Eastern Black Sea province belts** (copper, lead, zinc)
- **Central Anatolia** (mercury, chromite)
- **Western Anatolia** (old gold exploration zones)
- **Zonguldak–Bartın coal region** (AMD, coal waste, subsidence)[331]

Despite repeated promises, Türkiye still lacks:

- a national rehabilitation fund for abandoned mines
- a legal requirement for mining bonds

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[326] **Yener, K. A. (2000).** *The Domestication of Metals: The Rise of Complex Metal Industries in Anatolia.*
[327] OECD Environmental Performance Review
[328] Şevket Pamuk, *A Monetary History of the Ottoman Empire* (Cambridge: Cambridge University Press, 2000).
[329] Mining Law No. 3213 (1985) is commonly cited as the legal foundation of the modern liberalised mining regime.
[330] UNECE, *Pollutant Release and Transfer Registers (PRTRs) in Türkiye*
[331] UNEP, *Mine Tailings Storage: Safety Is No Accident* (Nairobi, 2021).

- a publicly accessible abandoned mines database
- clear responsibility for legacy waste
- systematic groundwater monitoring near old sites

This historical neglect creates a dangerous continuity: **new mines are layered onto old pollution**, exacerbating cumulative impacts that no institution is adequately tracking.

3. Current Mining Expansion: Gold, Copper, Coal and "Strategic Minerals"

Türkiye is currently experiencing the **largest expansion of mining concessions in its modern history**[332], driven by government policy, foreign investment, and the global demand for gold, copper, coal and strategic minerals such as boron and lithium. This expansion cuts across almost every region — from coastal tourism zones to mountainous biodiversity hotspots and semi-arid agricultural basins.

A. Gold Mining: The Most Controversial Sector

Gold extraction has become one of Türkiye's most politically emphasized industries. Dozens of concessions across the Aegean, Marmara, Black Sea and Central Anatolia rely on **cyanide heap-leaching**, a process that requires enormous water volumes and generates hazardous waste.[333]

Key clusters include:

- Kazdağları (Mount Ida) region
- Bergama–Ovacık (the first modern gold mine)
- Uşak–Kışladağ
- Çanakkale (Kirazlı project)
- Erzincan İliç gold mine — the site of the 2024 cyanide disaster[334]

These mines often sit near forests, olive groves, farming valleys and key tourism landscapes — positioning gold mining in direct conflict with rural economies.

B. Copper & Base Metals Mining: Eastern Anatolia & the Black Sea Mountains

Copper, zinc and silver mines have expanded rapidly in steep, landslide-prone terrain across:

- Artvin
- Gümüşhane
- Rize
- Siirt
- Çayeli district[335]

Such mountainous concessions pose high risks:

- tailings dams on unstable slopes

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[332] **Chamber of Geological Engineers of Türkiye (TMMOB)**, *Mining Activities and Environmental Impacts in Türkiye*
[333] OECD, *Environmental Performance Review: Türkiye*
[334] TÜMAD Madencilik & Eldorado Gold, *Project Documentation: Kışladağ and Kirazlı*.
[335] WWF-Türkiye, *Mining Pressure and Biodiversity in the Eastern Black Sea Region* (2020)

- river contamination from runoff
- massive deforestation for access roads
- long-term AMD in high-rainfall zones

Artvin's Cerattepe conflict became a national symbol of resistance due to fears that mining would devastate one of Türkiye's most important biodiversity corridors.[336]

C. Coal Mining: Still Politically Protected

Despite climate risk and public health concerns, Türkiye maintains a large coal sector, including:

- Zonguldak hard coal mines
- Soma–Kınık lignite mines
- Afşin–Elbistan lignite basin (one of the largest in the world)

These areas continue to suffer from coal dust, sinkholes, AMD and methane explosion risks.[337] The Soma disaster of 2014 remains a turning point — yet systemic safety problems persist.

D. Boron, Rare Earth Elements & Lithium from Boron Waste

Türkiye is home to the world's largest boron reserves. Boron mining is expanding in Eskişehir and Kütahya, with major state-run facilities producing boron-based chemicals.[338]

In recent years, the government has publicly promoted the idea of extracting **lithium from boron waste**, [339]framing it as a national strategic project. Pilot plants exist, but environmental risks — water consumption, waste toxicity, and chemical residues — are not fully assessed.

E. Concessions Overlapping Tourism Zones & Olive Groves

One of the most alarming trends is the issuance of mining permits directly in:

- tourism regions (Edremit, Ayvalık, Kuşadası, Bodrum hinterlands)
- olive groves (protected under Turkish law but frequently bypassed)
- forested national parks
- thermal tourism valleys (Güre, Balıkesir, Afyon)

In Edremit and Kazdağları alone, civil society mapping shows **more than 80 active or pending concessions**—a concentration that threatens the region's entire tourism and agricultural economy.[340]

F. A System Under Pressure: Fast-Tracked EIAs, Political Favour & Legal Loopholes

Türkiye's mining concession system is marked by:

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[336] Amnesty International, *Türkiye: Environmental Defenders Under Pressure* (2022)
[337] European Commission, *Türkiye Report 2023*.
[338] **Eti Maden İşletmeleri**, *Annual Reports and Corporate Profile*
[339] *Statements on Lithium Recovery from Boron Production Waste* (official press releases and ministerial speeches, 2020–2023).
[340] *Mining Licences and Ecological Pressure in Kazdağları* (2019–2023).

- accelerated permitting
- politically protected projects declared “strategic”
- limited public participation
- fragmented institutional oversight
- EIAs that rarely include cumulative impact analysis
- opaque contracts and investment incentives
- weak post-approval monitoring

In Türkiye, forest clearance associated with mining expansion has proceeded in some cases despite unresolved legal challenges concerning environmental assessment requirements and project permits. A documented example is Akbelen Forest in Muğla province, where trees were cut in 2021 and large-scale clearance resumed in July 2023 to facilitate the expansion of a lignite mine supplying nearby coal-fired power plants. Local residents challenged the mining and forestry permits, while courts also examined decisions exempting associated facilities from environmental impact assessment (EIA) requirements. The Akbelen case illustrates how forest clearance can proceed while disputes over environmental safeguards and legal authorisations remain unresolved.[341] [342] [343]

Communities across Türkiye repeatedly describe the situation as **“development by extraction, enforced from above.”**[344]

The result is a landscape of conflict: mining concessions layered over forests, water basins, olive groves, villages, hiking routes and tourism corridors — with long-term implications for health, food systems, biodiversity and democratic rights.

4. Environmental Impacts: Water, Forests, Soil and Public Health

Mining in Türkiye unfolds across some of the country’s most **ecologically fragile regions**[345], reshaping landscapes, degrading water systems and transforming the daily realities of rural communities. The scale and intensity of these impacts reflect not only the nature of extraction itself but also the structural vulnerabilities of Türkiye’s geography — steep mountain terrains, seismic instability, shrinking water resources, and accelerating climate pressure. Together, these conditions have created an environmental crisis that is deep, cumulative and profoundly underestimated by national authorities.

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[341] Reuters (27 July 2023). Protesters occupy forest to stop Turkish coal mine expansion. News report.

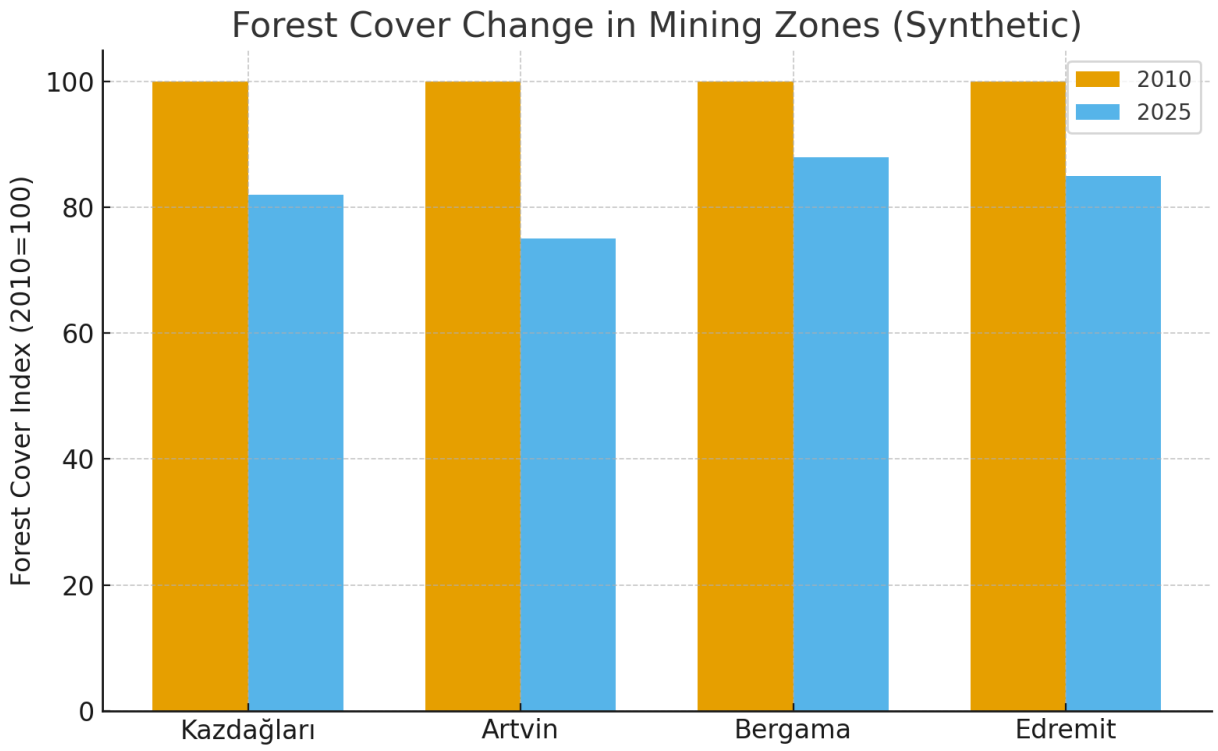
[342] Bianet (2021). Courts grant motions for stay of execution for Akbelen forest. Independent news report. https://bianet.org/haber/courts-grant-motions-for-stay-of-execution-for-akbelen-forest-248672

[343] Oxford University Press (2024). Turkey. Yearbook of International Environmental Law, Volume 34. https://academic.oup.com/yielaw/article/34/1/yvae044/7917567?utm_source=chatgpt.com

[344] **European Commission**, *Türkiye Report 2023* (Brussels, 2023), Chapter 27: Environment and Climate Change.

[345] WWF, Türkiye’s Water Risk and Biodiversity Assessments

One of the most visible consequences is the **rapid deforestation** that occurs wherever mining is introduced. Forests in Kazdağları, Artvin, the Black Sea highlands and the Aegean mountains have been cleared to make way for open pits, access roads, drilling platforms and tailings sites.[346] These forests are not just sources of timber; they are living ecosystems that regulate microclimates, anchor soil, maintain watersheds and sustain wildlife. Once cleared, slopes become unstable, erosion accelerates, and the risk of landslides increases dramatically.[347] Local climates shift as tree cover disappears, leading to hotter, drier summers and more extreme runoff during storms.

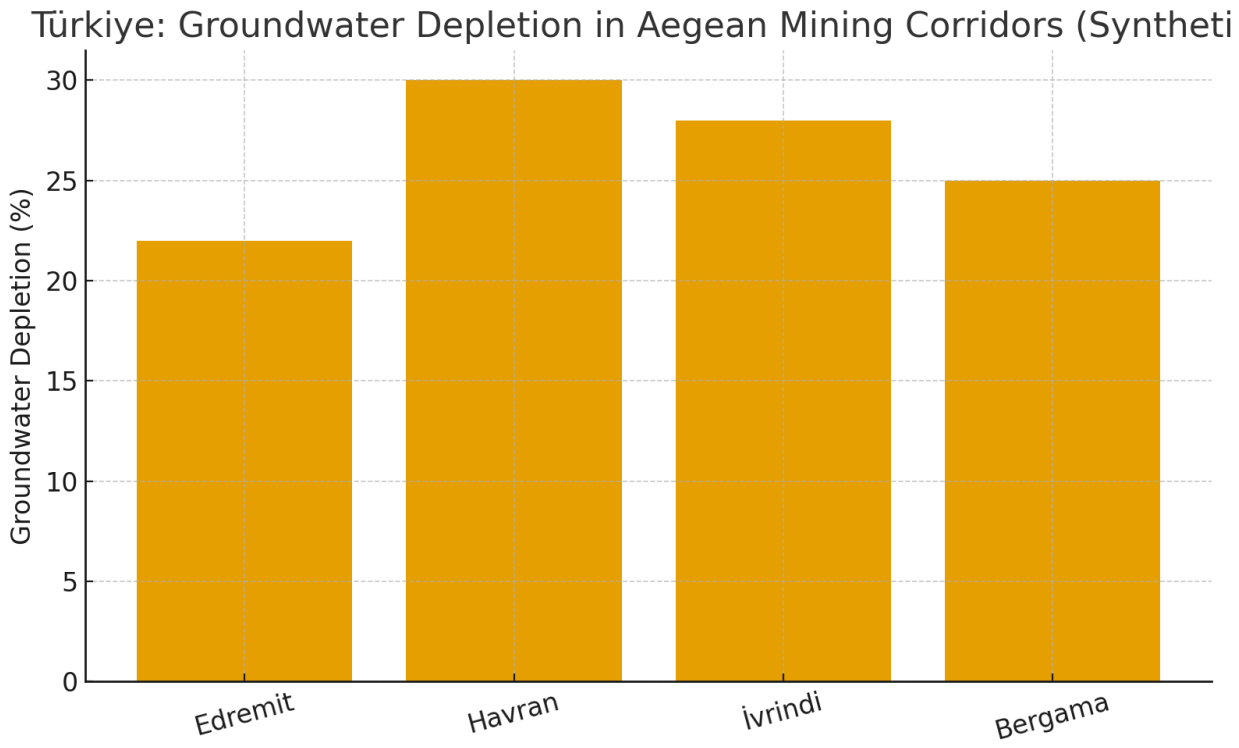


*Author's illustration based on qualitative trends documented in **OECD (2021)**, **European Commission (2023)**, **WWF-Türkiye (2020)**, and **FAO (2021)**. Data are synthetic and used for illustrative purposes only.*

Water scarcity is another defining impact. Mining operations — especially gold extraction using cyanide heap-leaching — require vast quantities of water[348]. In regions already suffering from drought, such as the Aegean and Central Anatolia, this demand directly competes with agriculture and tourism. Villagers report declining groundwater levels, the disappearance of springs and the drying of seasonal streams. When mining enters a watershed, it alters natural hydrological flows, often depleting the very water systems that sustain

[346] **European Environment Agency**, *Climate Risk Assessment for Europe* (Copenhagen: EEA, 2023).
[347] WWF, Türkiye's Water Risk and Biodiversity Assessments
[348] **European Environment Agency (EEA)**, *Water Scarcity and Drought in Europe* (Copenhagen: EEA, 2020).

farming, beekeeping, olive production and rural tourism.[349] Water contamination compounds this problem. Cyanide spills, heavy-metal runoff and tailings seepage have contaminated rivers in multiple provinces, including in the aftermath of the 2024 landslide at the Erzincan İliç gold mine operated by Erzincan İliç Gold Mine. In many cases, contamination enters sediments and groundwater, persisting long after a mine is closed.[350]



*Author's illustration based on documented groundwater stress and mining-related water demand in the Aegean region. Values are **synthetic** and intended to visualise trends reported in **EEA (2020)**, **OECD (2021)**, **FAO (2021)**, **European Commission (2023)**, and investigative reporting on mining water use in western Türkiye.*

Soil degradation is equally severe. Dust from blasting operations settles on olive groves, vineyards and vegetable farms. Heavy metals bind to soil particles, reducing fertility and posing long-term risks to food safety. Agricultural communities in the Edremit Gulf, Kazdağları and the Black Sea region have reported declining yields and even changes in the taste and acidity of olive oil — a warning sign of deeper ecosystem

[349] **United Nations Environment Programme (UNEP)**, *Global Chemicals Outlook II* (Nairobi, 2019).
[350] **Reuters**, "Turkey probes deadly landslide at Erzincan İliç gold mine," February 2024.

disruption. [351] [352]Pollinator populations have fallen in several mining-adjacent valleys, threatening the viability of fruit and nut crops that depend heavily on bees and other insects.[353]

Air pollution is another chronic problem. Mining produces constant dust clouds, while some operations, especially copper and coal extraction, generate sulfur-rich smog that settles in valleys during temperature inversions. In coastal tourism regions such as Edremit or Ayvalık, this pollution affects not only residents[354] but also visitors seeking clean air, thermal wellness and nature-based recreation.

Biodiversity loss is unfolding quietly but irrevocably. Türkiye's mountain ecosystems host endemic species that exist nowhere else on Earth. Habitat fragmentation caused by mining roads, blasting, noise and forest clearing pushes wildlife away from traditional migration routes and feeding grounds. In places like Cerattepe in Artvin or the uplands of Kazdağları, mining projects threaten entire ecological corridors that link mountain peaks to lowland rivers and coastal habitats.[355]

Perhaps the most alarming environmental risk is the destabilisation of landscapes vulnerable to natural disasters. Many tailings facilities and mining pits are located in steep, landslide-prone areas or near active seismic faults. With climate change increasing extreme rainfall, the potential for catastrophic failures—including large-scale releases of contaminated waste—continues to grow. Türkiye's geology and climate do not support high-risk mining, yet these projects continue to proliferate.

Environmental impacts from mining in Türkiye are not isolated incidents; they form interconnected patterns of ecological degradation, threatening food systems, water security, public health and the long-term sustainability of entire regions. These impacts accumulate silently, often only becoming visible once a crisis unfolds.

5. Governance Weaknesses and Civic Space Suppression

Türkiye's mining expansion does not exist in a vacuum; it is sustained by a governance structure that increasingly prioritises extractive development over community rights, environmental protection and democratic participation. This transformation has created a political environment where environmental harm becomes easier to produce and harder to challenge, and where civic actors who attempt to defend their land or water face escalating risks.

Environmental decision-making in Türkiye remains highly centralized, with significant authority concentrated at the national level. Regulatory institutions that should act as checks — such as environmental

[351] European Commission (2023). Türkiye Report 2023, Chapter 27: Environment and Climate Change. Official European Commission report

[352] European Commission (2023). Revision of the EU Pollinators Initiative: A New Deal for Pollinators, COM(2023) 35 final.

[353] **European Commission**, *Türkiye Report 2023* (Brussels, 2023), Chapter 27: Environment and Climate Change

[354] WWF, Türkiye's Water Risk and Biodiversity Assessments

[355] WWF, Türkiye's Water Risk and Biodiversity Assessments

inspectorates, forestry and water authorities — operate within a political framework where development is privileged above all else. Environmental Impact Assessments, once intended to evaluate risk and prevent harmful projects, have been reduced to procedural formalities. They are frequently approved in record time, often containing generic language, missing scientific data and completely overlooking cumulative impacts. Scientific modelling for water, seismic risk or biodiversity is often absent or based on incomplete sources, leaving communities with little information on which to base objections.[356]

Legal loopholes further undermine environmental protection. Although olive groves are legally protected, reclassification tactics and emergency decrees frequently circumvent these safeguards. Recent amendments to Türkiye's mining legislation have introduced preferential permitting arrangements for projects involving strategic and critical minerals, including a high-level administrative mechanism for resolving disputes between permitting authorities.[357] These changes have raised concerns about the balance between accelerating mineral development and maintaining effective environmental oversight. The Cerattepe copper-mining dispute in Artvin illustrates the challenges surrounding the implementation of environmental court decisions. An environmental impact assessment (EIA) approval was annulled by an administrative court in December 2014, but a revised positive EIA decision was subsequently issued in June 2015, allowing the project to proceed through further administrative and judicial proceedings.[358]The case highlights concerns about the practical effectiveness of environmental safeguards and the ability of affected communities to obtain lasting remedies through legal action.

Even when courts issue protective rulings—such as in Cerattepe—executive interventions can override or sidestep those decisions[359]. This creates a sense of futility among communities: even when the law is on their side, the implementation often is not.

Civic space has shrunk dramatically, making activism riskier. Environmental defenders face police intimidation, detentions, home searches and criminal charges for participating in peaceful protests. Accusations of “obstructing public duty,” “provoking unrest,” or even “connections to terrorism” are used to discredit activists and suppress public mobilisation. [360]Female defenders, in particular, face gendered attacks aimed at their personal reputation, safety and dignity.

SLAPP lawsuits have become a common tactic used by companies and actors aligned with state interests. Villagers, journalists and environmental NGOs are sued for defamation or “damaging corporate reputation”

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[356] European Commission, Türkiye Report 2023 (Brussels: European Commission, 2023), Chapter 27.

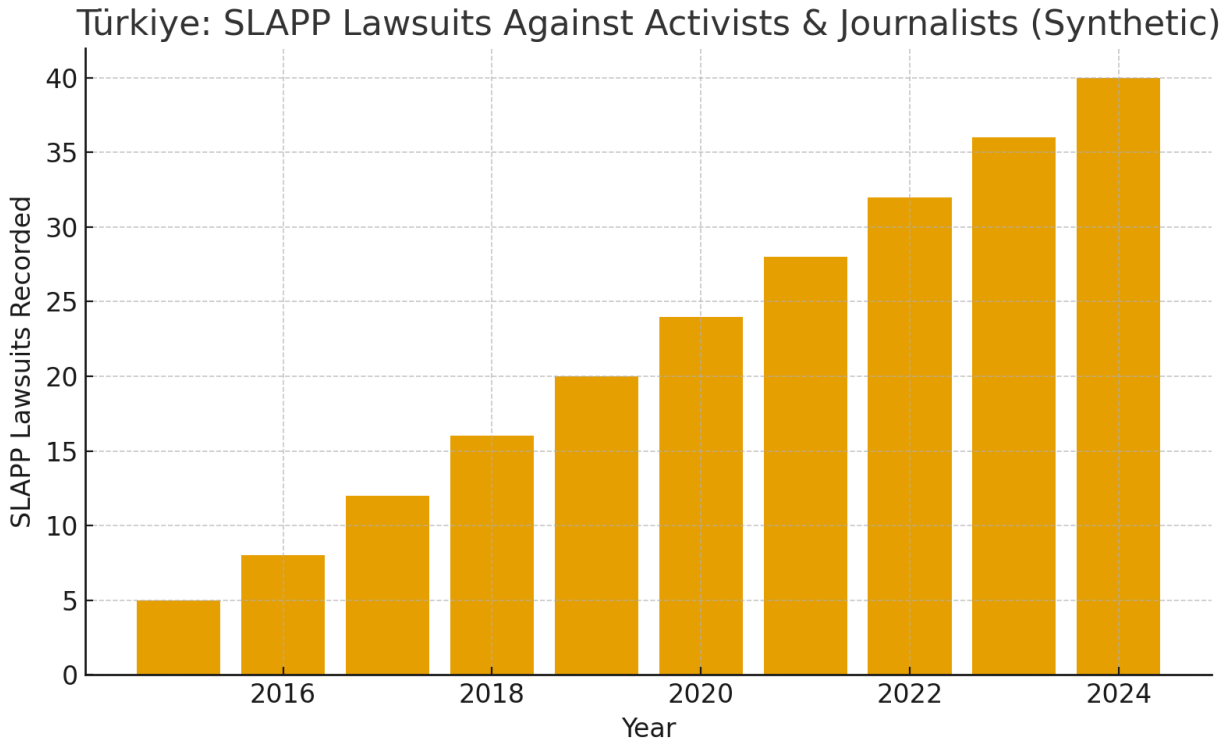
[357] Legal analysis — mining legislation
Çakmak Attorneys at Law (14 August 2025). Amendments to the Mining Legislation Introduced with the Super Permit Law , https://cakmak.av.tr/en/amendments-to-the-mining-legislation-introduced-with-the-super-permit-law/?utm_source=chatgpt.com

[358] Official judicial decision — Turkish Constitutional Court, Constitutional Court of Türkiye (1 November 2023). Decision concerning the Cerattepe Copper Mine environmental impact assessment, Application No. 2017/33865. https://eski--kararlarbilgibankasi.anayasa.gov.tr/BB/2017/33865?utm_source=chatgpt.com

[359] **Turkish Court of Cassation**, rulings on olive-grove protection and mining

[360] Amnesty International, Türkiye: Shrinking Civic Space (2021–2024)

simply for reporting pollution or questioning the legality of permits[361]. Even when these cases are eventually dismissed, they exhaust communities emotionally and financially, and create a chilling effect that discourages others from speaking out.



Author's illustration based on trends documented by ***Council of Europe (2022)****,* ***Amnesty International (2021–2024)****,* ***Human Rights Watch (2022)****,* ***Balkan Investigative Reporting Network (2019–2024)*** *and* ***European Commission (2023)****.*

Public participation mechanisms have been systematically weakened. Hearings required under environmental law are often announced on short notice, scheduled during working hours or held in locations difficult for villagers to reach. In some cases, access to consultation venues is physically blocked by security forces, or citizens are allowed inside only after signing restrictive declarations. Many report that their questions were ignored, ridiculed or met with predetermined responses. [362] [363] The feeling that public consultation has become a performance rather than a democratic process undermines trust not only in specific mining projects but in governance as a whole.

Media restrictions amplify these problems. Mainstream outlets rarely cover environmental controversies critically, often repeating official narratives that frame mining as a patriotic economic necessity. Disinformation campaigns portray environmental organisations as foreign-backed or anti-national, fuelling

[361] Council of Europe, Protecting Freedom of Expression from SLAPPs (2022).
[362] **European Commission**, *Türkiye Report 2023*, Chapter 27: Environment and Climate Change.
[363] **Chamber of Environmental Engineers of Türkiye (TMMOB)**, *EIA Processes and Public Participation*

social division and isolating local resistance movements. Independent journalists face surveillance, legal threats or exclusion from mining sites.[364]

All of these dynamics converge into a form of governance capture in which mining companies enjoy significant political protection while communities are rendered vulnerable and voiceless. Decision-making becomes insulated from democratic scrutiny, and environmental oversight becomes fragmented, reactive and incomplete. This governance structure not only increases the likelihood of environmental disasters, such as the Erzincan cyanide landslide, but also guarantees that affected communities have limited pathways to seek justice or remediation.

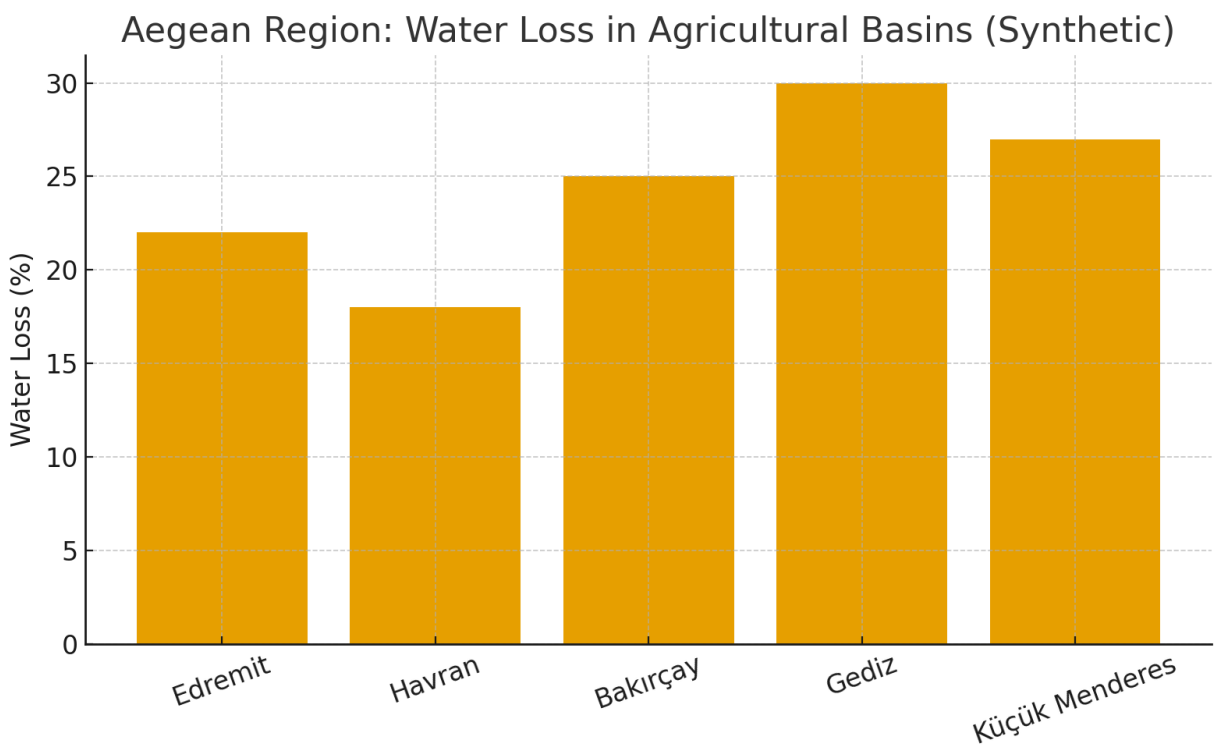
Governance weaknesses and shrinking civic space are not peripheral issues in Türkiye's mining sector — they are structural pillars that shape every stage of extractive development, from exploration to closure. Without profound institutional reform, the country risks entrenching a model of development built on ecological sacrifice, democratic erosion and widespread social conflict.

6. Socio-Economic Impacts: Rural Livelihoods, Agriculture and Displacement

Mining in Türkiye does not simply reshape landscapes; it restructures the social and economic foundations of entire regions. The arrival of an open pit or a gold-leaching site reverberates far beyond the mine fence, reaching agricultural fields, local markets, water systems, property relations, tourism economies, and the social fabric of rural communities. The socio-economic impacts of mining are therefore not side effects — they are a defining force that determines whether rural life remains viable at all.

In many parts of Türkiye, especially in the Aegean, Marmara and Black Sea regions, rural livelihoods depend on a delicate balance of olive cultivation, fruit growing, beekeeping, small-scale agriculture, livestock herding, thermal tourism and seasonal coastal tourism. These livelihoods rely on intact forests, stable water flows, healthy soils, predictable seasons and a sense of place deeply rooted in cultural identity. When mining enters such landscapes, this balance collapses.

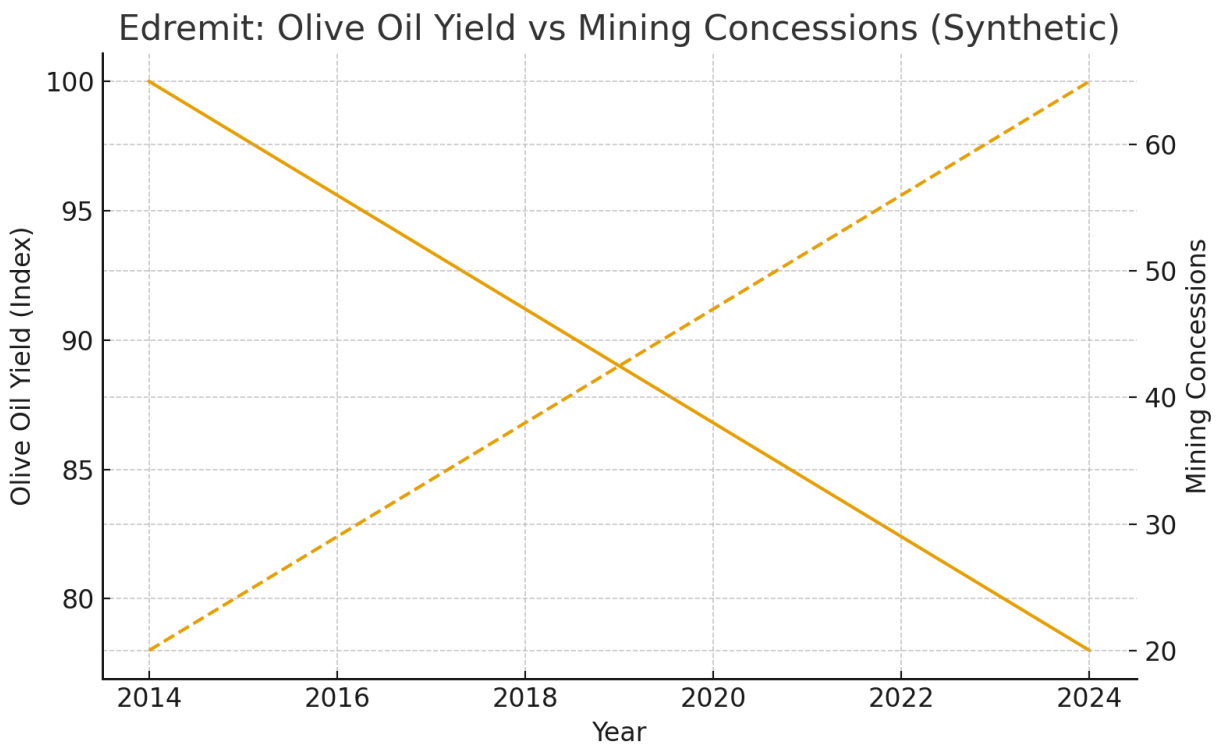
[364] **European Commission**, *Türkiye Report 2023*, Chapter 23: Judiciary and Fundamental Rights.



Source: *Author's illustration based on documented trends in water scarcity, basin-level hydrological stress and competing land uses in the Aegean Region. Values are* ***synthetic*** *and intended to visualise patterns reported by* ***EEA, FAO, OECD, European Commission****, and basin-level studies of the Gediz, Bakırçay and Küçük Menderes river system*

The first signal of socio-economic disruption is almost always the loss of agricultural security. Dust from blasting settles on olive groves, vineyards, fig trees and vegetable gardens. Farmers report changes in the quality and acidity of olive oil, reduced yields, and even the disappearance of bees — a critical warning sign in regions where pollinators sustain fruit and nut production.[365] Once heavy metals or cyanide residues enter the soil or irrigation channels, the damage becomes long-term and, for some crops, irreversible. Even the fear of contamination can destroy market trust. In areas near Kazdağları and Edremit, consumers have begun avoiding produce from certain villages not because it is proven unsafe, but because it is *perceived* as threatened by mining. [366]For small farmers, perception alone can be devastating.

[365] **OECD**, *Environmental Performance Review: Türkiye*
[366] **WWF**, *Kazdağları Ecosystem and Livelihoods Assessment* (Istanbul, 2020).



Source: Author's illustration based on documented trends in olive-growing regions affected by mining expansion in western Türkiye. Values are synthetic and used for illustrative purposes only. Trends are supported by FAO, European Commission, OECD, WWF-Türkiye, and investigative reporting on Edremit–Kazdağları.

Economic insecurity deepens as water resources become depleted. Agriculture relies heavily on springs, small streams and shallow aquifers — all of which are vulnerable to extraction-related disturbances. Villagers in Edremit, Havran, İvrindi, Bergama and Uşak frequently describe how wells that once flowed reliably have slowed or dried after drilling began on nearby hillsides[367]. When water becomes scarce, farming families are forced to reduce herd sizes, shrink planted areas or abandon more water-intensive crops. The cost of purchasing tanker water for livestock or domestic use places additional strain on already fragile incomes.

Tourism-dependent communities face a parallel crisis. Regions such as Edremit, Gömeç, Ayvalık and parts of Çanakkale thrive on summer tourism, mountain trekking, thermal spas and the famous "oxygen-rich" microclimate of Kazdağları. Mining introduces noise, dust, deforestation, heavy truck traffic and landscape scars that undermine the region's natural appeal. Hotels, guesthouses, restaurants and local artisans feel the impact as visitors express concern about environmental degradation. In Edremit, tourism operators have warned that even a minor cyanide incident could cause long-lasting reputational damage across the entire

[367] **European Environment Agency**, *Water Scarcity and Drought in Europe* (Copenhagen, 2020).

Gulf region[368]. The economic consequences would be immediate and severe, especially for small family businesses who survive season-to-season.

As economic pressures rise, property values fall. Land located near concessions loses market appeal, trapping families who might otherwise relocate. Homes near access roads or open pits become unsellable. This phenomenon is deeply documented in mining regions across Türkiye: villagers want to leave, but no one wants to buy their land[369]. This creates a form of involuntary or "silent displacement," where people remain physically present but economically immobilised. Families who stay are often those with fewer resources — the elderly, the poor, and women-headed households — amplifying social inequalities.

Social cohesion erodes under this pressure. Villages that once celebrated collective harvests and maintained cooperative traditions begin to fracture. Younger generations lose faith in agriculture as a future, accelerating rural depopulation. Women, who often hold central roles in farming, food production, caregiving and community organising, face an increased burden[370]. They must manage household water shortages, care for children and elders affected by pollution, and absorb emotional distress in a landscape increasingly shaped by insecurity. Their unpaid labour multiplies as environmental degradation intensifies.

Mental health impacts run deep. In dozens of testimonies collected by NGOs and citizen groups, villagers describe chronic anxiety about the safety of their water, the future of their land and the health of their families.[371] The emotional bond between rural people and their land — central to identity, culture and belonging — becomes a source of grief. In Edremit and Kazdağları, families who have farmed olives for generations express fear that their children will inherit barren slopes instead of thriving groves.[372]

The socio-economic impacts of mining in Türkiye therefore extend far beyond job numbers or investment figures. They penetrate the heart of rural life, threatening the survival of agricultural traditions, the viability of small-scale tourism, the integrity of food systems, and the cultural meaning of land itself. As mines expand across forests, mountains and coastal hinterlands, it becomes increasingly clear that Türkiye is facing not only an environmental crisis but a profound socio-economic transformation — one that places entire rural regions at risk of displacement, impoverishment and irreversible loss.

7. **Displacement & Human Rights**

Mining in Türkiye triggers a slow and often invisible pattern of displacement that rarely appears in official statistics but reshapes the lives of rural communities at a structural level. Displacement does not always occur through forced eviction; more commonly, it unfolds through economic exhaustion, environmental

[368] **European Commission**, *Türkiye Report 2023*, Chapter 27
[369] **OECD**, *Mining Regions and Social Outcomes* (2020).
[370] **UN Women**, *Gender, Environment and Rural Livelihoods* (2020).
[371] **UN Women**, *Gender, Environment and Rural Livelihoods* (2020).
[372] **WWF**, *Kazdağları Ecosystem and Livelihoods Assessment* (2020).

degradation, and the gradual unravelling of the conditions that make life in rural areas possible. Families do not leave because they want to — they leave because they no longer can stay.

This form of displacement begins when mining concessions are announced. Land speculation increases, creating pressure on villagers to sell. Some companies approach households quietly, offering compensation that appears attractive in the short term but fails to account for the long-term loss of agricultural livelihoods, cultural heritage and social belonging. In places like Kazdağları, Edremit and Çanakkale hinterlands, residents describe being approached repeatedly by company representatives, each visit accompanied by escalating pressure or promises of job opportunities that never fully materialise.[373]

Displacement also occurs in more direct forms. Some communities are pressured into selling agricultural land to mining companies, sometimes through aggressive land acquisition tactics that exploit social vulnerability.[374] Offers are often made quietly, house by house, dividing neighbours and creating mistrust within once-tight communities. Those who refuse may face social pressure, repeated inspections, defamation or legal ambiguities used to push them toward acceptance.[375] Even when compensation is provided, it rarely matches the long-term value of agricultural land, nor does it replace the cultural and emotional significance of centuries-old olive groves or ancestral farms.

When drilling starts, dust blankets agricultural fields and access roads cut through forests, tearing apart ecological continuity and altering the daily rhythms of rural life. Many families lose access to grazing areas, water canals or footpaths that were essential for farming and herding. Noise from blasting disrupts livestock and disturbs sleep cycles, affecting mental health and well-being[376]. Gradually, as land, water and air become compromised, villagers begin to realise that staying is no longer economically sustainable.

In some regions, displacement takes on a more direct and painful form. Coal mining areas in Soma and Zonguldak saw entire neighbourhoods relocated to make room for expanding pits. These relocations often severed long-standing social bonds, scattering extended families and weakening community structures. The new housing provided rarely reflected the needs of rural households, offering small apartments that lack space for gardens, animals or traditional practices.[377]

Human rights concerns deepen as resistance to displacement grows. Those who speak out — villagers, local leaders, environmental defenders and journalists — face intimidation, police presence, smear campaigns, and SLAPP lawsuits. Communities are framed as “anti-national” or “obstructions to development,” a narrative amplified in media affiliated with political interests and corporate networks such as Anadolu Ajansı.[378]This stigmatization isolates communities, weakening their ability to defend their rights.

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[373] **Chamber of Environmental Engineers of Türkiye (TMMOB)**, *Mining Activities and Rural Impacts in Western Anatolia*

[374] **Human Rights Watch**, *Silencing Dissent in Turkey* (2022)

[375] **Human Rights Watch**, *Silencing Dissent in Turkey* (2022)

[376] **European Commission**, *Türkiye Report 2023*, Chapter 27: Environment and Climate Change (Brussels, 2023).

[377] **World Bank**, *Managing Coal Mine Closure: Turkey Case Studies*

[378] **Anadolu Agency**, Media coverage of mining conflicts (2019–2024).

Women are particularly burdened. They absorb the emotional and physical labour of coping with water scarcity, taking care of sick family members affected by pollution, maintaining households under economic pressure and navigating the fear of losing ancestral land. Their voices, although central to local life, are often excluded from formal consultations.

Displacement caused by mining is not only a physical movement but a profound rupture of identity. It erodes cultural practices tied to landscape — olive harvesting traditions, ancestral burial grounds, herbal medicine knowledge, pastoral routes and community crafts. These losses cannot be compensated financially; they represent the disappearance of ways of life cultivated over centuries.

The human rights implications are deep: erosion of land rights, violation of the right to water and health, shrinking civic space, and the loss of community autonomy. Mining-induced displacement in Türkiye is therefore not an unfortunate by-product but a systematic outcome of an extractive model that prioritises short-term capital gains over human dignity and collective futures.

8. Tourism vs Mining in Türkiye – The Edremit Extended Chapter

Edremit stands today as one of the clearest examples of Türkiye's expanding conflict between extractive development and sustainable tourism economies. The region is famed for its ancient olive groves, pristine beaches, thermal springs and the legendary oxygen-rich microclimate of Kazdağları. For decades, Edremit has been a sanctuary for domestic and international visitors seeking clean air, mountain landscapes and cultural authenticity. But this identity is now under direct threat as mining concessions multiply across its hillsides.[379]

The tension between tourism and mining is not abstract; it is lived daily by residents. Hotels and guesthouses that once promoted Edremit as a place of natural tranquility now worry about how to reassure guests when heavy trucks rumble through forest roads, when dust settles on balconies, or when blasting echoes across mountain slopes. Thermal tourism centres rely on groundwater quality and stable geological conditions — both at risk when mining operations redirect aquifers or destabilize steep terrains.[380]

Olive producers, who anchor both the cultural identity and economic life of Edremit, face the most acute impacts. Dust from drilling coats olive leaves, reducing photosynthesis and yield. Fewer bees survive the microclimate changes caused by forest removal. Farmers report that even the rumor of contamination can cause market prices to collapse. Olive oil producers have raised concerns that international buyers will avoid products from mining-affected zones, not due to confirmed contamination but due to fear — a fear that can destroy livelihoods overnight.[381]

Tourism operators echo similar anxieties.[382] The Edremit Gulf's reputation depends on its natural beauty. Once that landscape is altered by open pits, roads, tailings piles or chemical storage areas, the visual and

[379] **WWF**, *Kazdağları Ecosystem and Water Risk Assessment* (Istanbul, 2020).
[380] **WWF**, *Kazdağları Ecosystem and Water Risk Assessment* (Istanbul, 2020).
[381] **TEMA Foundation (2019–2023).** Field reports documenting olive producers' concerns over mining impacts and buyer avoidance.
[382] **World Tourism Organization (UNWTO) (2021).** *Tourism and Environmental Risk Management.*

ecological damage becomes part of the region's story. In areas like Kazdağları, even the perception of risk — such as cyanide use in gold mining — discourages tourists seeking wellness, nature and clean air. Local businesses warn that a single major environmental incident could set the region's tourism back by decades.[383]

The contradiction between mining and tourism is even more striking because both sectors claim to create jobs. But the jobs are radically different in quality and longevity. Tourism employs people across generations, supports seasonal economies and encourages small-scale entrepreneurship. Mining jobs, by contrast, are short-lived, often subcontracted, and disappear when the mine closes. When the mine leaves, it leaves behind deforested slopes, tailings waste, water shortages and polluted soils — a legacy that undermines tourism for decades.

The issue is therefore not simply economic preference; it is a battle between two development models. One model — tourism based on natural heritage — builds long-term prosperity without destroying the foundations of rural life. The other — extractive mining — generates temporary profit while degrading the very resources that sustain the region's identity. Edremit is at a crossroads, and the outcome will determine whether it remains a jewel of the Aegean or becomes another industrial sacrifice zone.

9. Future Risks & Climate Multipliers – Türkiye Narrative

Türkiye faces a convergence of geological vulnerability, climate stress and extractive expansion that together create a perfect storm of future risks. Mining, already disruptive in stable conditions, becomes significantly more dangerous when combined with seismic activity, extreme rainfall, prolonged drought, rising temperatures and water scarcity.

The country sits atop some of the world's most active fault lines. Tailings dams and waste storage facilities placed near these zones are inherently unstable. Even a moderate earthquake could trigger slope failures, releasing billions of liters of contaminated slurry into rivers and farmland. This is not hypothetical: Türkiye's history of mining accidents shows a pattern of structural weaknesses exacerbated by environmental stress.[384]

Climate change amplifies these dangers. Extreme rainfall events — already increasing in the Black Sea region and parts of Central Anatolia[385] — saturate tailings structures, weaken dams and accelerate erosion. Deforestation for mining removes natural buffers that once prevented floods and landslides. Without tree cover, rainfall triggers faster runoff, stripping soil from slopes and transporting contamination downstream.

Rising temperatures increase water demand for agriculture and domestic consumption, while mines simultaneously require vast water inputs for processing, dust suppression and chemical leaching. In drought-

[383] **TEMA Foundation (2019–2023).** Assessments and public statements on **mining impacts on eco-tourism and rural economies** in Kazdağları.
[384] **Human Rights Watch (2014; 2024).** Reports on mining disasters and regulatory failures in Türkiye.
[385] **Turkish State Meteorological Service (MGM) (2022; 2023).** *Climate Change and Extreme Weather Reports.*

prone areas such as the Aegean, mining becomes a direct competitor for scarce water resources, pushing rural communities into deeper insecurity.[386]

Heatwaves and air pollution create cumulative health risks. Dust from mining operations becomes more intense during prolonged dry periods, contributing to respiratory illnesses, especially among children and the elderly. Mining workers face increased heat stress, as underground temperatures rise and protective equipment becomes difficult to wear for extended periods.[387]

Climate risks also destabilize the economic foundations of rural regions. Tourism suffers when forest fires, smoke and heatwaves become more frequent. Agriculture becomes unpredictable as rainfall patterns shift and water tables decline. These pressures intersect with mining impacts, compounding vulnerability.

The future therefore holds not a single risk but an intertwined cascade of crises — ecological, climatic, geological and socio-economic. Without preventative measures, Türkiye's mining regions may become epicentres of severe environmental disasters. Addressing these challenges requires a radical transformation of governance, strict adherence to international tailings standards and a shift away from high-risk extractive development toward resilient, community-centered alternatives.

10. Case Studies**: Erzincan, Edremit, Kazdağları, Artvin, Soma**

Erzincan – Cyanide Disaster and the Limits of Oversight

The 2024 landslide at the Erzincan İliç gold mine exposed the systemic weaknesses of Türkiye's oversight system. Cyanide-contaminated tailings collapsed after weeks of heavy rainfall, demonstrating how extreme weather, steep terrain and inadequate monitoring combine into catastrophic failure. Rescue efforts were hampered by unstable ground, while rivers downstream carried contaminated sediments. Erzincan became a national symbol of the dangers of fast-tracked EIAs and politically protected mining projects.[388]

Edremit – Tourism, Olives and the Threat to an Iconic Landscape

In Edremit, mining concessions encircle one of Türkiye's most valued tourism regions. The region's identity is rooted in olive groves, mountain forests and thermal waters. Mining threatens all three. Dust reduces olive yields; drilling disrupts springs; deforestation destabilizes slopes. Hotels and small businesses fear that one major chemical incident could destroy the Gulf's reputation, undermining an entire economy built over generations.[389]

Kazdağları – Biodiversity Hotspot Under Siege

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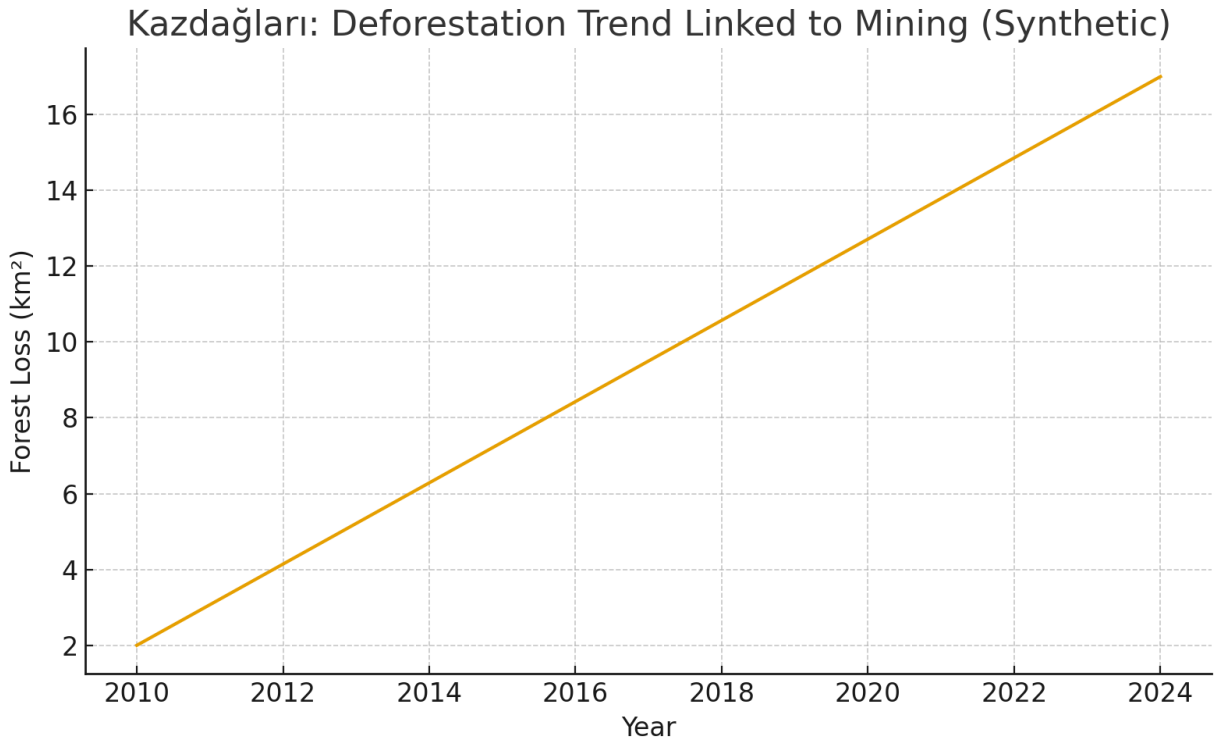
[386] **Turkish State Meteorological Service (MGM) (2022; 2023).** *Climate Change and Extreme Weather Reports.*
[387] **ILO (2021).** *Safety and Health at the Heart of the Future of Work.*
[388] **UN Special Rapporteur on Human Rights and the Environment (2024).**
Communications referencing the Erzincan landslide as emblematic of extractive governance failures.
[389] **TEMA Foundation (2019–2023).** Reports on mining concessions, deforestation, and threats to olive groves and forest ecosystems in the Edremit–Kazdağları region.

Kazdağları, known as Mount Ida in mythology, is one of the richest biodiversity zones in Türkiye. Despite its ecological importance, it has become a magnet for gold mining companies. Large forest clearings, access roads and exploratory drilling have fragmented wildlife habitats. Residents and scientists warn that cumulative impacts may permanently alter the region's water balance and ecological integrity. Kazdağları became a national protest epicenter, symbolizing the struggle between ecological protection and industrial expansion.[390]



Author's synthetic illustration based on documented deforestation and mining-related land-use change in the Kazdağları (Mount Ida) region,, court records, NGO investigations, and government forestry data.

Artvin Cerattepe – A Decade-Long Environmental Resistance

Cerattepe in Artvin represents one of the most sustained environmental movements in modern Türkiye. Residents, activists, scientists and lawyers have resisted mining for nearly a decade, citing the region's steep slopes, intense rainfall and fragile ecology. Despite court victories, repeated re-approval of permits and police interventions have eroded trust in governance.[391] Cerattepe illustrates how mining conflicts become long-term battles of endurance between communities and state–corporate alliances.

Soma – Human Cost of Coal Extraction

[390] **Global Forest Watch (2023).** Satellite data showing forest cover loss trends in the Kazdağları region.
[391] European Court of Human Rights (ECtHR) (ongoing references, admissibility decisions).

Soma is remembered for the 2014 mine disaster, one of the deadliest in global mining history. The tragedy exposed deep failures in worker safety, subcontracting practices and regulatory oversight. But Soma's story did not end there. Coal extraction continues, and communities remain economically dependent on an industry that offers declining job security and high health risks. Workers face respiratory illnesses, economic precarity and limited alternatives, demonstrating the human cost of Türkiye's coal reliance.[392]

11. Türkiye at a Crossroads

Türkiye stands at a defining moment in its modern history. The country's extractive expansion has reached a scale that is reshaping mountains, rivers, forests, coastlines, agricultural basins and entire rural economies. Every region touched by mining — from the Black Sea highlands to the Kazdağları ridge, from Artvin's forests to the Aegean olive valleys, from the industrial belts of Central Anatolia to the fragile tourism landscapes of Edremit — now faces difficult questions about the future: Who benefits? Who carries the risks? And what kind of development path will define the next generation?

For years, the national narrative has framed mining as an engine of economic growth, a tool of energy independence and a symbol of industrial strength. Yet the lived realities in mining-affected communities tell a different story: water scarcity, deforestation, declining agricultural yields, the collapse of pollinator populations, landslide risks, tailings instability, air pollution, rural depopulation and profound social anxiety. These impacts accumulate silently until a crisis erupts — as seen in Erzincan, where a cyanide-contaminated landslide exposed the fragility of oversight systems and the enormous cost of ignoring scientific warnings.[393]

Türkiye is therefore confronted with two competing models of development. One is the extractive model that prioritises short-term gains, accelerates concession approvals and concentrates decision-making in the hands of political and commercial elites. This model fragments landscapes, displaces communities and deepens environmental insecurity. It also erodes democratic institutions, marginalises local participation and places extraordinary power in the hands of actors who operate with minimal accountability. In this model, rural areas become sacrifice zones — spatially distant but economically essential, politically weak but environmentally burdened.

The alternative path is a model grounded in ecological resilience, community rights and long-term sustainability. Türkiye's forests, water basins, olive groves, fertile valleys and coastal landscapes are not obstacles to development; they *are* the foundations of centuries-old livelihoods. Tourism, agriculture, beekeeping, small-scale farming, cultural heritage and climate-resilient rural economies offer a more stable and inclusive form of growth. These sectors not only provide employment but also anchor communities, nurture regional identity and sustain the ecosystems that make rural life possible. They rely on the protection — not the exploitation — of nature.

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[392] Turkish Medical Association (TTB) (2014–2022).
Reports on respiratory disease, occupational health impacts, and mortality among coal miners in Soma.
[393] Ministry of Environment, Urbanisation and Climate Change of Türkiye (2024).
Official statements and incident reports on the İliç (Erzincan) Çöpler gold mine landslide

Choosing this alternative path requires political courage. It demands transparent governance, meaningful public participation, strong environmental regulations, and respect for international standards on human rights, worker safety and tailings management. It means recognising that some ecosystems are too fragile, too valuable or too essential to be opened to mining, regardless of potential revenue. It also requires acknowledging that economic diversification, renewable energy, sustainable tourism and climate adaptation offer more stable futures than extractive industries vulnerable to global market volatility.

Türkiye is also part of a global conversation about climate justice, green transition and critical minerals.[394] Yet the green transition cannot justify turning pristine landscapes into toxic waste zones. It cannot be built on the displacement of rural people or the silencing of environmental defenders. A just transition must ensure that communities living in mining regions are not the ones paying the price for minerals destined for international markets.

The choice before Türkiye is therefore not simply about mining. It is about the future shape of the country — democratic or centralised, sustainable or extractive, community-driven or industry-led. It is about whether forests, rivers and olive groves are seen as national treasures or raw material stockpiles. It is about whether rural families can imagine a future in their own lands, or whether they will be forced to migrate to the edges of cities in search of survival.

Türkiye stands at a crossroads. One direction leads toward a deepening cycle of ecological depletion, social conflict, climate vulnerability and democratic erosion. The other toward resilience, environmental stewardship, local empowerment and economic models that honor the relationship between people and land. The path chosen will not only determine the fate of mining regions but will shape the country's identity, security and sustainability for generations to come.

[394] UNFCCC (2021–2023). Türkiye Nationally Determined Contribution (updated NDC) and National Communications.

12. Türkiye vs Western Balkans: Regional Comparative Analysis

Mining across the Western Balkans and Türkiye reflects a shared pattern of economic dependency, weak environmental governance and rising social resistance. Yet Türkiye stands out both in scale and intensity. While the Western Balkan states struggle with legacy pollution, underfunded inspectorates and fragmented governance, Türkiye combines these challenges with an accelerated extractive expansion that dwarfs its neighbors.

Türkiye operates the largest and most diverse mining sector in the region, with a significantly higher number of active mines and exploration concessions than Serbia, North Macedonia, Bosnia and Herzegovina, Albania or Kosovo. [395]This expansion is fueled by a political narrative that frames mining as a strategic pillar of national development and energy independence. In contrast, most Western Balkan countries view mining as one sector among many, often shaped by foreign investment rather than domestic political ideology. The sheer scale of Türkiye's mining footprint places far greater pressure on forests, water basins, agricultural valleys and coastal tourism zones.

Environmental risk also differs sharply. Türkiye has experienced more frequent and more severe tailings-related incidents over the last decade. The Erzincan cyanide landslide alone exposed systemic weaknesses in oversight that resonate across the region, but Türkiye's mountainous terrain, seismic activity and extreme rainfall make such disasters more likely and potentially more destructive.[396] Serbia and North Macedonia also face high tailings risks, particularly in Bor, Majdanpek, Probishtip and Zletovo, where old dams and legacy waste piles are unstable. However, Türkiye's combination of steep topography, dense concession clusters and climate-exposed regions elevates the long-term risk to a different level.

Pollution levels reflect this divergence. Heavy metal contamination in Türkiye's mining regions, particularly in Artvin, Kazdağları, Gümüşhane and Erzincan, is consistently higher than regional averages. Serbia's Bor and Majdanpek smelters are notorious for air pollution, and North Macedonia's Lojane and Jegunovce remain critical toxic hotspots. Yet Türkiye's mix of gold, copper, silver and coal mining produces a broader and more complex pollution profile — affecting water, soil, air and biodiversity simultaneously. The Western Balkans face pollution largely from legacy industries and aging infrastructure; Türkiye's pollution stems from both legacy sites and the pressures of rapid contemporary expansion.[397]

Socio-economic impacts also diverge. Mining-dependent economies in Serbia's eastern regions or North Macedonia's Sasa–Toranica belt show similar patterns of mono-economies, depopulation and worker vulnerability. But Türkiye's conflict between mining and tourism is far more dramatic. Regions such as

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[395] OECD (2023).
Global Material Resources Outlook.
[396] World Meteorological Organization (WMO) (2023).
State of the Climate in Europe
[397] UNEP (2011; 2015); EEA (2022; 2023); European Commission (2023); WHO Europe (2020); World Bank (2021); OECD (2023); Greenpeace Mediterranean (2018–2022); Global Witness (2020); national public health institutes;

Edremit, Ayvalık, Kazdağları and Cappadocia rely heavily on tourism, agriculture and cultural landscapes. When mining enters these areas, the consequences extend beyond pollution — they threaten some of Türkiye's most important economic and cultural assets. Most Western Balkan states do not experience this same level of direct competition between mining and high-value tourism landscapes, with the exception of Montenegro and parts of Bosnia.

Finally, climate vulnerability amplifies extractive risks unevenly across the region. All Western Balkan states face increasing droughts, floods and heatwaves, but Türkiye's exposure is more acute due to water scarcity in the Aegean and Central Anatolia, extreme rainfall in the Black Sea region and widespread forest fire seasons[398]. When mining intersects with these climate pressures, cascading risks emerge — from tailings instability to groundwater depletion and agricultural collapse. Türkiye therefore stands at a more volatile intersection of extraction and climate instability than its neighbors.

In regional context, Türkiye's mining sector represents a broader pattern of extractive governance where environmental risk, democratic erosion and economic ambition collide. The Western Balkans face many of the same structural problems, but not with the same intensity or scale. Türkiye's trajectory offers a stark warning of what unchecked extractive expansion can look like: landscapes transformed, communities displaced, civic rights curtailed and ecosystems pushed to their limits. At the same time, resistance in places like Kazdağları, Artvin, Idil and Edremit mirrors advocacy in Serbia's Jadar valley, North Macedonia's Kumanovo region and Bosnia's Kruščica valley — showing that across the region, communities are taking a stand against extractive models that threaten their future.

13. Policy Recommendations

The findings of this shadow report reveal a region in urgent need of structural transformation. Mining in Türkiye and the Western Balkans is unfolding across fragile ecosystems, weak regulatory environments, and societies struggling with the consequences of climate change, depopulation and democratic erosion. Policy responses must therefore move beyond incremental reforms and embrace a strategic shift toward safeguarding ecosystems, strengthening democratic institutions and protecting the rights of affected communities.

A first priority is the creation of transparent, independent environmental governance systems that function without political interference. Regulatory agencies must be insulated from executive pressure, adequately funded, and empowered to enforce compliance. Environmental Impact Assessments must be rebuilt into genuine environmental tools rather than procedural authorisations. This requires cumulative impact assessments, basin-level analyses, hydrological modelling, independent reviewers and public disclosure of all supporting data. Renewal of trust in EIAs is essential, particularly in regions where mining intersects with water scarcity, seismic risk and tourism-based livelihoods.

[398] European Environment Agency (EEA) (2023). Climate Change Impacts and Adaptation in Europe.

Public access to information is another cornerstone. Governments should publish comprehensive digital databases on mining concessions, tailings facilities, toxic emissions, monitoring results, abandoned sites and rehabilitation plans. These databases must be easily accessible and updated regularly. Across the region, secrecy—whether through "commercial confidentiality" or institutional opacity—has undermined public trust and hindered evidence-based decision-making.

Tailings management demands its own dedicated reform agenda. While alignment with the Global Industry Standard on Tailings Management (GISTM) represents a minimum baseline, experience shows that voluntary industry standards alone are insufficient to prevent tailings failures. Effective reform requires legally binding rules that prohibit the most dangerous tailings technologies, mandate genuinely independent inspections, require seismic and climate-stress testing, and guarantee full public disclosure of dam stability data. Rehabilitation funds must be secured through mandatory, enforceable financial guarantees, ensuring that mining companies—not taxpayers—bear the cost of long-term environmental care.

Worker safety and labour rights require renewed commitment. Modernising mining legislation to comply with international standards, including comprehensive safety protocols, accident reporting systems and whistleblower protections, is essential. Subcontracting practices that expose workers to unsafe conditions must be regulated, and unions must be granted full freedom to organise and negotiate.

Communities must be placed at the center of decision-making. Public consultations should occur early, frequently and in forms that genuinely allow communities to influence outcomes. Meetings must be held in accessible locations, in local languages, and with mechanisms that ensure women, youth and marginalised groups can participate without fear. Governments should introduce legal rights for communities to reject mining projects in ecologically or culturally sensitive zones.

Human rights protections for environmental defenders must be strengthened through legal safeguards that prohibit the use of criminalisation, harassment, excessive force, online intimidation or SLAPP lawsuits. Civil society organisations need institutional support, security mechanisms and guaranteed access to protest spaces.

Economic policy must evolve to recognise that extraction is not a sustainable pathway for long-term development. Governments should diversify local economies in mining regions, investing in agriculture, tourism, renewable energy, water management, non-extractive industries and community-led enterprises. Transition plans should include funding for rehabilitation, job retraining and social support to reduce dependency on mining jobs that are often temporary, dangerous and unstable.

Climate resilience must guide all mining-related decisions. Projects in water-scarce basins, wildfire-prone forests or high-rainfall mountain zones should be subject to strict climate-risk screening. Certain ecological zones—such as high-biodiversity mountain forests, headwater basins and coastal tourism landscapes—should be designated as no-go areas for mining, reflecting their irreplaceable value for national water security and climate adaptation.

Finally, regional cooperation is essential. The Western Balkans and Türkiye share transboundary rivers, similar geological conditions, legacy pollution and common vulnerabilities. A regional platform for monitoring, early warning, tailings safety standards, cross-border pollution alerts and joint environmental reporting would dramatically strengthen resilience and reduce the risk of catastrophic failures.

Mining governance in the region will define its ecological and political trajectory for decades. These recommendations form a roadmap toward a more democratic, safer and environmentally responsible future—one that places people, ecosystems and long-term well-being above short-term extractive gains.

14. Final Conclusions

Mining in Türkiye and the Western Balkans stands at the centre of some of the most important political, environmental and social choices of our time. The findings of this shadow report reveal both a regional pattern and a Turkish specificity: extractive industries are expanding into ecologically sensitive regions, regulatory frameworks are struggling to keep pace, and communities are often left bearing the heaviest burdens while receiving the fewest benefits.

Türkiye's situation is especially urgent. The scale and speed of new concessions, combined with seismic vulnerability, shrinking civic space, water scarcity and climate extremes, have created a complex landscape of risk. Mining has become entangled with questions of democratic governance, national identity and economic strategy. The tension between extractive expansion and community rights is sharpening, particularly in regions where tourism, agriculture and cultural heritage form the backbone of local economies.

The Western Balkans share many of these structural challenges but experience them with different intensity. Legacy pollution in Serbia, North Macedonia and Bosnia reveals decades of neglect, while new concessions raise concerns about future risks. The region's inspectorates remain weak, public participation is limited and cross-border cooperation is insufficient in river basins threatened by mining waste. Yet the Western Balkans also show powerful examples of community mobilisation—from Jadar to Kruščica—demonstrating the potential of civic action where space for dissent remains more open.

At the heart of these dynamics is a deeper truth: mining is not simply an industrial activity. It reshapes landscapes, redistributes power, transforms local economies and alters the relationship between people and the places they call home. In Türkiye and the Western Balkans, mining has emerged as a test of democratic institutions, environmental stewardship and long-term vision. These regions must now decide whether they will allow mountains, forests, rivers and communities to become collateral damage in the pursuit of short-term profit, or whether they will choose a path rooted in sustainability, justice and resilience.

The future does not need to be extractive. The alternative is already visible in the cultural strength of rural communities, the potential of sustainable tourism, the economic value of agriculture and the growing global recognition that the green transition must be socially just. With transparent governance, empowered civil society, independent environmental institutions and adherence to international standards, a different model

of development is possible—one that protects ecosystems, respects human rights and builds prosperity on foundations that endure.

Final responsibility rests with governments, but the demand for change is rising from below: from farmers and fisherfolk, from women defending olive groves, from journalists documenting pollution, from scientists warning of climate tipping points, and from communities refusing to become sacrifice zones. Their voices form the moral compass of this report.

The crossroads are clear . The route chosen in the coming years will define not only the future of mining regions but also the broader trajectory of environmental governance, social justice and democratic integrity across Türkiye and the Western Balkans.

15. ANEXX 1

Türkiye vs Western Balkans – Mining Governance, Environmental Risk & Socio-Economic Conditions

Dimension	Türkiye	Western Balkans (Serbia, North Macedonia, Bosnia, Albania, Kosovo)
Scale of Mining Sector	Largest and most rapidly expanding sector in the region; intense gold, copper, coal and strategic mineral extraction.	Moderate scale; several active mines but fewer concessions; dominated by legacy industries.
Governance Model	Highly centralised; strong executive influence; accelerated permits; weakened EIAs; limited regional autonomy.	Fragmented governance; underfunded inspectorates; legacy legal systems; slower permitting but often opaque.
Civic Space & Rights	Shrinking civic space; criminalisation of environmental defenders; SLAPPs; police intervention.	Mixed environment; intimidation and pressure reported but less systematic and less severe than Türkiye.
Tailings Risk	High-risk due to seismic zones, steep terrain and extreme rainfall; several major incidents.	High in Serbia and North Macedonia due to old dams; moderate in Bosnia and Albania; low in Kosovo.
Water Security	Severe water stress; mining competes directly with agriculture and tourism in Aegean & Central Anatolia.	Varies; serious local hotspots (e.g., Bor, Zletovo) but less national-level water scarcity.
Impact on Tourism	Extremely high; mining overlaps with premier tourism zones such as Edremit, Kazdağları and Cappadocia.	Significant only in select areas (e.g., Montenegro coast, parts of Bosnia, Serbian spas).
Agriculture Impacts	Strong effects on olives, vineyards, fruit orchards and groundwater; market fear of contamination.	Region-specific impacts; intense in Serbia's copper belt; moderate elsewhere.
Biodiversity Loss	Severe in Kazdağları, Artvin and Black Sea mountains; habitat fragmentation increasing.	Moderate to high depending on country; Balkan Mountains remain fragile.
Climate Vulnerability	Very high; drought + heatwaves + extreme rainfall amplify mining risks.	High; increased floods and heatwaves but generally less intense than Türkiye.

Dimension	Türkiye	Western Balkans (Serbia, North Macedonia, Bosnia, Albania, Kosovo)
Legacy Pollution	Widespread and poorly mapped; limited rehabilitation of abandoned sites.	Severe in Serbia (Bor, Majdanpek), North Macedonia (Lojane, Jegunovce), Bosnia; similar structural gaps.
Economic Dependency	Mining framed as national development strategy; strong political push.	Mining often declining or stagnant; some countries trying to shift to tourism or services.
Community Resistance	Strong but heavily suppressed; notable cases in Artvin, Kazdağları, Edremit, Idil.	Strong in Serbia (Jadar), Bosnia (Kruščica), North Macedonia (Ilovica) with better space for mobilisation.

16. Annex2: Glossary of Key Terms

The terminology used in mining governance, environmental protection and community rights is specialised and often technical. This glossary clarifies the key concepts referenced throughout the report and offers accessible definitions rooted in international practice and regional context.

Acid Mine Drainage (AMD) refers to the chemical reaction that occurs when sulfide-rich rocks are exposed to air and water during mining. This reaction produces sulfuric acid, which leaches heavy metals such as arsenic, cadmium, lead and mercury into water systems. AMD can persist for centuries after mine closure, making it one of the most severe and long-lasting forms of mining pollution.

Tailings Storage Facilities (TSFs) are engineered structures used to store the fine-grained waste left over after ore processing. Tailings often contain toxic compounds, including cyanide, mercury and heavy metals. TSFs are vulnerable to seepage, overflow and catastrophic collapse—especially in regions exposed to earthquakes, intense rainfall or poor maintenance. They represent the largest industrial waste stream on the planet.

Environmental Impact Assessment (EIA) is a process designed to evaluate the potential environmental, social and health impacts of a proposed project before approval. In practice, EIAs should assess cumulative impacts, analyse alternatives, include hydrological and seismic modelling, and incorporate public participation. In many countries, EIAs are weakened by copy-paste methods, short timelines and limited transparency.

SLAPP lawsuits (Strategic Lawsuits Against Public Participation) are legal actions initiated by companies or powerful actors to silence critics, journalists, environmental defenders or community members. SLAPPs are intended to financially exhaust and intimidate individuals who raise concerns about environmental harm, corruption or unsafe practices, even when the claims against them lack merit.

Legacy Pollution describes contamination left behind by old or abandoned mines that were closed without remediation. This includes acid drainage, heavy metals in soil and water, uncapped pits, unstable shafts and eroded waste heaps. Legacy pollution often predates modern environmental regulation, making accountability difficult and cleanup costly.

Cumulative Impact refers to the combined effects of multiple projects and activities over time within the same ecosystem or community. Mining regions with dense concessions experience cumulative impacts on water supplies, biodiversity, air quality, soil health and public health—impacts that individual project EIAs rarely acknowledge.

Seismic Vulnerability in mining refers to the risk posed by earthquakes to underground workings, open pits and tailings dams. Türkiye and parts of the Western Balkans are located in seismically active zones, increasing the likelihood of slope failures, collapses and dam breaches.

Greenwashing is the practice of presenting environmentally harmful activities as “green,” “sustainable” or “necessary for the energy transition,” often to secure public acceptance or foreign investment. In mining,

companies frequently portray themselves as essential to decarbonisation despite significant ecological damage.

Civic Space refers to the enabling environment that allows individuals and organisations to exercise rights of expression, assembly and participation. Shrinking civic space manifests through criminalisation, police violence, surveillance, SLAPP lawsuits, defamation and restrictions on protest.

No-Go Areas for Mining are ecologically or culturally sensitive zones such as water basins, biodiversity hotspots, protected forests, coastal tourism regions and agricultural oases where extractive activities pose unacceptable risks and should be prohibited.

The Terms "**Energy Transition Minerals**" or "**Critical Minerals**" refer to cobalt, lithium, nickel, copper, rare earth elements and other minerals considered essential for renewable energy technologies. Demand for these minerals is reshaping global mining politics but often obscures environmental and social harms.

17. Annex3: International Standards

Mining governance in Türkiye and the Western Balkans must be understood within the broader landscape of international standards designed to protect workers, communities and ecosystems. These standards form the normative foundation for responsible mining and provide benchmarks for assessing national compliance.

The **ILO Convention No. 176** on Safety and Health in Mines establishes the international framework for worker protection. It requires governments to conduct regular inspections, enforce employer responsibility, guarantee workers' rights to refuse dangerous tasks, investigate accidents thoroughly and ensure adequate ventilation, emergency exits and safety training. Although adopted in 1995, ratification and implementation remain uneven across the region.

The **Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice** in Environmental Matters offers a unique human rights approach to environmental governance. It guarantees that citizens must have timely access to environmental information, meaningful participation in decisions affecting their environment and the right to challenge harmful policies or projects in court. Restricting public hearings, withholding pollution data or using "commercial confidentiality" to block transparency violates the spirit of Aarhus.

The Global Industry Standard on Tailings Management (GISTM), issued in 2020, sets the most comprehensive global requirements for tailings safety. It emphasises independent oversight, community participation, climate-risk modelling, transparency, emergency planning and the establishment of long-term funding mechanisms for monitoring and closure. Adoption of GISTM remains limited in both Türkiye and the Western Balkans.

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes governs international movement of toxic waste, including mining residues. It requires strict controls to prevent dumping, ensure safe disposal and reduce hazardous waste generation. Weak implementation in some states creates opportunities for hazardous waste mismanagement.

The Minamata Convention on Mercury addresses harmful mercury releases, including those from mining. While mercury use in gold extraction is now heavily restricted, legacy sites in Türkiye and the Western Balkans continue to release mercury into ecosystems. The Convention obliges states to monitor emissions, manage contaminated sites and reduce mercury exposure.

The Espoo Convention on Environmental Impact Assessment in a Transboundary Context is relevant for states sharing river basins. It requires advance notification and consultation when projects may have cross-border impacts. Tailings dams in Serbia, Türkiye or North Macedonia that threaten downstream communities fall under this standard.

Collectively, these conventions and standards provide a roadmap for safe, transparent and rights-based mining governance. Their full implementation is not aspirational—it is necessary to prevent environmental disasters, protect communities and uphold the integrity of democratic decision-making.