BRIEFING NOTE

Tailings Dams & Pollution

Environmental Risks, Human Impacts, and the Governance Challenge

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KEY MESSAGES

Tailings dams, structures that store the toxic waste generated by mining, represent one of the most significant environmental and safety risks in the extractive sector.

Historical records document over 366 dam failures releasing more than 279 million cubic metres of tailings, causing 3,043 deaths and polluting approximately 4,868 kilometres of watercourses.

Recent failures in Indonesia and Bolivia (March 2025) confirm that the crisis is ongoing, driven by rapid industrial expansion, inadequate regulation, and the deployment of new technologies without sufficient safeguards.

The Global Industry Standard on Tailings Management (GISTM), launched by ICMM, UNEP and the Principles for Responsible Investment in 2020, represents the most significant global regulatory response, but compliance and enforcement remain uneven.

Reducing demand for minerals, enforcing rigorous independent oversight, and embedding community rights are essential pillars of any credible response.

1. What Are Tailings Dams?

Tailings are the waste materials left over when ore is processed to extract economically valuable minerals, copper, gold, nickel, iron, uranium, and others. Depending on the mineral being extracted and the processing method used, tailings may be in the form of fine-grained slurry, sand, or thickened paste. They are stored in large engineered containment structures known as tailings storage facilities (TSFs) or, more commonly, tailings dams.

Tailings dams are among the largest engineered structures on earth. Unlike conventional water-retention dams, which are built to a fixed design and then filled, tailings dams are typically raised incrementally as the mine produces more waste, sometimes over decades. This creates a dynamic structure that changes in geometry, mass, and stability throughout its operational life.

What do tailings contain?

The chemical composition of tailings varies by ore type and processing method, but they commonly contain:

- Heavy metals, including lead, mercury, arsenic, cadmium, zinc, copper, chromium and nickel;
- Processing chemicals such as cyanide (used in gold extraction), sulphuric acid (used in nickel and copper processing) and xanthates;
- Naturally occurring radioactive materials (NORM) in uranium and some gold mining operations;
- Sulphide minerals that generate acid mine drainage (AMD) when exposed to air and water.

Construction methods and risk

Three principal construction methods are used:

- **Upstream method:** The dam wall is progressively raised over previously deposited tailings. It is the cheapest and most widely used method, but the least stable, the one most commonly associated with catastrophic failures.
- **Downstream method:** The dam wall is raised on the downstream face, requiring more material but providing greater stability and is preferred for high-consequence facilities.
- **Centreline method:** A hybrid that raises the crest vertically above the centreline of the starter damm which is intermediate in cost and stability.

> **The Scale of the Problem**
> There are estimated to be between 3,500 and 18,000 tailings storage facilities worldwide, depending on the definition and counting method applied. Many thousands more are abandoned or no longer actively managed, yet continue to leach contaminants into the environment. Because the industry's full inventory is not publicly disclosed, the precise scale of the global tailings challenge is unknown.

2. The Pollution Threat: Pathways and Contaminants

Tailings dams generate pollution both in routine operation, through seepage, dust, and drainage, and catastrophically when they fail. The two pollution pathways are fundamentally different in character. However, both pose serious long-term risks to ecosystems and human health.

2.1 Chronic Pollution in Normal Operation

Even without structural failure, operating tailings facilities contaminate the surrounding environment through multiple pathways:

Seepage and groundwater contamination

Contaminants leach continuously through the base and sides of the tailings dam into underlying soils and groundwater. In areas with shallow water tables or fractured geology, this can migrate to drinking water sources. The process is slow, diffuse, and often undetected until contamination is severe. Contamination may persist for decades or centuries after the mine closes.

Acid mine drainage (AMD)

When sulphide minerals in tailings are exposed to oxygen and water, they oxidise, producing sulphuric acid. This acidic drainage dissolves heavy metals from the tailings, making them mobile and bioavailable. Acid mine drainage is one of the most persistent and expensive environmental problems in the mining industry. Once initiated, it can continue for hundreds of years. It dramatically reduces the pH of receiving watercourses and kills aquatic life across extensive areas.

Wind-blown dust (fugitive emissions)

The exposed surface of tailings dams dries and becomes subject to wind erosion, generating dust plumes that can carry heavy metals and other contaminants over considerable distances. Communities living downwind are exposed through inhalation and the deposition of contaminated particulates on soil, vegetation, and water. Children are disproportionately affected through hand-to-mouth pathways.

Altered hydrology and thermal impacts

Tailings dams alter natural stream flows, modify water temperature, and change the chemistry of receiving waters, reducing oxygen levels and disrupting aquatic ecosystems even before acute contamination events occur.

2.2 Catastrophic Failure and Acute Pollution Events

When tailings dams fail structurally, through slope instability, overtopping, liquefaction, foundation failure, or earthquake, they can release enormous volumes of highly toxic slurry in seconds. The resulting flood wave travels at high velocity, engulfing communities, destroying infrastructure, and spreading contamination across river systems hundreds of kilometres in length.

What distinguishes tailings dam failures from other pollution events is the combination of:

- **Volume and velocity:** Slurry may travel at speeds exceeding 30–70 km/h, overwhelming communities with no warning;
- **Chemical toxicity:** The slurry carries high concentrations of heavy metals, acids, and processing chemicals;
- **Persistence:** Contaminated sediments deposit across floodplains and riverbeds, from which they are repeatedly remobilised by subsequent rainfall events, extending the pollution impact for years or decades;
- **Geographic reach:** Failures can contaminate entire river systems from source to ocean.

The Samarco Disaster: A Measure of Scale

The November 2015 collapse of the Fundão tailings dam at the Samarco iron ore mine in Brazil released approximately 40–60 million cubic metres of iron tailings into the Doce River basin. The resulting slurry wave travelled 650 km to the Atlantic Ocean, killing 19 people directly and devastating aquatic ecosystems across one of Brazil's longest river systems.

Scientific analysis found suspended sediment loads reaching 33,000 mg per litre, approximately 165 times typical background levels. Heavy metals, including iron, arsenic, mercury, barium, and manganese, exceeded sediment quality guidelines across the river basin. The highest contamination enrichment factor for mercury was recorded at 4,234, more than 4,000 times baseline levels. The Doce River basin's fisheries and water supply systems were severely disrupted, and restoration continues more than a decade later.

2.3 Human Health Impacts

The human health consequences of tailings pollution are wide-ranging and operate across multiple exposure pathways:

Contaminant / Pathway	Health Effects
Lead contamination	Neurological damage and cognitive impairment, particularly in children; cardiovascular disease in adults; irreversible at high exposures

Contaminant / Pathway	Health Effects
Arsenic in water/food	Cancers of the lung, bladder and skin; cardiovascular disease; peripheral neuropathy; developmental impacts in children
Mercury exposure	Central nervous system damage; Minamata disease; foetal and infant neurological harm through maternal exposure; bioaccumulates through fish consumption
Acid mine drainage	Reduced bioavailability of essential nutrients; destruction of aquatic food chains; indirect impacts on food security in fishing-dependent communities
Dust inhalation	Respiratory disease; silicosis from silica particles; cardiovascular impacts; heavy metal poisoning through chronic low-dose exposure
Cyanide contamination	Acute toxicity in high doses; chronic exposure linked to neurological, thyroid, and reproductive effects
Acute flood events	Direct trauma and drowning; psychological trauma and displacement; long-term displacement disrupts access to healthcare and clean water

Communities living in proximity to tailings facilities often face a 'pollution burden', the cumulative effect of multiple contaminants from multiple sources acting simultaneously. This is particularly acute in low- and middle-income countries where regulatory enforcement is weak, and communities may already face significant health disadvantages.

3. The Record of Failure

3.1 Historical Data

Historical data are alarming in both scale and trend. Research published in 2024 and 2025 documents:

- 505 tailings dam incidents between 1915 and 2022, drawn from global databases supplemented with Chinese data;
- 366 documented accidents releasing over 279 million cubic metres of tailings;
- 3,043 fatalities directly attributable to tailings dam failures;
- Environmental contamination across approximately 4,868 kilometres of watercourses.

Critically, the trend is worsening. Analysis of the data shows an increase in both the frequency and severity of incidents over the past two decades, particularly involving large dams. This is counterintuitive given the growth of safety standards and monitoring technology, and points to underlying drivers including: the sheer growth in the number of tailings facilities as mining expands; the scale of individual facilities increasing; and the use of newer construction methods, particularly the upstream method, at facilities in jurisdictions with inadequate oversight.

The three leading causes of tailings dam incidents are:

- Overtopping (the dam is overwhelmed by water volume, often during heavy rainfall)
- Slope stability failures (the dam face or foundation loses structural integrity)
- Earthquake-induced liquefaction (vibration causes saturated tailings to behave as a liquid)

3.2 Recent Significant Failures

CASE STUDY · Brumadinho, Minas Gerais, Brazil · *January 2019*

The collapse of Vale's Córrego do Feijão tailings dam killed 270 people, the deadliest mining disaster in Brazilian history. The dam used the upstream construction method and had been classified as stable by a licensed auditor shortly before failure.

The catastrophe was the direct catalyst for the development of the Global Industry Standard on Tailings Management (GISTM). It exposed critical failures in third-party auditing, regulatory oversight, and the inherent instability of the upstream construction method.

Brazil subsequently legislated a ban on the upstream construction method for tailings dams, with an enforced deadline for decommissioning existing upstream structures.

CASE STUDY · Indonesia Morowali Industrial Park (IMIP) · *March 2025*

Two tailings facilities failed at IMIP, a major nickel processing hub in Sulawesi, Indonesia, within days of each other during heavy rainfall. The PT Huayue Nickel Cobalt facility breached on 16 March, sending a wave of red, toxic slurry into the Bahadopi River and flooding the village of Labota. The health of 341 families was put at risk from exposure to heavy metals associated with high-pressure acid leach (HPAL) nickel processing.

On 21 March, the PT Qing Mei Bang New Energy Materials facility collapsed, killing three workers. Satellite imagery from January 2025 showed evidence of an earlier landslide at the same site, predating the March failures, suggesting structural problems were pre-existing and unaddressed.

Investigations revealed that at least one facility had been built on an infilled pond. This highly questionable engineering practice would have elevated the water table within the facility, increasing instability. IMIP sits on the seismically active Matano Fault system.

The failures occurred in the context of Indonesia's extraordinary nickel boom: Indonesia's share of world nickel mine production rose from 5.7% in 2015 to 59.5% in 2024, driven largely by demand for electric vehicle batteries. Critics argue that regulatory capacity has failed to keep pace with industrial expansion.

CASE STUDY · Laguna Kenko, Llallagua, Bolivia · *March 2025*

On 16 March 2025, the same day as the first Indonesian failure, a tailings dam at the closed Laguna Kenko tin mine in the Bolivian Altiplano failed during heavy rains. Two people were killed. The failure impacted 70% of the downstream town of Andavilque, destroying 47 homes. The tailings contained numerous toxic heavy metals and were actively leaching into the surrounding environment; the site was being remined to extract residual tin from the waste.

The failure is illustrative of a wider problem: many of the world's most hazardous tailings facilities are associated with closed or abandoned mines, where long-term responsibility for monitoring and maintenance is unclear.

CASE STUDY · Sino-Metals Leach Zambia — Kafue River, Copperbelt · *February 2025*

On 18 February 2025, a tailings storage facility at the Sino-Metals Leach Zambia copper mine near Chambishi, a subsidiary of China Nonferrous Mining Group, a Chinese state-owned enterprise, failed catastrophically. Engineering investigations determined that the failure was a cascading piping failure through a divisional wall between two upper compartments of the facility. Approximately 50 million litres (50,000 cubic metres) of acidic and highly toxic waste were discharged into tributaries of the Kafue River.

The Kafue River is Zambia's longest and most important waterway, flowing for over 1,500 kilometres through the country. It provides drinking water to approximately five million people, including residents of Lusaka, and approximately 12 million of Zambia's 20 million citizens, 60% of the population, live within the Kafue basin. Authorities were forced to shut down the water supply to Kitwe, a city of approximately 700,000 residents. Fish and crocodiles died in large numbers. Crops were destroyed along the riverbanks. One miner's family spent two weeks without access to clean water until local authorities treated the acidity with lime.

Initial official statements significantly downplayed the scale of the disaster. An independent investigation by the South African environmental company Drizit, contracted by Sino-Metals itself, found that the actual volume of toxic material released was approximately 1.5 million tonnes, around 30 times the figure initially admitted. Sino-Metals terminated Drizit's contract after it submitted preliminary reports indicating the severity of the pollution. The Zambian government has been accused by civil society of further downplaying the disaster, and the company has been accused of instructing security personnel to silence local whistleblowers.

The failure occurred amid the rapid expansion of Chinese-owned copper mining in Zambia, driven by rising global copper prices and the energy transition. Critics have noted that Chinese-operated mines in Zambia have repeatedly been accused of disregarding environmental, safety, and labour regulations. Since the beginning of 2025, four mining companies, one British and three Chinese, have been accused of causing severe environmental damage in Zambia by releasing toxic waste into the Kafue River watershed.

A peer-reviewed study published in 2026 assessed the ecological impact and found elevated levels of heavy metals in water, fish, and pasture samples, significantly exceeding ZEMA regulatory thresholds. Senior academics warned of long-term and potentially irreversible health impacts on communities dependent on the Kafue River.

CASE STUDY · Kabwe — A Colonial Legacy of Chronic Lead Contamination · *Ongoing, documented 2025*

Zambia's tailings crisis is not only about acute dam failures. Kabwe, the capital of Zambia's Central Province, represents one of the world's most severe examples of chronic tailings pollution, a legacy of colonial-era industrial lead and zinc mining that continues to poison communities generations after the mine closed.

The former Broken Hill mine operated from 1904 until 1994, leaving massive tailings deposits across and around the city. Lead is now found at extraordinary concentrations throughout Kabwe's soil, water, and air. A 2025 Human Rights Watch report documented soil contamination in some areas at up to 300 times the level considered hazardous by the US Environmental Protection Agency (the US EPA limit is 400 mg/kg; some Kabwe sites exceed 3,000 mg/kg). The UN described Kabwe as a 'sacrifice zone' in 2022.

The health consequences are severe and well-documented. Over 95% of children living near the former mine have elevated blood lead levels. Approximately half require urgent medical treatment. Lead levels in children surveyed averaged nearly 10 times the CDC's reference value for abnormal blood lead. The economic cost of lead poisoning in Kabwe, through loss of IQ and lead-related mortality for children born between 2025 and 2049, has been estimated at between USD 224 million and USD 593 million.

Despite the mine's closure, the tailings crisis in Kabwe is active and worsening. Human Rights Watch documented in its March 2025 report 'Poisonous Profit' that businesse, including Jubilee Metals Group, a South Africa-based company, through its subsidiary Enviro Processing Limited, have been mining, removing, and processing toxic lead tailings waste, generating new dust and spreading contamination to previously unaffected parts of the city. Satellite imagery confirmed significant removal of lead waste from the 'Black Mountain' tailings dump between 2023 and 2024. A contract dated February 2025 showed lead tailings being sold to a Chinese company, Union Star Industry Limited, as 'zinc tailings.'

Kabwe illustrates two specific dimensions of the tailings problem that are easily overlooked: first, the severe long-term consequences of 'orphaned' tailings for which original operators no longer bear responsibility; and second, the hazard of tailings being remined without adequate environmental safeguards, generating new pollution from old contamination. The Zambian government has been criticised for issuing mining licences in Kabwe without adequate enforcement of environmental and health standards, and an inter-ministerial committee announced in April 2024 to address the contamination had not been formally established as of the time of reporting.

A Pattern Across Four Continents

The 2025 cluster of failures, across Indonesia, Bolivia, and Zambia, occurring within weeks of each other, alongside the decades-long chronic contamination crisis in Kabwe, demonstrates that tailings dam failures and tailings pollution are not isolated events or statistical outliers. They reflect systemic failures in design, construction oversight, regulatory enforcement, corporate transparency, and the speed of industrial expansion driven by global commodity demand. In each case, there were warning signs that were not acted upon, corporate actors who downplayed or concealed the scale of harm, and

> communities, disproportionately poor, often indigenous, frequently Black and African, who bore the consequences with little recourse.

4. The Governance and Regulatory Landscape

4.1 The Global Industry Standard on Tailings Management (GISTM)

The GISTM was developed between 2019 and 2020 by the Global Tailings Review, convened by the International Council on Mining and Metals (ICMM), UNEP, and the Principles for Responsible Investment (PRI), in direct response to the Brumadinho disaster. Published in August 2020, it is the first global standard on tailings facility management. It represents the most significant reform effort the industry has seen.

The GISTM comprises:

- 6 topic areas covering the full lifecycle of tailings facilities;
- 15 principles addressing safety, governance, environmental and social performance;
- 77 auditable requirements against which facilities can be independently certified.

The GISTM introduced several significant innovations relative to previous practice:

- **Independent qualified senior engineer (IQSPE**): An independent expert must oversee facility design, operation, and closure;
- **Public disclosure**: Companies must publicly disclose compliance status for all facilities;
- Community engagement: Affected communities must be meaningfully engaged throughout the lifecycle;
- **Risk classification**: Facilities are classified by potential consequence severity, determining the stringency of requirements;
- **Zero harm aspiration**: The standard sets an explicit goal of eliminating fatalities and catastrophic events.

Compliance deadlines

All ICMM members are committed to implementing the GISTM. Compliance deadlines were:

- 5 August 2023: All facilities with 'Extreme' or 'Very High' potential consequences;
- 5 August 2025: All other operational tailings facilities not in a state of safe closure.

The Global Tailings Management Institute (GTMI)

On 21 January 2025, ICMM, UNEP and PRI launched the Global Tailings Management Institute (GTMI), an independent body based in South Africa responsible for managing the assurance framework through which facilities are independently audited and certified against the GISTM. The GTMI represents a significant institutional development: it moves compliance assessment from self-reporting toward independent third-party verification.

4.2 Limitations and Gaps in the Current Framework

Despite the significance of the GISTM, several substantial limitations constrain its effectiveness:

Voluntary and industry-led

The GISTM is an industry-led voluntary standard that binds only ICMM members. The majority of the world's mining operations, particularly smaller and medium-sized operators, state-owned enterprises in developing countries, and operations in jurisdictions with weak regulatory environments, are not subject to GISTM requirements. The March 2025 IMIP failures in Indonesia involved companies that were not ICMM members.

National regulation lags

In most countries, national legislation on tailings dam safety lags significantly behind international best practice. In South Africa, one of the world's most important mining jurisdictions, compulsory registration of tailings facilities under the National Water Act was only gazetted in November 2024, with a registration deadline of January 2025. National legislation does not yet directly address the GISTM. In many other jurisdictions, tailings dam regulation remains fragmented across multiple agencies with no single body holding primary responsibility.

Abandoned and orphaned facilities

A substantial proportion of the world's tailings infrastructure is associated with mines that have closed, are in administration, or have unclear ownership. These 'orphaned' facilities often receive no ongoing monitoring or maintenance, yet continue to pose serious pollution risks. The GISTM provides no direct framework for addressing legacy facilities where the responsible operator no longer exists.

Upstream construction method

Despite the well-documented safety record of upstream-constructed dams, this method is still used in many jurisdictions. Brazil enacted its prohibition following the Brumadinho disaster, but no binding global prohibition exists. The GISTM discourages but does not prohibit the method.

Climate change as a multiplier

The GISTM was developed against a relatively static picture of hydrological risk. Climate change is increasing the frequency and intensity of extreme rainfall events, the primary trigger of overtopping failures in many mining regions globally. Facilities designed to pre-climate-change precipitation standards may be structurally inadequate for the rainfall events they will increasingly face. Design criteria need urgent revision in climate-affected jurisdictions.

Disclosure and transparency gaps

The full global inventory of tailings storage facilities is not publicly known. Estimates range from 3,500 to 18,000 facilities. Without a comprehensive public registry, with data on location, construction method, consequence classification, volume, and compliance status, regulators, communities and emergency services cannot assess or respond to risk effectively.

5. Environmental and Ecosystem Impacts

Beyond the immediate human toll of dam failures, the ecological consequences are profound and long-lasting. Environmental damage associated with tailings pollution falls into several categories:

5.1 Water Systems

Rivers, lakes, and coastal waters receiving tailings contamination suffer multiple forms of degradation:

- **Suspended sediment loading:** Acute failures can increase sediment loads by orders of magnitude. The Samarco failure caused suspended sediment loads of 33,000 mg/L, far exceeding levels compatible with aquatic life.
- **Heavy metal deposition:** Contaminated sediments settle and persist in river beds and floodplains, creating a reservoir of toxicity that is repeatedly remobilised by rainfall and floods.
- pH alteration: acid mine drainage depresses pH to levels incompatible with most aquatic life, effectively sterilising river reaches.
- **Bioaccumulation:** Heavy metals enter the food chain through aquatic organisms, concentrating at each trophic level. Fish consumption by communities downstream of contaminated rivers represents a significant and often underappreciated exposure pathway.
- **Coastal and marine contamination:** Major river-borne contamination events can extend to estuarine and coastal ecosystems, affecting marine fisheries and coral reef systems.

5.2 Terrestrial Ecosystems

- **Vegetation destruction:** The physical smothering of tailings slurry prevents vegetation from re-establishing. Phytotoxic concentrations of metals in tailings prevent natural revegetation for decades.
- **Soil contamination:** The deposition of contaminated material permanently alters soil chemistry, affecting agricultural productivity and biodiversity.
- **Biodiversity loss:** Habitat destruction combined with toxic contamination depresses species diversity across affected landscapes. Recovery, where it occurs, may take generations.

5.3 Long-term Persistence

A defining characteristic of tailings contamination is its persistence. Unlike many organic pollutants that degrade over time, heavy metals do not decompose. They may be chemically transformed between forms, shifting between more and less bioavailable states depending on pH, oxygen levels, and organic matter, but they do not disappear from the environment. Studies of rivers affected by historical mining operations show elevated metal concentrations in sediments many decades after active mining ceased.

> **Climate Change and Remobilisation**
> Climate change will increase the frequency and intensity of flood events in many regions, including regions where mining is concentrated. Each major flood event has the potential to remobilise contaminated sediments from river beds and floodplains, redistributing historical contamination into previously unaffected areas and creating new exposure pathways for communities and ecosystems. This means that tailings pollution is not a closed chapter once a mine closes, it is a dynamic and evolving risk.

6. The Just Transition Dimension

The tailings dam issue intersects directly with the global push for a 'just transition' to a low-carbon economy. The energy transition requires enormous quantities of minerals, lithium, cobalt, nickel, copper, and manganese, to manufacture batteries, solar panels, wind turbines, and electric vehicles. Demand for these minerals is expected to increase dramatically over the coming decades.

This creates a profound tension: the transition away from fossil fuels is partly dependent on an expansion of mining, which carries serious environmental and human rights risks, including, centrally, those associated with tailings dams. The March 2025 failures at the Indonesia Morowali Industrial Park, a facility processing nickel for electric vehicle batteries, and the Sino-Metals Kafue River disaster in Zambia, a copper mine supplying metal essential for virtually every element of green energy infrastructure, illustrate this tension with stark clarity.

Zambia's situation is particularly instructive. The government has designated copper, cobalt, zinc, and lead as 'critical minerals' for the global energy transition and is actively courting foreign investment: copper export revenues jumped more than 30% in a single month in 2025, a UAE-based company invested over USD 1.1 billion in Mopani Copper Mines, and Barrick Mining is planning to double production at the Lumwana mine. Yet this same period saw the Kafue River disaster unfoldc caused by a Chinese state-owned enterprise operating without adequate safety standards, and Human Rights Watch documented the ongoing poisoning of children in Kabwe by tailings from a mine closed in 1994. The economic benefits of the mining boom are not reaching the communities bearing its environmental and health costs. A 2024 campaign led by Zambian civil society described Kabwe as 'Zambia's Sacrifice Zone', a phrase that captures, with painful accuracy, the distributional injustice at the heart of the current transition-minerals model.

Several principles are essential to a genuinely just transition:

- **Demand reduction:** The most effective way to reduce tailings risks is to reduce the volume of ore that needs to be processed. This requires investment in material efficiency, recycling, and circular economy approaches for critical minerals.
- **Supply chain transparency:** Companies producing electric vehicles, electronics, and renewable energy equipment must know where their minerals come from and what environmental and social standards are being met at the mine level.
- **Community free, prior and informed consent:** Communities living near tailings facilities must have genuine decision-making power over whether and how mining proceeds, not merely be informed after decisions are made.
- **Polluter pays:** Where tailings contamination occurs, the responsible operators and their investors and insurers must bear the full cost of remediation, not local taxpayers or affected communities.

7. Recommendations

Addressing the tailings dam crisis requires action at multiple levels simultaneously. The following recommendations are drawn from current evidence and best practice:

7.1 For Governments and Regulators

- **Establish comprehensive national tailings facility registries**: All active, inactive, and abandoned facilities should be publicly registered, with data on construction method, consequence classification, volume, and compliance status.
- **Legislate minimum standards**: National regulations should be raised to align with or exceed GISTM requirements, with independent enforcement mechanisms. The upstream construction method should be prohibited for new facilities and phased out for existing ones.
- **Mandate independent oversight**: An independent qualified professional should be legally required for all tailings facilities above a defined risk threshold, with legal liability for negligent certification.
- **Address legacy and orphaned facilities**: Establish funded programmes to remediate abandoned and orphaned tailings sites, with financing mechanisms that reflect the polluter-pays principle where historical ownership can be established.
- **Strengthen emergency preparedness**: Downstream communities must have credible, tested emergency response plans, informed by knowledge of tailings facility risk.

7.2 For the Mining Industry

- **Achieve and demonstrate genuine GISTM compliance**: Not as a box-ticking exercise but as a substantive commitment to zero harm. Public disclosure must be transparent, complete, and independently verified.
- **Phase out the upstream construction method**: Even where not legally required, companies should commit to eliminating upstream construction from their portfolios.
- Invest in tailings reduction and alternative disposal: Pyrometallurgical dry-stack tailings, paste tailings, and mineral processing innovations that reduce the volume and toxicity of tailings generated.
- **Disclose full facility inventories**: Companies should publicly disclose the location, volume, construction method, and consequence classification of all tailings facilities in their portfolio, including legacy sites.
- **Integrate climate resilience**: Tailings facility design and operating parameters must explicitly account for projected climate change impacts, including increased rainfall intensity in affected regions.

7.3 For Investors and Financial Institutions

- **Make GISTM compliance a condition of finance**: Banks, institutional investors, and insurers should require demonstrated GISTM conformance, verified independently, as a prerequisite for financing mining operations.
- **Conduct enhanced due diligence:** Tailings facility risk should be a standard element of ESG due diligence for mining-sector investments, including assessments of legacy facilities.
- **Support the GTMI**: The Global Tailings Management Institute needs consistent financial and institutional support from investors and companies to fulfil its independent certification function.

7.4 For Civil Society and Affected Communities

- **Demand meaningful participatio**n: Communities have a right to participate in decision-making about mining operations that affect them, including tailings facilities. This right should be exercised early, continuously, and with access to independent technical advice.
- **Support community-led monitoring**: Affected communities should have access to monitoring data and to training that enables them to assess and challenge official accounts of facility safety.
- **Advocate for public registries and transparency**: Without comprehensive public disclosure, communities, journalists, and civil society cannot hold operators or regulators to account.

8. Conclusion

Tailings dams represent one of mining's most serious and least adequately managed environmental risks. The historical record of failures, causing thousands of deaths, contaminating thousands of kilometres of river systems, and generating pollution that persists for generations, should be treated as a humanitarian and environmental crisis, not an acceptable cost of doing business.

The Global Industry Standard on Tailings Management represents genuine progress, but it is a voluntary, industry-led standard covering only a fraction of the world's tailings facilities. The 2025 failures in Indonesia and Bolivia demonstrate that the gap between standard-setting and on-the-ground practice remains dangerously wide, particularly in jurisdictions experiencing rapid mining expansion.

As global demand for transition minerals intensifies, the pressure to expand mining output and the risk profile of the world's tailings portfolio are growing. Closing the governance gap, through mandatory national regulation, comprehensive public disclosure, independent oversight, and genuine community rights, is not optional. It is a prerequisite for any credible claim that the energy transition is just.

Further Reading and Key References

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This briefing note was prepared in May 2026. It draws on peer-reviewed research, industry standards documentation, and NGO reporting. It is intended as a general information resource and does not constitute legal or technical advice.