

# Safety First

## Guidelines for Responsible Mine Tailings Management

JUNE 2020



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Report available at [earthworks.org/safety-first](http://earthworks.org/safety-first) and [miningwatch.ca/safety-first](http://miningwatch.ca/safety-first)

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### AUTHORS

This report was written by Earthworks (Jan Morrill and Payal Sampat) and MiningWatch Canada (Ugo Lapointe and Jamie Kneen), with contributions from Dr. Ann Maest (Buka Environmental), Dr. Dave Chambers (Center for Science in Public Participation), Dr. Steve Emerman (Malach Consulting), Dr. Bruno Milanez (Grupo Política, Economia, Mineração, Ambiente e Sociedade/Universidade Federal de Juiz de Fora). — *This report was written using publicly available data and interviews. The information contained herein is believed to be accurate but does not purport to be complete.*

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### COVER PHOTOS AND DESIGN

Cover photo: Workers from the Brazilian Ministry of Environment survey the catastrophic damage after the collapse of the Vale tailings dam in Brumadinho, Brazil, in 2019. Minas Gerais, Brazil. By IBAMA from Brazil.

Contributors and Endorsement pages photo: Tailings dam at the Red Chris mine operated by Imperial Metals, British Columbia, Canada. By Garth Lenz ©Garth-Lenz-1486 (courtesy of Salmon Beyond Borders).

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# Executive Summary

The 2019 mine tailings dam collapse near Brumadinho, Brazil, killed over 250 people and decimated houses and buildings for kilometers before flowing into the Paraopeba River. The catastrophe stunned the world, but should not have come as a surprise. Tailings facilities, which contain the processed waste materials generated from mining metals and minerals, are failing with increasing frequency and severity.

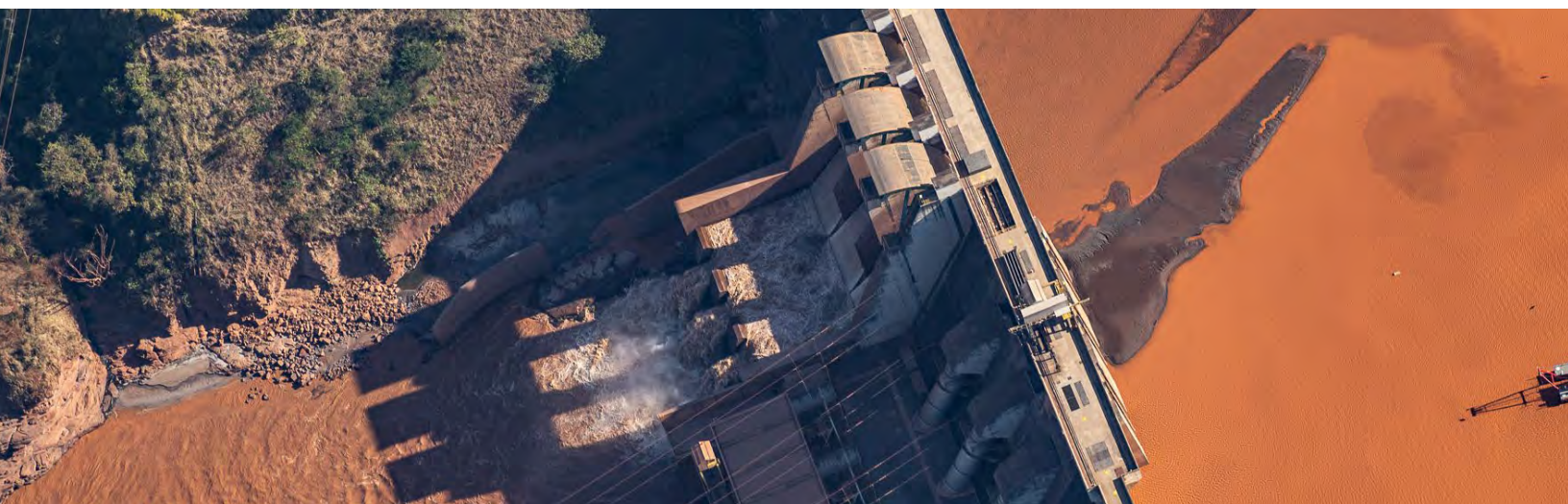
Current industry standards, including the draft of the Global Tailings Standard released in 2019, do not go far enough to adequately protect communities and ecosystems from failures. The design, construction, operation and closure of tailings facilities require significant changes to protect people and the environment.

The safest tailings facility is the one that is not built. To avoid the long-term liability of mine waste sites and their social and environmental impacts, we must reduce the volume of tailings produced, as well as the overall demand for primary raw minerals. Over the past 40 years, ore grades have declined on average by half for many minerals, effectively doubling the volume of mine waste tailings generated for each unit of mineral produced. Current trends suggest an additional 2- to 10-fold increase in the extraction and uses of most minerals by 2060. These trends are not sustainable. We need to continue to mine at least some minerals, including to support energy transition technologies, but we need best standards and practices to do so.

Tailings facilities can fail in many ways and with varying degrees of severity. This document outlines guidelines aimed at preventing catastrophic failures: failures where the structural integrity of the storage facility has been compromised.

The ultimate goal of tailings management must be zero harm to people and the environment and zero tolerance for human fatalities. Operating companies must commit to and document that they have made safety the primary consideration in tailings facilities and dam design, construction, operation, closure and post-closure. If an operating company identifies any potential loss of life as a

The Doce River, polluted from the Samarco tailings spill, runs through a hydro-electric power plant in July 2016. Minas Gerais, Brazil. Photo: Júlia Pontés.





result of a tailings dam failure, the dam must be designed to withstand the most extreme credible meteorological and seismic events.

Prior to permitting approval and over the life of the mine, operating companies must ensure the meaningful engagement, participation and consent of affected and potentially affected communities for any tailings facility.

The use of upstream dams must be banned in favor of centerline and downstream dams, which are much less vulnerable to all mechanisms of dam failure. Additionally, dams must not be built in close proximity to communities or above mining infrastructure where workers are likely to be present.

Design, construction, operation and closure at any tailings facility must all be subject to the best available technologies and best available practices. This would encourage the use of filtered tailings, which reduce the probability and consequence of failure.

Operating companies must document detailed understanding of the dam foundation as well as the tailings material properties, with special attention to clay content and liquefaction potential. There must be annual reporting that verifies that dam operations and construction adheres to the documented dam design.

Tailings facilities must be reviewed, inspected, monitored, and maintained until they reach a permanent state where the potential for failure is essentially impossible. The initial storage of filtered tailings facilitates an eventual safe closure.

Worst-case tailings failure scenarios must be modeled and made public prior to permitting and regularly updated throughout facility lifecycles. Emergency and evacuation drills related to catastrophic failure of tailings facilities must be held on an annual basis, and their planning and execution must include participation from affected communities, workers, local authorities and emergency management.

A culture of safety and responsibility must be upheld at the highest level within a corporation; this can only be achieved if the Board of Directors is held accountable for its actions (or lack thereof). The Board of Directors must bear the prime responsibility for the safety of tailings facilities, including the consequences of dam failures, and demonstrate that the company has the necessary financial assurance to cover the full cost of closure and post-closure plans as well as public liability insurance to cover the full cost of any catastrophic failures.

Aerial view of mine waste, Catalão, Goiás, Brazil. Photo: Júlia Pontés.



## SUMMARY OF GUIDELINES

- Make safety the guiding principle in design, construction, operation, and closure
- Ban new mine tailings facilities immediately upstream from inhabited areas
- Ban upstream dams at new mines and close existing upstream facilities
- Any potential loss of life is an extreme event and design must respond accordingly
- Mandate the use of Best Available Technology for tailings, including the use of filtered tailings, and implement rigorous controls for safety, including after mine closure
- Demonstrate understanding of local conditions and tailings characteristics with robust monitoring systems and develop emergency preparedness/response plans
- Affected communities must provide consent, and safety oversight must be independent, including the establishment of grievance procedures and whistleblower protections
- Information regarding mine safety must be made publicly available
- Corporate boards must assume full responsibility for risk (including financial risk) and accept the consequences of failure

In order to understand how and why failures occur, we must understand the scope of the issue. There is currently no global inventory of the thousands of tailings storage facilities, or a complete registry of dam failures. Compiling and sharing this information, publicly and transparently, is essential. An independent international agency, such as a United Nations-endorsed agency, in collaboration with responsible States, operating companies, and civil society, must drive this process, collect information on tailings dams and tailings dam failures worldwide, and share it with affected communities in order to de-risk these sites and support work to put in place proper emergency action plans.

Ultimately, this nascent international agency must be able to oversee tailings management safety worldwide. It must be a well-resourced agency capable of efficiently updating global standards, certifying their implementation, investigating failures and making publicly available recommendations. In order to determine the reach and scope of such an agency, an independent study should investigate which governance model would be most appropriate for this task.

### Language

This document uses the word “must” to indicate an action or guideline that is required. The word “should” is used when the action or guideline is optional or unattainable at this time.