



A global concern

Tailings management has been brought to the forefront of the industry, but much remains to be done to ensure future disasters are prevented

By Tijana Mitrovic



his past September, a tailings failure at an abandoned diamond mine in South Africa caused heavy flooding and left at least three people dead. The failure at the Jagersfontein mine is the latest in a string of recent tailings disasters, including the failure at Vale's *Córrego do Feijão* mine in Brumadinho in 2019, which killed 270 people and decimated the nearby communities and environment, prompting worldwide outcry and calls for change.

Operating as the Global Tailings Review, in August 2020 the International Council on Mining and Metals (ICMM), Principles for Responsible Investment and the UN Environment Programme co-created the Global Industry Standard on Tailings Management (GISTM) in response to the tailings failure in Brumadinho. The goal of the global standard is to strengthen the safety and governance of tailings facilities worldwide, to protect people and the environment, and to prevent another Brumadinho – and now, another Jagersfontein – from occurring.

The global mining industry has had the GISTM for two years now. These standards represent important first steps in a very long journey. The process of rolling them out around a world with a patchwork of pre-existing standards, incomplete data, a skills shortage and growing social concerns is a monumental task. Following the latest failure in South Africa, it is a task that is as urgent as ever.

An incomplete picture

While standards and guidance on tailings management already existed, such as Towards Sustainable Mining (TSM) from the Mining Association of Canada (MAC), the GISTM is the first standard to be designed with worldwide adoption in mind. Yet the scale of the standard has led to some confusion among operators.

“A lot of companies are still trying to digest the GISTM,” explained Charles Dumaresq, MAC vice-president of science and environmental management. “There’s a lot of uncertainty still on exactly how it is going to be implemented and how performance is going to be measured against the requirements of the standard.”

Many questions remain about the GISTM and how the future of tailings management will look. How will companies report on requirements, Dumaresq asks, and how will compliance with those requirements be audited? Will results be publicly available? “In some cases, that’ll be straightforward. For other requirements, that’s a fairly complicated question,” he said.

Another one of the major problems facing tailings management is that there is no exhaustive record of how many tailings facilities exist worldwide. Estimates of the number of tailings facilities range from some 7,000 to nearly five times as many.

Tracking failures is also difficult. According to Jan Morrill, tailings campaign manager at Earthworks, an environmental non-profit organization focused on the mining industry, “There is no

central registry of tailings failures, and so no one is really tracking and keeping an eye on that. It [becomes a question of] ‘Did you happen to come across the news article in the Turkish press about the tailings failure in November of 2021?’ It’s really hard to know.”

The status of standards

Today about 78 companies have indicated they are working towards the global standard. Adam Matthews, chief responsible investment officer at the Church of England Pensions Board, believes there is still some distance to go. “Unquestionably, progress is being made,” he said. “But this issue requires continued attention from boardrooms, from the chief executives, from chairs, as well as from investors and all the other stakeholders that have an interest in ensuring that this issue is properly addressed.”

However, not all mining companies are required to adopt the GISTM. “The standard itself is only as good as the people and the processes at every site,” Amanda Adams, principal engineer at Stantec, said. “In other words, it’s only as good as how people implement it.”

And for those not paying attention? According to Matthews, investors are ready to act: they are poised to start voting against the chairs of companies that are not clearly committed to implementing or working towards the standard. “The dynamics on this issue have changed,” stated Matthews.

The upcoming Global Tailings Management Institute will play a key role in ensuring that wider stakeholders, from investors, banks, insurers and communities, have confidence and evidence that the standard is being applied at individual mine sites on a broad, global scale.

The institute will also help clarify how other standards, such as MAC’s TSM tailings management protocol, first released in 2004 and most recently revised in 2019, relate to the GISTM. “That’s going to be a really important part of ensuring clarity amongst companies and all stakeholders as to how all these things fit together,” said Matthews.

Navigating a multi-standard system

According to Andre Gagnon, director of tailings at Lundin Mining, the company’s corporate tailings team is currently managing the implementation of the GISTM at its operating sites across five different countries. Gagnon said Lundin Mining has already completed the initial gap assessments at its priority operating sites in Chile, Brazil and Portugal, and plans to be in conformance with the global standard at these sites by August 2023.

When the GISTM was introduced, Lundin Mining turned to review its own global tailings management standard, a supporting standard to the company’s overall Responsible Mining Policy. “One of the challenges we had to deal with right away [was that] we had an existing tailings standard and existing company policies that overlapped with the GISTM,” Gagnon explained. “In collaboration with the operating sites, Lundin Mining needed to consider: ‘How do we design or update our tailings standard to align with the GISTM and not duplicate efforts that already exist?’”

The solution was to keep the same numbered principles and requirements in the GISTM and reference the company’s other existing policies and standards, rather than duplicate them. While Lundin Mining found its solution, Gagnon said the GISTM could still clarify some processes. “The industry could use more clarity going forward on how to measure and quantify conformance so

there is increased consistency across various jurisdictions and the industry as a whole,” he said.

MAC’s TSM was inspired by a series of tailings dam failures in the early and mid-1990s. Dumaresq said that the era acted as a catalyst for MAC to say, “We need to do better,” and to ask itself, “What can we as an association do?”

After the release of the GISTM in 2020, MAC did a gap analysis on the alignment between existing TSM and GISTM requirements, which Dumaresq said led to updates to MAC’s tailings guide and minor updates to its guide on developing and implementing operation, maintenance and surveillance manuals. According to the analysis, there are nine GISTM requirements that TSM only partially meets and only five requirements that TSM does not address out of the 77 GISTM requirements.

The scope of GISTM and TSM do differ, with TSM covering a range of topics other than tailings. For example, the GISTM includes aspects related to affected communities, while this is covered in TSM in a separate protocol. As well, TSM will sometimes defer to the Canadian Dam Association on some more technical pieces of guidance.

Karen Chovan, founder and CEO of Enviro Integration Strategies, believes that TSM has garnered broader industry support due to its longevity and greater detail in guidance. “With TSM, there is a more multifaceted system because they have several individual protocols, enabling focus on tailings specifics separate from other areas like climate change and community relations, even as they are integrated,” said Chovan. “MAC has their governance established differently than GISTM, but offers a much more rigorous process on making sure you can evaluate properly and determine whether you have the right things in place.”

According to Dumaresq, there are also some aspects of TSM that go beyond the GISTM. “The GISTM says to ‘have a tailings management system,’ but it doesn’t describe what a good tailings management system looks like,” he explained. “Whereas we have that similar requirement, have a tailings management system, but then we have all this detail in the table of conformance... that provides a much more complete picture of what a good tailings management system looks like and how you make it really function effectively.”

The goal, said Dumaresq, is for TSM to be recognized as equivalent to the GISTM to a certain degree so that companies do not necessarily need to follow two separate systems. Of course, this will depend on how the global institute decides to proceed with equivalencies.

Until then, companies will have to manage a multi-standard system. “I think the challenge going forward for Lundin Mining, and probably other companies, is doing internal and external audits on all these various standards and making sure that where there’s overlap,” Gagnon said. “We need to carefully plan and execute these audits so we’re not duplicating efforts.”

In practice

The increased focus on tailings management has also brought newer challenges to those on the ground, including the expectation for tailings engineers to expand their expertise. In her work, Adams said that the many requirements of the GISTM are a learning opportunity for engineers to improve their understandings of dam-break analysis, risk assessments, social impacts and more.

“Tailings dam engineers now have to have a whole new skill set,” Adams explained. “We have to become more familiar with risk assessment because evaluating the risk of these facilities is a



Feijao. Brazil, 2019.



Jagersfontein. South Africa, 2022.



Philex. Philippines, 2012.



Hindalco. India, 2019.



Akja. Hungary, 2010.



Mount Polley. Canada, 2014.

huge part of the GISTM... It's been a real challenge to build up those skills. It's also challenging to find enough people that have those skills and bring them onto tailing projects so that we can perform additional studies, tasks and evaluations within the timeline that's required."

When it comes to navigating the challenges of working across multiple jurisdictions with different regulations, following best practices no matter the location is still critical. "If you're adopting best practices and applying that wherever you work, then you shouldn't run into major issues," Chovan explained. "That's why the standards were developed: to give guidance on the best practice to those without."

From an investor perspective, this stance is even more firm. "We need assurance that companies are operating to the best standard in all jurisdictions," Matthews stated. "It's not acceptable because you're in a different jurisdiction that may have weaker governance that you can operate to a lesser standard. Why is that possibly right? It isn't."

Yet finding ways to communicate well and maintain that communication on a tailings dam project can be challenging given the massive scope of these projects. "There may be dozens of people who touch that project on a given day," Adams explains of her experience working on tailings dams. "How do we communicate those most important things to prioritize dam safety?"

The communication piece matters not only to keep stakeholders in the loop, but also to allow them to potentially bring up concerns or risk management actions that people should be doing, and Chovan still considers this part a challenge. "There's a lot of focus now on governance and getting the right systems in place, but we still seem to need focus on the people side, the communication and the culture," said Chovan. "You really need to dig into getting cross-department teams to be open and transparent and talking to each other and having clear communications because there are so many different people involved with these facilities."

Social standards

There is also a growing conversation on the need for community outreach in tailings management, in addition to focusing on technical standards that go beyond company walls. Sometimes companies still fall short regarding communicating and collaborating with local communities. In her research, Chovan has seen companies gather information for technical analysis on the local communities, their activities and potential risks, but not truly connect with these communities on the topic of tailings.

"We don't actually engage them in a transparent fashion to understand their concerns before we make decisions and decide on what kind of facilities or technology we want," Chovan explained. "Nor do we often do a good job of working with – if we have an existing facility – and communicating to them the potential risks of these facilities that are right next to them or upstream of them."

Some companies also remain uncertain about the level of transparency necessary given the complexity of the subject matter. It

can be challenging to put out information with the proper context, given how technical it is, in addition to the work companies are doing to improve and handle risk management. Companies may worry that the complexity will either worry engaged communities or be misinterpreted. "To communicate all that is still a big struggle," Chovan said. "We don't speak the same language."

According to Morrill, this is at odds with what affected communities expect, especially those who have already experienced tailings dam failures. "They want to see strong measures for corporate accountability," Morrill said. "They want to see strong measures in place for protecting communities in the event of failures. And that's not far enough in the current standards."

Earthworks released its own set of recommendations on tailings failure management, Safety First, in June 2020 and re-released it with updates in May 2022. Co-authored with Mining Watch Canada, it says the guidelines can protect communities, workers and the environment from the risks of tailings dam failures.

The organization wants significant changes beyond those outlined in current standards. "There also needs to be these hard and fast guidelines around other pieces: banning upstream dams, ensuring there's a certain probability of failure, ensuring a certain factor of safety... regulating the distance between dams and communities," Morrill said. "There are certain things that can be set in stone that just haven't been put into any standard."

Earthworks' stance is that while there has been uptake on the GISTM from ICMM members and beyond, many communities inevitably remain at risk due to industry stragglers. "From our perspective, we still see both dangerous tailings proposals across the world, but also some pretty substandard tailings management practices that are aimed at reducing cost or supporting a company's bottom line," said Morrill.


Looking ahead

Within the industry, Chovan highlights the greater collaboration and open discussion between professionals on methodologies for studies and evaluations. "There's been a lot of sharing of knowledge, best practices, common risks and common solutions that have been discussed," she said. "There's been a lot of positive effort that's gone forward."

Companies are also already turning to train the next generation of tailings engineers and share their existing knowledge. "There's been a lot of development of new training programs, and they're all being developed with contributions from professionals in the industry who are giving their time to do it," Chovan said. "Everybody [is] trying to help fill the gap of the next generation of experts."

Before these recent developments, good tailings management was practiced more on an individual level than on an industry level. "This issue hadn't been owned across the industry," Matthews explained. "[There was no] global best practice standard that everyone was working towards. That's what we're now working towards."

The tailings dam failure in South Africa is just the latest tragic reminder of the gravity of the task.

"A disaster in a company doesn't just impact the company – it impacts the whole industry," Matthews said. "It challenges the social licence of the whole industry. It makes it difficult for people to have confidence in the whole industry. It makes it difficult for investors to have confidence in the whole industry. And that's what we want to avoid. We want to be able to really ensure this issue is well addressed and that we can have confidence in it." 

A September 2022 study in *Earth-Science Reviews* titled "Global magnitude-frequency statistics of the failures and impacts of large water-retention dams and mine tailings impoundments" recorded 303 reported tailings failures at 249 distinct mine sites between 1965 and 2020. However, due to the uncertainty of the true number of facilities and failures, such as in regions with poor reporting, this number might be incomplete.

- Jagersfontein image courtesy of Planet Labs. All others taken using Google Earth.