

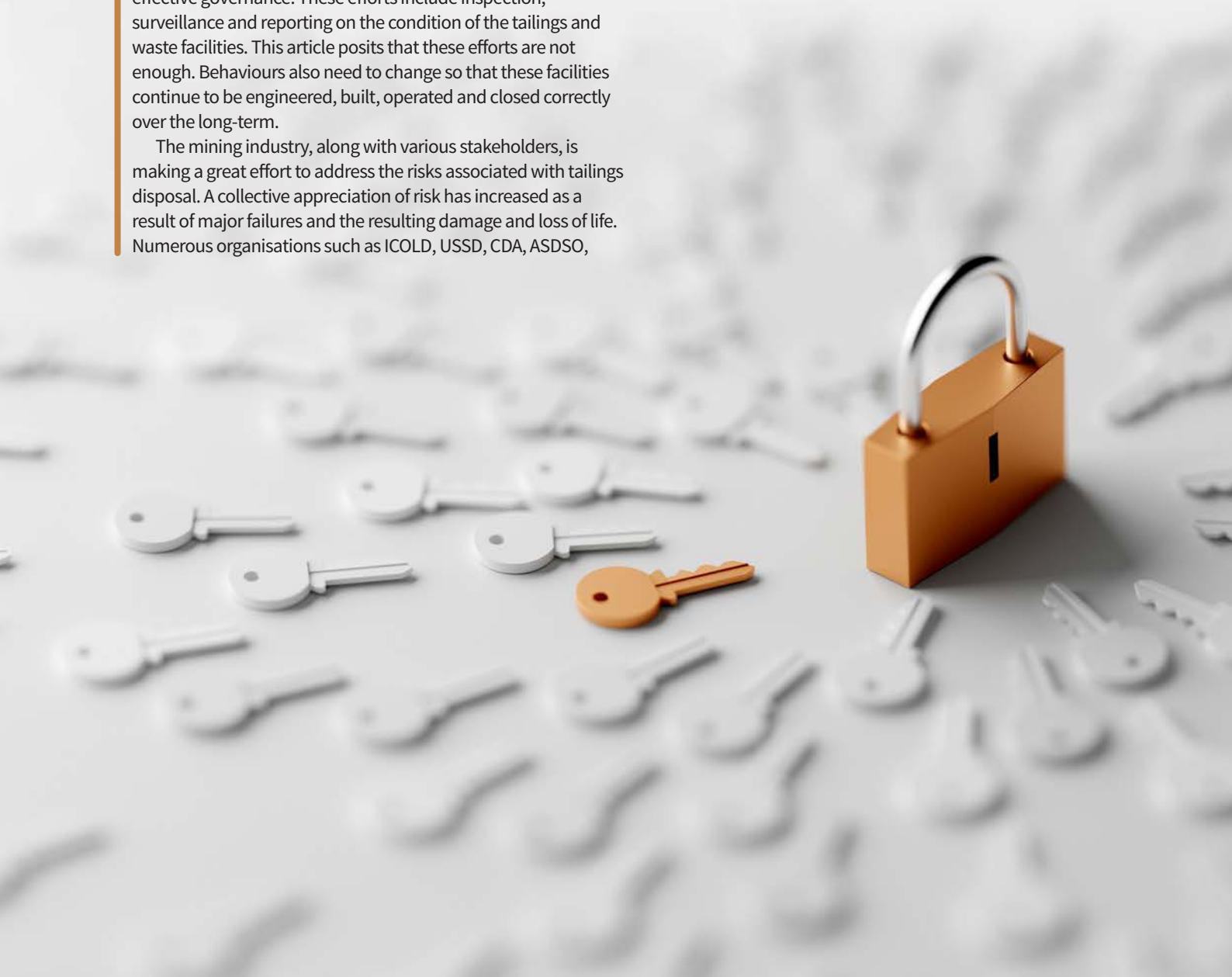
IS SAFETY SUFFERING?

High-profile tailing dam failures over the past 4 years have shocked stakeholders, embarrassed mining companies and taken the shine off a trajectory of steadily improving health, safety and environmental performance. With this has come a new focus from the mining industry and its stakeholders on tailings dams and the risk these structures pose to infrastructure, ecosystems and people downstream.

Many efforts are underway to impose better and more effective governance. These efforts include inspection, surveillance and reporting on the condition of the tailings and waste facilities. This article posits that these efforts are not enough. Behaviours also need to change so that these facilities continue to be engineered, built, operated and closed correctly over the long-term.

The mining industry, along with various stakeholders, is making a great effort to address the risks associated with tailings disposal. A collective appreciation of risk has increased as a result of major failures and the resulting damage and loss of life. Numerous organisations such as ICOLD, USSD, CDA, ASDSO,

Andrew Watson and Resa Furey, Stantec, Canada, ask the question: are industry efforts to manage tailings and demonstrate effective risk mitigation enough?



MAC, ANCOLD and others, are considering what should be done, with the potential for duplication of efforts. To promote alignment, a global review of international standards for tailings dams was co-convened by the International Council of Mining and Metals (ICMM), the Principles for Responsible Investment (PRI) and the United Nations Environment Programme (UNEP). The Investor Mining & Tailings Safety Initiative (chaired by the Church of England) embarked on a comprehensive inventory of tailings facilities by requesting detailed disclosures from mining companies in an effort to identify where the more urgent problems lie. The disclosure request indicates the lengths to which investors are going to understand the risks they and the industry face.

Risk is defined as the product of likelihood of a failure occurring and the damage potentially caused should the event

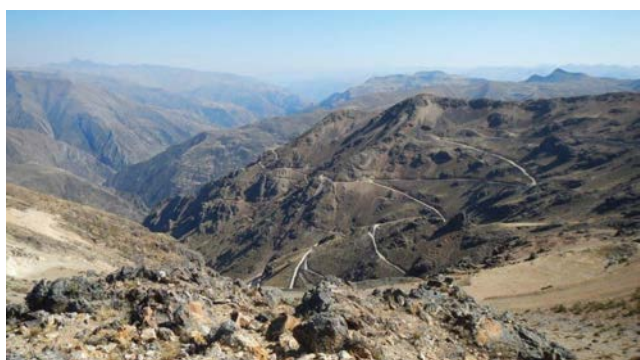


Figure 1. Mines in mountainous regions can leverage the natural topography for storing mine waste.



Figure 2. The tailings dam at Cerro Corona mine (Peru).



Figure 3. The walls of a tailing storage facility in Southern Africa.

occur. The potential damage caused by these factors has caused a re-evaluation of risk and taken the comfort out of the very low probabilities of occurrence. Evidently, the recent failures did not arise due to a lack of inspection or absence of third party review; those measures were in place. In this analysis, the causes are attributable to decisions and actions taken – or not taken – years before. Changes had been made and perhaps small liberties taken that collectively eroded the factors of safety. Ignorance or an excess of confidence led the actors to discount the potential impact of each individual change as it was made or observed.

Safety

For the industry to arrive at a more comprehensive and robust approach to tailings management, behaviours need to change. The current generation of mining professionals is challenged to reconsider the way we evaluate risk and how tailings, water and waste are managed. How mining companies currently approach safety, environmental management and mine closure offers mature and robust templates for communication of risk and behaviour modification.

Over the past 25 years, significant progress has been made with respect to accident and environmental impact prevention, as demonstrated by the significant reduction in fatalities, injuries and pollution. Improving tailings and waste management practices will require a similar all-encompassing effort – everything learned should be applied and the behaviour-based approach should be immediately adopted.

Safety has shown over the years that:

- It is a culture, carefully created and cultivated over time. The need for safety must be understood and supported at all levels. There is a shared ownership of the outcome.
- A safety programme is a set of behaviours that are learned. Companies invest in considerable training and provide equipment, support personnel and procedures for safe work. Much is made of learning from mistakes and near misses; the industry routinely shares experiences so that others do not repeat the same mistakes.
- In addition to the collective responsibility for the safety of those around, safety requires a very personal commitment. Behaviour-based programmes rely on education, training, standards, rules and regulations along with constant reinforcement through messaging from leadership. Safety as a practice takes off when it becomes part and parcel of how one lives, and mining companies and their leaders go to great lengths to make safety personal.
- The industry identifies and evaluates risks, prepares emergency preparedness plans and conducts drills. There are procedures and equipment to aid in responding to emergencies, such as trained first responders, mine rescue teams, etc.

Environmental management

Greater environmental awareness and comprehensive regulations have led to much improved performance at mine sites. Today's mines incorporate measures to limit, control and mitigate environmental impact and monitor and report their performance to stakeholders. Environmental management has taught us that:

- Prevention is far less expensive than remediation. Rules and regulations are forward-looking and can be a huge benefit.

- Environmental management systems for scheduling of inspection, monitoring and reporting activities make routine work of what might otherwise be left to the discretion of those responsible.
- Training and certification are mandatory for those performing certain high risk functions. This is for the protection of the worker and ensures that the work is carried out by suitably qualified persons.

Mine closures

In an effort to reduce the environmental impact from past mining activities, many tailing storage facilities (TSFs) have been closed and remediated. These closed facilities provide a wealth of information about how the current inventory of tailings facilities may behave in the future. A thoughtful study and industry-wide sharing of how more of these facilities are behaving now will be a valuable guide for those presently operating and designing tailings dams. Lessons learned can guide current thinking about how new storage facilities can be engineered and built for the long term. Mine closure has taught us:

- While the productive life of a mine is finite, the post-closure period is open-ended. In the long run, even infrequent events are likely to occur. There is little comfort in the low probability of an event occurring, so the consequences are evaluated with greater rigour.
- Post closure costs have surprised the industry, as mining companies have been unable to relinquish their closed mines. A closed tailings dam can remain a high hazard

structure for a very long time. As a result, miners are increasingly inclined to invest today in practices that will reduce future obligations and seek a post-mining use for the site that supports the required monitoring and maintenance activities.

- Closure requires physical and chemical stability so the mine is not a chronic source of pollution. Water covers are sometimes employed to limit generation of acid drainage and this is at odds with the desire to have the tailings drain excess water and gain strength.

Conclusion

It is the mining industry's stated intent to do better at managing tailings dams. Doing so requires a rethink of how they are designed, built and operated. Work will also need to be done to bring many facilities up to standard. To realise the same improvements seen in safety, environmental management and mine closure, the challenge will require not just some but all to perform to very high standards. This is an opportunity for all practitioners in the field to up their game.

Thoughts become words, words become actions, actions – when repeated – become behaviours, and behaviours define cultures. By modifying attitudes and behaviours, a generation of miners shifted the industry from worst performer to best with respect to safety and the environment. This generation now carries the responsibility of changing a culture and transforming the way mine tailings are managed, for the benefit of all stakeholders. **GMR**