ECOLOGIST
THE JOURNAL FOR THE POST-INDUSTRIAL AGE

Alternative technology and tailings dam disasters

Jax Jacobsen | 6th March 2019

What causes tailings dam - an earth-fill embankment dam used to store byproducts of mining operations - disasters and are there industry solutions?

Brazil witnessed its worst ever mining disaster earlier this year, after Vale's tailing dam in the Brazilian town of Brumadinho in Minas Gerais collapsed without warning.

Estimates tag the number of deaths at 142, while nearly 200 remain missing. Hundreds were evacuated this week near the dam area of another mine in Minas Gerais as a precaution.

This tailings dam collapse comes less than four years after another devastating tailings mine disaster destroyed the town of Samarco, also in Brazil, also managed by Vale (though in a joint partnership with BHP). The Samarco tailings dam failure killed 19, and caused widespread environmental destruction through the state of Minas Gerais.

Tailings technology

Tailings dam disasters have not been limited to Brazil. The Samarco incident came only a year after the tailing dam at Imperial Metals' Mount Polley copper

and gold mine in British Columbia breached. Though no deaths were recorded, the tailings spill was one of the largest ever recorded in history.

Since 1970, there have been over 70 major incidents of tailings dam breaches and collapses. Despite this, there is very little indication that future tailing spills will be averted, due to the nature of the industry and the technical difficulties in finding viable alternatives to storing mine waste.

The Mount Polley independent engineering review panel, released in January 2015, found that incremental changes to the design and implementation of tailings ponds would not be sufficient in preventing another such disaster. The report said: “Without exception, dam breaches produce tailings releases. This is why best practices can only go so far in improving the safety of tailings technology that has not fundamentally changed in the past hundred years.”

Instead, the panel called for the use of alternative methods, including storing mine waste underground, or using the process of dry stacking, which calls for the dewatering and compacting of mine waste for storage.

The report also called for the increased use of dry soil covers for tailings ponds, which can help reduce infiltration and keep oxygen out to prevent sulfide oxidation of mining waste.

Technological change

Four years later, these alternative technologies have yet to make much headway in the industry, though Anglo American did release its vision for its waterless mine last month.

One reason for the delayed uptake in disaster-avoidance strategies is that the mining industry has a reputation for being slower than other industries in embracing

technological change.

Though the hot-button word in the industry has been ‘transformation’ for the past 10 years, mining companies have taken only the smallest of steps to incorporate new technologies and reconsider problematic processes, including but not limited to mine waste storage.

Though there is some appetite for change, market realities have made it near impossible to move forward on these plans. The bottom line of mining companies took a sustained hit in the years of the downturn of the supercycle, and companies were forced to significantly pare down their businesses to survive.

R&D departments were gutted, leaving mining companies with fewer resources now to come up with innovative, effective means of preventing future tailings disasters. Though the industry has recovered somewhat, many of these departments are at minimum staffing levels, if they exist at all.

Cutting costs

Another obstacle to taking more preventative measures to prevent another Brumadinho is the continued disconnect between executives and on-the-ground operators involved in mine planning and closure.

Top-level managers are driven to cut costs wherever possible because of the mining industry’s tight margins, which discourages long-term thinking and responsible budget estimates for extended stage in the life of a mine, such as mine closure and land rehabilitation.

Mine closure is still too often an afterthought in the project plans, and is more often than not seen as a non-essential ‘nice to have’ element in the mine design.

The scale and the human cost of latest Brazil tragedy may change this mode of thinking – but it won’t be overnight, and it’s likely that mine planners will still be butting their heads against budget constraints as they try to create closure plans which do not endanger the local population and environment.

Meanwhile, tailings dams are getting bigger and bigger across the world. Untapped mineral deposits on the earth's surface are increasingly rare, and finding a surface-level deposit is next to impossible. This means that mining operations must dig deep to extract mineral resources, which creates more mining waste - and substantially larger tailings ponds facilities.

Government regulation

Governments have a role to play, though have been slow to respond to the threat posed by potentially unstable mine waste structures. Brazil's government signaled that they would be toughening mining regulations in the wake of the disaster.

Following the Mount Polley incident, British Columbia reconfigured its mine approval process by requiring companies to fully consider the likelihood of a tailings disaster and the environmental and health impacts it would have.

But the reality is that more and more countries are increasingly economically dependent on mining revenues. According to a report put out by the International Council on Mining and Metals this year, low- and middle-income countries were found to depend most heavily on mining.

The report found that the top 50 countries with the highest dependence on the mining industry "are governed at levels below those considered satisfactory for good governance of natural resources."

The more a country relies on mining to reinforce its GDP, the less likely it will be to impose strict environmental and health and safety regulations on companies extracting local metals and minerals. Before Brumadinho, Brazil had been stripping away regulations on mining companies and how they managed mining waste. Only now are officials looking to put those regulations back in place.

Moving forward

Finally, it's important to remember that because the mining industry has no direct consumers it's very difficult for consumers to put any pressure on them by way of

boycotts and public shaming campaigns.

It's all very well and good to be publicly outraged about the poor working conditions of those working in cobalt mines in the Congo – but who among us is willing to forfeit the smartphones that use that cobalt? The same goes for other base metals (iron ore, nickel, lead, copper).

We may be dismayed at the environmental cost of poorly managed tailings dams, but it is very difficult to protest the use of these metals when they're used to build bridges, cars, and other necessities of modern living.

So, what's the way forward?

First, industry organisations – including, but not limited to ICMM – must push harder on the industry to meet environmental and sustainability goals, and ensure that these companies follow best practices at every stage.

Secondly, our generation needs to invest in mining and metals companies. Shareholders have power, and it is to the shareholders that these companies are beholden.

Investors in natural resources firms have traditionally seemed older and more conservative, but as this generation passes into retirement, new shareholders are needed. If new investors demand higher safety and environmental standards, mining companies will have to respond and comply.

This Author

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Image: Bento Rodrigues dam disaster, Wikimedia.