Tailings dams: an explainer

Brumadinho, a week after the tailings dam collapse. Photo credit: Felipe Werneck/Ibama

The who, the what and the why of mining waste dams
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Introduction

With every mining operation comes a mining waste dam, or tailings dam. The first were built two centuries ago and now there are an estimated 3,500 of them around the world. Most people only hear about them if they fail, and even then, the headlines fall in and out of mainstream news fairly rapidly. Anyone wanting to know more about mining should know about them as they are an integral part of the industry.

One of the most deadly mining waste disasters was recorded almost a year ago, on 25th January 2019 in the town of Brumadinho, Minas Gerais, Brazil. Marcela Nayara Rodrigues, from Brumadinho and member of Movement of Water and Mountains, reported during a recent visit to the UK that 272 people were killed by the massive wave of toxic sludge, with 14 still missing. Owned by Brazilian mining giant Vale, many of those affected by this collapse don’t call what happened a tragedy, but a corporate crime.

London Mining Network (LMN) is working on this issue with affected communities and groups supporting affected communities at this critical time. Since 2008, there have been an estimated 50 tailings dam failures and an average of three tailings dams fail a year out of a total of 3,500 worldwide. But as there are around 30,000 mines worldwide, the true number of both tailings dams and dam failures is likely to be far higher.

Cutting through the jargon, we explain below what tailing dams are and the consequences of their failure.

What are mine tailings?

Tailings are the waste products from mining - mining waste. During mining, machinery and chemicals are used to grind up rock into a fine sand to extract minerals and metals from the rock, along with large amounts of high pressured water, often in countries prone to drought. Everything that isn’t useful at the end of this process is waste. This includes finely ground rock particles, chemicals, minerals and water. Depending on the type of mining, tailings can be liquid, solid or a bit of both.

Many substances found in tailings are lethal, others are radioactive. It’s not uncommon to find large amounts of cyanide, mercury and arsenic, thereby creating toxic sludge.

What are tailings dams?

Before tailings dams, all mining companies used to dump their waste into the nearest water source. Tailings dams reduce this but there are still notable cases of companies still disposing their tailings in rivers and the sea, such as PT Inalum, the Indonesian company which owns Grasberg gold mine in West Papua. Birds and animals drink from and bathe in these contaminated waters, whether designated tailings dams or not. And toxic substances from tailings dams regularly leak into nearby rivers and streams, devastating local ecosystems.

Tailings dams can be huge lakes, with embankments reaching hundreds of metres high. Mining waste is piped into or dumped into the dam. One of the main reasons dams fail is due to a lack of monitoring and poor or inadequate maintenance. Companies should be
compelled to monitor their dams, draining excess water if necessary and checking that the dam is strong enough to contain the mining waste.

Movement Against Dams protesting following Brazil's 2015 Samarco disaster

What are the different types of tailings dams?

Tailings dams are different to those built for reservoirs or hydroelectric projects which are usually made from reinforced concrete or stone. There are four different types:

Upstream dams
These dams use a cheaper, higher risk method of construction which is therefore more dangerous. The mine tailings is used to create a barrier. The dam gets higher as more tailings are stored behind them, increasing the risk of collapse. Upstream dams can become unstable and leak if the mine waste behind the dam gets too wet. This will damage the dam and may cause it to collapse. It is no coincidence that most of the dams which have collapsed around the world have been upstream dams.

Upstream tailings dams are finally beginning to be made illegal in some countries, including in Brazil and Chile. The devastating Brumadinho dam disaster has been the catalyst for some governments, some mining companies and some investors to make changes - but none of this is compulsory. There is no international independent or impartial body regulating tailings dams, or in fact, any of the mining industry.

Centreline dams
Centreline dams are in between upstream and downstream dams in terms of expense and stability. The barriers are made out of earth or rock to form a barrage rather than mining waste.
Downstream dams
Downstream dams are also constructed with earth or rock. They are more stable than the two dams above because they don’t store wet mining waste underneath the barriers. They are also more expensive because they take up more space and more material. However, this form of construction is by no means safe from failure or free from negative consequences. For example, a downstream dam at British multinational Anglo American’s Minas Rio operation is regularly leaking toxic waste, local residents told LMN during a visit to the area, in Minas Gerais, Brazil, in August 2019.

Dry tailings
In this method, water is removed so that the dry tailings can be stored with less risk to nearby water sources, ecosystems, workers and communities. So far it is not a popular choice due to it being more expensive and time-consuming. Like all tailings dam types, dry tailings is not free from risk or possible negative impacts. For example, the water removed from dry tailings is likely to remain toxic, making reusing or disposing of it still problematic.

What are the consequences of collapse?

Mining dam failures present a global danger (I will embed this video)
<iframe allowfullscreen="true" webkitallowfullscreen="true" mozallowfullscreen="true" frameborder="0" scrolling="no" marginheight="0" marginwidth="0" width="512" height="288" src="https://video-api.wsj.com/api-video/player/v3/iframe.html?guid=A9BD334E-30B2-4610-822D-1F13032BCB9F"></iframe>

Seven dams collapsed in 2019, in Brazil, Peru, India, Myanmar and Russia. The latter, which collapsed on 17th October, was apparently an illegally built dam which violated safety regulations and was part of a gold mine operation in Siberia. 15 people were killed, 13 others are missing. The first of these was the dam failure at Brumadinho, in the Brazilian state of Minas Gerais on 25th January. An upstream tailings dam, owned by the Brazilian mining giant Vale, burst near to the town of Brumadinho, owned by Brazilian mining giant Vale. Vale employees and external experts had previously warned the company that the dam was unstable. The collapse destroyed or damaged people’s homes and devastated the local environment. A country hotel nearby was destroyed, killing those inside. The company is still clearing the toxic sludge, the dust of which still covers buildings nearby.

In 2015, just 50 miles away and also in Minas Gerais, the Fundao tailings dam collapsed in the town of Mariana. Twenty people were killed and it was Brazil’s worst environmental disaster to date; some 33 million cubic metres of iron ore tailings were released into the vital water source, the river Doce. A million people along the river were affected and the waste travelled over 500km to the mouth of river in the Atlantic Ocean. This mine operation was owned by Samarco - a joint venture of Vale and British-Australian mining company BHP. Over four years on and Samarco has not yet completed one single house for the affected communities. The ecosystems and fish which support communities alongside the river may never recover.

In August 2014, Canadian mining company Imperial Metals’ Mount Polley copper-gold mine dam collapsed releasing 25 million cubic metres of waste water and tailings into nearby water systems and lakes. A year before it failed, the company reported that the dam
contained 84,831 kilograms of arsenic, 38,218 kg of lead and 562 kg of mercury along with other minerals and waste products.

**Dodgy dams we know about**

Some 687 tailings dams are at high risk of failure, according to recent research carried out by investors. Most of the 262 high risk upstream dams are in South Africa. Back in 2016, tailings dam expert Lindsay Newland Bowker wrote that all 144 of Brazil’s large tailings dams should be considered at significant risk of failure.

In June, British multinational companies such as Glencore and BHP reported that five of its tailings dams were at ‘extreme’ risk of causing damage and loss of life. Glencore admitted that 17 of its dams were at extreme risk of failing.

Spanish mining company Atalaya is listed on London’s Alternative Investment Market - a less regulated market (for smaller companies) than the London Stock Exchange. The company’s Riotinto Mine [formerly associated with Rio Tinto mining company but not now] is an opencast copper mine in the province of Huelva, Andalusia, southern Spain. The mine currently processes 9.5 million metric tons of copper ore per year with plans to expand to 15 million metric tons per year.

In May 2017, Spanish environmental organisation Ecologistas en Acción published a video which was picked up on social media showing one of the sections of the Riotinto dam leaking and piping/bubbling, indicating problems with the dam’s retaining walls.

The ratio of liquid to solid in the dam is 70 percent liquid to 30 percent solid. Violating the environmental conditions of which the company holds its license to operate, Atalaya Mining has not built the necessary concentration plant to thicken the tailings to the 50 percent solids required. Despite warnings by Ecologistas en Accion and expert Dr Steve Emerman in his
report for LMN, published in June 2019, that the dams have exceeded their capacity and are at extreme risk of collapsing, nothing has been done.

Are there alternatives to tailings dams?

Yes, no, kind of! Rather than calling for the use of a different type of tailings dam, LMN calls for independent monitoring of tailings dams and that mining companies are accountable for their dams during and post-operation. We also urge shareholders to hold these companies to account. We advocate for a justice transition to post-extractivism, in other words, we agree there needs to be less fossil fuel mining to decrease carbon emissions, but we shouldn’t replace this with metals mining - we need to reduce all types of mining. This approach would necessarily reduce the number of tailings dams.

Is the mining industry doing anything?

Governments that grant mining licenses to companies need to implement stricter environmental legislation for them to abide by, the UK government needs to increase penalties for mining companies operating overseas which violate UK law, and international binding regulations need to be implemented by an independent body. Currently companies are invited to sign up to voluntary standards rather than binding ones.

The International Council on Mining and Metals (ICMM) has formed an independent committee to set global standards for tailings dams, but as long as its members include British-linked multinationals Glencore, BHP, Rio Tinto and other large mining companies, it’s difficult to see how it could be truly independent.

Since Brumadinho, major mining industry investors such as the Church of England pensions board along with other investors are developing an Investor Mining and Tailings Safety Initiative on tailings dams to record data from around the world. Some mining corporations are responding to requests for data and others are not. It is important to remember that this initiative relies on self-reporting, and as many companies have failed to report back on some or all of the questions asked, the database is far from complete. Diligence is needed to ensure that companies do not use the database to greenwash the harmful practices they are continuing elsewhere, while improving their reputation with regards to the appearance of increased tailings dam safety.

What work is LMN doing on tailings dams?

London Mining Network supports communities badly affected by companies listed on the London Stock Exchange and the Alternative Investment Market (AIM), so our work on tailings dams focuses on multinationals BHP, Rio Tinto, AngloAmerican and Glencore. We continue to monitor these companies activities, as well as many other UK-connected mining companies operating around the world. We continue to monitor these companies activities, as well as many other UK-connected mining companies operating around the world.

We are also looking into Vale - a New York Stock Exchange registered company - because some of its current and former investors are British, and work being done in the aftermath of Brumadinho such as the Investor Initiative will, we hope, place effective pressure on the mining industry as a whole.
We have been involved in advocacy on Brazil’s 2015 Samarco disaster for a number of years, inviting representatives to the UK to attend the company’s annual general meetings (AGMs) so they can ask the BHP board what they plan to do for those affected, in terms of house-building to broader reparations and accountability. We continue this work and advocacy throughout the year.

We have recently published a detailed report and a report summary on Atalaya Mining’s RioTinto tailings dams in Spain, which are at real risk of collapse. This report has already been used in legal proceedings against the company.

We will be marking the first anniversary of the Brumadinho collapse with a vigil between 4-6pm on 24th January 2020 at London’s Brazilian Embassy. We will be remembering those who died by reading out their names, holding a minute’s silence, lighting candles and hearing from those affected, or reading out statements on their behalf.