



Mining Waste Overview

Mining produces a large waste stream in Australia, estimated at 502 Mt in 2018-2019. All mining waste is managed by companies as part of their normal operations. Mineral processing generated 28.2 Mt and agriculture and fisheries accounted for 28 Mt. These industries also manage their own waste. The waste industry managed 74.1 Mt of 'core' waste from households, industry, and construction. Household and local government waste accounted for 12.6 Mt of core waste. Yearly mine waste production is approximately 40 times that of yearly household waste.

Options for tailings

An estimated 83% of mine waste is tailings – pulverised rock from which economic minerals have been extracted. The chemical composition of tailings varies according to the source rock.

Tailings are generally mixed with water and the slurry (25% - 50% solid) is pumped into a storage facility, usually a tailings dam. Tailings can be treated by centrifuging or filtration to make a mostly solid product. Due to water scarcity, techniques that thicken the tailings and recover water are increasingly important.

In some cases, tailings can be used to fill worked-out open pits (e.g. Granites Gold Mine, Northern Territory). If the chemistry is favourable, tailings dams may be revegetated for rehabilitation. If economic minerals are present, tailings may be re-processed (e.g. Mineral Hill Mine, NSW). The flat surface of a tailing's storage facility may be repurposed as a solar farm (e.g. Kidston Gold Mine, Queensland).

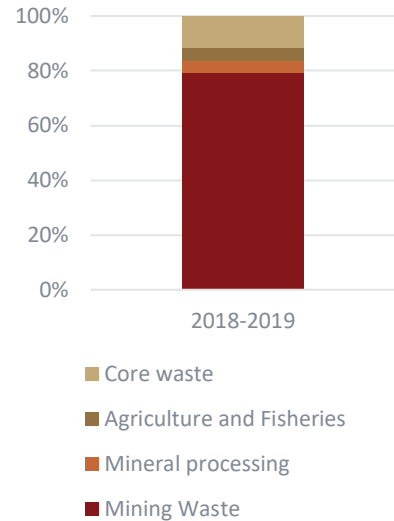
Reuse of tailings at Mungari gold mine

Evolution Mining's Mungari operation is located near Kalgoorlie in Western Australia. It consists of two open pits and the Frog's Leg underground mine.

Large quantities of grout are used in underground mining to stabilise tunnels and prevent water inflow. Grout is usually made from sand and cement, but tailings are used instead of sand at the Frog's Leg site.

Each year, approximately 200 000 tonnes of tailings are reused for grouting. If the mine used sand, this would need to be mined

Australia's Waste
2018-2019



Tailings being pumped into a tailings storage facility at Mungari (courtesy of Evolution Mining)



elsewhere and would cost approx. \$10 million per year. Use of tailings reduces the need for waste storage and avoids the use of other mined resources (sand).

Grouting paste is 76% solids and 24% water. The mine uses saline water pumped out of the open pit operations to make up the grout, thus saving surface waters and reducing the need for management of hypersaline water.

The mine tried using tailings for shotcrete – a spray-on concrete used to support tunnels underground. Workers needed additional protective gear due to fumes from the mixture, so this use was not pursued for the Frog’s Leg mine.

Creating grout from tailings



From top left to bottom right: close view of dried tailings; dried tailings stockpile; dry tailings are loaded into a hopper; cement from the large cylinder is mixed with tailings in a 1:21, cement : tailings ratio (photos courtesy of Evolution Mining)

Discussion questions

1. Identify ways in which mine tailings or tailings storage facilities (tailings dams) may be used.

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2. Outline the environmental benefits of reuse of mining waste. Use data on Australia's waste as well as information from the case study in your response.

3. What are the financial benefits of reusing tailings? _____

4. An idealised production model is that of the circular economy, in which waste is used as a resource. Explain how the Mungari operation shows characteristics of a circular economy.

References:

With thanks to Evolution Mining for providing information and illustrations from Mungari Gold Mine.

Australian Government (2016). *Tailings Management: Leading Practice Sustainable Development Program for the Mining Industry*. Available online at: <https://www.industry.gov.au/sites/default/files/2019-04/lpsdp-tailings-management-handbook-english.pdf>

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