Onland Waste Disposal

Generally, the type of waste management that ought to be used for a mining operation is specifically designed to suit that particular deposit (site-specific). This is mainly due to natural events and conditions, of which tectonic activities (e.g., earthquakes and landslides), high rainfall, rugged topography, and rock types can influence the salinity, porosity, and permeability of the near-shore environment. Significant environmental damages have been reported to be associated with improper dumping of mining waste.

Submarine Waste Disposal

The mining industry has a long history of dumping waste into the sea. Submarine waste disposal encompasses both the direct dumping of waste rock and the discharge of tailings via pipelines into the sea. The dumping of mining waste in the marine environment may only be considered and used where on-land disposal options are problematic, due to the factors highlighted above.

Submarine Tailings Disposal (STD) is simply the dumping of tailings into the marine environment. With new technological innovation and increasing concerns of environmental impacts, the use of a disposal system known as Deep Sea Tailings Placement (DSTP) is reported to have been used in various regions including the Pacific Islands region. This method of waste disposal, where tailings are discharged through a submerged pipe into the marine environment below the primary productivity zone (euphotic zone) of the surface water (Figure 7b), is generally considered to be environmentally safe. These discharged tailings are expected to be permanently deposited in a deep-water environment. Hundreds of million tonnes of tailings are discharged into the marine environment annually from any mine operation that uses the DSTP system.

However, the impacts of this “out-of-site” waste disposal system are arguably not fully understood due to limited scientific knowledge and data. This method may have serious long-term environmental ramifications hence environmental conservation groups have called for independent reviews of studies conducted by consultants for mining companies. This method may have serious long-term environmental ramifications. The impacts of this “out-of-site” waste disposal system are generally considered to be environmentally safe. These discharged tailings are expected to be permanently deposited in a deep-water environment. Hundreds of millions of tonnes of tailings are discharged into the marine environment annually from any mine operation that uses the DSTP system.

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Tailings and Copper Ore and Waste

Mining Waste Disposal

Mining waste can be defined as waste materials that result from the exploration, mining and ore processing. It may consist of natural material without any modification other than crushing or of natural material processed to varying degrees during the ore processing phase, and possibly containing chemical, inorganic and organic components. Overburden and waste rock are largely produced during the mining phase whereas tailings and processing waste are generated during the ore processing stage (Figure 3). There are other waste categories that are associated with mining such as sulphur and gases produced during ore processing, waste water, mechanical waste (fuel/oil/grease), and sewage.

Overburden and Waste Rock

Overburden is the top soil and/or rock that overlie an orebody. Waste rock is any rock material produced during a mining operation that contains minerals of no economic value. Generally, mine overburden and waste rock are removed to allow access to the orebody.

Tailings are generally stored on the surface in retaining structures but can also be used as backfill materials in mined out areas underground. Backfilling can provide ground and wall support in any underground operation and also provide an alternative to surface tailings storage.

Mine Tailings

Tailings can simply be defined as the mine waste, predominantly crushed rock materials, produced after the extraction of wanted minerals during ore processing. They are usually transported from the processing plant via pipeline to a final storage area commonly known as a Tailings Storage Facility (TSF) or Tailings Dam (Figure 5A).

Waste rocks contain hard and soft rock materials including low concentrations of targeted minerals (e.g. gold, copper and silver) that are uneconomic to process, and measurable concentrations of other metals such as arsenic, cobalt, nickel, mercury, lead, zinc, and other minerals. Waste rock may incorporate other waste materials such as soil, water, fuel, oil and remnants of used explosives.

A concerted effort by key stakeholders of the industry is needed to better manage mining waste in order to avoid or minimise environmental impacts. Environmental regulations are being modernised, placing more stringent requirements on the mining industry, particularly with regard to waste disposal practices. This ultimately places added pressure on the operators to ensure proper methods of waste disposal and waste water management are implemented and monitored regularly.

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