

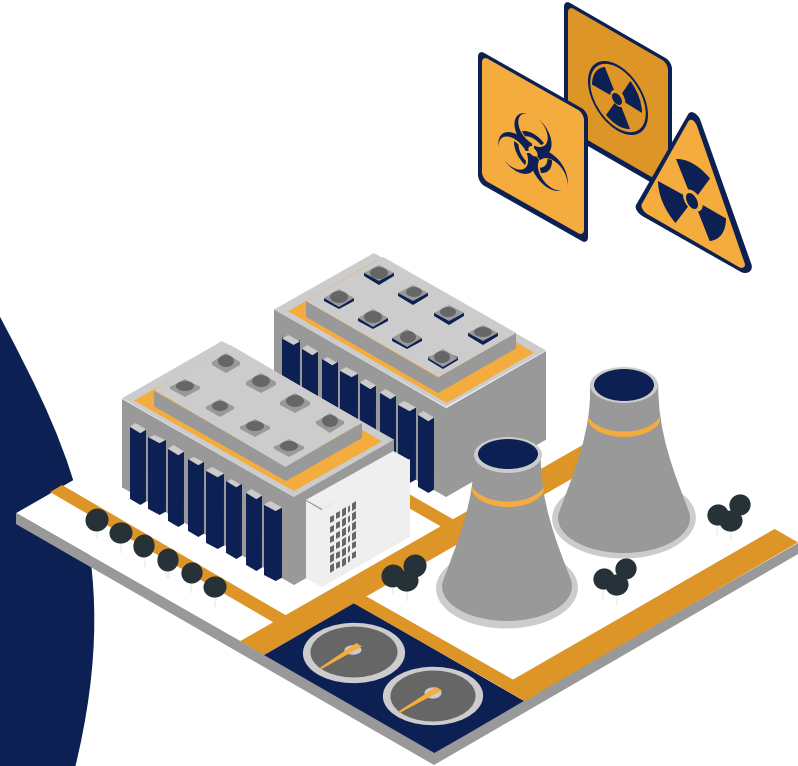


Potential and Prospects of Tailings Waste Utilization

Wednesday, 21st Januari 2026



Director of Hazardous and Non-Hazardous Waste
Management



Generation of Tailings Waste in Indonesia (Government Regulation No.22/2021)

Tailings are classified as hazardous waste (B3) under code B416, originating from the processing and/or refining of metallic mineral ores in the mining industry. In mining practice, tailings are also commonly referred to as mine dumps, culm dumps, slimes, refuse, leach residue, slickens, or terra-cone (terrikon).



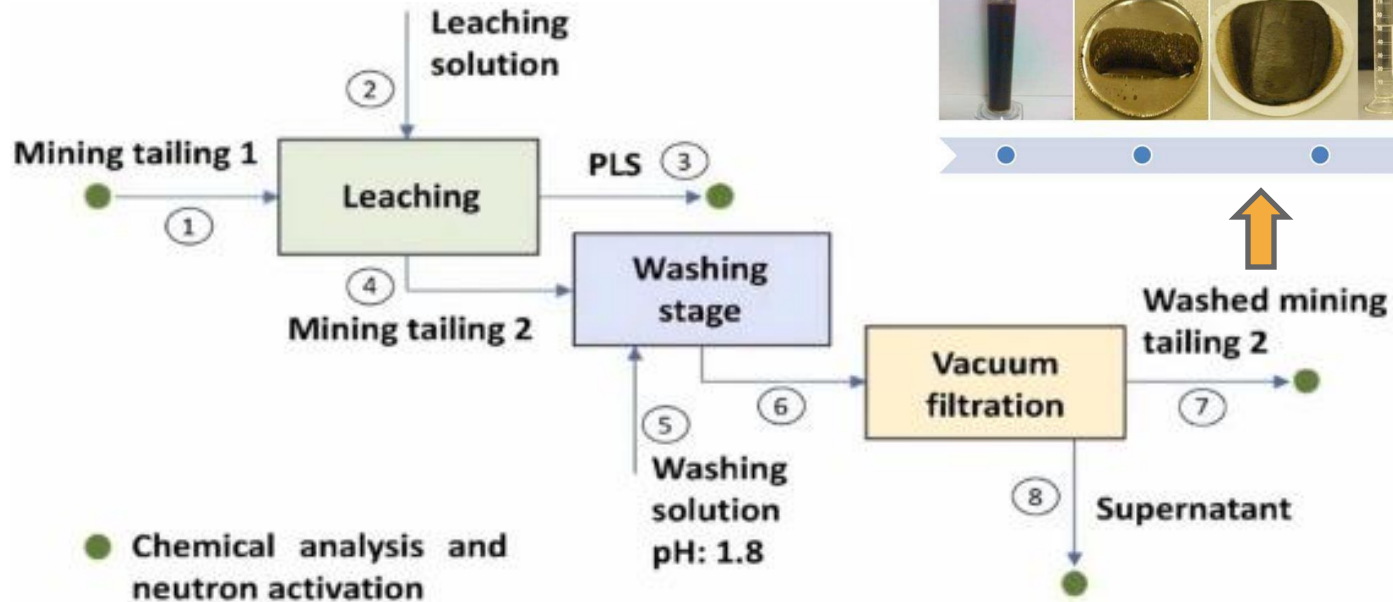
122,088,087 Ton

This volume of tailings waste has been reported by all mining operators In 2025.

(Source SPEED KLH)

Mine Tailing Generation

From Journal of Environmental Chemical Engineering, Mine tailings (MTs) are pulverized rock and mineral fractions that are abandoned after the targeted and gangue fractions have been separated :



Tailings Waste Management

In recent decades, the global mining sector has expanded rapidly in response to the increasing demand for metals and minerals. The mining industry plays an important role in achieving the United Nations Sustainable Development Goals (SDGs 17: “ensuring sustainable consumption and production patterns”), because it consumes large amounts of natural mineral resources and generates massive waste streams, **with tailings being the largest waste stream.**



At present, tailings are commonly disposed of in the most convenient ways, such as into Final disposal or tailing dam



Final Disposal



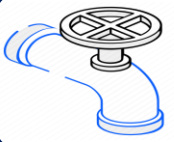
Re-deposition in Ex Mining Areas



Tailings Storage Dams

Urgency of Tailings Waste Utilization


Tailings are considered an environmentally friendly construction material because they consist of more than 50% fine sand fraction with particle sizes of 0.075–0.4 mm. In addition, according to the hazardous waste management hierarchy, landfilling is not a preferred option..



Massive Quantities
Produced in large volumes along with the rapid growth of the mining sector.



Water Pollution



Agricultural land contamination

Contamination of drinking water

Agricultural land pollution



Threat to Human Health

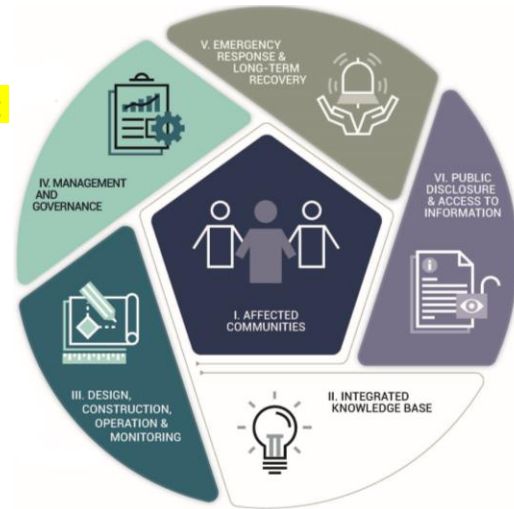
Dependence on Disposal Practices



Land Exploitation Used



GHG



Tailing Dam Failures

The largest incidents occurred in the Philippines in 1992 and in Brazil in 2015 and 2019.



Dry stacking can be used, but it requires complex geotechnical structures.



Examples of Tailings Utilization Based on Type

MT type	Blend type	Attributes	Applications
Copper	-	High compressive strength	Bricks
	-	High mechanical characteristics	Road-construction materials
	FA	Uniform microstructure	Binder materials
Gold	Al ₂ O ₃	High adsorption capacity	Lead (II) adsorbent from aqueous sol
Iron	FA	High compressive strength and Improved setting time	Binder materials
	FA	Good thermal resistance; low porosity and microcrackings	Binder materials
	Glass wool residue	High compressive strength and flexural strength	Binder materials
	FA	High adsorption capability; porous structure	Copper (II) adsorbent from water
Phosphate	FA/MK	High mechanical properties and density	Binder materials
Lead-Zinc	Coal gangue/BFS	High compressive strength	Binder materials

The utilization of tailings waste highlights the potential of tailings to address sustainability challenges across various industries, particularly in the construction sector. Research by Caballero et al. (2024) has demonstrated that tailings possess exceptional mechanical strength and long-term durability.



Presents an economically viable and structurally sound approach

Data Source: *Journal of Environmental Chemical Engineering*

Utilization of Tailings Waste in America

Types of tailings identified	Application
Iron ore; Copper; Platinum Group Metals; AMD; Zinc; Phosphogypsum; Slag; Red mud; Electric oven powders; Limestone powder; Fly ash and sewage sludge; clay-based residues; Gold tailings; Marble; Coal combustion;	Construction materials
Manganese; Phosphogypsum; Platinum Group Metals; Combustion coal; Mine drainage sludge; Limestone powder; Phytoremediated tailings	Agricultural applications
AMD-causing tailings	Geopolymers
Chromium ore tailings	Automobile catalytic converters; electronic materials; jewelry
Sand-based tailings; Platinum Group Metals; Coal combustion; Copper slag	Landfills and source of rare earth elements

- ❑ America has utilized tailings to produce **lightweight construction materials and ceramics** (commercially known as autoclaved aerated cement and Ceramext™).
- ❑ The use of tailings reduces Portland cement demand by up to 20% while still producing materials with good strength and durability.
- ❑ Therefore, according to the Global Tailings Review, **America has utilized 85% of the tailings waste it generates.**

Tailing Waste Utilization in Indonesia

Ministerial Regulation No.6/2021 (Hazardous Waste Management)

Utilization of Tailings Waste as Raw Material Substitution



Must contain more than 50% metal oxides



Requires market research



Must comply with SNI or equivalent standards

Potential economic value of utilization:
IDR 3,384,000 per ton of tailings

Tailings Waste Disposal (Landfilling)



Requires complex geotechnical structural analysis



Consumes large areas of land

Land requirement: 1 hectare for 288 million tons of dry tailings

Products from Tailings Utilization

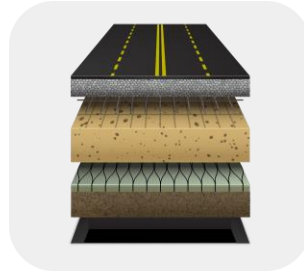
The Ministry of Environment fully supports the utilization of tailings waste, with careful attention to preventing environmental pollution.



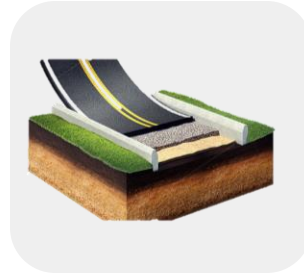
Dore Bullion



Paving Block dan Batako



Roadbase



Mining Roads



Readymix



Paste Fill

HOW TAILING WASTE MANAGEMENT CONTRIBUTE IN GHG REDUCTION

Utilization of Tailings Waste as Raw Material Substitution

In general, tailings are used as a substitute for natural sand in various construction material applications.

Carbon Emission Factor

Natural Sand	Tailing
6.6 KgCO _{2eq} /Ton	0 KgCO _{2eq} /Ton

Since tailings are an unwanted by-product in the mining production cycle, their carbon footprint burden is considered to be zero.

Reduction Tailings Waste Generation

- Tailing waste can be reduced by improved separation technologies and residual metals can be extracted.
- By improving processing efficiency in mining through tailings recovery, the overall GHG impact per functional unit of the mining system will be improved.
- With the reduction of tailings waste, the land required for tailings disposal will also decrease, thereby reducing greenhouse gas (GHG) emissions associated with land use.

THANK YOU

**Directorate of Hazardous and Non-Hazardous
Waste Management**

