Mining Waste Management

Value in Circularity
Major Categories of Mining Waste ................................................................. 3

Circularity – The Solution to Multiple Challenges ........................................ 3

Potential Mining Waste Management Market and the Way Forward ............ 4

How Leading Companies are Embracing Circularity ................................. 5

Evaleserve Support and Solutions ................................................................. 6
The global mining sector is faced with dual challenges: depleting reserves amid growing demand and the need to transition to net-zero emissions. The solution lies in sustainable growth; optimized operations; and reduction, reuse, and recycling of waste.

Mining companies need to reconsider their waste management processes. We will try to identify opportunities that mining companies can capitalize on. But before we do that, let's understand the types of mining waste.

**Major Categories of Mining Waste**

- **Exploration**
  - Orebody: A solid mass of ore, coupled with gangue; it is different in form and character from its surrounding host rock

- **Mining**
  - Waste rock: Large mass of initial soil and rock covering mineral deposits; close to five tons of waste rock is typically removed to extract a ton of ore
  - Gangue: Commercially valueless rock or vein matter in which valuable metals or minerals occur

- **Mineral Processing**
  - Tailings: Fine ground rocks and mineral waste left over after minerals are extracted from gangue; generally, contain processing chemicals

- **Metallurgical Processing**
  - Mine water: Water pumped from mines usually containing impurities, either suspended, or dissolved. The water often contains corrosive agents, such as acids or alkalis
  - Sludge: Is a semi-solid slurry that includes a variety of solid sedimentary material, mixed in with any kind of liquid

**Circularity – The Solution to Multiple Challenges**

One of the most versatile solutions for the mining industry’s waste management challenges is circularity. While a linear economy is structured to ‘take, make, and create waste,’ a circular economy is restorative and regenerative in nature. While the former focuses on transforming raw materials into products that are used and subsequently discarded, circular economies use waste to build materials that can be reused across segments. For example, mining companies can use solid waste from mines to make construction materials (such as bricks and concrete) and tailings to produce glass or fertilizer (depending on mineral composition).

No wonder the mining sector is already witnessing a strong move towards circularity, supported by conducive regulations and legislation. Moreover, consumers’ preference for responsibly sourced metals and mounting pressure from stakeholders and governments to operate more sustainably are
driving this shift. Consequently, metals and mining companies are being compelled to look at partnerships and operating models that help them operate in a circular economy.

Why More Mining Companies Should Accept Circularity

Potential Mining Waste Management Market and the Way Forward

The volume of the global mining waste management market was estimated to be around 200 billion tons in 2020 and is predicted to post a CAGR of ~5% during 2021–26, accompanied by a lot of attention to the monetization of solid waste. At the same time, a commodity super cycle is providing a much-needed push to the concept of circular economy and the need for businesses to take up recycling.

Although the opportunities are immense, circularity also carries some risks for mining companies. Increased circularity can impact primary demand, as waste and material losses will be reduced. Companies that are not well-positioned to monetize the new recycling flow would lose the market to more innovative players. Therefore, it is important that mining companies adopt circularity by taking the following steps:
Discarded e-waste has a 50 times higher concentration of precious metals and rare earth elements than ores mined from the earth. In 2019, ~54 million metric tons of e-waste was generated globally, but only <18% was recycled. The remaining >82% represented ~USD 50 bn of lost value from materials (cobalt, palladium, copper, etc.) that could have been recovered.

How Leading Companies are Embracing Circularity

Rather than mining for new ore, companies should try and meet demand through recycling. Companies such as Sumitomo, JX Nippon, and Glencore have already established specialized business units to focus on recycling.

Recent Examples

**GLENCORE**
- **Waste Processing** — separate recycling arm to recycle electronics. Recycles secondary copper, gold, silver, platinum and palladium
- **GHG Emissions** — committed to switching to 100% renewable by 2023

**LKAB**
- **Waste Reuse** — production ofapatite (phosphorus) concentrate from the waste generated by its iron ore operations. The material also contains REEs
- **Tailings Management** — Veolia designed, built and now operates tailings water treatment plant to recover a concentrated copper solution

**ANTIMANTRA PLC**
- **Renewable Energy** — committed to switching to 100% renewable by 2023

**NORNICKEL**
- **Recycle & Reprocess** — Uses high pressure hydro/mechanical mining to reprocess tailings and obtain minerals
- **GHG Emissions** — started producing “carbon-neutral nickel” by upgrading the hydro power plant and cutting CO2 emissions at all stages

**GETCO**
- **Mining Stages** — exploration
- **GHG Emissions** — started producing “carbon-neutral nickel” by upgrading the hydro power plant and cutting CO2 emissions at all stages
- **Tailings Management** — Veolia designed, built and now operates tailings water treatment plant to recover a concentrated copper solution

---

© Evalueserve. All rights reserved.
Conclusion

The impending ‘green transition’ of the economy will drastically increase the demand for metals. The demand for copper is expected to increase from ~1.5m tonnes in 2020 to 4.5m tonnes in 2030, leading to a supply gap of more than 8 mt. Nickel and cobalt will face similar supply deficits over the next few decades. Primary mining alone will not be sufficient to meet this demand and companies will have to embrace circularity and look at secondary metals to meet the increased demand.

Evalueserve Support and Solutions

Clients across the globe are using Evalueserve’s decarbonization solution frameworks to accelerate their decarbonization journey and move towards greener operations and product portfolios.

Key Pillars of Decarbonization – Evalueserve Perspective on Improving Environmental Performance

Making existing products sustainable

- Extending life of existing products
- Green innovation in existing products
- Increasing efficiency or decreasing energy consumption
- Repositioning existing products

Introducing disruptive / breakthrough products

- Self-sustaining solutions
- Smart systems to reduce waste

Accomplishing Cleaner Operations

- Carbon Efficiency
  - Carbon capture utilisation and storage
  - Energy efficiency
- Using Clean Energy
  - Renewable power
  - Fuel alternatives
  - Clean hydrogen

Moving from Linear to Circular Economy

- Recycling

Sustainable Sourcing and Supply Chain

- Green Sourcing
- Sustainability performance
Authors

Ankur Verma
Manager, Metals & Mining Practice

Rahul Arora
Manager, Metals & Mining Practice

ABOUT EVALUESERVE

Evalueserve is a leading analytics partner to Fortune500 companies. Powered by mind+machine™, Evalueserve combines insights emerging from data and research with the efficiency of digital tools and platforms to design impactful solutions. A global team of 4,000+ experts collaborates with clients across 15+ industries

CONNECT WITH US

If you are interested in speaking with Evalueserve about how your organization can adapt for tomorrow, please contact us at info@evalueserve.com or for more information, visit www.evalueserve.com.

Evalueserve Disclaimer

The information contained in this report has been obtained from reliable sources. The output is in accordance with the information available on such sources and has been carried out to the best of our knowledge with utmost care and precision. While Evalueserve has no reason to believe that there is any inaccuracy or defect in such information, Evalueserve disclaims all warranties, expressed or implied, including warranties of accuracy, completeness, correctness, adequacy, merchantability and / or fitness of the information.