

ICMM's Track 1 Tailings Aspirational Goal

Overview and Objectives

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Who is ICMM?

27 company members operate in over 50 countries



With the support of over 30 regional and commodities associations, we strengthen the environmental and social performance across the mining and metals industry.



ICMM Principles for sustainable development



Ethical business + sound governance



Sustainable development in decision making



Respect for human rights



Effective risk management



Health + safety performance



Environmental performance



Conservation of biodiversity + land use management



Responsible use + supply of materials



Social contribution



Engagement + transparent reporting

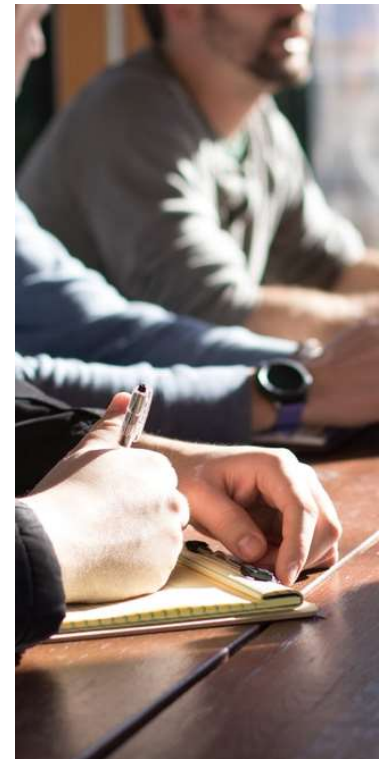
ICMM's aspirational goal on tailings

Overview

- In late 2018, ICMM company member CEOs signalled their commitment to a long-term goal on tailings
- Members agreed to ***“work collectively to advance progress over the next 10-15 years towards developing superior and cost-effective alternatives to conventionally managed tailings storage facilities (TSFs) with the aim of reducing the risk of catastrophic failure”***.

Three tracks of work to support progress towards the goal:

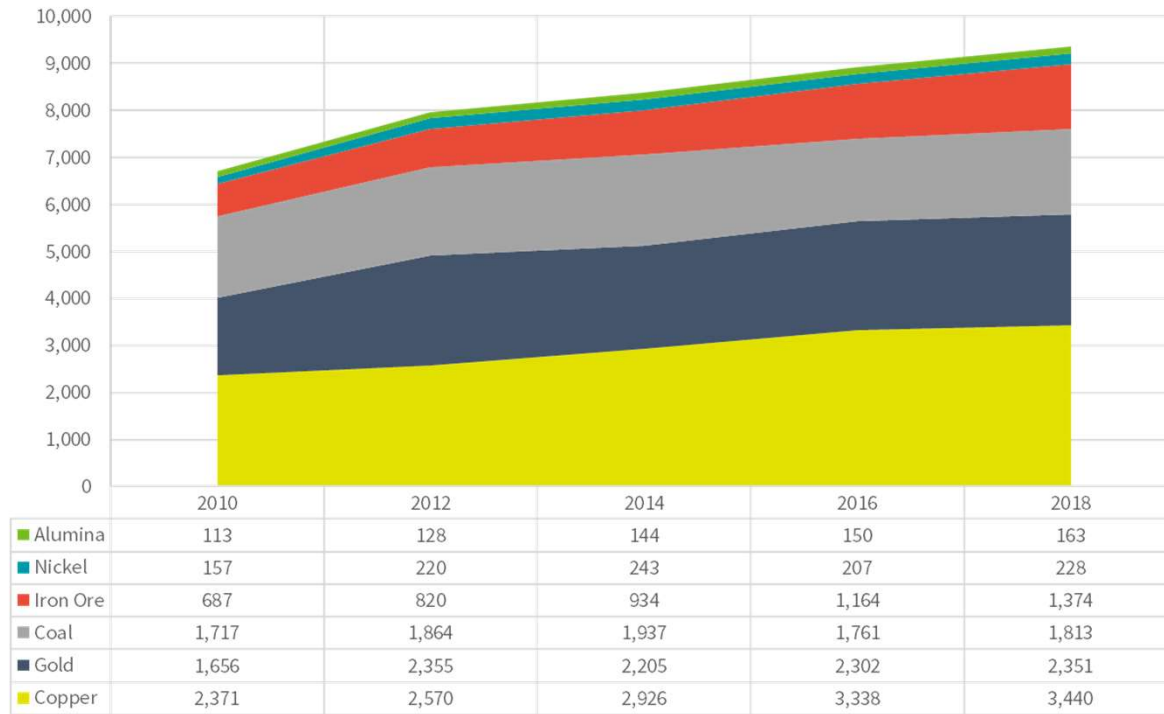
1. Reduce / eliminate tailings (>15 years)
2. Remove moisture from and strengthen tailings (5-10 years)
3. Strengthen operational performance for the design, operation and closure of tailings storage facilities (3-5 years)



Context

Combined tailings production rate has increased by ~40% since the start of the decade.

Estimated Global Tailings Production 2010-2018 (Million Metric Tonnes)



Year

Technology Themes for Reducing Tailings

4 technology themes and 5 groups have been selected

Technology Themes

Precision Geology: Advanced geometallurgy (Enabler)

- Quantitative mineralogy,
- Spectral imaging,
- Data analytics (typhoon, AI, measure while drilling)

Precision Segregation: Bulk Ore sorting

- Continuous bulk sorting
- Batch sensing (truck and shovel)

Precision Segregation: Advanced sensing and particle sorting

- Sensor hardware (quantum sensors) & software (quantum technology and AI)
- Sensor calibration and verification
- Advanced particle sorting

Precision Mining: Preferential fracturing

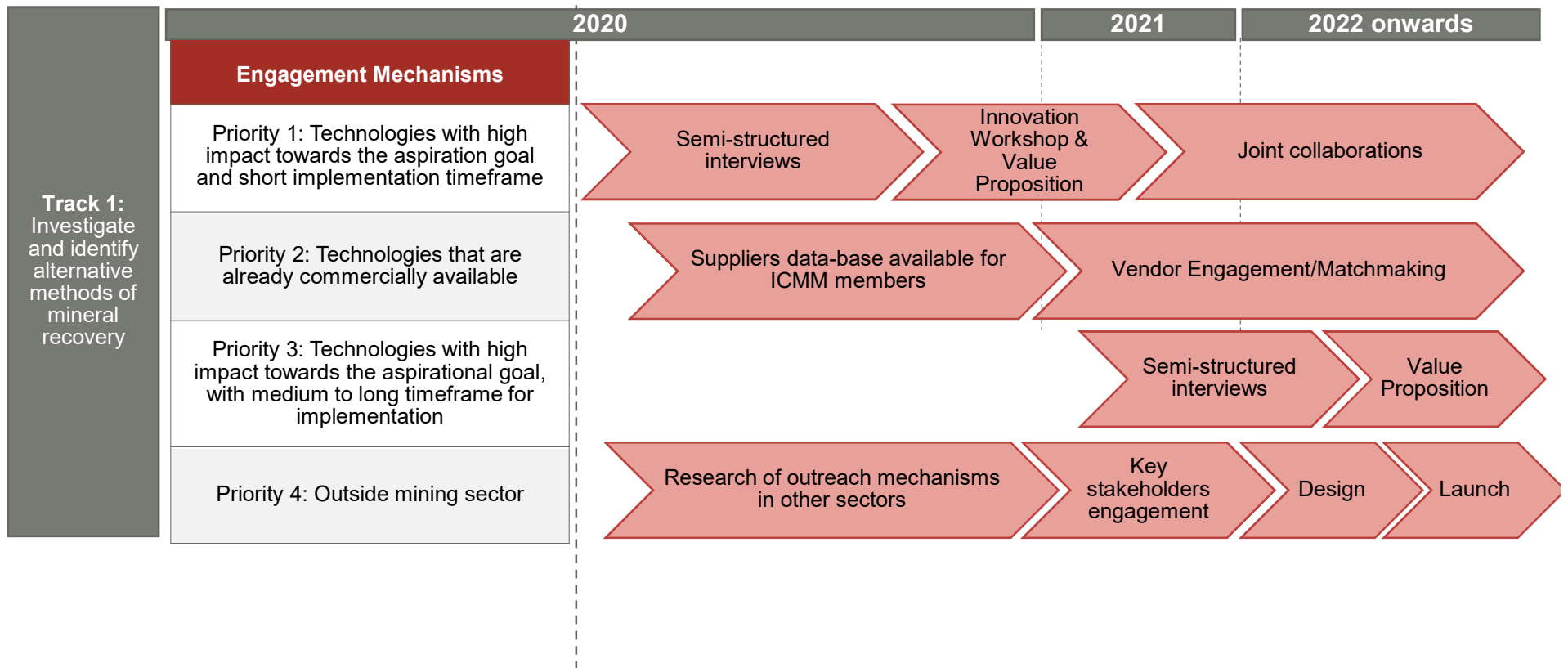
- Fragmentation (high voltage pulse, microwave, laser, other)
- Continuous Mining - Preferential Cutting in Hard Rock

In-situ Recovery / In-situ Mining

- Percolate ISR (underground and ISR reactors)
- Well-to-well ISR for hard rock
- Lixiviant development

- ❑ Landscape Review
 - Hatch identified ~90 technologies and with input from a sub-committee of AngloAshanti, Freeport, Glencore, Newmont, Rio, South32
- ❑ Deep Dive and Prioritization (in progress)
 - Based on TRL level, impact on tailings reduction, timeframe to commercialization
- ❑ Goal to encourage collaboration and possibly contribute to the on-going work
- ❑ Aspirational goal therefore clear expectations are required
- ❑ Knock on Effects
 - Energy reduction in (hoisting/comminution/trucking)
 - Lower overall capital costs, water use
 - Synergies ie: Fragmentation + Continuous Miners + Sorting

Schedule of Implementation (Preliminary)



Do you have a technology could impact on the ICMM Track 1 Aspirational Goal?

ICMM
International Council
on Mining & Metals

MINING WITH
PRINCIPLES

How do you get involved and participate?

ICMM

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on Mining & Metals

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