

ICMM's work related to tailings

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1. About ICMM
2. Global Tailings Review (GTR) to develop an international standard
3. ICMM Guide to Tailings Management
4. Progress on Tailings Aspirational Goal

- Vice President, Science and Environmental Management, with the Mining Association of Canada
- Since 2015, I have been leading MAC's work on tailings management
- Lead author on the MAC guidance documents on tailings management
- In early 2019, I was asked to play a similar role in the development of the ICMM guidance on tailings management
- Appointed to the Advisory Group for the Global Tailings Review
- Prior to joining MAC, I was a subject matter expert on mining for 22 years with Environment Canada, the federal regulatory agency for the environment in Canada
- A geologist by training, I did graduate work looking at the geochemistry of tailings from early 20th century silver mines

1. About ICMM

What we do

Our mission:

To strengthen the social and environmental performance of the mining and metals industry and build recognition of its contribution to local communities and society at large.



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

Who we are

26 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.

2. Global Tailings Review

Council strongly supportive of the proposed actions

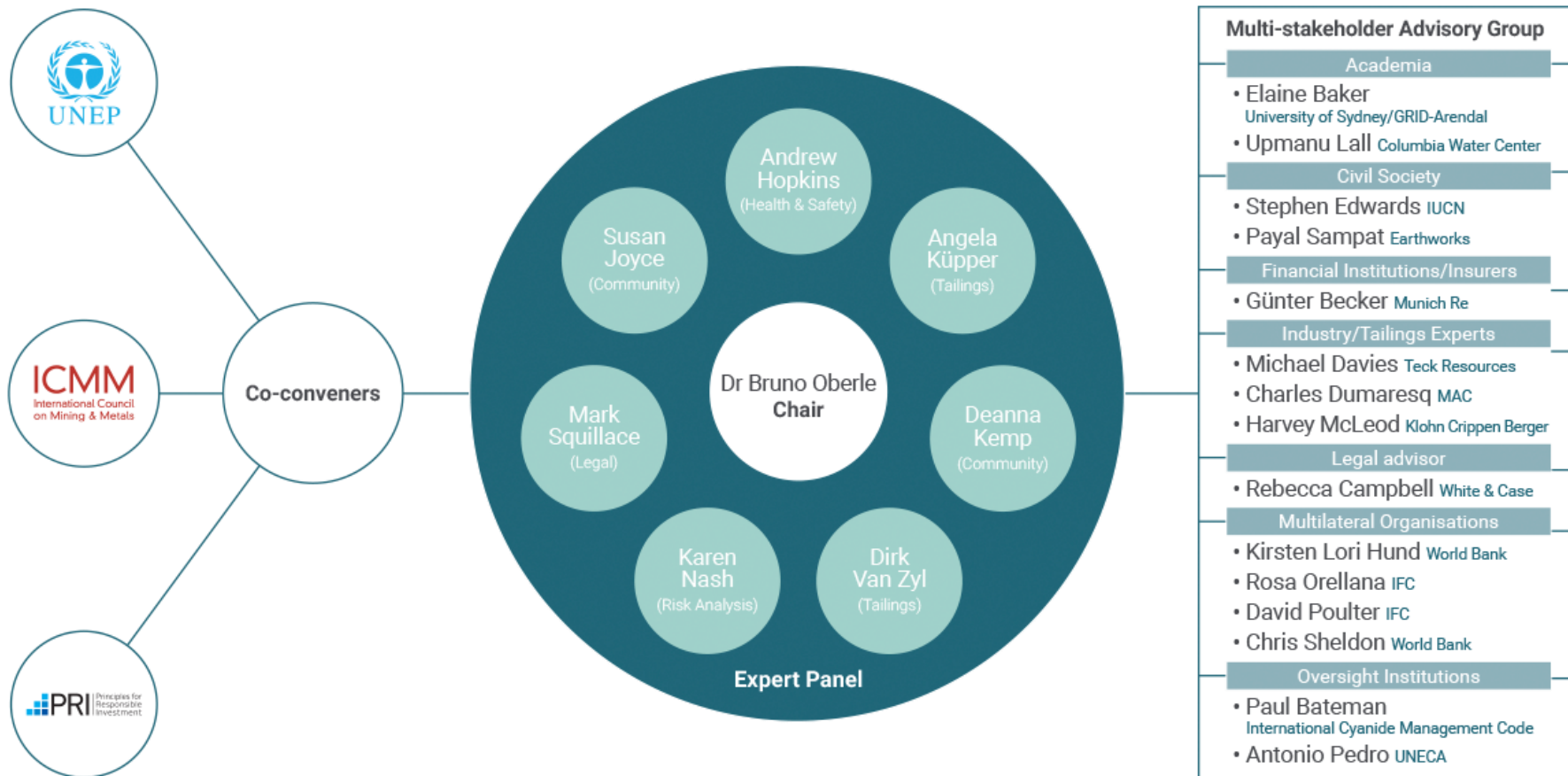
- A. High level review – fully independent
- B. The review will develop a international standard including a consequence-based classification system and associated disclosure
- C. Develop guidance document for the safe design, construction, operation, and closure of tailings facilities
- D. Short term - training on the Mining Association of Canada tailings management guidance and ICMM's guidance
- E. Supporting longer term research and training
- F. Strengthening capacity within ICMM to support members, eg develop a knowledge database on lessons learned

Global Tailings Review

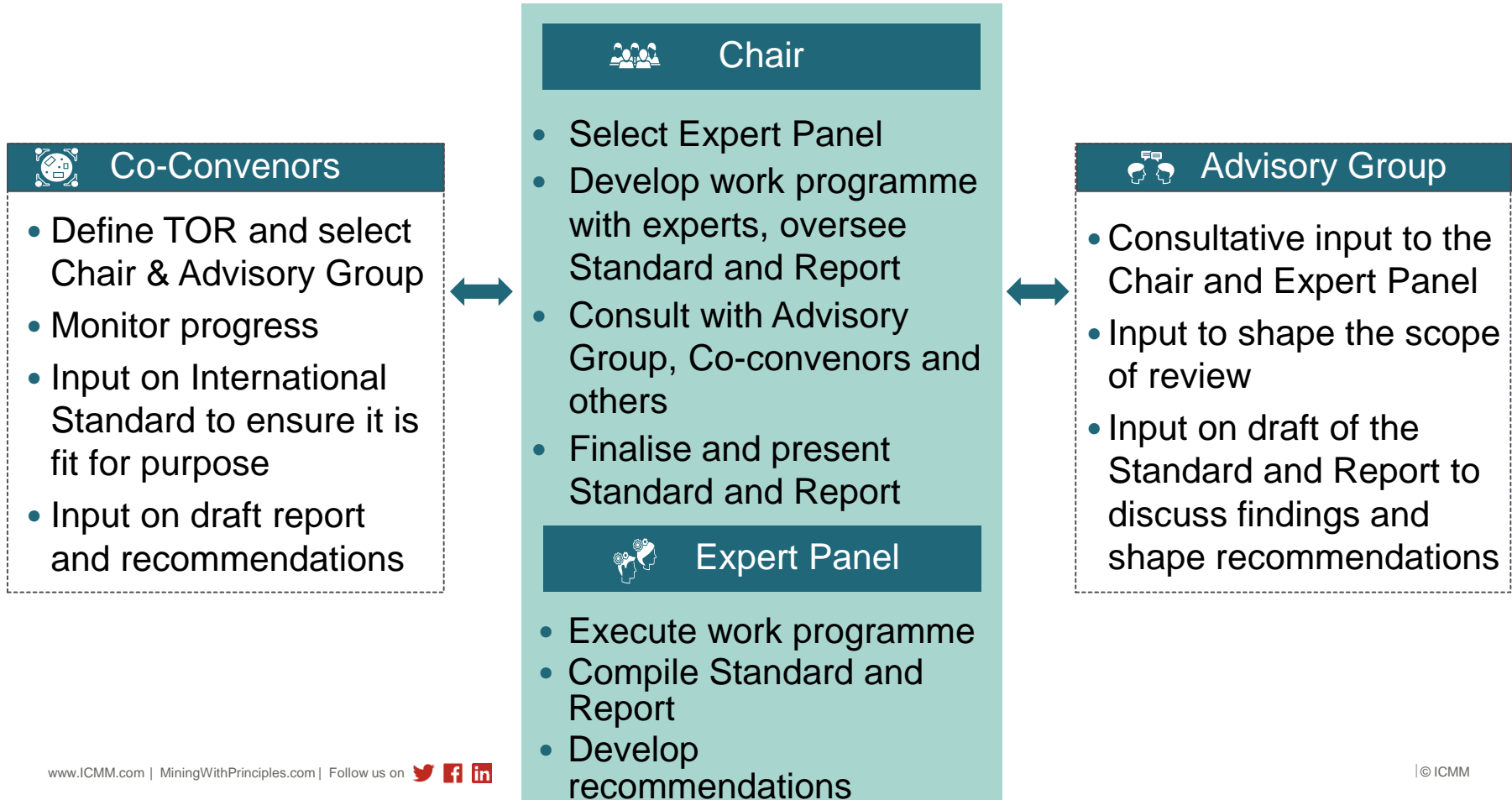
Global Tailings Review (GTR) Governance

ICMM
International Council
on Mining & Metals

**MINING WITH
PRINCIPLES**



Roles of Various Parties



Two key outputs



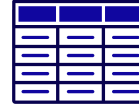
International Standard for Tailings Management

Review global best practices and lessons learned to inform International Standard, with flexibility to improve over time



Includes, but is not limited to:

- Consequence-based classification system for TSFs
- System for credible, independent reviews
- Requirements for emergency planning and preparedness for each classification level



Recommendations Report

Analysis of behavioral, cultural and structural factors (which may not appear directly in the International Standard)



The Report will outline broader recommendations to support uptake and implementation of the Standard.

Likely elements of the Standard – TBC

- **Knowledge base** to inform decisions relating to the design, operation and closure of tailings facilities
- **Initial planning** to include selection of tailings facility site and technology, inundation study
- **Tailings facility** design, construction, operation, and monitoring
- **Governance**, which includes defining accountabilities, independent reviews, disclosure of information
- **Emergency preparedness**, ensuring that all responsible authorities and affected communities are engaged
- **Recovery plan** in the unlikely event that a failure happens

Method	Audience
Main method	
Online public consultation	Global concerned stakeholders participating either on behalf of their organisation or as an individual. All audience groups
Supplementary methods	
Regional in-person consultation	Local regulators and concerned stakeholders (including local community members) <i>[Potential locations include Australia, Chile, China, Ghana, Kazakhstan, South Africa]</i>
Consultation with government representatives at IGF	Engage with ~60 governments at the highest level at IGF meeting in Geneva, Switzerland

GTR Anticipated Timeline

Field Visits



Brazil (July)
British Columbia and Alberta (September)

Public Consultations (online and regional)



Before end of December 2019

Standard & Report Finalisation



Quarter 1 2020

Launch and Dissemination



Quarter 1 2020 onwards

3. ICMM Guidance on Tailings Management

Overview

- Being developed by ICMM's Tailings Working Group, in consultation with Professor Morgenstern and GTR team
- Will provide comprehensive guidance on principles and practices for tailings management, intended to support
 - Safe, responsible management of tailings
 - Implementation of the international standard
 - Implementation of a performance-based, risk-informed approach to tailings management
- Will not provide detailed guidance on technical aspects of tailings management (which is provided elsewhere such as the ICOLD technical bulletins)



How Guidance relates to the International Standard

	International Standard	ICMM Guidance
What it is	Succinct, non-negotiable requirements	A 'how-to' guide, describes best practice
How it will be used by ICMM	Committed to by ICMM members; the co-convenors will support broader uptake across the industry	Will be used as a basis for capacity building within ICMM and beyond
How it is developed	Developed by a fully independent process, shaped by multi-stakeholder consultative input and drafted by an interdisciplinary expert panel	Developed by ICMM's tailings working group (in line with other ICMM's guides), with extensive input from Prof Morgenstern
Timing of completion	Final draft will be completed after the public consultation period	Final draft will be completed after the Standard is released, in order to support the implementation of the Standard and provide further guidance in areas where a Standard cannot be too prescriptive

Structure of the Draft Guidance

- Guidance is intended to reach a wide audience, including some for whom the concepts presented will be unfamiliar
- To effectively reach a broad audience the guidance will be structured in two parts:
 - Descriptions of concepts, principles, and practices for safe, responsible tailings management that apply across the life cycle of TSFs, in order to:
 - Provide explanations of topics that may be unfamiliar to some readers
 - Introduce concepts, principles, and practices that apply across the life cycle (eg accountability, independent review, tailings management systems)
 - Descriptions of how these concepts, principles, and practices (eg managing risk) apply to specific life cycle activities, and introduce additional concepts, principles and practices that are specific to certain activities (eg alternatives assessment)

Basis for the Guidance

- Guidance builds upon ICMM's 2016 *Tailings Governance Framework* but is more comprehensive in scope with guidance for the site-specific management of tailings
- ICMM using established guidance on tailings management from the Mining Association of Canada (MAC) as a starting point
 - 2019 *Guide to the Management of Tailings Facilities* (the MAC Tailings Guide)
 - 2019 *Developing an Operation, Maintenance, and Surveillance Manual for Tailings and Water Management Facilities* (the MAC OMS Guide)
- Guidance responds to recommendations to ICMM from Norbert Morgenstern, (Distinguished University Professor (Emeritus), University of Alberta in Canada)
 - Recommended that ICMM develop guidance on a tailings management system based on a Performance-Based, Risk-Informed Safe Design Construction Operation and Closure of TSFs (PBRISD)

MAC Tailings Guide

- Designed to be applied by MAC members or non-MAC members to any tailings facility in the world
- Applies across the entire life cycle, from conceptual planning of tailings management to closure and post-closure
- Describes a management framework for tailings, based on the ISO 14000 Environmental Management standard but tailored to tailings management
- Emphasizes that accountability for tailings management must rest with the Owner, at the highest level of the company
 - Stakes are too high for the ultimate accountability to rest at the site level

MAC OMS Guide

- A tailings management system, performance objectives and risk management plan provide a framework, but OMS is needed to operationalize them on a day-to-day basis
- *Without OMS, there is no control*
- To be effective, OMS manuals MUST be site-specific, reflecting the specific site conditions and life stage, and the experiences and knowledge of personnel on site
- OMS Guide provides guidance for developing and implementing site-specific OMS manuals
- Designed to be applied by MAC members or non-MAC members to any tailings facility in the world

Recommendations of Prof. Morgenstern

- In a lecture in Brazil in 2018, Prof. Morgenstern stated that there is “no set of simple prescriptions will resolve the crisis” with tailings dams
- Concluded that the “dominant cause of these failures arises from deficiencies in engineering practice associated with the spectrum of activities embraced by design, construction, quality control, quality assurance and related matters”
- Recommended Performance-Based, Risk-Informed Safe Design, Construction, Operation, and Closure (PBRISD) of tailings facilities
- Underlying principle is accountability, achieved by multiple layers of review, recurrent risk assessment and performance-based validation from construction through to closure
- Referenced both the MAC Tailings Guide and OMS Guide

Performance-Based, Risk-Informed Safe Design, Construction, Operation, and Closure (PBRISD)

Stage 1: Conceptual

- Qualified Operator
- Establish Independent Review Board
- Uncertainty Assessment
- Potential Problems Analysis
- Multiple Account Analysis

Stage 3: Construction and Operations

- Operations

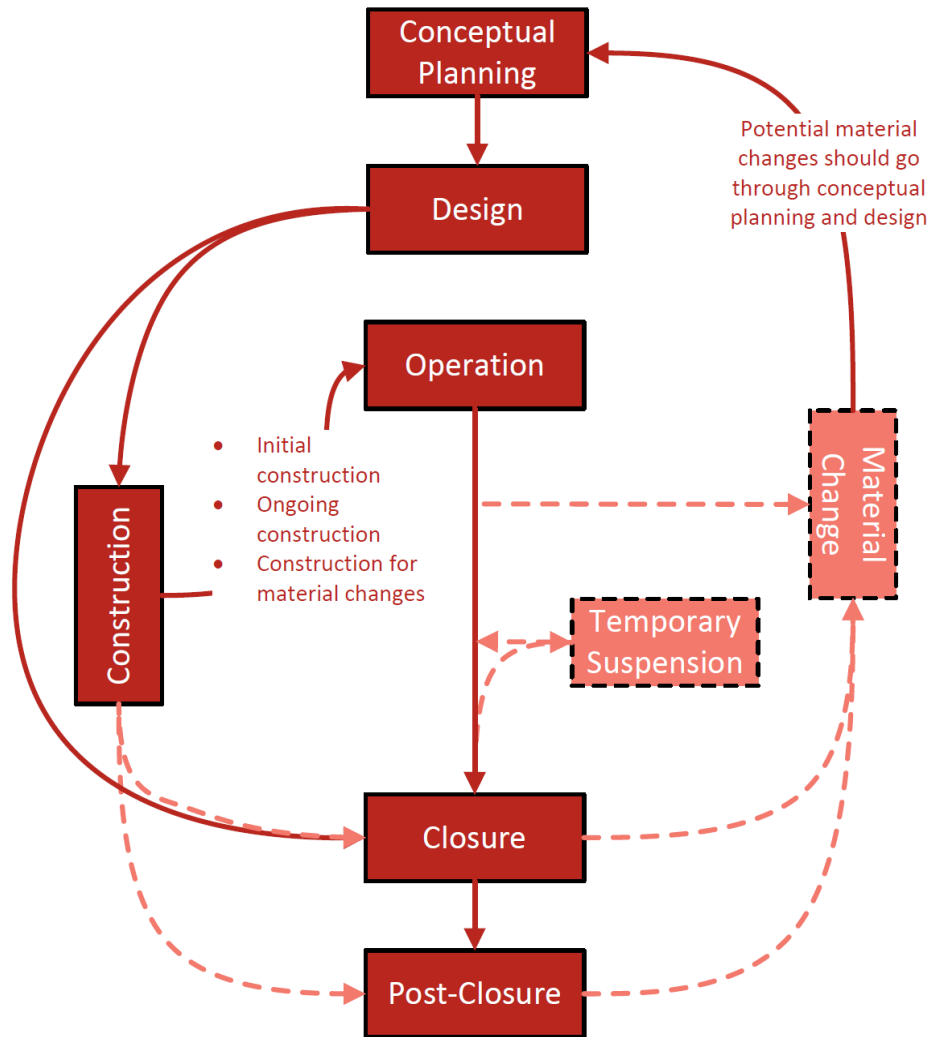
Stage 2: Feasibility

- Engineer-of-Record (EoR)
- Designer
- Design Basis Memorandum
- Risk Assessment
- Quality Management
- Documentation

Stage 4: Closure Implementation

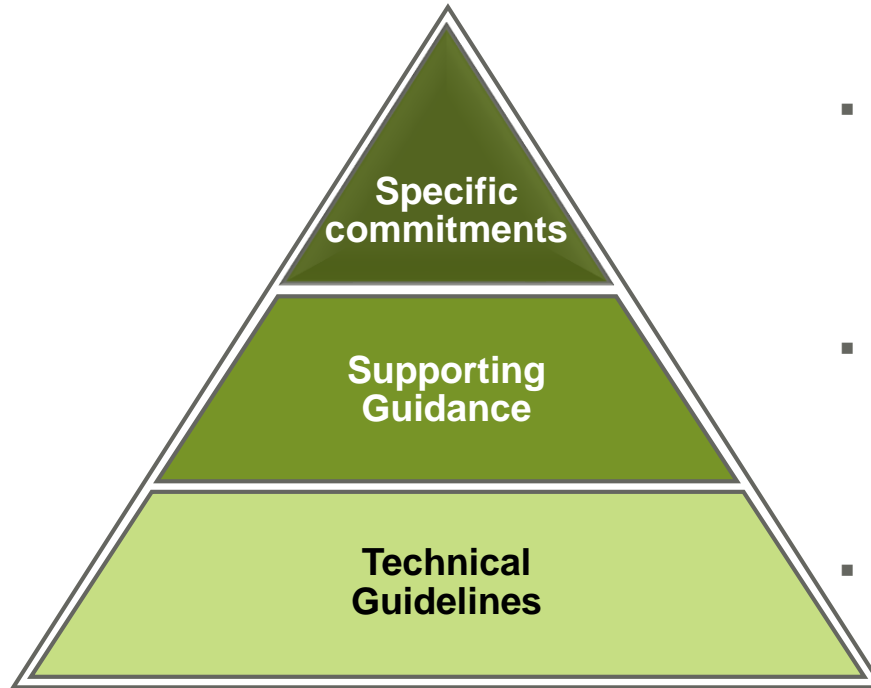
Food for Thought

What is the Life Cycle of a Tailings Facility?



Connection between various 'documents'

How various pieces of work connect together



- Future requirements of **International Standard** from GTR
- ICMM **guidance** that responds to Prof. Morgenstern, international standard, and incorporates other materials
- ICOLD, ANCOLD, CDA, JCOLD, SANCOLD, etc.

<https://www.icmm.com/en-gb/environment/tailings>

<https://globaltailingsreview.org/>

<https://mining.ca/our-focus/tailings-management/>

<http://victorfbdemello.com.br/en/de-mello-lectures-2/>

Tack!

ICMM
International Council
on Mining & Metals

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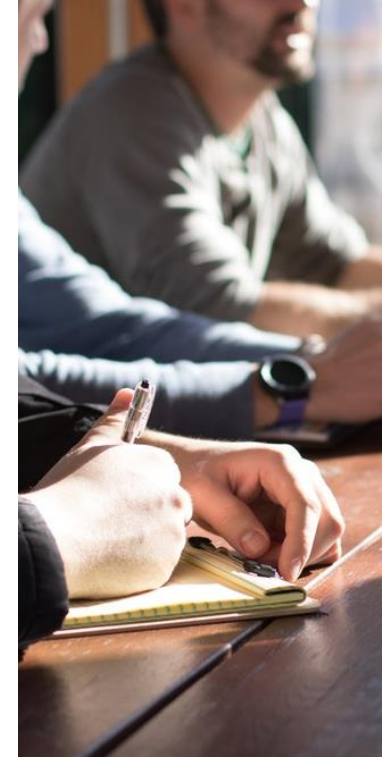
4. Progress on Tailings Aspirational Goal

ICMM's aspirational goal on tailings

- 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 conventional wet tailings storage facilities (TSFs)”***.

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)



Progress on the tailings aspirational goal

ICMM's aspirational goal on tailings

Landscape Review to identify roadmap for 2020 and beyond (Tracks 1, 2)

- Contracted Hatch to review alternative methods of mineral recovery to reduce or eliminate tailings & technologies to dewater & strengthen tailings

Vendor engagement to canvas technologies for dewatering tailings and monitoring of TSFs (Tracks 2, 3)

- Vendors selected to present to 7 ICMM members in July, at Tailings Conference in Santiago
- The second round will be held on 16 Nov, before Tailings & Mine Waste Conference in Vancouver

Internal member survey (Tracks 1 to 3)

- To gain a view on the current R&D initiatives underway, benchmark amongst members, and provide a picture of the market to the vendors

