



Challenges and opportunities in the path towards sustainable development of mineral resources
 Why UNFC should respond?

The Challenges for mineral industry



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- Ensure sufficient, reliable, affordable and environmentally responsible supplies of energy and raw materials
- Demonstrate alignment to SDGs
- Decarbonize the economy
- **Social acceptance**

“If mining companies truly hope to repair their image, they must do more than change their messaging. They must also fundamentally change their behaviors around the way they mine how they engage with communities, attract talent, and deliver on their promises.”

James Ferguson
Global Mining Tax Leader
Deloitte UK

Changing mineral working conditions



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- Depleting grades
- Difficult mining conditions (greater depths; difficult terrain)
- **Improving productivity with decreasing grades**
- Increasing energy and other requirements for processing
- Boom-Bust cycles

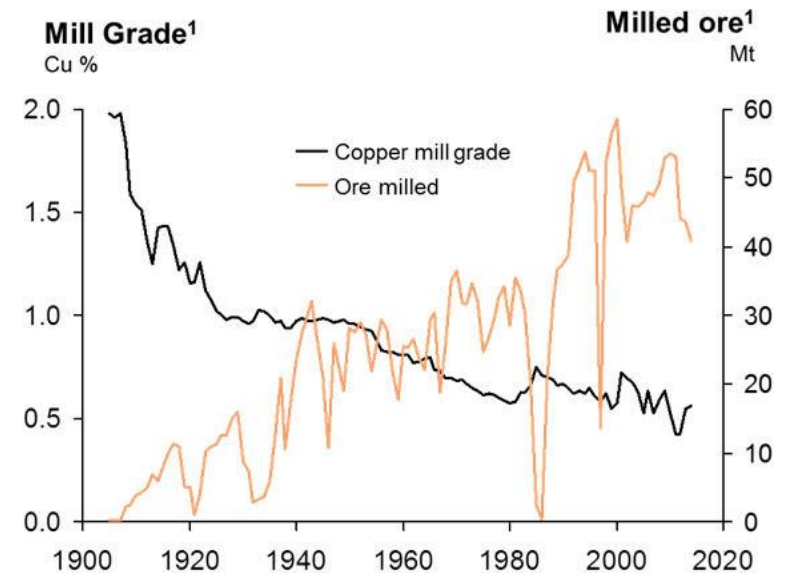
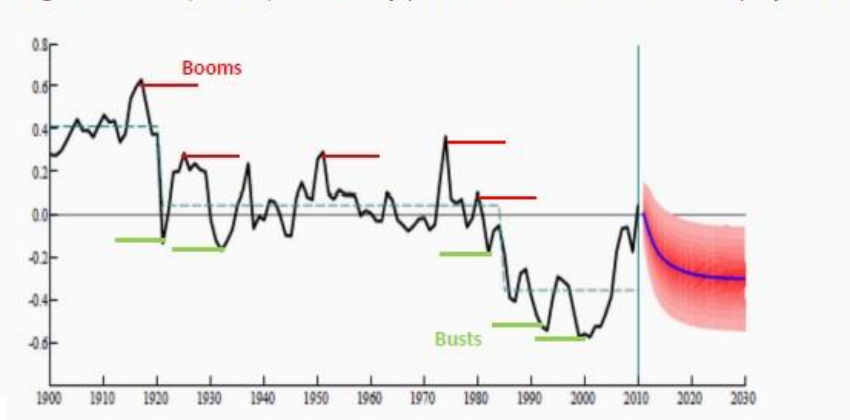


Figure 1. Real (non-oil) commodity prices since 1900 and a naive projection



Water stress



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A quarter of mining production, representing up to US\$50bn in annual revenue, could be exposed to water shortages and drought by 2030.

CDP, July 19, 2017. "World's mining heavyweights put \$16 billion at risk in climate costs."

<https://www.cdp.net/en/articles/investor/press-release-worlds-mining-heavyweights-put-16-billion-at-risk-in-climate-costs>

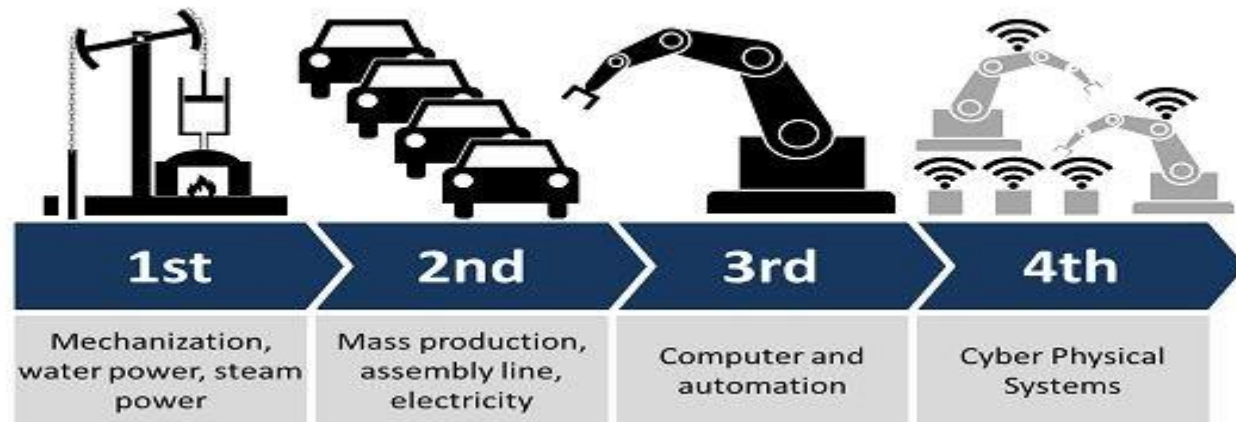


Mining 4.0



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- Technology
 - Big data
 - Artificial intelligence
 - Ultra selective mining
 - Comprehensive resource recovery



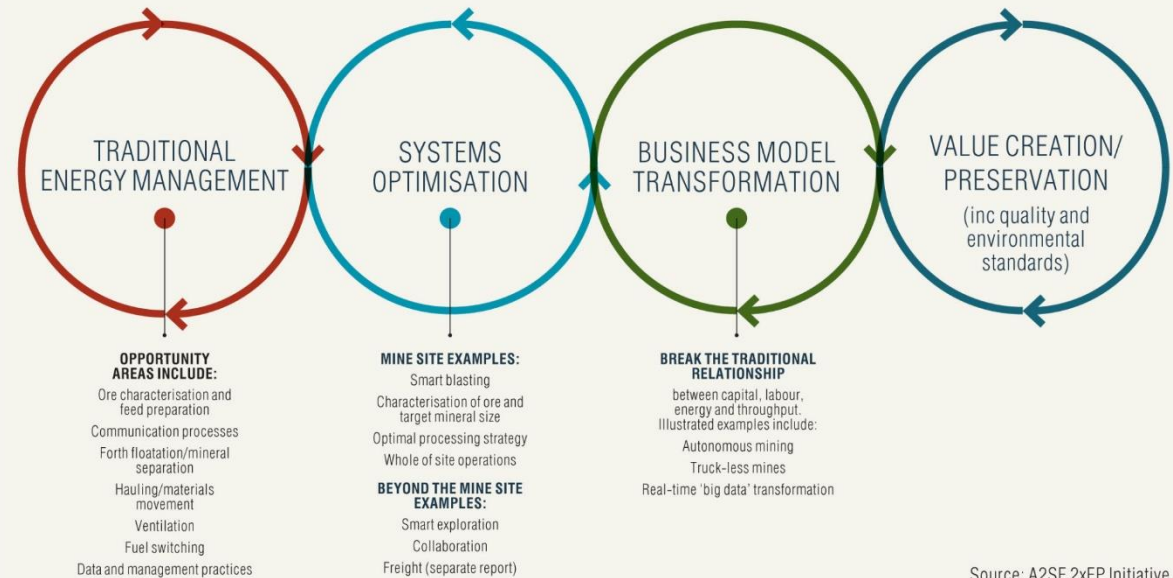
Value beyond minerals



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- New business models needed to:
 - Discover of “clusters of value”
 - Value-added mineral products and services
 - Secondary resources from “wastes”
 - **Water resources**
 - Land resources

Figure 2. Mining energy productivity framework.



Source: A2SE 2xEP Initiative.

Resource progression depends on ...



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- ✓ Policy
- ✓ Social
- ✓ Economic
- ✓ Regulatory
- ✓ Treatment of exploration data
- ✓ Mining Methods
- ✓ Sorting
- ✓ Processing
- ✓ Refining
- ✓ Metallurgical aspects
- ✓ Comprehensive recovery
- ✓ Value-addition
- ✓ Environment
- ✓ Anthropogenic resources
- ✓ Safety
- ✓ Infrastructure
- ✓ Marketing
- ✓ Legal and contractual framework
- ✓ Fiscal design and administration
- ✓ Revenue management and distribution
- ✓ Site closure
- ✓ Remediation
- ✓ External cost factors (esp. water treatment)
- ✓ Human resources
- ✓ Sustainable Development Implementation

UNFC Mineral Management System – A Global Workspace



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Predicting the future of mining



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- **Innovation in the mineral sector** (exploration, mining, processing, remediation, mine closure) and understanding of how sustaining, transformational and experiential innovations are going to change discovery of resources in the future.
- The mineral potential that will be mined in the future (**materials that will be required for the future**).
- How we foresee mineral industry transformation, especially through the networked development and **identifying clusters of value**.
- Success stories focused on building and **nurturing a catalytic environment** conducive to innovation in mineral management.
- Development of **less water consuming mining, milling and processing technologies**

UNFC Mineral Management System



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- Promote the consistent and coherent classification of all mineral resources and “values”
- **Provide specifications and guidelines that will allow the mineral industry to align to good outcomes**
 - Resource classification (UNFC Framework)
 - Resource management
 - Socio-economic and commercial assessment
 - Innovation planning and management
 - Definition of life-cycle and certification of recovery chains
 - Collaboration with CRIRSCO, **PERC and other National Reporting Organizations** for improvement of the Template



Thank you and Glückauf!

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