The Mining Association of Canada | L'association minière du Canada

Presentation to the FPT Working Group on Adaptation and Climate Resilience

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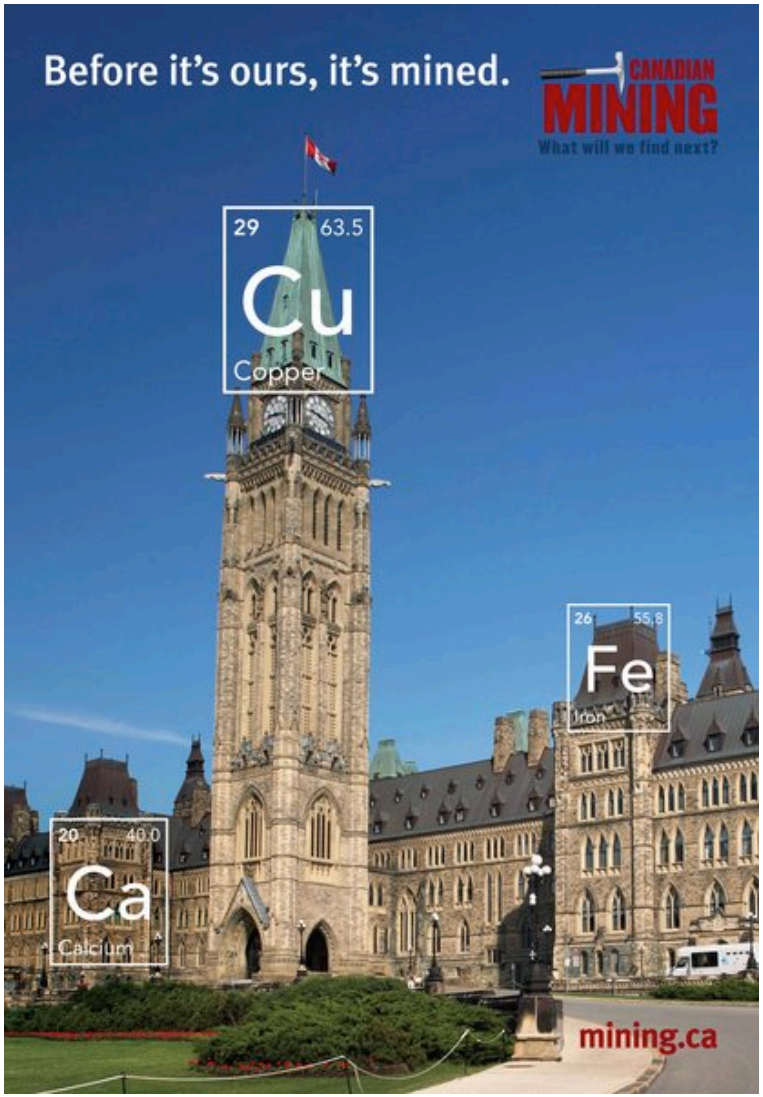


The Voice of the Canadian Mining Industry

Representing members committed to sustainable mining

- Advocacy – to advance the business of mining.
- TSM Initiative – stewardship and social license.
- 35+ members in iron ore, gold, diamonds, oil sands, met-coal, base metals, uranium.
- 50+ members that service the mining industry, including engineering, environmental and financial services.
- Members engaged in exploration, mining, smelting, semi-fabrication, supply.

- Canada produces 60+ minerals and metals; 215+ operating mines.
- World-class deposits: uranium, met-coal, diamonds, base metals, oil sands, potash.
- **Economic Contributions:**
  - 375,000+ direct jobs; many more work indirectly in mining.
  - Approx. 20% of Canada's total export value annually – trade exposed
  - $71B in taxes and royalties to Canadian governments in the past decade.
- TSX lists the most mining companies globally – 1,300+ companies.
- Leading global mining supply sector with 3,700 companies providing goods, services and expertise to the industry.
- Canada has been one of the top destinations for mineral exploration investment for 36 years.

Improving energy efficiency and reducing GHG emissions are priorities for the mining industry

- 2000 MAC Climate Change Position Statement
- 2009 ICMM Climate Change Position Statement
- 2016 MAC Principles for Climate Change Policy Design:
  1. Establish a broad-based carbon price
  2. Apply any climate change policy-related revenues to manage the transition toward a lower carbon future, including climate adaptation
  3. Address competitiveness and carbon leakage concerns across all sectors
  4. Be predictable, flexible and sensitive to changing conditions
  5. Be simple, complementary and effective
  6. Support lower-emission generation technology development and implementation
  7. Recognize early action

Mining products are fundamental in the transition to a lower carbon economy

- Mining products, such as copper, nickel, steel-making coal, rare earths and precious metals and zinc, are critical components of lower carbon energy infrastructure.
- Canadian uranium is integral to the generation of carbon-free nuclear energy.
- Majority of MAC members are operating in jurisdictions that have adopted carbon policies.
- Through TSM, MAC members have put in place robust energy management systems and are committed to improving our energy efficiency and reducing emissions where possible.
- Industry is investing in technological innovation and alternative energy options - approximately $675M annually in R&D.

GHG EMISSIONS PERFORMANCE - MINING

Metal / Non-Metal Mines	1990	2014
Total Energy Use (PJ)	143	150
Total GHG ($MtCO_2e$)	8.6	8.0
Share of Total Canadian GHG emissions (%)	1.5	1.1

Source: Canadian Industrial Energy End-Use Data Analysis Centre (CIEEDAC) Report, 2016.

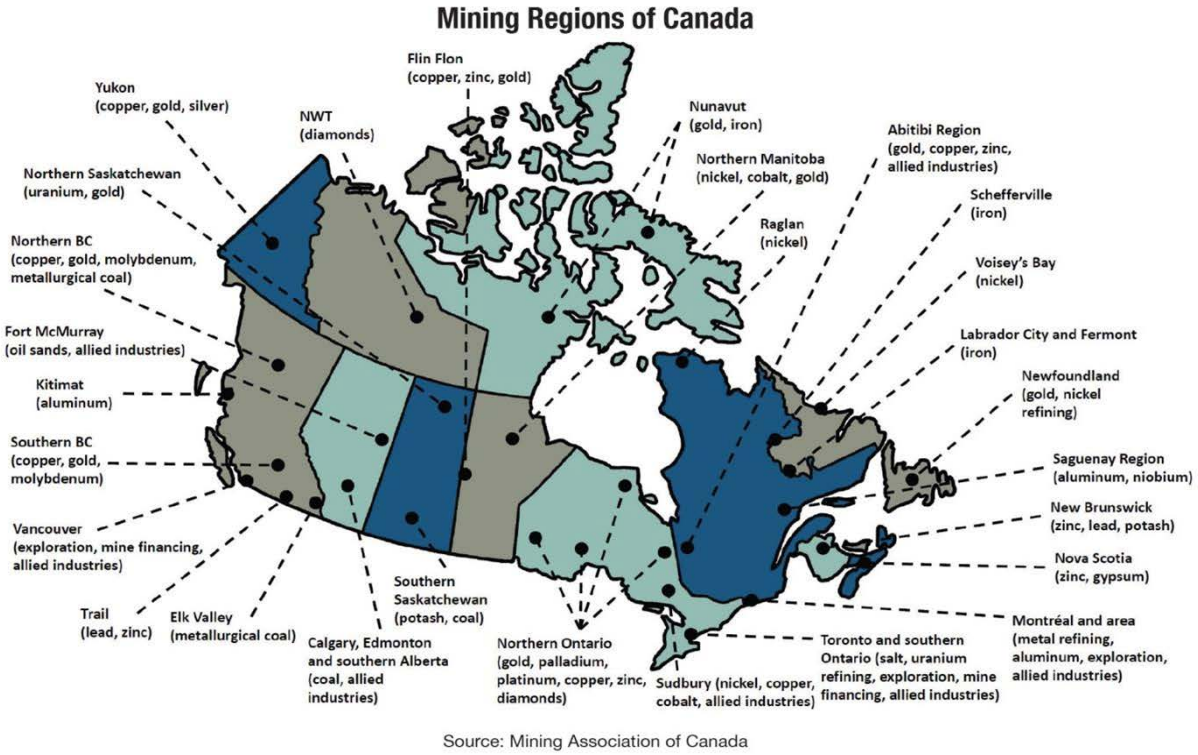
Note: CIEEDAC does not have access to oil sands mining or coal mining energy and emissions data to augment the non-metal mining data set.

Mining Industry a proxy for macro climate change policy challenges.

Adaptation to:

1) A lower carbon future – competitiveness and cost considerations, and varying capacities/options to adapt across companies/regions

2) Physical changes to the environment – site/operational resiliency



Source: Mining Association of Canada

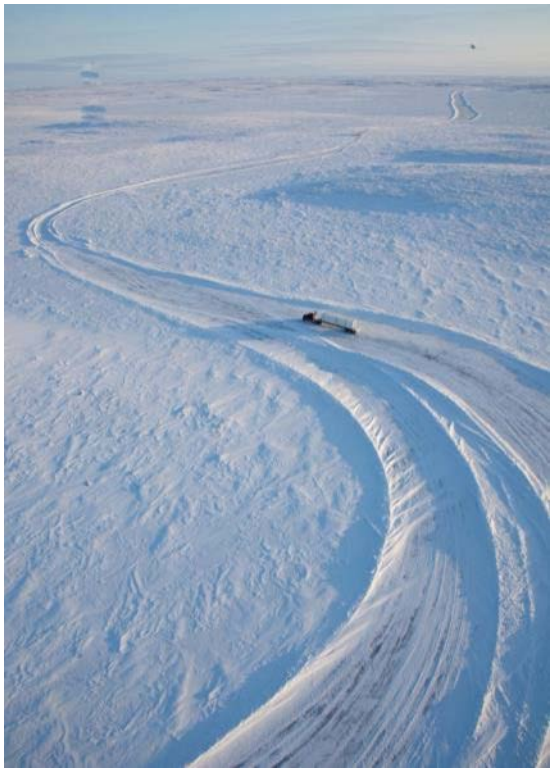
"A particular consideration should be on those sectors and regions where the most cost-effective low carbon technologies or abatement options are possible."

Our Principles Speak to this:

- **Establish a Broad Based Price on Carbon:**
  - *"…seeking synchronized international and regional/national government policies and regulations."*
  - *No double taxation*
- **Revenues should manage the transition to a lower carbon future, including climate adaptation:**
  - *(1) "…support the development of lower carbon technologies and fuels, and energy and fuel efficiency, with a particular focus on investment in research and technology improvements in the resource sector"*
  - *(2) "help 'exposed' economic sectors and populations adapt to the costs associated with a carbon-limited future."*
  - *Strict revenue neutrality*
- **Support investments in the development and implementation of technologies that lower emissions:**
  - *"Policies should not limit energy technology choices, unfairly discriminate against energy choices, or establish technical barriers to trade or market entry."*
  - *Maximum company flexibility*

ADAPTATION: A CONTINUOUS MINING PRACTICE

- The mining and metals sector is already very experienced at identifying and managing risks.
  - when designing structures, significant redundancy is built into site-specific mine design modelling
- A changing climate presents physical risks to mining and metals operations because sites:
  - are often located in challenging geographies
  - rely on fixed assets with long lifetimes
  - involve global supply chains
  - manage climate-sensitive water and energy resources, and;
  - balance the interests of various stakeholders.
- Increased temperatures, changes in precipitation, sea level rise and extreme events may become additional stressors with the potential to exacerbate existing risks managed by mining and metals companies.



This is not about 'reinventing' the wheel but integrating these additional climate impact stressor scenarios within existing risk management and planning procedures.

Q.1 What barriers do you face in adapting to climate change?

- Geography, infrastructure and strategic industry-wide innovation

  Remote, off Grid sites:

  - Operations in remote and northern regions are disconnected from electrical grids, pipeline and transportation infrastructure, facing higher costs and less able to displace reliance on diesel fuel
  - Seasonal infrastructure (winter ice roads) affected by changing climate – impacts to energy security and operation/site resiliency
  - Reduced integrity of permafrost can present challenges to critical site infrastructure

  Grid connected sites:

  - Diverse power generation make-up distributes access to cleaner power unevenly across jurisdictions
  - Aging mines are deeper/further from processing infrastructure, requiring greater energy-per-unit of production
  - Industry innovates significantly, but in silos – some problems better addressed at industry-wide level.

Q.2 What opportunities for innovation exist in your sector?

Grid Connected:

- **Continuous underground mining:** drilling/cutting and grinding underground, and only conveying valuable material to surface:
  - will reduce energy consumption, GHG emissions and waste bi-products
- **Transforming mineral processing:** Grinding (breaking rock) accounts for 30-35% of total mine site energy on average, 90-95% of which is wasted.
  - waste can be massively reduced by replacing current mill technology and developing low grade waste energy recovery.
- **Electric mining haul fleet:** Replacement of underground scoop trams, and other mining vehicles, with electric motors
  - Reduces/eliminates diesel reliance, associated emissions, and reduces waste heat by 50%.

Remote/Off-Grid:

- **Reducing remoteness** by enhancing connectivity is key to enabling company performance
  - The above solutions could be applicable in remote contexts with connectivity
- **Renewable / alternative generation opportunities**

Q.3 What are your proposed Solutions

- **Canada Mining Innovation Council's** (CMIC) Towards Zero Waste Mining (TZWM) Strategy key to whole-of-industry GHG and waste reduction, energy and fuel efficiency improvement, and clean technology development
  - CMIC seeking a five-year, $50M investment from federal government to catalyze strategic industry investment
  - TZWM has developed technology roadmaps that will lead to zero waste:
    - Spearheading continuous underground mining
    - Major focus on reducing energy intensity of mineral processing
    - Innovating and enhancing the deploy-ability of electric mine vehicles.
- **Strategic Energy Infrastructure Investment** that reduces remoteness, enhances connectivity, and enables flexibility to manage energy/emissions
- **Renewable / alternative Generation:** incentives; efficiency improvements; energy storage; technology development
- **Predictable / flexible policy** that is sensitive to the changing physical environment, the increased costs and limited options for remote operations

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