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# Climate Change Impacts and Adaptation in Ontario's Mining Industry

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## Introduction

As a key driver of local and provincial economic growth and prosperity, Ontario's mining sector faces significant risks from the effects of climate change. Increasing temperatures and changes in precipitation, including increasing variability and extremes, will have far-reaching implications for the mining sector. Although published reports have outlined climate change risks and opportunities affecting exploration, planning, transportation, operations and decommissioning, a recent poll found only one-third of mining companies consider climate change a risk to their business operations<sup>1</sup>.

Ontario's mining sector employs 80,000 people directly and indirectly, including processing, refining, and the mine equipment and services sector. This sector has a total direct economic impact of over \$6 billion. Although Ontario's mining sector is predominantly a metal mining sector with over 20 sites located across northern regions of the province, the sector also includes diamond mining in the far north, and numerous aggregate mining operations in Southern Ontario<sup>2,3</sup>. Integrating climate change in all aspects of mine planning and operations can help protect investments, the environment, and people who rely on Ontario's mining sector.



*Figure 1: Mining is a key driver of local and provincial economic growth in Ontario; understanding climate change risks can help protect investments and the environment. Photo: Ontario Mining Association.*

## Implications of a Changing Climate

Across Ontario, the average temperature is expected to increase by 2.5°C to 3.7°C by 2050, with largest changes in the north<sup>4</sup>. Annual precipitation is expected to increase as well, with largest changes anticipated in the northeast region of the province<sup>5</sup>. Due to its reliance on and operation in the natural environment, climate change will magnify existing risks throughout the supply and value chains, while creating risks beyond those that mining companies are accustomed to dealing with<sup>6</sup>.

Changes in averages and extremes are expected to have a variety of direct impacts for mine operations and assets, including buildings and equipment, and tailings and water retention structures. For example:

- Extreme rainfall and changes in precipitation patterns, including rain-on-snow events, can impact site drainage, diversion structures, and runoff to tailings facilities, can hasten flushing of acid rock drainage, or result in damage to equipment or facilities from flood<sup>6,7,8</sup>.
- Extreme precipitation events can cause wash-outs and erosion in transportation networks, leading to disruptions to mine operations and supply<sup>7</sup>.
- Increased temperatures can accelerate evaporation from tailings ponds, with consequences for passive contamination reductions systems including wetland filtration<sup>7</sup>.
- Increased temperatures can reduce timing, availability or safety of ice road transportation, but can also increase access for resources exploration or operations<sup>7</sup>.
- Changes in precipitation patterns have impact on water availability for all phases of mine lifecycle, including processing and refining and post-closure<sup>6</sup>.

Climate change can also present challenges for mining sector indirectly. Where transportation networks are susceptible to disruptions, interruptions in the mining supply chain are possible; this risk is greatest for remote mine sites where there are no alternative routes. Increased forest fire risks, and increased exposure to environmental diseases (e.g. Lyme disease), can affect employee health and safety. Outages and interruptions in delivery of energy can increase costs or decrease productivity of mining sector activities.

To assess new risks and liabilities related to climate change for their assets and operations, mining companies will increasingly be expected to incorporate climate change in analysis and reporting. Investors and regulators alike are now expecting stronger analysis and reporting to acknowledge and address climate risks. Environmental Impact Statements, for example, have for a number of years required an understanding of the effects of the project on climate change as well as climate change effects on the project. However, emerging guidance and best practice indicates mining companies need to understand with greater sophistication the range of effects of climate change on the project, the environment, and the potential interaction of these project and environment throughout the project life cycle<sup>9</sup>.

## **Adapting to Climate Change**

Through strong adaptation planning, the mining sector can identify and treat a variety of climate risks. This will help protect their employees, their operations and investments, and the environment and communities in which they operate.

Adaptation may take many forms, ranging from design changes to infrastructure and operations to ensure mine activities and sites are robust and better able to cope with potential climate events, to integrating climate change impacts into existing plans, policies and procedures (such as emergency response and internal risk management policies)<sup>10</sup>. Reviewing and revising strategies and approaches for risk financing in light of increased frequency or severity of risks, including how risks can be transferred or retained, can ensure mining companies are protected in the event of losses, or that losses aren't catastrophic.

Climate change focused risk assessments can be completed to identify and address climate risks at the site or regional scale. These can be targeted infrastructure or asset-focused engineering vulnerability analysis, using tools and approaches such as Engineers Canada Infrastructure Vulnerability Assessment Tool ([PIEVC](#)). Climate change can also be incorporated in existing Enterprise Risk Management frameworks, allowing companies to identify adaptation strategies that incorporate strategic and financial considerations, including supply-chain issues. Various cost-benefit analysis approaches can also be applied to improve financial decision-making in light of potential climate change impacts<sup>11</sup>.

There are numerous examples of proactive adaptation measures in Ontario. Glencore has adjusted operating procedures to accommodate new climate normals in Sudbury<sup>12</sup>. DeBeers, the operator of a diamond mine in Ontario's far north, has taken measures in response to projected climate change including construction of all-season roads and airstrips, and optimizing logistics planning to accommodate winter road availability<sup>11</sup>.



*Figure 2: Climate change will have effects on both mine and its surrounding environment. Ensuring mining projects operate sustainably requires a sophisticated understanding of the interaction between climate change, mining activities, and the environment throughout project life cycle and after mine closure. Photo: Ontario Mining Association.*

## Climate Change Adaptation Resources

**Natural Resource Canada's Adaptation Platform** is a unique online resource hub for tools and information that members of the mining sector can use to support their efforts to adapt to a changing climate. Led by the Climate Change Impacts and Adaptation Division (CCIAD), the Adaptation Platform is a national forum that brings together key Working Groups to collaborate on various climate change adaptation priorities and to produce project-level research and activities. The Mining Working Group aims to facilitate a more resilient and sustainable mining sector in a changing climate.

### How can the adaptation platform products help?

The following is a sample of resources available on the platform that members of the mining sector can utilize in their efforts to prepare for a changing climate:

**Product:** [Economic Impacts of a Changing Climate on Mine Sites in Canada: Assessing Proactive Adaptation Investments against Estimated Reactive Costs](#)

**Description:** This report describes the impacts of climate change on mining operations, transportation and reclamation in Ontario and Quebec. It describes a modeling tool that decision-makers in the mining sector can use to assess the net present value of undertaking adaptation actions, versus responding to impacts as they occur.

**Product:** [Understanding Mining Policy Drivers and Barriers in the Context of Climate Change Impacts and Adaptation](#)

**Description:** This study assesses the ability of 10 of Ontario's existing mining policy tools to support climate change adaptation. It focuses on policy instruments relating to tailings facility design and management, and mine closure planning.

For more information, and to view more products through the Adaptation Platform, visit: <http://www.nrcan.gc.ca/environment/impacts-adaptation/adaptation-platform/10027>

## Footnotes

1. Delphi, 2014.
2. OMA, 2017.
3. NDMN, 2015.
4. MOE, 2011.
5. CCDS, 2009.
6. Grossman, 2011.
7. Ford, 2010.
8. Pearce, 2011
9. Government of Ontario, 2016.
10. ICCM, 2013.
11. Rodgers, 2015.
12. FBC and MIRARCO, 2015.

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