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climate change and Canadian mining

OPPORTUNITIES FOR ADAPTATION



A summary for decision-makers

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SOLUTIONS ARE IN OUR NATURE

**Climate Change and Canadian Mining: Opportunities for Adaptation
Summary for Decision-Makers**

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The link between global warming and human activities is well established.¹ Increases in temperature, more extreme weather events, changes in precipitation, and altered weather patterns have been documented across Canada and these changes are projected to continue in the future with implications for ecosystems, industrial activity and society.²

Due to its dependency on the natural environment, the Canadian mining sector is particularly vulnerable to the consequences of climate change. The extent to which the mining sector is able to mitigate its own impact and adapt to climate change will affect its long-term success and prosperity. The ability of individual operations to adapt will have profound economic consequences for host communities. In fact, the impact of climate change on mining is important for all of Canada to consider. The Canadian mining industry employs nearly 50,000 people in primary mineral extraction in over 115 communities across the country and contributes approximately \$10 billion a year to the Canadian economy. Downstream activities – the smelting and refining of minerals, the processing of non-metallic mineral products, and the fabrication of metal products – contribute even more.³

How well the mining sector adapts will also be determined by how much climate change actually occurs. The amount of warming and the subsequent severity of the climate impacts will depend on whether humans sharply curtail global warming pollution in the very near future or whether we continue along the path we are on now, with emissions rising every year. Scientific estimates suggest that the Earth will experience average global warming of between 1.1 and 6.4 degrees Celsius this century. The significant gap in this temperature range is largely the result of uncertainty over human action – whether our emissions rise or fall and by how much – rather than on uncertainty about the sensitivity of the climate system. In other words, we have a choice: To experience a little climate change or a lot.

The understanding of how economic sectors adapt to climate change is evolving. Most climate change research to date has focused on predicting the impacts of climate change on natural and human systems using climate models, with adaptation options chosen to



Lower water levels in the Great Lakes necessitate smaller shipping loads of metals and non-metals – an indirect climate change impact on the mining sector.

reduce one's exposure to those impacts.⁴ The options proposed in this context are largely techno-engineering in nature: for example, building levees against rising ocean levels or developing irrigation systems to cope with increased drought.

This so-called Type I adaptation research has provided vital information on the potential impacts of climate change. However, impacts-driven research largely neglects the complex dynamics that shape how climate change is experienced and responded to, and the nature in which businesses respond to change.

In contrast, Type II adaptation focuses on vulnerability to climatic events first. Even if climate change were not happening, climate conditions would vary year-by-year, month-by-month, with extreme conditions having impacts for business operations. Understanding this variability, and being ready to respond to a range of climatic events, means being less vulnerable right now. Overlaying this with predictions of future changes allows for a better understanding of future vulnerability and enables future responses to evolve as well. It also takes away some of the reliance on climate models, which have greater uncertainty at the regional and local scales.

This report documents and describes the vulnerability of the Canadian mining industry to climate change, including characterizing how the mining sector is sensitive to climate change and the capacity of the sector to cope with and adapt to current and projected future changes.

How the study was conducted

A variety of methods were used to assess the vulnerability of the mining sector to climate change including analysis of secondary sources of information (information in trade journals, academic publications and government reports), two fixed question surveys, in-depth interviews, and six case study analyses. The study drew extensively on the observations, experience and knowledge of mining sector practitioners.

Results from this study

MINING SECTOR SENSITIVE TO CLIMATE

Climate events are a fact of life for the mining sector and an important component of the operating environment. Over the past 20 years mines across Canada have been impacted by significant climate events, several which are regarded to be symptomatic of climate change. The late 1980s brought a multi-year drought in Saskatchewan, reducing water levels at the Chaplin sodium sulphate mine to the point where production was almost at a standstill. In 2005, a similar situation occurred in Marathon, Ontario, forcing several mines to reduce water intake and find alternative sources. Over the past few years, hot and dry temperatures in southern Quebec decreased water availability, forcing gravel quarries to curtail production in order to abide by dust suppression regulations. The 1998 ice storm cut off power to several mines in Quebec for three to four weeks, and in winter 2006 warm temperatures led to ice road closures in the NWT costing diamond mines millions of dollars for fuel and equipment that had to be transported by air. In August 2008, heavy rains in the Yukon flooded four kilometres of the Minto mine access road and forced the company to release excess untreated

water directly into the Yukon River system. And there have been indirect impacts as well, such as lower water levels in the Great Lakes that have necessitated smaller shipping loads of metals and non-metals. All of these events have the distinctive fingerprint of climate change.

Review of academic and mining trade journals revealed that there is a deficit in the mining sector in terms of what is known about climate change impacts and possible adaptive responses. Research on adaptation is very limited, establishing only very broad principles for integrating adaptation planning and no-regrets adaptations into everyday business planning. The focus in mining journals has been on mitigation: i.e., the reduction of greenhouse gases, rather than adaptation. Many publications approach the issue with respect to reducing energy use, and improving the bottom line, as a way to reduce emissions, while a minority of publications question whether climate change even exists.

The risks resulting from not sufficiently planning for climate change extend beyond the mining companies themselves to the natural environment and surrounding human communities as the productive stage is only a small portion of the life cycle of many mines. An estimated 27,000 orphaned or abandoned mines exist in Canada and there has been little research done on the impact of climate change in mine rehabilitation projects.⁵ What will happen to operating mines after decommissioning in a changing climate is also currently not well understood.

SURVEYING THE INDUSTRY: PERCEPTIONS OF IMPACTS, ADAPTATION, AND VULNERABILITY

Two surveys were undertaken with mining stakeholders to document perceptions of the implications of climate change for mining and opportunities for adaptation. Between 34 and 48 per cent of those surveyed said that climate change is already having a negative impact on their operations, confirming that it is an emerging issue facing the mining sector. A majority of respondents believed climate change would have a negative impact in the future, though some acknowledged potential benefits as well.

However, despite the perceived threat most companies were not pro-actively planning for climate change, and only 25 per cent of senior executives and those in management viewed future climate change as something that would impact their operations. In contrast, all of those surveyed who work in day-to-day mining operations perceived this threat. This seems to suggest that inertia at senior levels of mining companies may be constraining adaptive planning for climate change impacts. Cost and uncertainty over future impacts were the most important barriers contributing to that inertia, according to survey responses.

Both surveys strongly suggest that the mining sector is taking action to reduce greenhouse gas emissions and mitigation, not adaptation, is the most common action being taken to address global warming. Saving money was cited as the primary reason for doing so, while ethical reasons and avoiding the imposition of government regulations were also significant motivators. Almost all respondents expected that action to reduce greenhouse gas emissions would continue into the future.

Survey results also indicate that experience of climate stress is more likely to lead to adaptation planning compared to the threat of future climate changes. And those taking action to reduce greenhouse gas emissions were also more likely to be attempting to adapt to climate change impacts.



Helicopter loading fuel in Canadian Arctic. In 2006, warm temperatures resulted in ice road closures and millions of dollars in additional transportation costs for diamond mines in the NWT.



High altitude image of a potash mine in southern Saskatchewan.

CASE STUDIES

Six in-depth case studies were conducted to document climate change risks and opportunities for the mining industry in Canada, and the adaptation and mitigation strategies they are undertaking. The case studies include: (1) diamond mining in the Northwest Territories; (2) mining in the urban-rural interface in southwestern Quebec; (3) sulphate, uranium, and potash mining in Saskatchewan; (4) base metal and gold mining in northeastern Ontario; (5) the Voisey's Bay nickel-copper mine in Nunatsiavut, Labrador; and (6) mining in the Yukon Territory.

A number of key findings are evident across the case studies.

First, a majority of the mines in the case studies are affected by climatic hazards, with examples of negative impacts over the past decade. Many of these events are expected to become more intense and frequent with climate change. Those regions depending on transportation networks that are sensitive to climatic conditions (especially in northern Canada) are particularly susceptible.

Second, most mine infrastructure has been designed assuming that the climate is not changing. In instances where new risks have been identified, adaptation is usually reactive and ad hoc in nature.

Third, though industry stakeholders are aware that the climate is changing and that more dramatic changes will occur in the future, the majority of stakeholders viewed climate change as only a minor concern. Regulations, human resource issues, and fluctuating markets for their products were considered more pressing issues. This may be explained by the fact that many respondents were not aware of major scientific reports or predictions related to climate change. Naturally, poor understanding of the issue will exacerbate vulnerability. The mining sector is unlikely to adapt to something that it does not first understand.

Fourth, there is little planning being undertaken to develop adaptation strategies to future changes. However, even scenarios considered "low probability" will become much more common in the future.

Fifth, significant vulnerabilities exist in the post-operational phase of mines. If mine infrastructure is designed and developed considering only current climate conditions, the risk of structural failure due to the forces of future climate change becomes pronounced. Particularly worrisome are the vast number of abandoned mine sites across the country that have not yet been assessed for vulnerability to climate change.

Finally, mitigation options are being considered by many mine operations, though the motivation in many cases is to save costs and avoid regulatory implications as opposed to responding to climate change *per se*.

1 IPCC. 2007. AR4 Synthesis Report: Summary for Policy Makers. Geneva.

2 Lemmen, D., Warren, F., Lacroix, J. & Bush, E. 2008. From impacts to adaptation: Canada in a changing climate 2007. Ottawa, Government of Canada.

3 The Mining Association of Canada. 2008. Facts and Figures 2008. Ottawa.

4 See for example IPCC. 2001. Climate Change 2001: Working Group II: Impacts, Adaptation and Vulnerability. Geneva.

5 Natural Resources Canada. 2007. Sustainable Management and Rehabilitation of Mine Sites for Decision Support. Ottawa.

Recommendations

Clear recommendations flow from this research and analysis, both for industry proponents and government regulators. There is a greater role required of industry leaders:

- **More effective communication of the potential risks posed by climate change is needed in the mining sector.**
- **Identification of the most cost effective measures and technologies that will allow mines to adapt to climate change. Specifically, win-win adaptations that bring benefits regardless of the severity of climate change impacts need to be identified.**
- **Adaptation and mitigation in many instances can reinforce each other. Research is needed to assess how this can be achieved for different mining operations and regions.**

There is also a clear role for government regulators:

- **Regulations are needed to mandate that mines plan for climate change both during their operational lifespan and through decommissioning. There is an opportunity for climate change planning to be enforced in closure planning.**
- **Regulatory certainty in regards to greenhouse gas mitigation needs to be established before mitigation efforts truly take hold in the mining sector. Developing this certainty should be a priority.**
- **There is a need for improved climate modeling and communication of climate change projections to better understand the risks that might affect mine sites and regions. The federal government should restore research funding for climate change impacts and adaptation in this sector and others.**

The manner in which the mining industry responds to the challenges brought on by climate change has important implications for the national economy and for mining-dependent communities across Canada. Climate concerns are a central fact of business life and adapting to the reality of climate change is in the best interests both of mining companies and communities whose well-being is intractably tied to the success of the industry. To date, the response to current and future climate change has been slow and where there has been response it has largely been the result of learning through experience. And yet the scientific evidence persuasively suggests that future climate change is unavoidable, and could be severe if emissions are not quickly and dramatically reduced.

There is now a real opportunity for Canadian companies to become leaders in climate change mitigation and adaptation. Collaboration between mining companies, mining associations, regulators, scientists, and other industrial sectors will greatly enhance the chance of success.



Decommissioned mine in British Columbia.

Climate Change and Canadian Mining: Opportunities for Adaptation – A Summary for Decision-Makers describes the vulnerability of the Canadian mining industry to climate change, highlights opportunities for adaptation and provides recommendations for industry and government.

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The David Suzuki Foundation is committed to protecting the diversity of nature and our quality of life, now and for the future.



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