Climate Change Impacts & Adaptation in Ontario: The Mining Sector

Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) 2015

Observed Impacts

Evidence of climate change has already been observed in the Ontario mining sector, affecting nearly every aspect of operations. Extreme precipitation events and variable water levels have resulted in increased flooding, warm and dry conditions have intensified dust emissions, increased levels of erosion have affected water quality and infrastructure stability, and reduced water levels have restricted access to water used in operations (Jyrkama and Sykes, 2007; Prowse et al., 2009; Pearce et al., 2009; Pearce et al., 2011; Lemmen et al., 2014).

Figure 1: Dust emissions in Ontario's Ring of Fire region (Photo credit: Matthew Brown).

In addition to direct impacts on mining operations, indirect climate change impacts have also been observed. Warmer winter temperatures have negatively impacted winter and ice road networks, limiting product transportation and supply lines, increased snow production in some areas has impeded transportation by blocking roads, and an increase in smog days have forced some operators to reduce site emissions (and therefore production) in order to meet commitments made to local stakeholders (Pearce et al., 2009). For example, Victor Diamond Mine located in the James Bay lowlands near Attawapiskat, Ontario has experienced winter road damage due to warming temperatures on a number of occasions. In some cases, the damage has been localized and relatively minor. In other cases, the damage has been extensive, curbing the use of winter roads and restricting transportation options (Rodgers et al., 2014). Five mines near Marathon, Ontario have experienced widespread water shortages due to reduced water levels and warmer, drier conditions in their local watershed (Pearce et al., 2009).

Expected Impacts

Studies agree that Ontario will gradually become 'warmer and wetter' (IPCC, 2007). The average annual surface air temperature in Ontario is expected to increase between 2.5 and 3.7°C by 2050 (from baseline average 1961-1990) (CCDS, 2009; MOE, 2011). Annual precipitation is expected to increase in Ontario, with the largest changes in the northeast and the lowest changes in the western part of the province (CCDS, 2009). Long-term warming may result in increased risk from impacts, including permafrost thaw, loss of winter roads, increases in evapotranspiration rates affecting local water levels, and increases in forest fire occurrence. Long-term increases in precipitation levels may lead to greater risks from impacts such as erosion, groundwater contamination and flooding, which may challenge designs for mine closure.

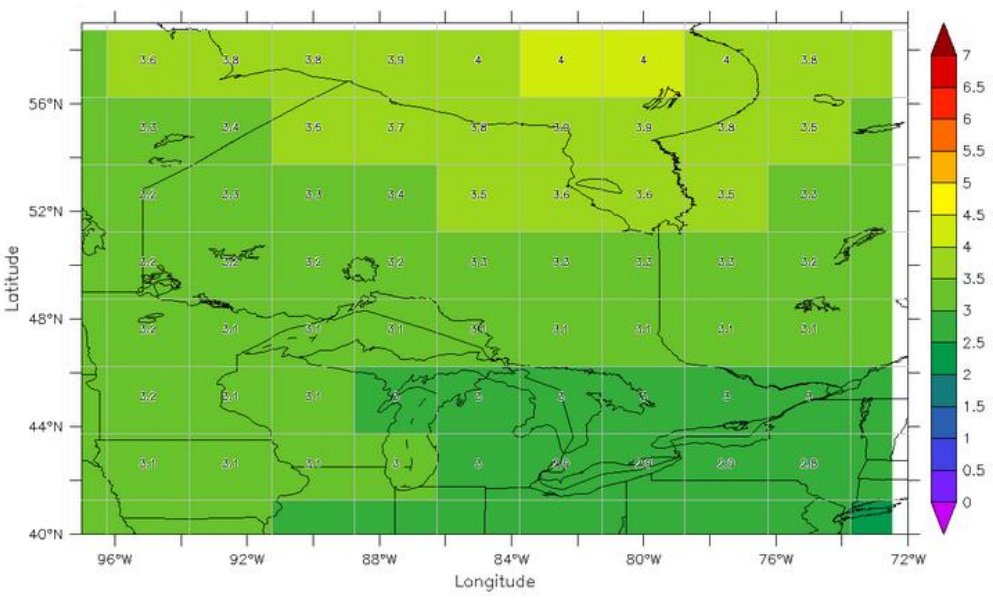

Figure 2: Projected increases in average annual temperature in the 2050s compared with 1961-1990 using HIGH GHG emissions (A1B emission scenario) (CCDS, 2009).

In addition to long-term trends, extreme weather events are expected to increase in magnitude and frequency (IPCC, 2007). This represents a significant threat to mine operations as extreme wind and precipitation events have the potential to cause extensive damage to infrastructure. Extreme heat can hinder operations by affecting health and safety of the labour force, and requiring additional energy for cooling.

Adaptation Measures

As climate change impacts become more frequent, mining operations in Ontario should be adapting their planning, design and operations. For example, Glencore's Sudbury Integrated Nickel Operations, located near Sudbury, Ontario, have incorporated climate change into their planning and decision-making processes. A climate change risk assessment was employed to gain a comprehensive understanding of the impact that climate change will have on mining operations. The assessment highlighted several climate- and weather-related risks, including flooding, extreme heat, freeze-thaw cycles and seasonal variability. In response, Glencore's staff have adjusted standard operating procedures to accommodate new climate normals, incorporated localized projections from Golder's GoldSim stochastic weather generator into decision-making processes, and developed a two-tiered adaptation plan which delivers long- and short-term adaptation measures (FBC and MIRARCO, 2014a).

DeBeers, who operate the Victor Diamond Mine in Ontario, have also responded to observed and expected climate impacts, including the loss of winter road access due to warmer winter temperatures. In response to these changes, the mine has instituted structural changes such as widening winter roads, the construction of all-season roads and airstrips, the use of rig mats for large water crossings, and optimizing logistical arrangements to accommodate winter road availability (Rodgers et al., 2014). Other companies, who face water shortages have been forced to implement conservation practices and actively search for alternative sources for future consumption (Pearce et al., 2009).

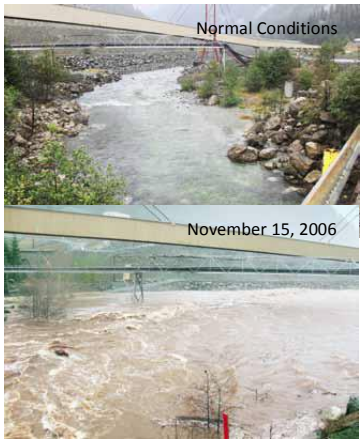

Figure 3: On November 15, 2006, the Myra Falls mine in British Columbia experienced particularly intense rainfall, characterized as a 1 in 200 year flood event, when approximately 205 mm of rain fell over a 24-hour period (FBC and MIRARCO, 2014b).

As climate change presents an ever-increasing threat, adaptation action is required at all phases of the mine cycle. Benefits associated with adaptive action may be social or reputational (in response to ensuring the health and safety of the surrounding environment and communities); or economic (as adaptation measures may prevent damage and loss related to future climate impacts).

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The information presented is based on Chapter 3 of NRCan's 2014 National Climate Assessment titled **Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation** with additional Ontario-specific information. For more information on the National Assessment, please visit: www.nrcan.gc.ca/environment/resources/publications/10766

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