# Climate Change Action Plan, Annotated Table of Contents (draft)

Baffinland Iron Mines Corporation
Mary River Project
NIRB File No. 08MN053

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# 1 PURPOSE OF THIS DOCUMENT

This document presents a draft outline and annotated content for the development of Baffinland's Climate Change Action Plan, building on the principles of the Climate Change Strategy. The development of this action plan is in progress.

# 2 OBJECTIVES

Baffinland is committed to building and operating the Mary River Project in an environmentally and socially responsible manner for all stakeholders. The Climate Change Strategy is focused on:

- Integrating climate change considerations into all aspects of Project planning;
- Collaborating on regional climate change initiatives and monitoring activities; and
- Operating the Project in a way that will support the needs and vision of future generations of Nunavummiut.

The Climate Change Action Plan will build on the key principles of the Climate Change Strategy. The following climate change considerations have been incorporated into Project planning and operations;

- Environmental Assessments are underway for the Phase 2 Project Proposal;
- Baffinland's Sustainable Development (SD) Policy. The SD Policy outlines importance of using energy, raw materials and natural resources efficiently and effectively, and is focused on:
    - Health and Safety
    - Environment
    - Investing in our communities and people
    - Transparent governance

The overall strategy of the Climate Change Action Plan is to reduce the project carbon footprint, consider climate change projections when designing mine and transportation infrastructure, and collaborate with groups in climate change research.

# 3 ENGAGEMENT AND ADAPTIVE MANAGEMENT

Baffinland will engage with regulatory agencies, communities and various stakeholder groups in the development of the Climate Change Strategy. This Strategy will include defined adaptive management procedures.

# 4 REGULATORY CONTEXT

- *Nunavut Agreement* (2009) and *Nunavut Planning and Project Assessment Act* (2015) provide for comprehensive impact assessment and monitoring that considers effects of climate change and the project
- Nunavut Impact Review Board (NIRB) responsible for administering impact assessment review and monitoring for major projects.
- Nunavut Impact Review Board issued Project Certificate 005 Terms and Conditions applicable to climate change
- Climate change related guidelines, legislation, and policy applicable to Project:
  - *Upagiaqtavut – Setting the Course: Climate Change Impacts and Adaptation in Nunavut* (XXXX)
  - The Mining Association of Canada (MAC) Towards Sustainable Mining (TSM) Initiative (2017)
  - Canadian Environmental Protection Act, 1999 (CEPA 1999).
  - Environmental Code of Practice for Metal Mines (2009)

# 5 COMMITMENTS AND ACTIONS

Baffinland is committed to manage the risks of climate change on the project through:

- GHG Reduction (Greenhouse Gas and Energy Management Initiative)
- Monitoring and Collaborative Research
- Climate Change Adaptation

## 5.1 Commitment No. 1 – GHG Reduction

### 5.1.1 Overview of GHG Reduction Commitment

The first step in GHG reduction is to develop and implement a system for reporting annual GHG emissions, in accordance with CEPA requirements. Facilities in Canada that emit over 50,000 t of $CO_2e$ annually must report emissions to Environment and Climate Change Canada (ECCC) under the Greenhouse Gas Emissions Reporting Program, so Baffinland has been reporting annual GHG emissions to ECCC since 2014. Baffinland also reports its annual GHG emissions in its annual report to the NIRB under PC Conditions 6 and 9.

The next step is to identify and implement means to reduce GHG emissions. The climate and remoteness of the Project play key roles in establishing the current level of GHG emissions, and in identifying opportunities for GHG reductions. There are a number of factors that make the Mary River Project a relatively energy intensive operation:

- The remote location requires equipment, materials and consumables to be transported by annual sealift or by airlift, and ore to be transported by ship to markets.
- The mine's inland location requires overland transport of ore to the coast.
- The fly-in/fly-out operation requires heavy reliance on air travel to move workers in and out of the site.
- The cold climate requires more fuel for heating and for diesel engines to idle.
- The remote location means that grid power is not available, and the project must generate all of its own power from diesel (as other lower GHG intensive fuels such as natural gas are not feasible to transport to the site).

The Project's high-grade iron ore does not require processing however, and so there are no GHG emissions associated with processing or the management of processing waste (tailings) which are required in processing lower grade ores at some other mine sites. In terms of lifecycle GHG emissions, this would partially offset the higher energy requirements related to transportation and on-site energy production.

GHG reduction opportunities on the Project may exist with energy conservation measures, the conversion of on-site power generation from diesel to a renewable energy source and changing the mode of ore haulage from trucks to less energy intensive rail. The switch from road to rail is currently being contemplated as part of the Phase 2 Proposal.

Regarding renewable energy opportunities, several arctic mines have recently employed wind farms to reduce GHG emissions. This includes the Diavik Diamond Mine in the Northwest Territories, and the Raglan Mine in Nunavik. Pilot solar photovoltaic projects are presently being initiated in several Qikiqtani communities. Baffinland previously conducted a pre-feasibility study on a potential hydroelectric project at Separation Lake, located approximately 35 km southeast of the Steensby Port (Knight Piésold, 2006).

**Table 5.1 (Example) – Regulatory, Legislative and Policy Requirements Met by the Climate Change Strategy – GHG Reduction**

| Regulatory, Legislative and Policy Document | Requirement | Baffinland Actions |
|---|---|---|
| Project Certificate (NIRB) | Proponent shall provide interested parties with evidence of continued initiatives undertaken to reduce GHG emissions | Baffinland will undertake the following actions to reduce GHG emissions:<br>• Pursue permitting and development of the Phase 2 Proposal<br>• Establish a more detailed action plan that will establish targets, resources and schedules for:<br>  ○ evaluating opportunities for energy conservation, and<br>  ○ evaluating potential renewable energy opportunities |
| EIS Guidelines | Various requirements to demonstrate predicted climate change effects have been considered in project design | |
| MAC's TSM Initiative | Use energy and GHG emissions tracking system for internal use and public reporting | |
| | Set measurable performance targets for energy use and GHG emissions | |
| CEPA (1999) | Facilities in Canada that emit >50,000 t of $CO_2$-eq annually must report emissions to Environment and Climate Change Canada (ECCC) under Greenhouse Gas Emissions Reporting Program | |
| Environmental Code of Practice for Metal Mines (2009) | Strategies to reduce carbon releases to the atmosphere should be considered and implemented | |
| Climate Change Impacts and Adaptations in Nunavut (XXXX) | Government, non-government, industry and public are encouraged to manage total GHG emission through energy management and alternative energy supply technology | |

## 5.2 Commitment No. 2 – Monitoring and Collaborative Research

### 5.2.1 Overview of Monitoring and Collaborative Research on Climate Change

Monitoring and scientific research are important elements supporting the development of accurate climate change predictions, recording the effects of climate change, and developing effective adaptation strategies. Baffinland has an opportunity and a responsibility to collect appropriate monitoring data at its Project to these ends.

The scientific literature on climate change adaptation specific to the mining sector is limited (Pearce et al., 2009). Fortunately for the Mary River Project, however, much of the research that is available on climate change impacts and adaptation in the mining sector focuses on operations located in northern regions and on issues such as permafrost integrity, winter transportation networks, water management and the potential for Arctic seaways as sea ice melts (Warren and Lemmen, 2014). Holubec (2007) and Haley and Proskin (2008) are examples of studies where climate change adaptation planning has been incorporated into design.

Collaboration with communities using the land and researchers on monitoring and research will be required. A cooperative approach between mining companies, mining associations, regulators, and Inuit groups will greatly enhance chances of success. An example of a company effectively using collaborative research and development is Teck Resources' Highland Valley Copper operation, which has partnered with Thompson Rivers University (TRU) to improve the efficiency and reliability of its energy use reporting system. Highland Valley Copper and TRU have collaborated on the research and development of an energy-modelling tool that will accurately predict energy performance based on mine planning inputs (MAC, 2014).

**Table 5.2 (Example) – Regulatory, Legislative and Policy Requirements Met by the Climate Change Strategy – Climate Change Adaptation**

| Regulatory, Legislative and Policy Document | Requirement | Baffinland Actions |
|---|---|---|
| Project Certificate (NIRB) | N/A | Baffinland will undertake the following actions to adapt the Project to climate change:<br>• Collect evidence through monitoring of a changing climate at the Project location as well as its effects on the Project<br>• Undertake periodic reviews to understand the latest climate change predictions, and review climate change adaptation literature: A Climate Change Assessment was completed in support of the Phase 2 Proposal (TSD 4), and additional reviews will be conducted in the future when major designs are undertaken and there is more up to date climate change information available from the IPCC or other credible sources<br>• Document evidence of climate change impacts on the Project, and develop mitigations plans as necessary |
| EIS Guidelines | Various requirements to demonstrate predicted climate change effects have been considered in project design | |
| MAC's TSM Initiative | Demonstrate a commitment to biodiversity conservation through conservation action planning, implementation and reporting | |
| | Plan and prepare for potential extreme events such as flooding and drought, including adapting to changing conditions | |
| CEPA (1999) | N/A | |
| Environmental Code of Practice for Metal Mines (2009) | Mining companies are required to consider potential impacts of climate change, and predicted changes in temperature, precipitation and extreme weather events, especially as they pertain to water and mine waste management. In areas of permafrost, potential impacts of climate change should be considered with respect to all aspects of site infrastructure. | |
| Climate Change Impacts and Adaptations in Nunavut (XXXX) | Given the uncertainty of the impacts of climate change and the significant risk that the potential effects of climate change poses for human and environmental health, a "weight of evidence" or precautionary approach will be used on part of the government to justify preventative actions rather than wait for full scientific certainty | |

## 5.3 Commitment No. 3 – Climate Change Adaptation

### 5.3.1 Overview of Climate Change Adaptation Commitment

Climate change adaptation is a process whereby climate change considerations are transparently incorporated into the design basis and operating practices of a Project. Mining operations in Canada have long dealt with climate variability, but in recent years they have been affected by an increasing incidence of climatic hazards, several of which are likely sensitive to climate change (Warren and Lemmen, 2014).

Key areas that are expected to be affected by climate induced impacts include:

- **Built Infrastructure -** Mines contain a variety of built structures. Buildings and transportation infrastructure for the Mary River project are built on thaw-sensitive land and require pro-active design consideration to deal with a potentially changing climate. Northern Baffin Island has experienced warming on the order of 0.07°C/a since 1975 (RWDI AIR Inc., 2010).
- **Hydrology and Water Balance -** Precipitation has increased an average of 0.24 mm/a since 1949 (RWDI AIR Inc., 2010), though this is partially offset by higher evaporation rates. Water management structures will require design to higher return periods to account for more extreme precipitation and runoff events.
- **Post-operational Structures -** Structures remaining after closure (i.e., waste rock stockpiles) will need to be designed with consideration of future climatic conditions (Pearce et al., 2011).
- **Slope Stability -** Climatic warming reduces the strength of permafrost and increases the risk of geotechnical instabilities.
- **Marine -** Climatic warming may also increase the season for open-sea operations and modify the zones of different ice types (landfast ice, polar pack ice, seasonal ice) in the offshore areas.

Pearce et al. (2011) has provided case studies where Canadian mining operations have been adversely affected by extreme weather exposure in recent years (2006-2008). Examples of mitigation and adaptation are provided in Table 5.4.

**Table 5.3 (Example) – Regulatory, Legislative and Policy Requirements Met by the Climate Change Strategy – Monitoring and Collaborative Research**

| Regulatory, Legislative and Policy Document | Requirement | Baffinland Actions |
|---|---|---|
| Project Certificate (NIRB) | Proponent shall provide the results of any new or revised assessments and studies done to validate and update climate change impact predictions for the Project | Baffinland is currently undertaking or has planned to undertake the following monitoring related to climate and climate change:<br>• Meteorological<br>• Stream Flow<br>• Sea Level<br>• Ground temperatures<br>Monitoring planned for future project phases:<br>• Ground Temperatures (dedicated stations to monitor mean annual temperature of permafrost)<br>• Railway Embankment Monitoring<br>• Waste Rock Stockpile Monitoring<br>Baffinland Monitoring and Collaborative Research Action Plan will complete the following:<br>• Identify local, national and international researchers with applicable background/interests/ongoing research<br>• Develop proposals within Baffinland to conduct monitoring or partner with researchers<br>• Formalize its climate change monitoring program<br>• Conduct ongoing and planned monitoring<br>• Sponsor and host a community workshop on climate change |
| | Proponent shall endeavor to include the participation of Inuit from affected communities and other communities in Nunavut when undertaking climate-change related studies and research | |
| EIS Guidelines | Various requirements to demonstrate predicted climate change effects have been considered in project design | |
| MAC's TSM Initiative | Members are encouraged to voluntarily invest in research, feasibility studies or demonstration of new technologies/processes targeting energy efficiency and reduced GHG emissions | |
| | Members are committed to a culture of research and innovation based on identified risks to improve closure and monitoring techniques | |
| CEPA (1999) | N/A | |
| Environmental Code of Practice for Metal Mines (2009) | N/A | |
| Climate Change Impacts and Adaptations in Nunavut (XXXX) | The Government of Nunavut commits to advance our knowledge of climate change impacts and adaptation strategies in Nunavut through Inuit Qaujimajatuqangit and scientific research | |

**Table 5.4 Examples of Climate Change Effects and Adaptive Strategies in Canada**

| Climate Condition | Effect | Adaptive Strategies |
|---|---|---|
| • Changing climatic norms (e.g. Precipitation, temperature)<br>• Melting Permafrost<br>• Extreme Weather Events<br>• Seasonally harsh climatic conditions | • Warmer temperatures causing melting of Northern ice roads<br>• Stronger winds increasing risks to barge traffic from waves and surges<br>• Warmer average temperatures leading to acid mine drainage<br>• Increased active layer thickness resulting in unintentional thawing of acid-generating waste rock, rather than planned encapsulation in permafrost<br>• Permafrost thaw jeopardizing structural integrity via ground instability<br>• Permafrost thaw causing cracks, sinking, slumping of road bed<br>• Extreme weather events causing power failures therefore altering activity timing | • Specialized engineering and designs for cold-weather environments have been employed<br>• Design benign waste rock covers over potentially acid-generating rock of sufficient thickness to account from increases in active layer thickness over time<br>• A number of technologies/strategies exist to combat the effects of climate change (e.g. thermosyphons)<br>• For the ice road: new lighter weight and amphibious machinery has been purchased, operational efficiencies made, alternative routings have been investigated<br>• Long term climate change adaptation planning has been done by some mining sector practitioners |
| **Non-Climatic Condition** | **Site Effect** | **Adaptive Strategies** |
| • Remote location of mine sites (e.g. transport of goods is a logistical challenge, emergency response is slowed)<br>• Regulatory requirements<br>• Greenhouse gas emissions | • Extreme weather events isolating mine operations from people, goods and services | • Energy management and GHG reduction initiatives<br>• Investigation of alternative energy sources<br>• Opportunities exists for climate change planning to be enforced in closure planning<br>• Environmental assessment process increasingly requiring consideration of climate change impacts |