



SESMIM
P R O J E C T

STRENGTHENING EXTRACTIVE SECTOR
MANAGEMENT IN MONGOLIA



CLIMATE CHANGE AND MINING

WESTERN REGION MISSION

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Tel: 976-7010-1080

Email address: info@sesmim.mn



**Global Affairs
Canada**

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Canada**





SESMIM PROJECT

STRENGTHENING EXTRACTIVE SECTOR
MANAGEMENT IN MONGOLIA

Project Overview



(2015-202



Partner Ministries:
MoMHI, MoET, MoF

Funding Agency:
Global Affairs Canada

Implementing Organization:
Agriteam Canada Consulting Ltd

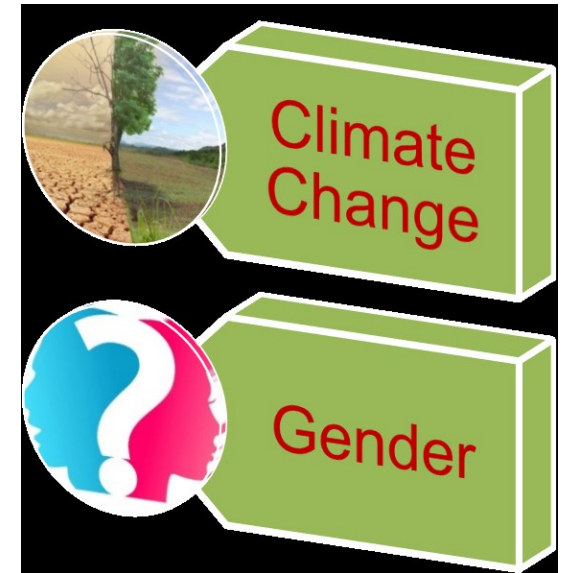
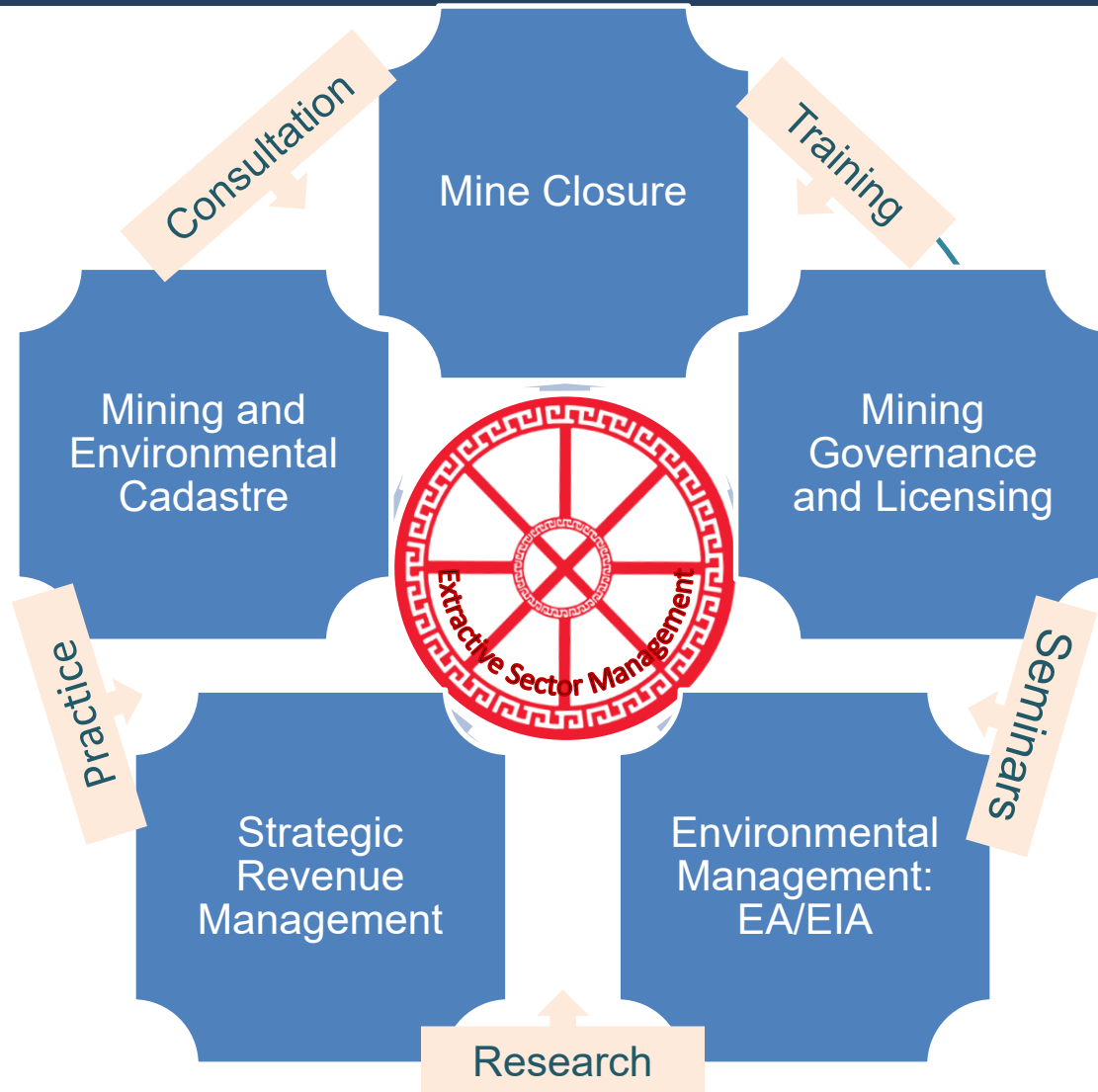
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SESMIM PROJECT

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Project Components





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Climate Change: 2019/2020



GOVERNMENT OF
MONGOLIA

SESMIM Activities:

- 1. Climate Change Knowledge Product:** Climate Change and Mining Knowledge Product Prepared –Compilation of SESMIM outputs from project initiation.
- 2. Climate Change and Mining Guide:** Preparation of Mining Guide covering environmental impact assessment, closure, government responsibilities, company responsibilities.
- 3. Ministry Capacity Building/ Institutionalization:** Roll out of knowledge product/guide to Ministry personnel at MoET and MoMHI individually and jointly for use.



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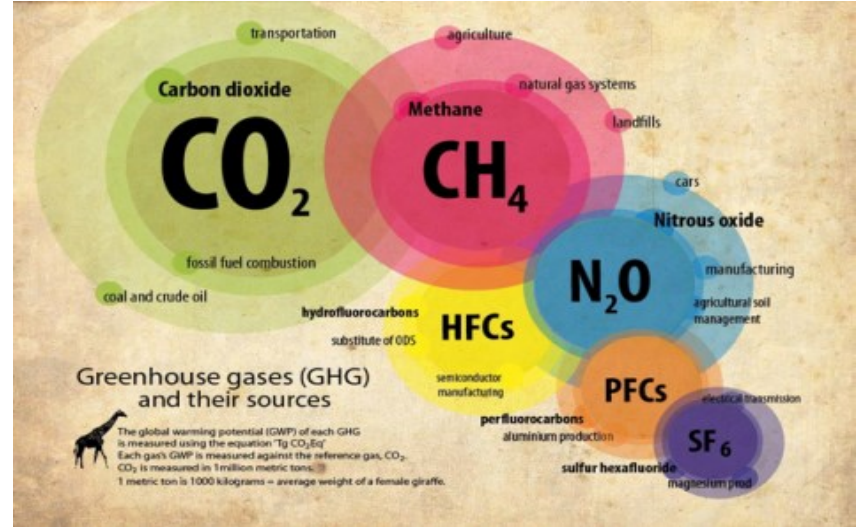
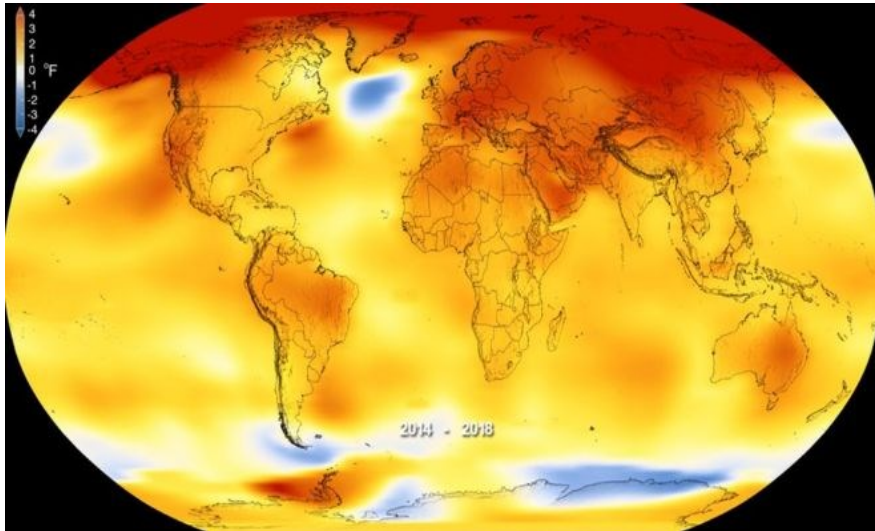
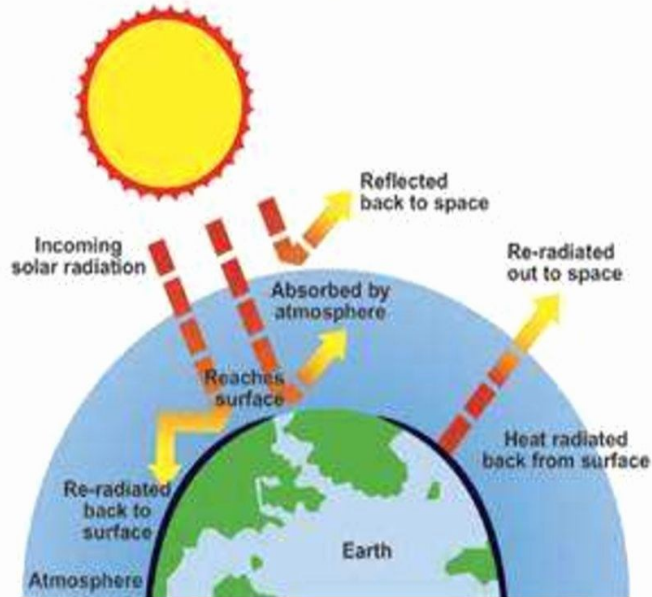
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Climate Change Context:

- *The potential contribution of carbon emissions from human activities to the atmosphere's naturally-occurring greenhouse effect was first identified in the late 1800's.*
- *Carbon dioxide is one of approximately two dozen greenhouse gases in significant concentration that exhibit heat-trapping properties in the earth's atmosphere.*
- *Records indicate that a rapid increase in global mean surface temperature has been associated with disturbances in global climate and hydrological patterns, often with significantly varying impacts on regional climate and hydrology.*

Global warming and the greenhouse effect

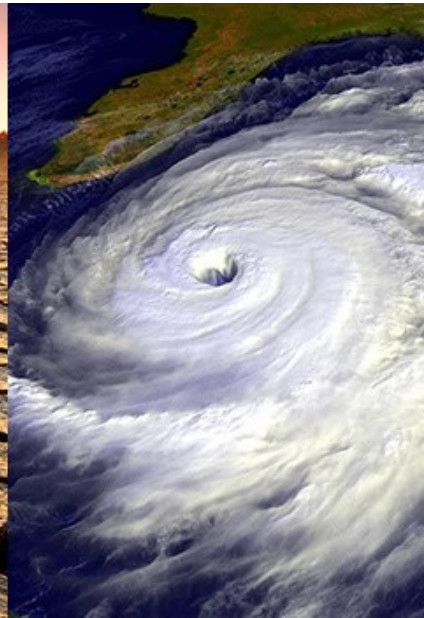
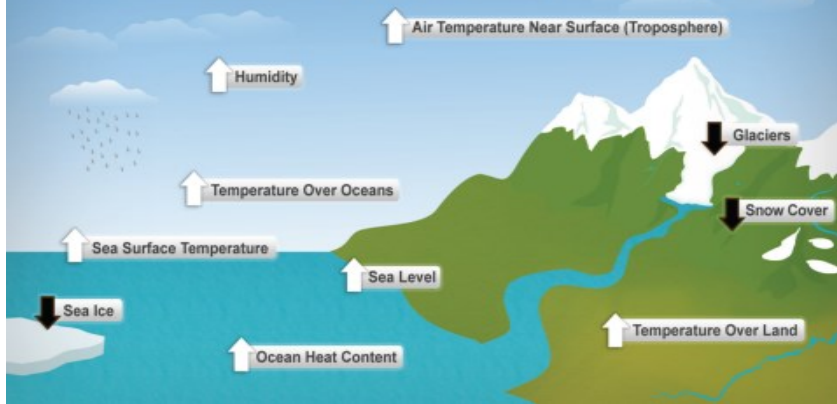


Climate Change Variables and Stressors:

Phenomena associated with this form of climate disturbance include:

- Changes in the frequency, intensity and duration of precipitation, wind and heat events*
- Changes in soil moisture and permafrost*
- Changes in sea levels and polar ice cover*
- Shifts in plant growth and growing season*
- Changes in the geographic extent of species range, habitat and forest cover climate*

Ten Indicators of a Warming World



Potential Climate Change Risks on the Mine Site:

Over Entire Life Cycle:

- *risks to structural integrity of surface impoundments and site conditions from flooding, subsidence, landslide and soil erosion, as well as thawing permafrost in some locations.*
- *risk of health, economic impacts on local communities and environments.*
- *on-site health and safety risks from increased risk of floods and wildfire.*

Exploration:

- *increased access to new reserves.*



Potential Climate Change Risks on the Mine Site:

Operations-Reduced Efficiency From:

- increased downtime and higher operational costs from higher temperatures,*
- increased intensity of extreme weather events,*
- reduced water quality and availability, particularly in areas where water resources are already under stress.*

Operations-Reduced Performance From:

- inadequate capacity for water treatment, water, and waste impoundments due to changes in hydrological conditions.*



Potential Climate Change Risks on the Mine Site:

Construction, Operations, Closure and Post-Closure:

- environmental impact assessment may need to take future climate into account;*
- long-term closure and reclamation plans should reflect the expected climate over the site lifetime.*
- potential for creation of new pollution pathways, exacerbating material management risks.*
- increased weathering of potentially acid-generating rock due to increases in temperature and precipitation.*

Potential Climate Change Risks off the Mine Site:

Inputs to Mining Operations:

- reduced availability of critical climate-sensitive inputs such as water and energy, particularly in water-stressed regions.*
- lower reliability in generation and transmission of power due to disruption by extreme climatic events.*
- insufficient water for cooling or hydroelectric generation.*
- increased energy demand during extreme heat events or from higher seasonal temperatures.*

Potential Climate Change Risks off the Mine Site:

Inputs to Mining Operations:

- employee absenteeism, illness and reduced labour availability due to increased risk of heat stress, chronic diseases*
- health and social impacts from drought and other ecosystem changes.*

Potential Climate Change Risks off the Mine Site:

Supply Chain:

- damage to transport infrastructure (ie road, rail, marine, air) from extreme events (eg flooding, storms, droughts, landslides) and sea level rise (eg erosion, inundation).*
- reduced reliability from disruptions or delays to transport routes (via rail, road, sea and waterway) from seasonal changes and extreme events.*
- increased risk of damage to stockpiled ore/metals due to supply chain disruptions.*
- changes in the periods over which remote locations are accessible by land or marine transportation modes.*

Potential Climate Change Risks off the Mine Site:

Markets:

- changes in demand for metals and minerals to meet need for technologies to mitigate or adapt to climate change.*
- opportunities to capitalize on changes, or risks from loss of competitive advantages or the emergence of competitive disadvantages*

Climate Change Meeting the Challenge:

- Mining sector is estimated to grow significantly due to low carbon technology adoption such as wind, solar power, and batteries for energy storage and electric vehicles to mitigate emissions- which will increase lithium, graphite and nickel demand by 965%, 383% and 108% respectively by 2050 (World Bank).*
- Addressing climate change effects on mining is an area where government (national, regional, local) must work with companies and local citizens (stakeholders) to achieve sustainable extraction and processing through effective mitigation/adaptation.*



Climate Change Meeting the Challenge:

Addressing climate change by government in collaboration with the mining sector can be achieved by:

- *reducing a project's impact on/contribution to climate change (**climate change mitigation**)*
- *increasing the project's and local ecosystem's resilience to climate change (**climate change adaptation**)*
- *strengthening supply chains and markets.*

climate change and Canadian mining

OPPORTUNITIES FOR ADAPTATION

19.86	37.52	17.12	-0.05	1.81
17.47	17.02	42.15	+0.75	0.48%
40.45	40.86	27.09	+0.13	2.09%
27.15	26.07	22.47	+0.46	-5.12%
1.99	21.71	22.47	-1.26	-5.12%
1.87	22.74	23.37	+12.51	3.30%
1.78	377.43	391.66	+0.74	0.78%
1.67	93.96	95.61	+0.42	1.69%
1.52	24.74	25.22	+0.30	1.22%
1.40	24.35	24.82		
1.25	55.00	57.23		

David Suzuki Foundation
SOLUTIONS ARE IN OUR NATURE

Climate Diplomacy REPORT

CLIMATE CHANGE AND MINING

A Foreign Policy Perspective

Lukas Rottinger, adelphi
Viggo Sherman, University of Queensland

Federal Foreign Office

adelphi

Electric Vehicles and Autonomous Vehicles in Mining 2018-2028

Technologies, Challenges, Benefits, Markets, Forecasts, Key Players and Opportunities

By Aman Atak

IDTechEx Research

www.IDTechEx.com

Minerals FOR CLIMATE ACTION

Climate Change Meeting the Challenge:

Climate Smart Mining is being advocated for sustainable extraction and processing of minerals and metals to secure supply for clean energy technologies while minimizing the climate and material footprint throughout the value chain for mining countries.

- ***Climate Change Mitigation-***Use of Renewable Energy, Innovation in Extractive Practices, Energy Efficiency
- ***Climate Change Adaptation-*** Forest Smart Mining, Resource Efficiency, Innovative Tailing Solutions, Enhanced Design Standards
- ***Reducing Material Impacts-*** Adoption of Circular Economy, Recycling of Strategic Materials, Strategic Mineral Supply Chain Management
- ***Creating Market Opportunities-*** Enabling Carbon Markets, Robust Geological Data, De Risking Investments.



Climate Change Meeting the Challenge:

- *government role and responsibility will need to change to reflect challenges posed by climate change especially related to licensing and approvals*
- *environmental assessment will need to be undertaken in a manner that includes climate change and its implications*
- *mine closure and post closure plans will need to incorporate climate change considerations to reflect entire life cycle of the mine (20 to 100 years)*
- *mining companies will need to address climate change corporately as well as at specific sites over their life.*

Government Role and Responsibility:

Many jurisdictions worldwide including Mongolia are considering, drafting or implementing legislation, regulations, programs and policies that:

- restrict greenhouse gas emissions allowed by projects.*
- increase the adaptive capacity and resilience of human-built structures and land use activities.*
- require planning processes for long-life projects (such as mines) to consider greater variation in future climate scenarios, resulting in projects that are more adaptable, more resilient and less likely to cause negative environmental effects.*

Government Role and Responsibility:

- ***Generate and share climate change information:*** Governments can play a crucial role in generating and sharing information on climate change with private sector stakeholders to address knowledge gaps and promote best practices.
- ***Develop supportive institutional arrangements:*** Governments can establish institutional arrangements that involve the private sector in national-level planning and action on climate change, including the country's National Adaptation Planning (NAP) process and its Nationally Appropriate Mitigation Actions (NAMAs).

Government Role and Responsibility:

- ***Build capacities:*** Mining companies may lack the technical capacities needed to adapt their operations in the face of a changing climate and to reduce their emissions. Governments can provide private sector actors with capacity building and training to better equip them to understand and act on climate change information.
- ***Establish a supportive policy and regulatory framework:*** Governments should develop policies, laws and regulations that encourage and support investments in mitigation and adaptation within the mining sector, including through the permitting process.



Government Role and Responsibility:

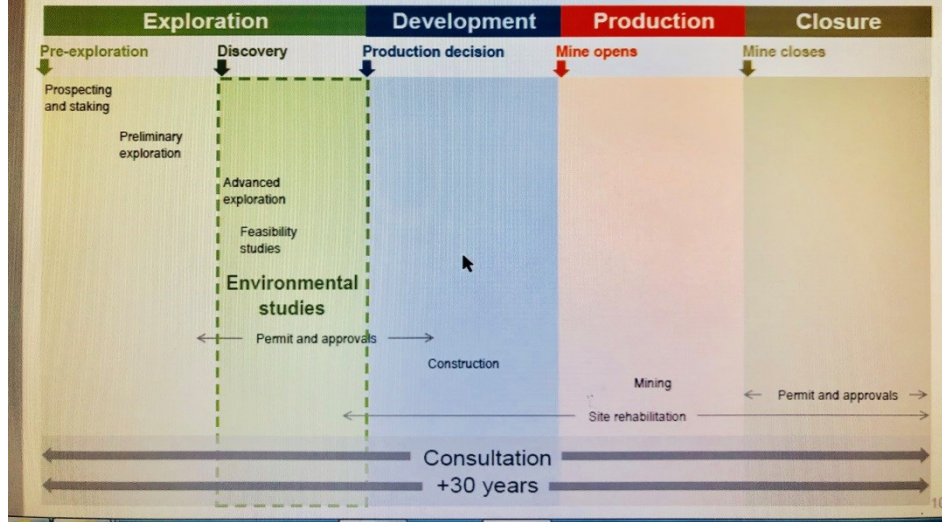
- ***Finance adaptation:** Financial barriers can prevent mining companies from engaging in mitigation and adaptation processes. Governments can use financial incentives as motivation for the private sector to invest in new products or operational methods that lower their emissions or increase their climate resilience.*

Government Role and Responsibility Summary:

- Governments have a crucial role to play in supporting the transition toward a low-carbon economy and increased climate resilience in mining.*
- Governments must ensure enabling conditions are in place within their jurisdictions that allow and encourage mining and mineral exploration companies to invest in renewable energy and adaptation activities.*
- Well-planned and implemented mitigation and adaptation actions from the mining sector, as well as from the private sector more broadly, will help countries achieve a number of their international commitments, including Sustainable Development Goals 7 and 13, the Nationally Determined Contributions agreed upon under the Paris Climate Agreement, and the Sendai Framework for Disaster Risk Reduction (UB host in July 2018).*



Mining Sequence and Approvals



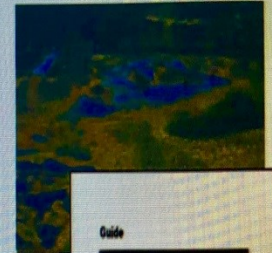
Stage 2: Environmental Assessment



Emerging Issues

Climate Change

- **Effects on climate change**
 - Assessment of emission rates of GHGs
 - Disturbance of the peatlands and release of carbon and other GHGs
 - **Mitigation** measures to avoid, offset or minimize contributions to climate change
- **Effects from climate change**
 - How the project will respond to storms, flooding, drought, fires or other severe weather events
 - How the site will be decommissioned to ensure resilience
 - Whether climate change scenarios could alter the anticipated effects
 - **Adaptation** of project plans to increase resilience to climate change
- **Examples for a mine**
 - GHG emissions from ore processing plant
 - Removal of peatland (carbon sequestration)
 - Droughts causing acidic tailings to become exposed
 - Flooding causing dam breach
 - Fires causing electrical outages
 - Severe weather preventing employees from travelling to mine site
- **Guide to Consideration of Climate Change in the EA Process 2017**



Guide

Consideration of Climate Change in Environmental Assessment in Ontario

version history
Approved November 14, 2017, page 13

COLUMN 1 Climate Variable	COLUMN 2 Generic Project Component
Temperature extreme • High • Low • Warmest / coldest period Precipitation (Rain) • Frequency • Intensity • Duration • Total annual Precipitation (Snow) • Snow load • Snow water equivalent Wind Speed • Extreme gusts • Gales, hurricane force winds, tornadoes • Fog, ice, lightning	Utilities • Air intake • Water intake • Drainage / wastewater • Electrical and gas • Fire and Safety • Communications • Transport (road, rail) Operations • Performance • Continuity • Reliability Administration • Personnel • Occupational Safety • Insurance / liability Buildings • Structural integrity • Wet-up / stress / failure

Mining Environmental Assessments – Climate Considerations:

Mining projects/proponents could consider the potential impacts of climate change on their project by addressing:

- How vulnerable is the mine to a changing climate during its construction, operation, decommissioning, or post-closure?*
- Does the mine directly or indirectly contribute to the vulnerability or resilience of surrounding ecosystems to climate change?*
- Are there potential impacts that climate change may exert on the mine that may pose a risk to the environment?*



Mining Environmental Assessments – Climate

Mining projects/proponents could consider the potential impacts of climate change on their project by addressing:

- Are there alternative methods of carrying out the existing/proposed mining project that could reduce the negative impacts of climate change thereby reducing the risk to the local environment?*
- Could the project, with the impacts of future climate change factored in, still result in disruption to lands or waters associated with Mongolian livelihood and cultural resources?*

Mining Environmental Assessments - Climate

How might the project/alternative generate greenhouse gas emissions or affect carbon storage or the removal of carbon dioxide from the atmosphere?

- A proponent may need to consider all direct and indirect greenhouse gas emissions that would be generated by the project, or indirectly stimulated by its implementation.*
- A proponent may need to consider changes in local hydrology and vegetation that could result in changes to the carbon sequestration and storage capacity of a local landscape feature (e.g. wood lot, soils, shrubbery).*



Mining Environmental Assessments – Climate:

To what extent have the project/alternatives already taken into account impacts on climate change in project planning?

- A proponent may need to review existing features of the project and detail those features which may reduce greenhouse gas emissions, like energy and water efficiency measures or adaptive re-use of buildings or structures to reduce new energy or material demands.*
- A proponent may need to identify impact management measures intended to limit the project's interference with the local landscape, plant cover, and other natural features.*
- A proponent may wish to describe contributions to or investments in natural spaces projects that offset or mitigate the project's climate change impacts.*



Mining Environmental Assessments - Climate:

Are there alternative methods to implement the project that would reduce any adverse contributions to a changing climate?

- A proponent should consider alternative methods to project implementation in order to reduce the project's greenhouse gas emissions or any negative impacts on carbon storage or the removal of carbon dioxide from the atmosphere. This may entail aspects of the proposed project's scheduling, footprint, operation, or function. For example, a proponent could consider the scheduling and roll-out of mine construction activities in a way and at a time of year that would limit the negative impacts on the vegetation of the site and vicinity.*
- A proponent may need to consult mining industry standards, best practices, and best available technology, in identifying alternative methods*

Mining Environmental Assessments – Climate:

How might the project/alternatives give rise to climate change impacts, positive or negative, on herdsman and/or communities (aimags/suoms)?

- A proponent will need to undertake special considerations where an environmental assessment of a mining project could affect herdsman, remote aimags and suoms and interests.*

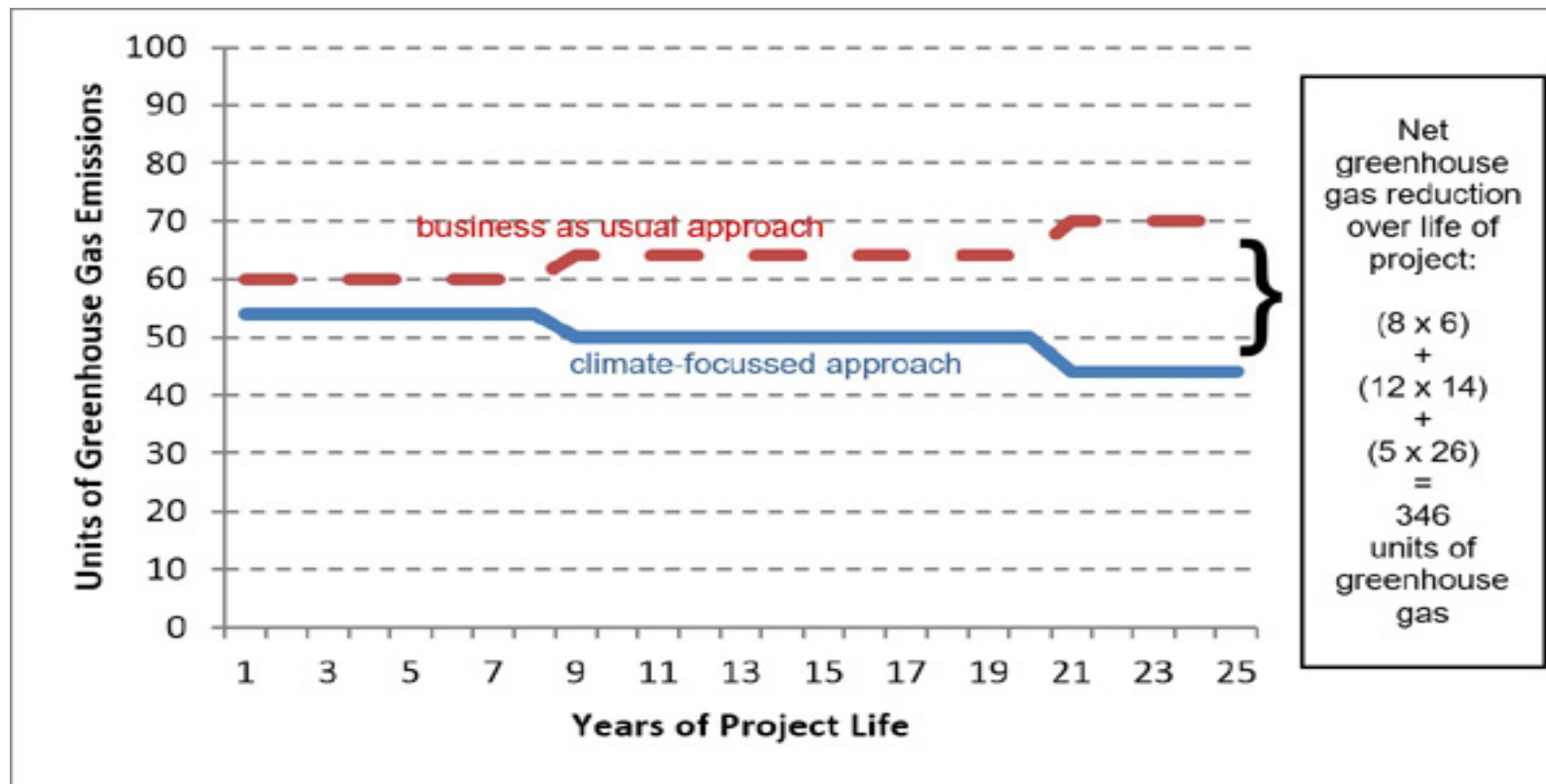


Mining Environmental Assessments – Climate:

What commitments can be made to reduce the impacts on climate change from the project over time, i.e. when the project is implemented?

- During the project planning phase, a proponent could consider near-term potential policy or technology developments that could have bearing on the project when implemented.*
- A proponent could consider and make commitments about ongoing assessment of best practices, continual improvement, or the ability to adopt technology that will further reduce greenhouse gas emissions, especially for projects with long lifespans.*

Environmental Assessment – Project Impact on CC:





Mine Closure and Post Closure– Climate:

Impacts:

- water scarcity and hotter temperatures will make it more difficult to reestablish vegetative cover*
- risk of heavier rainfall may result in tailings pond failure, discharge of contaminated water to surrounding areas, erosion, topsoil loss, land slides*
- increase in remediation costs, increase in potential liability and monitoring responsibilities extended*
- legacy mines reclaimed under older climate regimes may require supplemental protection to ensure stability of waste rock piles and tailings covers.*

Mine Closure and Post Closure – Climate:

Impacts:

- *higher evaporation rates may reduce need for water treatment and disposal by reducing volumes and costs (for acid mine drainage)*
- *Increased CO₂ and longer growing seasons may benefit revegetation efforts.*

Mine Closure and Post Closure– Climate:

- approaches to incorporate climate change into closure/post closure design/management will differ from site to site*
- currently no clear guidelines as to how to take into account climate change for long term prediction of closure systems performance*
- awareness of climate change and its effects as it pertains to the management of water resources in the context of mine closure design and cover system technologies required*
- combining conceptual components of future climate change effects and cover system performance, allows for more detailed modelling, that will recognize risk and facilitate resiliency.*

Mine Closure and Post Closure– Climate:

Adaptive Management

- plans designed to current knowledge with design criteria incorporated that accommodate long term conditions and extreme events (1 :1000 year storm event)*
- plan adapted as needed with modification of designs after construction or repairing structures after extreme events*
- approach requires owner/manager providing ongoing oversight and evaluation of conditions with resources to implement repairs make design modifications coupled with government interface/approvals program*
- liability for responsibility of closure/post closure success may depend on criteria and models used and who ultimately approved*

Mine Closure and Post Closure– Climate:

Predictive Management

- *planners use climate models to predict future conditions at the site*
- *models are run for different climate scenarios with the most conservative used for planning/design*
- *design meets modelled future condition*
- *who is responsible if predictions not accurate or wrong*
- *does not require same level of authority as adaptive management to implement*

Mining Company Best Practices-Policy:

- a corporate climate change policy and a means to publicize it*
- corporate guidelines for climate change that include commitments related to adaptation, such as changes in facilities management and integration of climate considerations into company plans*
- internal management structures that facilitate proactive, adaptive, and integrated management of climate change impacts*
- comprehensive management systems to address climate adaptation*
- a means to integrate a “climate test” into capital-expenditure approval processes*
- renewable and low-carbon energy’ criteria in the performance scorecards of senior and regional/site level management*

Mining Company Best Practices-Policy:

- *a plan to sign the Paris Pledge for Action, which requires signatories to pledge their commitment to a safe and stable climate in which temperature rise is limited to 2 degrees Celsius*
- *have insurance for weather conditions that would impact operations*
- *provide employee education/training on climate mitigation and adaptation*
- *encourage community partnerships and education projects*
- *have benefit agreements with communities that include/enhance/facilitate opportunities for mitigation and adaptation partnerships*
- *have a carbon offset program*



Mining Company Best Practices-Planning and Design:

- *integrate technical reviews of energy efficiency, greenhouse gas emissions, and water requirements into all projects proposed for development.*
- *gather data on the probability, magnitude, and frequency of extreme weather events at sites to understand their cumulative impact on structures.*
- *have pandemic preparedness procedures as part of emergency planning*
- *Voluntary Emission Trading Between Mines/Sectors*
- *consider vehicle Automation-Autonomous Trucks*
- *consider Automatic Idle Stop on Trucks*

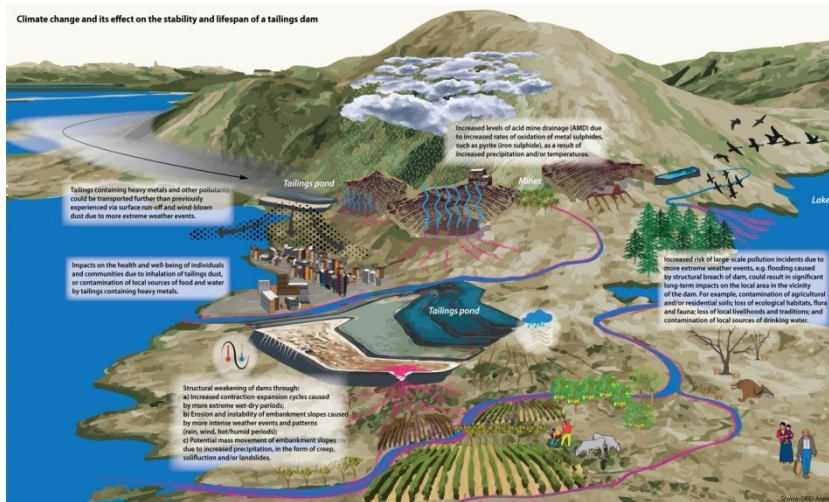


Mining Company Best Practices-Planning and Design:

- *utilize Mine Mapping Technology-3D mapping for efficient extraction of high value ore*
- *utilize GIS Data mapping for flooding or vulnerabilities*
- *utilize tailings and tailing covers (if applicable)*
- *have a dust control program*
- *incorporate structural reinforcement and retrofitting redundancy-1:100 year design to 1:500 year design*
- *utilize intensive maintenance routines focused on climate considerations*
- *incorporate water recirculation*



Climate change and its effect on the stability and lifespan of a tailings dam



Mining Company Best Practices-Energy and Carbon Management Strategy

- *a five-year energy security plan*
- *three-year operational targets for energy use, costs and carbon emissions*
- *a plan to identify and implement energy efficiency initiatives at all operations including fully integrating energy management into business processes, including strategic energy planning,*
- *a system to conduct climate change vulnerability assessments across its operations based on the Intergovernmental Panel on Climate Change (IPCC) high emissions ('business as usual') scenario, referred to as RCP8.5*

Mining Company Best Practices-Energy and Carbon Management Strategy

- a plan to utilize ICMM tools to undertake climate change vulnerability risk assessments*
- a strategy to implement a 20 percent (or other) renewable energy target, where feasible, at all existing/new operations and over the life-of-mine*
- a plan to utilize ICMM tools to undertake climate change vulnerability risk assessments*
- a plan to align its energy management practices to the ISO 50001 global energy management system standard*



Mining Company Best Practices-Water Management:

- *a prioritized reduction of evaporation losses program as a key water management strategy*
- *a means to ensure dry beneficiation processes, water recovery from slimes dams, and collection and use of storm water considered*
- *active reuse of water program such as petroleum water reuse (if applicable)*
- *a program to ensure potable water is available in sufficient quantity to meet the needs of local Aimegs and Suoms first and the project second.*

Mining Company Best Practices-Supply Chain Assessment:

- procurement and related functions to improve requirements and processes to more successfully consider climate impacts in sourcing and procurement decisions*
- a program to work with their suppliers to set qualitative climate targets*
- set requirements and encourage suppliers to reduce their emissions, develop adaptive capacity, and participate in programs with these goals including GHG-reduction criteria in supplier selection and product design*
- a supply chain risk-management team in place, with team members to monitor a number of risks related to climate change*





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Questions and Answers

General Discussion



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