2013 ADAPTool Application

iisd International Institute for Sustainable Development / Institut international du développement durable

Adaptive Policy Analysis of Mining Policies in Saskatchewan

Prepared by:

International Institute for Sustainable Development

Prepared for:

Province of Saskatchewan

Published by the International Institute for Sustainable Development.

International Institute for Sustainable Development

The International Institute for Sustainable Development (IISD) contributes to sustainable development by advancing policy recommendations on international trade and investment, economic policy, climate change and energy, and management of natural and social capital, as well as the enabling role of communication technologies in these areas. We report on international negotiations and disseminate knowledge gained through collaborative projects, resulting in more rigorous research, capacity building in developing countries, better networks spanning the North and the South, and better global connections among researchers, practitioners, citizens and policy-makers.

IISD's vision is better living for all—sustainably; its mission is to champion innovation, enabling societies to live sustainably. IISD is registered as a charitable organization in Canada and has 501(c)(3) status in the United States. IISD receives core operating support from the Government of Canada, provided through the International Development Research Centre (IDRC), from the Danish Ministry of Foreign Affairs and from the Province of Manitoba. The Institute receives project funding from numerous governments inside and outside Canada, United Nations agencies, foundations and the private sector.

Head Office
161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba, Canada R3B 0Y4
Tel: +1 (204) 958-7700 | Fax: +1 (204) 958-7710 | Website: www.iisd.org

2013 ADAPTool Application
Adaptive Policy Analysis of Mining Policies in Saskatchewan

Prepared by: IISD

Prepared for: Province of Saskatchewan

With support from Natural Resources Canada through the Adaptation Platform

Natural Resources Canada | Ressources naturelles Canada
Canada

iisd International Institute for Sustainable Development | Institut international du développement durable

For more information on climate change impacts and adaptation in Canada, please visit: **Adaptation.NRCan.gc.ca**

Project Delivery Team

The following people were involved in the research and writing of this report: Karla Zubrycki and Dimple Roy (IISD).

Additional researchers include:

Gabriel Huppé (IISD)
Benjamin Brodie (consultant with Saskatchewan Water Authority)

Acknowledgements

We thank the following contributors and staff for their engagement with this analysis: Doug Johnson, Wes Kotyk, Jeff Paterson, Tim Moulding, Sharla Hordenchuck, Mike Balfour, David Hanly, Neil Crocker, Todd Han, Darren Swanson, Terry Hanley, Tom Harrison and Kim Graybiel.

We'd like to also thank Pam Schwann, Blaine Renkas, Kevin Nagy, Brad Sigurdson, Jessica Theriault, and Mark Getzlaf from the Saskatchewan Mining Association for reviewing and providing feedback on the vulnerability and adaptation portions of our analyses.

We are also grateful to Natural Resources Canada for their funding for this work.

Recommended Citation

Roy, D. and Zubrycki, K. (2013). Adaptive Policy Analysis of Mining Policies in Saskatchewan. IISD Report submitted to Climate Change Impacts and Adaptation Division, Natural Resources Canada.

Executive Summary

Introduction

Saskatchewan's climate is projected to change in the coming years and decades. Climate experts inform us that drought, excess moisture and storms will be more common and severe in the future.

In 2013, the Water Security Agency (WSA) of Saskatchewan acquired Natural Resources Canada (NRCan) funding to analyze nine policies to assess the mining sector's ability to contribute to both anticipated and unanticipated adaptation needs. A version of the Adaptive Design and Assessment Policy Tool (ADAPTool) developed by the International Institute for Sustainable Development (IISD) in collaboration with other partners was used to undertake the analysis. The analysis was performed by IISD personnel and a consultant within the Saskatchewan government with the province's Water Security Agency. All analysis was reviewed by relevant provincial authorities involved with the relevant policy.

Purpose and Objectives

The purpose of the research was to provide insights to mainstream adaptation into existing and proposed government policies and programs. Specifically, this project examined how existing policies may act as drivers or barriers to effective adaptation action in the mining sector. A suite of policies was examined in Saskatchewan by an analysis group made up of provincial and IISD staff and informed by an advisory group that spanned government and non-governmental organizations and mining sector associations and companies.

Policy Selection and Identification of Adaptation Actions

The following nine policies/programs were analyzed:

- **Drilling Regulation:** The Drilling Regulation falls under the Oil and Gas Conservation Act and pertains to such matters as licensing, operations, decommissioning/reclamation, testing/measurement, and reporting requirements for oil and gas drilling.
- **The Environmental Assessment Act:** This act deals with environmental impact assessment for new developments. It includes responsibilities, processes, approval, investigations, offences and general issues pertaining to assessment.
- **The Environmental Management and Protection Act, 2010:** This regulation pertains to environmental protection with respect to mines. Sections of the regulations include the minister's general responsibilities and powers with respect to the environment, protection against unauthorized discharges and pollution, contaminated sites, civil liability for discharges, regulation of water quality, drinking water and waste water, halocarbons, permits, offences and penalties.
- **The Mineral Industry Environmental Protection Regulations:** This regulation pertains to pollution control and environmental protection with respect to mines. Sections of the regulations include construction etc. of pollutant control facilities, operation and temporary closure of pollutant control facilities, decommissioning and reclamation plan and assurance fund, exploration, applications and approvals for environmental protection, and general limitations.

- **The Hazardous Substance and Waste Dangerous Goods Regulations, Section 17 (HSWDG):** This regulation pertains to hazardous substances in relation to mining. It has sections on designation of hazardous substances, characterization of hazardous substances, exemption from requirements, approval to store, transferal of waste dangerous goods, etc.
- **The Mine Regulation, 2003, issued pursuant to The Occupational Health and Safety Act, 1993:** This regulation pertains to general occupational health and safety issues in mines. The regulation includes sections on plans and records, supervision of workers, general safety requirements, design of mines, underground mines, open pit mines, work practices and procedures, shaft sinking operations, shaft safety and shaft inspections, hoists and hoisting, use of explosives, diesel engines and their use, emergency response, etc.
- **Saskatchewan Environmental Code 2013:** This policy includes chapters on different environmental topics, with two proving to be the most pertinent to this analysis: Land Management and Protection (Section B) and Forestry (Section D). The guide used for this analysis includes explanations of changes to the code in 2013, frequently asked questions for each topic, contact information for questions and explanations of legislative authority for each chapter.
- **Drainage Approval Process:** Drainage works are defined under the Water Security Agency Act as being "any action taken or intended for the removal or lessening of the amount of water from land and includes the deepening, straightening, widening and diversion of the course of a stream, creek or other watercourse and the construction of dykes." The construction and operation of most drainage works requires an approval from the Water Security Agency. Some types of drainage works are exempt from requiring an approval, and these are explained in this document. For those where approval is required, the steps are articulated in this document.
- **Guidelines for Northern Mine Decommissioning and Reclamation:** These guidelines are intended to provide the proponent with an overview of the various factors to be considered during the development of a decommissioning and reclamation plan for a mining site. The first section will provide an overview of the legal requirements for developing and implementing a decommissioning and reclamation plan. The subsequent sections provide a review of some basic planning principles to be considered when designing a decommissioning and reclamation plan (Section 2); a review of the general closure criteria for the various components of a mining site (Section 3); and finally a brief discussion on the role of public consultation in developing, implementing and finally completing a decommissioning and reclamation plan (Section 4).

As a basis for gauging the ability of the suite of policies to support anticipated actions, a rapid expert-based assessment was undertaken that included the Saskatchewan Mining Association, staff from the SK-WSA and IISD staff. A total of 44 vulnerabilities were identified for the mining sector, along with 66 adaptation actions for each to address these vulnerabilities (see Appendix A for details).

Key Findings

Of these adaptation actions, 13 were directly supported by at least one policy in the suite and 59 were indirectly supported by at least one policy. Many actions had indirect support from more than one policy. Support for an adaptation action from a higher number of policies may mean there is more opportunity within existing policies to pursue an action, though it may also result in ambiguity regarding which policy should be used to pursue or implement an action. An overview of the scoring of the analyzed priorities is presented in Table 1.

TABLE 1: A BREAKDOWN OF HOW THE ANALYZED PRIORITIES WERE SCORED

Adaptive Policy Questions	Overall Synthesis	Drilling Regulation	Environmental Assessment Act	Environmental Management and Protection Act	Mineral Industry Environmental Protection Regulations	Hazardous Substance and Waste Dangerous Goods reg.	Mine Regulation	Sk. Environmental Code	Drainage Approval Process	Guidelines for Northern Mine Decommissioning and Reclamation
Ability to Support Anticipated Adaptation Needs (score out of 10)	5	5	6	7	5	2	6	5	4	4
Are anticipated adaptation actions supported by the policies?	0	0	0	1	1	0	1	0	0	0
Is the policy itself vulnerable to the stressor?	2	1	2	2	1	2	2	2	2	1
Can the existing suite of policies enhance the capacity of actors within each sector to undertake the anticipated adaptation actions?	1	0	1	1	1	0	1	0	0	1
Were foresight methods and multistakeholder deliberation used in the design of the policies?	1	1	1	1	1	0	1	1	0	1
Are foresight methods and multistakeholder deliberation used in the implementation of the policy?	1	1	1	1	1	1	1	1	2	1
Does the policy enable self-organization and social networking?	1	1	2	1	1	0	1	1	1	1
Is decision making for policy implementation adequately decentralized?	1	1	2	2	1	0	1	1	2	2
Is there adequate variety in the suite of policies and programs directed at the policy issue?	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Do the policies have a regular formal policy review?	1	2	1	1	1	0	1	1	1	1

The flags in the table represent scores ranging from -1 to 2. Low scores are flagged red, indicating that the suite of policies is not contributing to planned and autonomous adaptability. High scores are flagged in green and indicate the suit of policies is contributing to adaptation needs. Scores flagged in yellow signify partial contribution of the suite of policies to overall adaptability.

Low scores for any particular policy or characteristic are not meant to reflect negatively on that policy. The scores merely reflect an assessment of how they would respond to characteristics relevant to climate adaptation. All of the policies considered were designed for purposes other than climate adaptation.

Key Conclusions and Recommendations

The overall conclusions and recommendations of the adaptive policy analysis for the suite of policies considered include:

- **Support to Anticipated Adaptation Needs** (planned adaptability). Of 66 anticipated adaptation actions, 61 are directly (13) or partially (59) supported by at least one policy in the suite of policies considered. Five actions saw no direct or indirect support. Most of these unsupported actions (80 per cent) related to transportation in the operations phase, indicating a potential need for some consideration of adaptive capacity in this area (e.g., do other policies not included in this analysis lend adaptive capacity to transportation? If not, what potential is there to start including this topic in existing policies as they are amended?)
- **Policy Stress** (planned adaptability). The majority of the policies (66 per cent) were not vulnerable to the stressor. None were acutely stressed. The moderate vulnerability that did exist was mostly related to financial issues, particularly potential stress on funds related to remediation and reclamation. We recommend that some attention be paid to ensure these funds are not stressed, and that climate change considerations be included when deciding how financial resources are allocated in the future to these policies.
- **Support to Stakeholder Adaptive Capacity** (planned adaptability). The six determinants of adaptive capacity (access to economic resources, technology, infrastructure, information/skills, institutions/networks and equitable access to resources) had some support. The two factors with the highest degree of support were "access to relevant information and skills" and "access to relevant technology" (often represented more through *guidance* on and *requirements* for technology rather than "access," per se). "Equitable distribution of resources" and "access to financial resources" saw the least support, likely because there was nothing appropriate to distribute or access for many of the policies (i.e., the characteristic was not applicable). Given that only moderate support was seen throughout for this characteristic, there is likely considerable opportunity to strengthen the six determinants throughout the policies (e.g., by increasing access to institutions and networks).
- **Use of Foresight Methods and Multistakeholder Deliberation** (planned and autonomous adaptability). The policies that were more recently developed were more likely to have been developed with multistakeholder consultation, that is to say, the Drilling Regulation; the Environmental Assessment Act (amended in 2010); the Environmental Management and Protection Act, 2010; and the Saskatchewan Environmental Code 2013. The Hazardous Substance and Waste Dangerous Goods (HSWDG) Regulations developed in 1989 was the only policy with no support in this area; however, there is a plan to repeal it in the near future and include it in the Environmental Management and Protection Act (EMPA), which will likely then lead to more multistakeholder elements. We recommend that the repeal of the HSWDG Regulations be used as an opportunity to strengthen

the policy in this and other adaptive policy areas. There was little evidence of the deliberate use of foresight methods, though one highlight in the Drainage Approval Process is the fact that the Saskatchewan provincial standard for flood events is 1 in 500 year floods, rather than 1 in 100 or 200 year floods, used in other provinces. This forward-looking risk consideration is scenario- and foresight-related and strengthens resilience to floods.

- **Enabling Self-Organization and Networking** (autonomous adaptability). All but one policy (the HSWDG Regulations, Section 17) had moderate support for self-organization and networking. These opportunities were often uncovered in the interviews and were not evident by simply reading the policies. At times, informal and somewhat undocumented avenues for sharing lessons learned and best practices existed. For instance, chief inspectors of mines from across Canada meet on a yearly basis to discuss common interests across Canada, which allows for networking and sharing of best practices (relevant to the Mines Regulation, 2003 issued in pursuant to the Occupational Health and Safety Act, 1993). For more formal means of self-organization and social networking, some lessons may be learned from the Environmental Assessment Act. Again, there is an opportunity to strengthen the HSWDG Regulations when they are repealed and included in EMPA.
- **Decentralization** (autonomous adaptability). The suite of policies is generally sufficiently decentralized. For instance, the Drainage Approval Process is run out of five regional offices, which works well for decentralization and allowing for rapid response. The level of decentralization appropriate depends on the policy; some require more ministerial involvement (i.e., greater centralization) than others. The one policy to score lower on this measure was the HSWDG Regulations, for which decision making is at the government/ministerial level (i.e., not decentralized). It was suggested by the expert reviewer that there may be benefits to greater decentralization, a change that could happen in the near future when the policy becomes part of the EMPA. We recommend that this change be pursued.
- **Variation in Policy Instruments Employed** (autonomous adaptability). All of the instruments were primarily regulatory or guidelines, although there were some financial elements (e.g., assurance funds for remediation and reclamation). As there are many policies that influence the mining sector (both provincially and federally), and this analysis chose only some of the relevant policies, focussing on the legislative ones, the instrument mix may be balanced out in the "big picture."
- **Formal Policy Review and Improvement** (planned and autonomous adaptability). The policies varied in terms of formal policy review. One (Drilling Regulation) is reviewed regularly and has publicly available reports. Others have periodic reviews, but although "every five years" seems to be the goal, this is often not met. In most cases, the reports are not readily publicly available. Section 17 of the HSWDG Regulations has not been reviewed since 1989 and is typically reactive, but this is likely to change in the near future with its repeal and inclusion in EMPA. Most of the policies could improve in their frequency and formality of review process, as well as the availability of reports and results.
- **Finally,** it is recommended for a more comprehensive review for planned adaptation capacity to include policies that provide a transportation and building/infrastructure focus. There is a high degree of non-applicability in the current suite of policies in adaptation needs that include transportation and building actions. Inclusion of policies that do provide this focus will enrich and better inform how anticipated adaptation needs are supported in the mining sector.

Specific conclusions and recommendations for each policy are provided in Appendix B.

Table of Contents

1.0 What is Adaptive Policy/Programming?

Note: In this context, the term "policies" may refer also to programs, legislation and other policy instruments.

Over the past several decades, there has been recognition that public policies and programs intended to achieve stated objectives can, even if well-designed, lead to unintended consequences as conditions change. Public policy operates in a dynamic and complex environment. Actors in the policy domain interact with new external factors, changing economic and market conditions, new information, changing technology and evolving networks of exchange. With increased global interconnection, dynamic economic conditions, shifting climate and rapid changes in technologies, the resulting complexity and pace of change make outcomes difficult to predict. As conditions change, policies and programs may become less effective or even counterproductive. The idea of adaptive policies is to design policies and programs to increase their adaptability and help avoid these kinds of failures.

IISD collaborated with The Energy Research Institute (TERI) in India over a four year research project to explore case studies of policies in the agriculture and natural resource management sectors in both countries and identify characteristics of adaptive policies based on evidence of their actual performance. The results are described in the 2009 book *Creating Adaptive Policies: A Guide for Policy-Making in an Uncertain World* (Swanson & Bhadwal, 2009).[1]

- This research identified seven characteristics of policies that were adaptable to changing conditions. Some of these characteristics were designed to build in adaptability to anticipated change and projected future conditions, while others are useful in helping policies adapt to unanticipated conditions.
- The ADAPTool version used in this project is structured around these seven characteristics. Different questions in the tool are used to assess and score policies in relation to these factors.

The characteristics of adaptive policies/programs are: 1) integrated and forward-looking analysis; 2) multistakeholder deliberation; 3) automatic policy adjustment; 4) self-organization and social networking; 5) decentralization of decision making; 6) promoting variation; and 7) formal policy review and continuous learning.

These characteristics of adaptive policies/programs are summarized below and described in more detail with case studies in the book.

1.1 Integrated and Forward-Looking Analysis

Integrated and forward-looking analysis can identify key factors that affect policy/program performance and scenarios for how these factors might evolve in the future, so that policies and programs can be made robust to a range of anticipated conditions. These tools can also be used to develop indicators that will trigger adjustments when needed. Modelling tools of varying sophistication can be used to support this kind of analysis, which is often integrated through scenario planning.

[1] The full text of the book is available on-line at: http://www.iisd.org/publications/creating-adaptive-policies-guide-policy-making-uncertain-world

1.2 Multistakeholder Deliberation

Multistakeholder deliberation is a collective and collaborative public effort to examine an issue from different points of view as part of a decision-making process. Deliberative processes strengthen policy and program design by building recognition of common values, shared commitment and emerging issues, and by providing a comprehensive understanding of causal relationships. The key aspect of this process is that it involves participants in sharing multiple perspectives in an attempt to reach consensus on a relevant decision. This approach goes beyond stakeholder consultation.

1.3 Automatic Policy Adjustment

Automatic adjustment mechanisms can speed up the process of response to conditions that are more or less anticipated. They can be used in complicated policy/programmatic environments by separating the various issues into units in which the understanding of the system is high, allowing for fine-tuning of the system and making adjustments that help reduce risks and maintain performance. Automatic adjustment can be both fully and semi-automatic.

1.4 Enabling Self-Organization and Social Networking

The intent of this characteristic is to ensure that policies do not undermine existing social capital, but instead create forums that enable social networking, facilitate the sharing of good practices and remove barriers to local self-organization. Local responses, self-organization and shared learning all strengthen the ability of stakeholders to respond to unanticipated events through innovation.

These practices take advantage of the capacity of complex adaptive systems to generate solutions without external input or formally organized interventions. The ability of individuals and groups to self-organize in response to stresses, crises or unexpected problems is well documented in social and ecological literature, and a key aspect of healthy adaptation. For policy-makers and program managers, the idea is to foster self-organized responses to unexpected conditions by enabling and supporting interaction, learning and networking, without trying to control or dictate outcomes. This includes facilitating sharing and copying of best practices, providing resources to reduce barriers to self-organization and creating spaces for adaptive collaboration.

1.5 Decentralization of Decision Making

In governance terms, the principle of "subsidiarity" means decentralizing decision making to the lowest effective and accountable unit of governance. This has adaptive advantages because there are better opportunities for feedback and information sharing to ensure that decision-makers are aware of unexpected problems and effects of proposed interventions, as well as the nature of different interests. For policies/programs directly concerning natural resources and ecosystems, field staff typically notice significant change earlier and can mobilize affected local interests to address these changes more simply. Because local conditions vary widely, decentralization provides a way to implement policies and programs more flexibly to ensure effectiveness and adaptation to change. The potential for decentralization in any particular policy or program area will depend on the scale of intervention needed, the extent of local knowledge and capacity, and the structure of governance mechanisms for accountability and coordination.

1.6 Promoting Variation

Given the complexity of most policy settings, implementing a variety of policies to address the same issue increases the likelihood of achieving desired outcomes. Diversity of responses also forms a common risk-management approach, facilitating the ability to perform efficiently in the face of unanticipated conditions. Variation may be actively designed, as when a range of alternative options is provided to meet the diverse needs of different stakeholders. This can be facilitated by:

- Using a mix of policy instruments
- Exploring synergies with other policies
- Providing opportunities for risk-spreading

Another approach is to use policy tools to facilitate variation by removing barriers to alternative solutions and providing information to support exploration of options.

1.7 Formal Policy Review and Continuous Learning

Regular review, even when the policy or program is performing well, and the use of well-designed pilots throughout the life of the policy/program to test assumptions related to performance can help address emerging issues and trigger value-added policy adjustments. Formal review is different than automatic adjustment, where triggers and responses may be determined in advance. Formal review is a mechanism for identifying and responding to unanticipated circumstances and emerging issues. This assessment process can be very useful in detecting emerging issues that can affect the policy's performance. A formal review mechanism includes triggers for the review, definition of the nature of the review and a learning process that includes who needs to be involved in the review, who will take action on the results and what kinds of actions are to be considered.

Together, these seven characteristics of adaptive policies are relevant in the planning and design of policies and programs, as well as in their implementation and evaluation. The ADAPTool is intended to encourage assessment and discussion of these characteristics in various phases of the policy cycle.

2.0 The Adaptive Design & Assessment Policy Tool (ADAPTool)

The Adaptive Design and Assessment Policy Tool (ADAPTool) is a Microsoft Excel-based workbook designed to evaluate a suite of public policies and/or programs for their ability to contribute to the capacity of key economic sectors (e.g., mining, agriculture, forestry) to adapt to a specific socioeconomic or ecologic stress, such as climate change or market price volatility. A policy's ability to help stakeholders adapt to the stress and the policy's ability to adapt itself to the stress is assessed by answering fifteen questions across three worksheets, with a fourth worksheet aggregating results. The ADAPTool is based on the book *Creating Adaptive Policies: A Guide for Policy-Making in an Uncertain World* (Swanson & Bhadwal, 2009).[2]

The spreadsheet workbook serves as the basis for scoring each of the programs in response to the assessment questions identified below in Box 1. The questions cover both planned adaptability (i.e., how well the policy or program anticipates the likely impacts of the stressor) and autonomous adaptability (or adaptability to unanticipated impacts of the stressor).

BOX 1. ADAPTOOL QUESTIONS AND WORKSHEET STRUCTURE

I. Scope of Evaluation Worksheet:

1) What is the geographic scope of the analysis (e.g., watershed, conservation district, municipality, region, province)?
2) What is the stressor of concern (i.e., climate change, market price instability)?
3) What are the policies/programs to be assessed?

II. Vulnerability & Adaptation Analysis Worksheet (for planned adaptability):

4) What are the main sectors active in the geographic area?
5) In what ways are the sectors vulnerable to the stressor?
6) What adaptation actions might be necessary if this stressor becomes more severe in the future?
7) Are the identified adaptation actions supported by the policies/programs?

III. Adaptive Capacity Analysis Worksheet (for both planned and autonomous adaptability):

8) Is the policy itself vulnerable to the stressor identified?
9) Does the policy enhance the capacity of actors within each sector to adapt (with respect to access to finances, technology, infrastructure, information and skills, institutions and networks and equitable access)[3]?
10) Were foresight methods and multistakeholder deliberation used in the scoping and design of the policy?
11) Are foresight methods and multistakeholder deliberation used in the implementation of the policy?
12) Does the policy enable self-organization and social networking among affected stakeholders? (Does the policy provide mechanisms for the sharing and copying of best practices and lessons learned?)
13) Is decision making for policy implementation adequately decentralized?
14) Is there adequate variety in the suite of policies and programs directed at the policy issue (e.g., economic, regulatory, expenditure, institutional policy instruments)?
15) Does the policy have a regular formal review process in place that can detect emerging issues?

IV. Synthesis Worksheet

An aggregate ranking of planned adaptability and autonomous adaptability is provided for the overall suite of policies, as well as for each individual policy.

[2] Swanson, D. A., and S. Bhadwal (eds). 2009. Creating Adaptive Policies: A Guide for Policy-making in an Uncertain World. Sage Publications, New Delhi / IDRC, Ottawa.
[3] Based on Smit & Pilofosova (2001).

Systematically answering the above questions, the tool essentially assesses a suite of policies against two main considerations:

1. It shows whether policies and programs support adaptation to a particular stressor (in this case, climate change).
2. It shows whether the policies or programs themselves are inherently adaptable, due to the features of their design and implementation.

3.0 Policy Analyses

3.1 NRCan Project Process Overview

This Saskatchewan mining sector ADAPTool project is part of a multi-province project funded in part by NRCan's Climate Change Impacts and Adaptation Division. The project also includes a similar analysis of policies related to mining in Manitoba. In Saskatchewan, the project delivery team, consisting of analysts from IISD, the WSA, the Ministry of Environment and an independent consultant with Saskatchewan's WSA worked together to plan and implement the project.

This process involved several steps, described in more detail in subsequent sections of this report, including:

- Initial project scoping
- Literature review on vulnerability assessment in the mining sector
- Selection of mining sector policies to be assessed
- Staff training in the use of the ADAPTool
- Adaptability assessment of selected policies
- Reporting

IISD analysts and members of Saskatchewan WSA (administering the project) presented an initial list of vulnerabilities and adaptation actions that had been identified through research and a literature review to relevant stakeholders from relevant government departments and industry groups.

A session was convened in Regina to train the project partner lead in the use of the ADAPTool and to complete the scoping exercises for the Saskatchewan mining sector application. The policy selection, and the vulnerability and adaptation analyses were finalized through phone meetings and email correspondence.

Project team members first did an initial assessment of the policies using the ADAPTool spreadsheet, each taking approximately 1.5 to 2 days. Expert interviews on the analyses were then conducted by project team members, generally consisting of one interviewer (the project team member) and one interviewee. Once the interviews were completed, program scoring and details were validated and elaborated through follow-up emails and phone conversations.

The ADAPTool assessments for each program were then consolidated into a master workbook synthesizing results. IISD experts analyzed the synthesis and initial findings were checked and summarized with program leads and the project team.

3.2 Project Scoping and Policy Selection

The primary stressor of interest in this analysis is climate change. More specifically, increased drought, excessive moisture and increased temperatures are some of the most problematic impacts due to climate change for the Prairie region, and may have significant implications for the mining sector. Ensuring that policies and programs are able to positively influence adaptive capacity is an important part of climate change adaptation.

Table 2 details the changes in temperature, precipitation and extreme weather that are anticipated for Saskatchewan under climate change scenarios. Southern Saskatchewan's climate is projected to change in the coming years and decades, with anticipated increases in frequency and severity of drought, excess moisture and storms. For instance, the province experienced a taste of such a severe climate with the drought of 2001 and 2002, which cost the Canadian economy $6 billion in losses. Saskatchewan was one of the most affected provinces. Floods are also a concern. For instance, saturated soils, above average precipitation (150 –200 per cent above average) and snowmelt contributed to severe flooding of the Souris River in the spring of 2011 (U.S. Army Corps of Engineers, 2012).

TABLE 2: CLIMATE CHANGE STRESSORS FOR SASKATCHEWAN

VARIABLE	PROJECTED CHANGE
Temperature Projections	
Annual mean temperature	Increase of +1 to +3°C by 2020s
Warm season heat waves	Potential to get warmer and more frequent
Heat extremes	Potential to get warmer and more frequent
Frost-free season	Much longer
Mild winter thaws	Warmer and more frequent
Length of winter season	Much shorter
Winter freeze-thaw cycles	Increase
Precipitation Projections	
Annual precipitation	Modest increase
Winter precipitation	Substantial increase
Summer precipitation	Lower
Droughts	More intense and frequent
Intense rain events	Fewer and more intense
Surface water amount	Increase in near term. Decrease later in the century.
Extreme Weather & Other Projections	
Lightning	More frequent
Local summer flooding	Potential to increase

Source: Sauchyn, et al. (2009); SaskAdapt (2013).

The geographic scope of this policy analysis is the province of Saskatchewan. Policies were chosen in consultation with the WSA, the Ministry of Environment and industry stakeholders. The policies analyzed include the following:

Drainage Approval Process: The Drainage Approval Process falls under the WSA and, with some exceptions noted in the policy, explains the approvals process for "any action taken or intended for the removal or lessening of the amount of water from land and includes the deepening, straightening, widening and diversion of the course of a stream, creek or other watercourse and the construction of dykes."[4]

Drilling Regulation: The Drilling Regulation falls under the Oil and Gas Conservation Act and pertains to such matters as licensing, operations, decommissioning/reclamation, testing/measurement, and reporting requirements for oil and gas drilling.[5]

[4] https://www.wsask.ca/Permits-and-Approvals/Regulatory-Info/Drainage-Approval-Process/
[5] http://www.publications.gov.sk.ca/details.cfm?p=63704

Guidelines for Northern Mine Decommissioning and Reclamation: The Guidelines for Northern Mine Decommissioning and Reclamation "are intended to provide the proponent with an overview of the various factors to be considered during the development of a decommissioning and reclamation plan for a mining site" and include "an overview of the legal requirements for developing and implementing a decommissioning and reclamation plan," a review of basic planning principles, a review of "general closure criteria for the various components of a mining site" and information on the role of public consultation in decommissioning and reclamation.[6]

Saskatchewan Environmental Code 2013: This policy includes chapters on different environmental topics, with two proving to be the most pertinent to this analysis: Land Management and Protection (Section B) and Forestry (Section D). The guide used for this analysis includes explanations of changes to the code in 2013, frequently asked questions for each topic, contact information for questions and explanations of legislative authority for each chapter.[7]

The Environmental Assessment (EA) Act: The EA Act pertains to the assessment of the impact on the environment of new developments, including mines.[8]

The Environmental Management and Protection Act (EMPA), 2010: The EMPA 2010 is legislation for the protection of the province's air, land and water resources through regulating and controlling potentially harmful activities and substances. It repealed the Clean Air Act, the Environmental Management and Protection Act, 2002, the Litter Control Act and the State of the Environment Report Act.[9]

The Hazardous Substance and Waste Dangerous Goods (HSWDG) Regulations, Section 17: Section 17 of the HSWDG Regulations regulates the storage of hazardous substances and hazardous waste. It also includes appendices on different classifications on substances.[10]

The Mineral Industry Environmental Protection Regulations: These regulations pertain to pollutant control facilities and their construction, operation, temporary closure and decommissioning and reclamation. A pollutant control facility is a "facility or area for the collection, containment, storage, transmission, treatment or disposal of any pollutant arising from any mining operations or from the development of or the exploration for any mineral It also includes an assurance fund for decommissioning and reclamation."[11]

The Mines Regulations, 2003 issued pursuant to the Occupational Health and Safety Act, 1993: This regulation falls under the Occupational Health and Safety Act and provides detailed and specific information on health and safety requirements for a wide range of mining activities and conditions.[12]

It is worth noting is that the scopes and designs of these policies vary somewhat. For instance, some are parts of larger policies, such as the Drilling Regulation, which falls under the Oil and Gas Conservation Act. The full Oil and Gas Conservation Act was not reviewed as part of this analysis. Other policies in this analysis do include complete and full acts, such as Environmental Assessment Act. Therefore, some differences in scale exist.

[6] http://www.environment.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=e28770f9-33f5-4dfe-bc33-c2a255111b47&MediaID=1611&Filename=Northern+Mine+Decommissioning+and+Reclamation+Guidelines.pdf&l=English
[7] http://www.environment.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=1ab21da4-740c-42c9-b10b-00be9ea8c4d4
[8] http://www.publications.gov.sk.ca/details.cfm?p=488
[9] http://www.publications.gov.sk.ca/details.cfm?p=30313
[10] http://www.publications.gov.sk.ca/details.cfm?p=671
[11] http://www.publications.gov.sk.ca/details.cfm?p=1060
[12] http://www.publications.gov.sk.ca/details.cfm?p=678

3.3 Identification of Vulnerabilities and Adaptation Actions

In the mining sector four phases were identified: exploring and siting, development (construction of infrastructure), operations (processing and waste management, extractions) and closure and remediation. A list of vulnerabilities was identified using a literature review and rapid assessment process in cooperation with the Saskatchewan Economy and Saskatchewan Environment. Key documents used to identify vulnerabilities and actions include:

- *Adapting to a Changing Climate: Implications for the Mining and Metals Industry*
- *Climate Change and Canadian Mining*
- *Climate Change and Mining in Canada*
- *Climate Change and Acid Rock Drainage: Risks for the Canadian Mining Sector*

The rapid assessment also identified a list of anticipated necessary adaptation actions for each of the vulnerabilities listed above; these results are detailed in Appendix A. The list of adaptation actions is not meant to be definitive, but rather to provide examples of the types of actions that would be constructive in response to climate impacts identified.

3.4 Analysis Process

Once the vulnerabilities and potential adaptation actions were identified, the project team proceeded to review each of the nine identified policies using the ADAPTool workbook. This review was then shared with representatives from government who are well versed in the day-to-day workings of the policy, and who provided feedback on the analysis, through in-person and/or telephone discussions, and via email. Representatives in Saskatchewan also suggested they do a final review of the draft report. The process therefore relied on analyst experience, research and feedback and review from policy experts to provide a detailed accurate assessment of the policy vis-à-vis its response to sectoral adaptation needs and its performance on our scale of adaptive policy-making.

4.0 Adaptive Policy Conclusions and Recommendations

The diagram below presents the relative contributions of each of the policies analyzed in this report to both "planned adaptability"—the ability to support anticipated adaptation actions, and "autonomous adaptability" —the ability to support unanticipated adaptation needs. The position along the vertical axis of Figure 1 reflects a policy's relative support for anticipated adaptation actions, as well as the potential vulnerability of the policy itself to climate change; the ability of the policy to contribute to key determinants of adaptive capacity (economic resources, access to technology, infrastructure needs, information and management skills, institutions and networks, and equitable access); and the degree to which the policy consulted with stakeholders during scoping and design. A policy's relative position along the horizontal "autonomous adaptability" axis is a reflection of: the degree to which stakeholders have input during policy implementation; the ability to enable self-organization through the sharing of best management practices and lessons learned; if the policy is sufficiently decentralized to respond to local adaptation needs; and whether or not the policy has a formal review process to trigger key policy improvements and detect emerging issues.

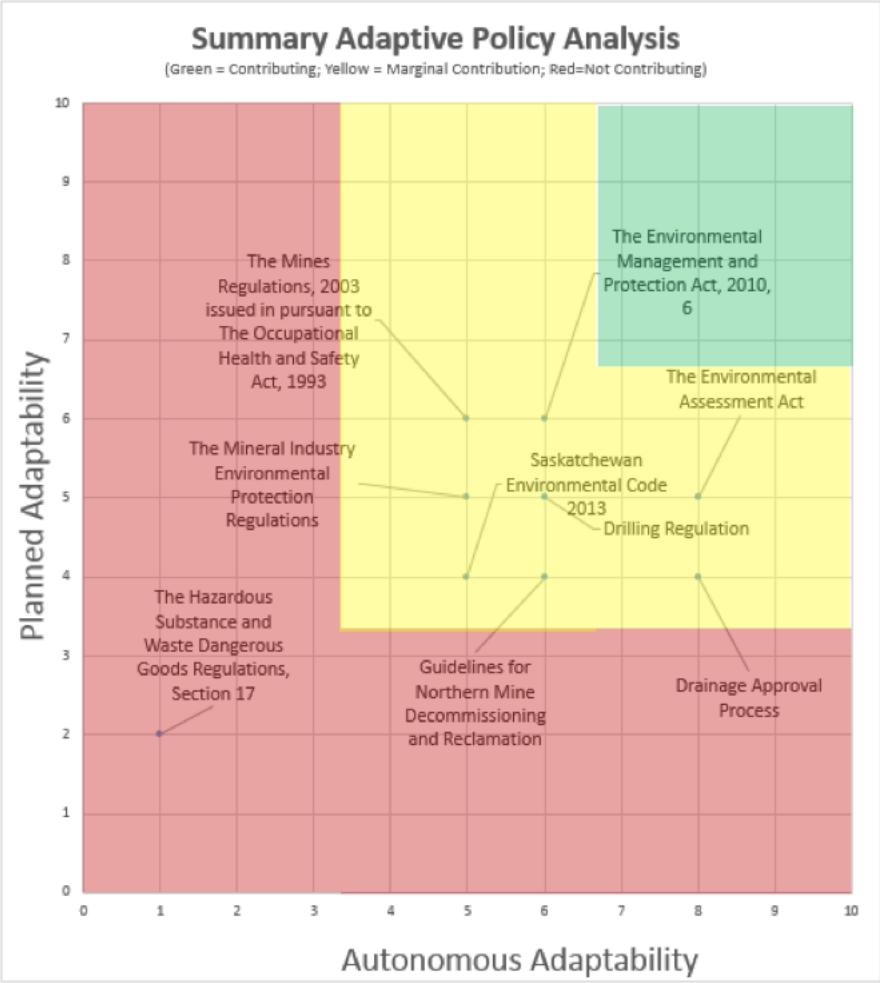

FIGURE 1: ADAPTIVE POLICY SUMMARY ANALYSIS DIAGRAM

If a policy appears in the green area of the diagram, it is contributing well to both planned and autonomous adaptability. A policy appearing in the red area signifies that there are issues to address with regard to its ability to contribute to adaptation and to adapt itself to the stressor of climate change. The yellow area signifies that a policy is partially contributing and that some improvements might be warranted to help it better contribute to adaptation needs and be more adaptive itself.

It is important to note that these rankings are not an assessment of policy performance relative to their original policy objective and mandate but their assessment with respect to adaptation and adaptive policy baselines. It is possible that policies that score well for adaptive capacity in the ADAPTool analysis might not actually be considered by policy-makers and other stakeholders to be "successful" at achieving their primary objectives, especially if that objective is not adaptation (which was not the main purpose of any of these policies). Similarly, a policy that scores in the red in the above chart might be achieving very well the goals for which it was designed, even though it is not scoring highly in its contribution to climate adaptation or adaptability. Therefore, this tool does *not* assess the success or failure of a policy. It does not identify "good" policies and "bad" policies. It simply identifies those that 1) contribute to climate adaptation in selected sectors and 2) demonstrate strong adaptive capacity in and of themselves and can be flexible in the face of predictable and unpredictable uncertainty.

In addition, a policy or suite of policies scoring very highly should not be taken as an indication that all climate change or other uncertainties or risks are mitigated. Policies demonstrating strong adaptive components, such as foresight methods and deliberation, likely increase resilience to uncertainty, *including* climate change. However, unforeseen events can still occur, and vulnerability still exists with the most robust of policy suites.

As illustrated in the diagram, all but one of the policies considered are ranked as 'partially contributing' (in yellow) to anticipated and unanticipated adaptation needs including: the Environmental Assessment Act; the Drainage Approval Process; the Guidelines for Northern Mine Decommissioning and Reclamation; the Saskatchewan Environmental Code; the Mines Regulation, 2003; the Mineral Industry Environmental Protection Regulations; the Environmental Management and Protection Act, 2010; and the Drilling Regulation.

The Environmental Assessment Act ranked among the highest, partially owing to: 1) involvement of expert reviewers in the Environmental Assessment process (resulting in access to information, skills, technology and networks); 2010 amendments that involved multistakeholder consultation; and 3) strong characteristics in decentralization and social networking/self-organization.

Three policies offered marginal support to adaptation actions. These were: the Environmental Management and Protection Act, 2010; 2); the Mineral Industry Environmental Protection Regulations; and 3) the Mines Regulation, 2003. This partial support can be attributed in part to the broader nature of these policies and, at times, general wording that offered opportunities for potential support (i.e., scorings of "1" for indirect support for an action). In comparison, the other policies in the suite were generally narrower in scope and so were unable to offer the same support for the adaptation actions.

The HSWDG Regulations scored the lowest, in part because of the highly targeted nature and deliberately narrow scope of the policy. This particular policy focuses on the storage of hazardous substances and waste and, as such, many of the vulnerabilities and adaptation actions were not applicable. The analysis involved coding such actions as "0"—the same as actions that had "no support" (but were arguably applicable)—contributing to a somewhat artificially low score. While all of the policies analyzed had some vulnerabilities and actions that were "not applicable," the HSWDG Regulations appear to have a higher number.

Other recommendations include:

- Analyze the replacement policy for the HSWDG Regulations after they have been repealed and included in EMPA. While the HSWDG Regulations scored the lowest in this analysis for adaptive capacity, indications from the expert review were that significantly more adaptive elements will be built into the replacement policy.
- As relevant policies come up for review, consider how climate change can be mainstreamed into them. For instance, can recommendations or requirements to include climate change scenario considerations be included more explicitly in policies?
- Repeat this assessment in five years to analyze if these policies are increasing in their adaptive capacity.
- Create a working group with industry to identify climate change vulnerability and actions, and ways in which they can be appropriately included in policy (not necessarily in legislation; information sharing, social networking or other means may be highly effective).

Specific recommendations:

- **Support to Anticipated Adaptation Needs** (planned adaptability). Five actions saw no support in the policies analyses. These actions were:
  - Flooding winter roads to thicken structure
  - Monitoring ice sheet thickness with ground penetrating radar
  - Plowing snow off the road to enhance freezing effect
  - Restricting hauling to hours of darkness towards the end of the season when the ice sheet is stronger
  - Use engineered cooling system to avoid disrupted potassium/sodium separation processes due to increased temperatures

It would be worthwhile to consider these actions more closely to determine if a) support is found in policies that were not analyzed or b) support should be built into a policy in the future in order to increase the mining sector's adaptive capacity for climate change.

This analysis showed that there is moderate adaptive capacity to climate change in the mining sector in Saskatchewan based on the specific policies reviewed. One of the most positive findings of this analysis was that more recently created or updated policies scored higher on their adaptive capacity than ones that have not undergone recent review—most notably, the HSWDG Regulations. Therefore, it appears that, as policies are created or undergo review, adaptive elements are being built into them. While a "next step" for some policies might be to explicitly include reference to or consideration of climate change adaptation, it is positive that adaptive capacity was already fairly apparent in most of the policies.

- **Policy Stress** (planned adaptability). Most of the policies have enough flexibility to reduce their vulnerability to climate change, though elements such as assurance funds added some potential vulnerability. Given that measurements are based on historical data, climate change may result in these baselines becoming inadequate. It is recommended that climate modelling and scenario planning be integrated where appropriate to encourage the building and installation of robust infrastructure to withstand projected climate change impacts during mining operations, as well as after the mines close. There is potential to consider improved access to information and skills related to assessing climate change vulnerabilities for the different mining phases.

- **Support to Stakeholder Adaptive Capacity** (planned adaptability). The two factors with the highest degree of support were "access to relevant information and skills" and "access to relevant technology," often represented more through guidance on and requirements for technology rather than "access," per se. "Equitable distribution of resources" and "access to financial resources" saw the least support, likely because there was nothing appropriate to distribute or access for many of the policies (i.e., the characteristic was not applicable).

  We recommend more access to institutions and networks be sought, as few policies had this characteristic, despite the fact that there is potential for it.

- **Use of Foresight Tools and Multistakeholder Deliberation** (planned and autonomous adaptability). Design of most of the policies included some stakeholder and/or public consultation, particularly if the policy was recently developed. The degree of deliberation undertaken varied. It is recommended that a space, such as a forum, is provided to host deliberation among the various stakeholders, including community members.

  The formation of the HSWDG Regulations is a good example of where foresight would have been useful; the creation of the policy was a reaction to an incident in which farm chemicals were stored at an old turkey farm and the site caught on fire. In the aftermath, there was a realization that policy was needed on the storage of hazardous substances. Foresight could have helped prevent this incident.

- **Enabling Self-Organization and Networking** (autonomous adaptability). All of the policies except the HSWDG Regulations provided some support for this element. The Environmental Assessment Act was the only policy to get a rating of "2" and, as such, it is recommended that other policies learn from this act and build in relevant aspects, where possible.

  The fact that the HSWDG Regulations do not provide support may not be a major concern, as this policy is being repealed and included in the EMPA in the near future. It is expected that self-organization and social networking will be supported in this area in the future. We recommend the government use the opportunity to strengthen the HSWDG topics (storage of hazardous substances).

- **Decentralization** (autonomous adaptability). The HSWDG Regulations are the only policy to be rated as "0." However, the regulations are being repealed and included in the EMPA in the near future. We recommend that this is an opportunity to increase decentralization, as appropriate.

  All of the other policies provided some support, with four policies rating "2." Whether or not a policy is "adequately" decentralized is a bit of a subjective question; there may be the opportunity to further optimize decentralization in the policies.

- **Variation in Policy Instruments Employed** (autonomous adaptability). All policies reviewed were regulatory. Some also have economic elements (e.g., mine closure has a related assurance fund.).

  As there are many policies that influence the mining sector (both provincially and federally), the instrument mix may be balanced out in the "big picture."

- **Formal Policy Review and Improvement** (planned and autonomous adaptability). Most of the policies scored a 1 for policy review, with only the Drilling Regulation scoring a 2 due to the fact that it both conducts regular reviews and publishes them on the website. The main recommendation for this element is to make reports publicly available.

  The HSWDG Regulations has never been formally reviewed. We recommend that a review mechanism be included when it is repealed and included in the EMPA in the near future.

- Finally, it is recommended for a more comprehensive review for planned adaptation capacity to include policies that provide a transportation and building/infrastructure focus. There is a high degree of non-applicability in the current suite of policies in adaptation needs that include transportation and building actions. Inclusion of policies that do provide this focus will enrich and better inform how anticipated adaptation needs are supported in the mining sector.

5.0 References

Government of Saskatchewan . (1989). Hazardous Substances and Waste Dangerous Goods Regulations. Retrieved from: http://www.publications.gov.sk.ca/details.cfm?p=671

Government of Saskatchewan . (1996). Mineral Industry Environmental Protection Regulations, 1996. Retrieved from: http://www.publications.gov.sk.ca/details.cfm?p=1060

Government of Saskatchewan. (2003). Mines Regulations, 2003. Retrieved from: http://www.publications.gov.sk.ca/details.cfm?p=678

Government of Saskatchewan . (2010). Environmental Management and Protection Act, 2010. Retrieved from: http://www.publications.gov.sk.ca/details.cfm?p=30313

Government of Saskatchewan . (2012). Oil and Gas Conservation Act (Drilling Regulation). Retrieved from: http://www.publications.gov.sk.ca/details.cfm?p=63704

Government of Saskatchewan. (2013). Environmental Assessment Act. Retrieved from: http://www.publications.gov.sk.ca/details.cfm?p=488

International Council on Mining and Metals (ICMM). (2013). *Adapting to a changing climate: Implications for the mining and metals industry*. Retrieved from: http://www.icmm.com/publications

Pearce, T., Ford, J.D., Prno, J., Duerden, F., Berrang-Ford, L., Smith, T.R., et al. (2009). *Climate change and Canadian mining*. Retrieved from: http://www.davidsuzuki.org/publications/downloads/2009/Climate_Change_And_Canadian_Mining.pdf

Pearce, T., Ford, J.D., Prno, J., Duerden, F., Duerden, F., Pittman, J., et al. (2011). *Climate change and mining in Canada*. Retrieved from: http://intranet.iisd.ca/shared/administration/ic%20files/minisis%20pdfs/Pearce15.pdf

Saskatchewan Ministry of the Environment. (2008). *Guidelines for Northern mine decommissioning and reclamation*. Retrieved from: http://www.environment.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=e28770f9-33f5-4dfe-bc33-c2a255111b47&MediaID=1611&Filename=Northern+Mine+Decommissioning+and+Reclamation+Guidelines.pdf&l=English

Saskatchewan Ministry of the Environment. (2013). *Saskatchewan Environmental Code: Quick reference guide*. Retrieved from: http://www.environment.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=1ab21da4-740c-42c9-b10b-00be9ea8c4d4

Smit, B. & Pilofosova, O. (2001). Adaptation to climate change in the context of sustainable development and equity. In J.J. McCarthy and O.F. Canziani (Eds.), *Climate change 2001: Impacts, adaptation and vulnerability. Contribution of Working Group III to the 3rd Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 877–912). Cambridge: Cambridge University Press.

Stratos Inc, & Brodie Consulting Ltd. (2011). *Climate change and acid rock drainage: Risk for the Canadian mining sector*. MEND Report 1.61.7. Mine Environment Neutral Drainage Program (MEND).

Swanson, D. A., & Bhadwal, S. (Eds). (2009). *Creating adaptive policies: A guide for policy-making in an uncertain world*. New Delhi: Sage Publications; Ottawa: IDRC.

U.S. Army Corps of Engineers. (2012). *2011 post-flood report for the Souris River Basin*.Prepared for the The International Souris River Board and The United States Department of the Interior Fish and Wildlife Service.

Water Security Agency. (n.d.) *Drainage Approval Process*. Retrieved from: https://www.wsask.ca/Permits-and-Approvals/Regulatory-Info/Drainage-Approval-Process/

Appendix A: Results of Vulnerability and Adaptation Action Analysis

Policies Analyzed:

- **Policy 1:** *Drilling Regulation*
- **Policy 2:** *The Environmental Assessment Act*
- **Policy 3:** *The Environmental Management and Protection Act, 2010*
- **Policy 4:** *The Mineral Industry Environmental Protection Regulations*
- **Policy 5:** *The Hazardous Substance and Waste Dangerous Goods (HSWDG) Regulations, Section 17*
- **Policy 6:** *The Mine Regulation, 2003*
- **Policy 7:** *Saskatchewan Environmental Code, 2013*
- **Policy 8:** *Drainage Approval Process*
- **Policy 9:** *Guidelines to Northern Mine Decommissioning and Reclamation*

As mentioned earlier in this report, scoring is not meant as a judgement of the policy. A "0" simply means that a particular action is not supported or addressed in the policy. During our multi-province analysis using this tool, we later adopted a scoring of "not applicable or N/A." This has since been formally adopted into the ADAPTool scoring to ensure that policies are assessed more fairly against what they are designed to do. While a scoring of "0" indicates that a policy does not support an action (but has the potential to do so), a scoring of "NA," represented in grey, indicates that the potential does not exist in the policy.

Mining Phase	Vulnerability	Adaptation Action	Policy								
			1	2	3	4	5	6	7	8	9
Exploration and Siting	Roads (permanent and winter): energy, drilling on ice cover, wet and fire season issues	Roads – Need to fly in equipment (potential show stopper for projects)	0	0	1	0	0	0	0	0	0
		Drilling on ice – Barges (also potential show stoppers)	0	0	1	0	0	0	0	0	0
	Increase in wetlands due to more precipitation could affect location of exploration and increase regulation	TBD	0	1	1	1	0	0	0	1	0
	Increased forest fires: smoke could affect location of exploration	TBD	0	0	1	0	0	1	1	0	0
Development (construction of infrastructure)	Roads (access to site, transportation of materials): excess water inhibiting access to site	Divert water around new site	0	2	0	1	0	0	0	2	0
	Water availability and siting: impacts on development location	Preferential sourcing of large water bodies that are unlikely to dry up	0	1	1	0	0	1	0	0	0
		Maximize water recycling	0	1	0	1	0	1	0	0	0
		More dry processes	0	1	0	1	0	0	0	0	0
		Increased use of ground water	0	1	1	1	0	1	0	0	0

	Foundation: permafrost (discontinued), identifying permafrost pockets and melt, risk of sinking, slopes can degrade, foundations fails as permafrost degrades = problems with infrastructure	Avoiding water and winter roads	0	0	1	1	1	1	0	0	0
		Airships	0	0	1	0	0	1	0	0	0
	Climate Change impacts on policy/ regulation: changes to building codes for increased wind/storm activity	TBD	1	0	1	0	0	0	0	0	0
Operations (Processing and Waste Management, Extraction)	Adequate amount of water for brining: lack or excess water can delay the process, affect recovery periods and increase amount of energy required to bring brine to adequate concentrations (non-metal -sodium sulphate)	Diversion of rivers	1	0	-1	1	0	0	0	2	0
		Build storage unit to control water flow from rivers to lakes	1	0	-1	1	0	0	0	2	0
		Use of dikes to divert water to sections of lake	1	0	-1	1	0	0	0	2	0
	Passive contaminant reduction systems (e.g., wetland filtration): increase in temperatures, particularly during the summers, can dry up water, re-exposing metals and contaminating ground below (metals)	Build backup systems	1	0	1	1	0	0	0	0	0
	Invasive species and passive filtration system: more use of natural bogs affecting water management plan; significant drying can lead to erosion; drought increased risk of fires	Build backup systems	1	0	1	1	0	1	0	0	0
	Waste piles and tailing: for water cover (tailing or pit), rise in evapotranspiration and mean annual precipitation can increase which in turn may reduce risk of drought effects but also increase risk of emergency discharge. In some regions where more seasonal drought is projected, increased risk of exposure of tailing to air (metal-Acid Rock Drainage [m-ARD])	Use alternative cover technology where more negative water balance is projected	1	0	1	1	0	1	0	0	0
	Water treatment: failure and underperformance of other components can be caused by an increase in hydraulic (precipitation sensitive) or chemical loading (temperature sensitive) (m-ARD)	Hydraulic – increase mine water treatment system capacity (e.g., holding pond, flow)	1	0	1	1	0	1	0	0	0
		Chemical – process modifications, increase use of reagents	1	0	1	1	0	0	0	0	0
	Open pits: increase in extreme precipitation can lead to a rise in flooding of pit and need for pumping treatment or emergency release; changes in chemical loading to pit water (m-ARD)	Plan for increased use of pits as storage ponds for extreme events, increased treatment of pit water or enhance other diversion structures and storage options	0	0	1	1	0	0	0	0	0
	Underground workings: rise in extreme precipitation can increase flooding of underground and can intensify use of pumping and treatment (m-ARD)	Plan for increased management of mine water (pumping and treatment) or enhance other and water storage options	1	0	1	1	0	1	0	0	0

	Other hydraulic structures (ditches, diversions, holding ponds): with increase in extreme precipitation current diversion ditches and channels are undersized resulting in more infiltration into or contact with acid generating material (m-ARD)	Increase capacity of diversion and storage structures	1	0	1	1	0	0	0	2	0
	Dams: increase in permafrost degradation and in annual and extreme precipitation can escalate the amount of seepage in the foundation (m-ARD)	Design for stability in frozen and unfrozen state	0	1	1	1	0	1	0	0	0
		Design for no pond at closure (i.e., dry tailings)	0	1	1	1	0	0	0	0	1
	Dams: increase in extreme precipitation can cause overtopping in freeboard/spillway (m-ARD)	Provide additional freeboard, design with option to increase spillway capacity	0	1	1	1	0	0	0	0	0
	Heating system: higher temperatures during the winter lowers the cost for operational heating (metal)	Use alternative heating system (cost savings)	0	0	0	1	0	1	0	0	0
	Cooling System: higher temperatures in the summer could increase operating costs if cooling systems are required	Take longer breaks	0	0	0	1	0	1	0	0	0
		Drink water	0	0	0	1	0	1	0	0	0
		Install cooling system units	0	0	0	1	0	1	0	0	0
	Water intake capacity for mineral processing: changes in regional temperature and precipitation will affect the amount of water runoff collected in basins or rivers needed for mineral processing	Incorporate climate change models within engineering designs (currently in need of detailed, local-level projections as most climate change models are generalized)	0	1	1	0	0	0	0	0	0
	Transportation: road and rail networks are sensitive to extreme weather and changes in temperature and precipitation, e.g., road-related drainage infrastructure and the winter road system	Flood winter roads to thicken structure	0	0	1	0	0	1	0	0	0
		Monitor ice sheet thickness with ground-penetrating radar	0	0	1	0	0	1	0	0	0
		Plowing snow off the road enhances freezing effect	0	0	1	0	0	1	0	0	0
		Restrict hauling to hours of darkness towards the end of the season when the ice sheet is stronger	0	0	1	0	0	0	0	0	0
	Transportation: spring flooding can affect transportation of product from mines and access to mine sites	Flood winter roads to thicken structure	0	0	1	0	0	1	0	0	0
		Monitor ice sheet thickness with ground-penetrating radar	0	0	1	0	0	1	0	0	0
		Plowing snow off the road enhances freezing effect	0	0	1	0	0	1	0	0	0
		Restrict hauling to hours of darkness towards the end of the season when the ice sheet is stronger	0	0	1	0	0	0	0	0	0

	Buildings: infrastructure built on or near steep slopes are at risk of slopes slumping and sliding as underlying frozen material loses cohesion due to melt as extreme flooding, ice storms and wind events are projected to increase in some regions	TBD	0	0	1	1	0	1	0	0	0
	Buildings: buildings erected on thaw-sensitive land could see their foundations settle and shift—and in worst case collapse—as permafrost melts, increasing maintenance expenditures and causing potential operational delays	Use of thermosyphon technology can help keep permafrost cool, ultimately help maintain structure integrity during permafrost degrading conditions	0	0	1	1	1	1	0	0	0
	Raw tailings: increased temperatures can lead to increased evapotranspiration from tailing ponds, potentially exposing raw tailings to sub-aerial weathering (metals)	TBD	0	0	1	1	0	1	0	0	0
	Potash separation processes: increased temperature can disrupt potassium/ sodium separation process.	Would require engineered cooling system	0	0	0	0	0	0	0	0	0
	Potash separation processes: increase in precipitation can create an increase in surface runoff and affects self-contained tailing ponds, making them less effective (lowers crystallization process)	Include in the design divisions/dams to control runoff	0	1	1	1	0	0	0	1	0
		Energy-intensive technology	0	0	1	0	0	0	0	0	0
	Brine injection wells: Process can be affected by extreme temperature +/- 30 degrees Celsius.	Technology design	1	1	0	1	0	0	0	0	0
	Northern mines: Sensitive to increased forest fire activity and associated smoke.	TBD	0	0	1	1	0	1	1	0	0
Closure and Remediation	Waste piles and tailing: change in mean annual and extreme precipitation can affect storage and release cover leading toward an increase in percolation, erosion or metal uptake; erode the cover. In turn, it affects ability of the surrounding vegetation to adapt properly (and with increase in temperature vegetation runs higher risk to forest fires)(m -ARD)	Increase vegetation (more or new)	1	0	1	0	0	1	0	0	2
		Increase thickness/capacity of storage layer	1	0	1	1	0	1	0	0	1
		Increase erosion resistance	1	0	1	1	0	1	0	0	1
	Waste piles and tailing: soil infiltration barrier can be affected by eroded cover and increase percolation caused by increase mean annual and extreme precipitation (m-ARD)	TBD	1	0	1	1	0	0	0	0	1
	Waste piles and tailing: when the protection layer is eroded due to increase precipitation (mean annual and extreme) the synthetic infiltration barrier runs the risk of being damaged (m - ARD)	Increase erosion resistance of protection layer where required	1	0	1	1	0	0	0	0	1
	Waste piles and tailing: through higher permafrost degradation it can lead to increased percolation (m-ARD)	Rock cover thickness can be increased or use of alternative cover technology	1	0	1	1	0	0	0	0	1

	Waste piles and tailing: for water cover (tailing or pit) rise in evapotranspiration and mean annual precipitation can increase MAP which in turn may reduce risk of drought effects but also increase risk of emergency discharge. In some regions where more seasonal drought is projected, increased risk of exposure of tailing to air (m -ARD)	Use alternative cover technology where more negative water balance is projected	1	0	1	1	0	0	0	0	2
	Waste piles and tailing: higher temperatures can create less entrained ice and less settlement of future reclaimed surface, positively affecting the tailings storage	Construct a smaller dam, if needed	1	0	0	0	0	0	0	0	1
	Water treatment: failure and underperformance of other components can be caused by an increase in hydraulic (precipitation sensitive) or chemical loading (temperature sensitive) (m-ARD)	Hydraulic – increase mine water treatment system capacity (e.g., holding pond, flow)	1	0	1	2	0	1	0	0	1
		Chemical – process modifications, increase use of reagents	1	0	1	2	0	1	0	0	1
	Open pits: increase in extreme precipitation can lead to a rise in flooding of pit and need for pumping treatment or emergency release; changes in chemical loading to pit water (m-ARD)	Plan for increased use of pits as storage ponds for extreme events, increased treatment of pit water, or enhance other diversion structures and storage options	1	1	1	1	0	1	0	1	1
	Underground workings: rise in extreme precipitation can increase flooding of underground can intensify use of pumping and treatment (m-ARD)	Plan for increased management of mine water (pumping and treatment), or enhance other and water storage options	0	1	1	1	0	2	0	0	1
	ARD biochemical process (i.e. sulphide oxidation rate): increase in rate of sulphide oxidation process due to higher average temperature (other factors considered constant) (m-ARD)	Implement water treatment or make process modifications to existing water treatment to address increased chemical loading (e.g., increased use of reagents)	0	0	1	1	0	0	0	0	1
	Native species: changing climate could affect the types of native species that can be planted and survive on reclaimed land.	Adjust what is considered "native" to shifting bio regions	0	1	1	0	0	0	0	0	1
	Dams: increase in permafrost degradation and in annual and extreme precipitation can escalate the amount of seepage in the foundation (m-ARD)	Design for stability in frozen and unfrozen state	0	1	1	2	0	0	0	0	0
		Design for no pond at closure (i.e., dry tailings)	0	1	1	2	0	0	0	0	1
	Dams: rise in precipitation (mean annual and extreme) can slope foundation due to rising phreatic surface (m-ARD)	Flatter slop ore buttress required	1	0	1	2	0	1	0	0	1
	Dams: increase in extreme precipitation can cause overtopping in freeboard/spillway (m-ARD)	Provide additional freeboard, design with option to increase spillway capacity	1	1	1	1	0	1	0	0	1
	Dams: change in permafrost degradation can affect settlement of foundation	Provide additional freeboard	1	0	1	1	0	1	0	0	1

Appendix B: Conclusions and Recommendations for Specific Policies

Adaptive Policy Questions	Score	The Drilling Regulation
Program's Ability to Support Anticipated Adaptation Needs (Planned Adaptability, score out of 10)	5	
Are anticipated adaptation actions supported by the policies?	0	No recommendation. Policy scope pertains specifically to drilling and so many actions were not supported.
Is the policy itself vulnerable to the stressor?	2	No recommendation.
Can the existing suite of programs enhance the capacity of actors within each sector to undertake the anticipated adaptation actions?	0	No recommendation.
Was multistakeholder deliberation used in the design of the policies?	1	No recommendation.
Program's Ability to Enable Sector Responses to Unanticipated Events (Autonomous Adaptability, score out of 10)	6	
Is multistakeholder deliberation used in the implementation of the policy?	1	Recommendation: increase deliberate use of foresight methods - e.g., in multistakeholder deliberations.
Does the policy enable self-organization and social networking?	1	No recommendation.
Is decision making for policy implementation adequately decentralized?	1	No recommendation. No clear ways to increase decentralization.
Is there adequate variety in the suite of policies and programs directed at the policy issue?	n/a	No recommendation.
Do the policies have a regular formal policy review?	2	No recommendation. This policy could be used as a good example of formal policy review and publication of changes.

Adaptive Policy Questions	Score	The Environmental Assessment Act (EA)
Program's Ability to Support Anticipated Adaptation Needs (Planned Adaptability, score out of 10)	5	
Are anticipated adaptation actions supported by the policies?	0	No recommendation. While there appears to be a general understanding from the policy implementation that climate change needs to be considered an actual statement in the act would strengthen the support, but this is somewhat outside of "building adaptive policies" in a general sense. Some things scored as "0" may actually be "n/a" – e.g., if covered under another act. Strategic planning appears to be a positive element of the act re: actions.
Is the policy itself vulnerable to the stressor?	2	No Recommendation. The expert review process associated with the act should buffer any vulnerability to the stressor.
Can the existing suite of programs enhance the capacity of actors within each sector to undertake the anticipated adaptation actions?	1	No recommendation. The considerable access to reviewers is a notable strength.
Was multistakeholder deliberation used in the design of the policies?	1	No recommendation. One could use this policy as a good example of consultation (2 years of consultation prior to amendment in 2010).

Program's Ability to Enable Sector Responses to Unanticipated Events (Autonomous Adaptability, score out of 10)	8	
Is multistakeholder deliberation used in the implementation of the policy?	1	Recommendation: Dictate use of foresight/scenario planning within the act. (The projects considered under the EA assessment can be quite different but there definitely could be something about addressing potential changes in hydro climate over the lifespan of the project, particularly in water-intensive areas such as potash. This type of planning has been utilized by the EA group, but if it is not explicit in the act it could easily not be included in the future depending on the personal beliefs of a DM or a shift in government).
Does the policy enable self-organization and social networking?	2	No recommendation, as this policy is a good example for self-organization and social networking. "This process cultivates the use of best practices and builds upon lessons learned."
Is decision making for policy implementation adequately decentralized?	2	No recommendation.
Is there adequate variety in the suite of policies and programs directed at the policy issue?	n/a	No recommendation.
Do the policies have a regular formal policy review?	1	While reviews have been done periodically, there is no formal requirement for them at a set interval. A minor recommendation might be to formalize these reviews to ensure they are done in the future.

Adaptive Policy Questions	Score	The Environmental Management and Protection Act
Program's Ability to Support Anticipated Adaptation Needs (Planned Adaptability, score out of 10)	6	
Are anticipated adaptation actions supported by the policies?	1	No recommendations. Acknowledging potential climate change impacts based on the current state of knowledge as an addition to the *State of the Environment* report would be beneficial, but this would be too specific and outside the seven pillars of adaptive policy-making.
Is the policy itself vulnerable to the stressor?	2	No recommendation.
Can the existing suite of programs enhance the capacity of actors within each sector to undertake the anticipated adaptation actions?	1	No recommendation.
Was multistakeholder deliberation used in the design of the policies?	1	No recommendation.
Program's Ability to Enable Sector Responses to Unanticipated Events (Autonomous Adaptability, score out of 10)	6	
Is multistakeholder deliberation used in the implementation of the policy?	1	Recommendation: Build in foresight/scenarios/projections, if possible.
Does the policy enable self-organization and social networking?	1	Recommendation: formalize sharing of information and communicate the availability of resources more.
Is decision making for policy implementation adequately decentralized?	2	No recommendation.
Is there adequate variety in the suite of policies and programs directed at the policy issue?	n/a	No recommendation.
Do the policies have a regular formal policy review?	1	Build in a regular (e.g., five-year) review of the policy, and make this policy available for viewing (e.g., on the government website).

Adaptive Policy Questions	Score	The Mineral Industry Environmental Protection Regulations
Program's Ability to Support Anticipated Adaptation Needs (Planned Adaptability, score out of 10)	5	
Are anticipated adaptation actions supported by the policies?	1	No particular recommendation. The wording in the regulations offers a fair bit of general and indirect support, depending on interpretation. It was helpful to learn via expert review how the regulations are applied in reality – e.g., re: water recycling (row 11): "Although not specifically mentioned in the Regulation, all proposals are reviewed taking into account how well environmental impacts are avoided or minimized. This would include waste minimization and water recycling. Many operating approvals do include condition to maximize water recycling where possible." (feedback from expert reviewer)
Is the policy itself vulnerable to the stressor?	1	Recommendation: there may be a bit of vulnerability related to the decommissioning and assurance fund, so be sure that the funds are adequate to cover possibilities that could come with climate change. There is already review and flexibility (e.g., to increase fund) built in.
Can the existing suite of programs enhance the capacity of actors within each sector to undertake the anticipated adaptation actions?	1	Recommendation: it may be beneficial if section 6, "Application for approval to construct" (included in analysis under access to relevant info and skills), included reference to climate change – e.g., "a statement of the nature of wildlife, fisheries, air, water resources, soil, hydrogeology and likely climate change scenarios in the area of the facility."
Was multistakeholder deliberation used in the design of the policies?	1	No recommendation.
Program's Ability to Enable Sector Responses to Unanticipated Events (Autonomous Adaptability, score out of 10)	5	
Is multistakeholder deliberation used in the implementation of the policy?	1	Recommendation: build in more multistakeholder deliberation.
Does the policy enable self-organization and social networking?	1	Recommendation: add opportunities to enhance sharing of practices/lessons learned in a more formal and deliberate way.
Is decision making for policy implementation adequately decentralized?	1	Recommendation: build in mechanisms to involve non-mining and non-governmental stakeholders more (e.g., those who could be affected by events, such as nearby communities, perhaps through public availability of monitoring data).
Is there adequate variety in the suite of policies and programs directed at the policy issue?	n/a	No recommendation.
Do the policies have a regular formal policy review?	1	Recommendation: Make reports publicly available.

Adaptive Policy Questions	Score	The Hazardous Substance and Waste Dangerous Goods Regulations, Section 17
Program's Ability to Support Anticipated Adaptation Needs (Planned Adaptability, score out of 10)	2	
Are anticipated adaptation actions supported by the policies?	0	No recommendation. The score is low in part because the policy is very targeted on the storage of hazardous substances and hazardous waste. Many of the actions may be covered under other acts (e.g. the Transportation of Dangerous Goods Act).
Is the policy itself vulnerable to the stressor?	2	No recommendation.
Can the existing suite of programs enhance the capacity of actors within each sector to undertake the anticipated adaptation actions?	0	Consider updating some aspects of policy, as technology referenced may be outdated given that policy has not been updated since 1989.
Was multistakeholder deliberation used in the design of the policies?	0	No recommendation. This policy was developed in response to an incident involving hazardous waste (in which farm chemicals were stored at an old turkey farm and the site caught on fire), perhaps indicating the value of foresight and scenarios to create policies before incidents happen, if possible.

Program's Ability to Enable Sector Responses to Unanticipated Events (Autonomous Adaptability, score out of 10)	1	
Is multistakeholder deliberation used in the implementation of the policy?	1	Once the policy is repealed and included in EMPA, consultation and deliberation may be a significant element. We recommend this as a good idea. The repeal of the act is an opportunity to increase adaptive capacity in this area.
Does the policy enable self-organization and social networking?	0	Suggest opportunities for self-organization and social networking be sought when the policy is repealed and included in EMPA. They currently do not exist.
Is decision making for policy implementation adequately decentralized?	0	There is interest in having more consultation in the future, according to the expert reviewer. This opportunity may come with the repeal of the act. Decision making is currently at the government/ ministerial level (i.e., not decentralized).
Is there adequate variety in the suite of policies and programs directed at the policy issue?	n/a	No recommendation.
Do the policies have a regular formal policy review?	0	The policy has not been updated since 1989. It would be a good idea to include review; the opportunity to include it will occur through the repeal and inclusion in EMPA.

Adaptive Policy Questions	Score	The Mine Regulation, 2003 issued in pursuant to The Occupational Health and Safety Act, 1993
Program's Ability to Support Anticipated Adaptation Needs (Planned Adaptability, score out of 10)	6	
Are anticipated adaptation actions supported by the policies?	1	There could be potential for more of the 1's to become 2's with stronger health and safety guidance. There could be value in adding climate change considerations to the act re: safety/health and mining. A lot of the links were tenuous and could be strengthened. "General safety" section provides broad, somewhat vague, support—degree of support depends on interpretation.
Is the policy itself vulnerable to the stressor?	2	No recommendation.
Can the existing suite of programs enhance the capacity of actors within each sector to undertake the anticipated adaptation actions?	1	No recommendation.
Was multistakeholder deliberation used in the design of the policies?	1	No recommendation.
Program's Ability to Enable Sector Responses to Unanticipated Events (Autonomous Adaptability, score out of 10)	5	
Is multistakeholder deliberation used in the implementation of the policy?	1	Recommendation: Increase the use of foresight planning (e.g., scenarios), as for example in any future consultation processes. No foresight elements were observed. However, the chief inspector has some flexibility through the regulations
Does the policy enable self-organization and social networking?	1	No recommendation.
Is decision making for policy implementation adequately decentralized?	1	No recommendation.
Is there adequate variety in the suite of policies and programs directed at the policy issue?	n/a	No recommendation.
Do the policies have a regular formal policy review?	1	The policy is currently under review at the time of this analysis (July 2013), more than 10 years after its creation. Therefore, more regular formal review would be warranted.

Adaptive Policy Questions	Score	Saskatchewan Environmental Code 2013
Program's Ability to Support Anticipated Adaptation Needs (Planned Adaptability, score out of 10)	4	
Are anticipated adaptation actions supported by the policies?	0	Recommendation: seek ways in which policy could provide more support for adaptation actions. The policy is easy to modify, and is reviewed frequently; therefore, opportunities to add support for adaptation actions, where appropriate, likely exist.
Is the policy itself vulnerable to the stressor?	2	No recommendation.
Can the existing suite of programs enhance the capacity of actors within each sector to undertake the anticipated adaptation actions?	0	Recommendation: given the low support recorded, build into the policy more support for information, infrastructure, institutions, networks etc.
Was multistakeholder deliberation used in the design of the policies?	1	No recommendation. This policy is a fairly good example of a consultation process in policy development. Use of foresight methods would be good.
Program's Ability to Enable Sector Responses to Unanticipated Events (Autonomous Adaptability, score out of 10)	5	
Is multistakeholder deliberation used in the implementation of the policy?	1	Ensure foresight methods are built into policy design, including in multi stakeholder deliberations.
Does the policy enable self-organization and social networking?	1	Build in more opportunities for sharing of lessons learned, best practices etc. Transparency is good, but sharing could be more formalized.
Is decision making for policy implementation adequately decentralized?	1	No recommendation. Decentralization is mainly achieved by way of stakeholder deliberations, which enhances the ability of local actors. Code is general and high level, so more opportunities for decentralization may not be realistic.
Is there adequate variety in the suite of policies and programs directed at the policy issue?	n/a	No recommendation. Code is legislation, but it also references standards within the code that are legal requirements, and there are a number of fact sheets and guidelines.
Do the policies have a regular formal policy review?	1	Recommendation: include formal review (e.g. every five years).

Adaptive Policy Questions	Score	Drainage Approval Process
Program's Ability to Support Anticipated Adaptation Needs (Planned Adaptability, score out of 10)	4	
Are anticipated adaptation actions supported by the policies?	0	No recommendation. This is a very specific policy and a lot of the proposed actions were not relevant to "action(s) taken or intended for the removal or lessening of the amount of water from land and includes the deepening, straightening, widening and diversion of the course of a stream, creek or other watercourse and the construction of dykes." Many of those policies that had support scored "2." So, where there was support, it was fairly strong. If the "0" scores were coded as "n/a," this policy would have scored higher. Of the eight policies that had support, five scored "2," and three scored "1."
Is the policy itself vulnerable to the stressor?	2	No recommendation.
Can the existing suite of programs enhance the capacity of actors within each sector to undertake the anticipated adaptation actions?	0	There is probably not a lot of opportunity here to enhance capacity; one option could be to increase access to institutions, information and networks, as none was evident.
Was multistakeholder deliberation used in the design of the policies?	1	No recommendation.

Program's Ability to Enable Sector Responses to Unanticipated Events (Autonomous Adaptability, score out of 10)	8	
Is multistakeholder deliberation used in the implementation of the policy?	2	No particular recommendation. This is a good example of broad foresight (though not deliberately regarding climate change) when looking at threats, as the provincial standard = 1 in 500 year flood, greater than in other provinces, where it is often 1 in 100.
Does the policy enable self-organization and social networking?	1	Recommendation: track relevant (to drainage) progress towards target in 25-year WSA plan (https://www.wsask.ca/About-WSA/25-Year-Water-Security-Plan/).
Is decision making for policy implementation adequately decentralized?	2	No recommendation. This is a good example of decentralization. Five regional offices. One window approach.
Is there adequate variety in the suite of policies and programs directed at the policy issue?	n/a	No recommendation.
Do the policies have a regular formal policy review?	1	Recommendation: for new policy, ensure formal five-year review and publicly available reports.

Adaptive Policy Questions	Score	Drainage Approval Process
Program's Ability to Support Anticipated Adaptation Needs (Planned Adaptability, score out of 10)	4	
Are anticipated adaptation actions supported by the policies?	0	Main recommendation: seek ways to use "progressive decommissioning" to support adaptive action. This policy focuses on decommissioning and reclamation, which means few actions were applicable in the exploration, construction and operations phases. Since we did not have an "n/a" coding, actions that were not applicable were scored as "0." To some degree, the resulting score is artificially low. When actions from the first 3 stages of mining are taken out of the equations, only 20 relevant actions remain, and 85 per cent of them are indirectly supported while 10 per cent are directly supported.
Is the policy itself vulnerable to the stressor?	1	The assurance fund and unforeseen events fund, given upfront by mining companies (e.g., early in the project) could be vulnerable to severe climate change. Climate change could increase the amount of funding necessary to properly decommission/reclaim a site. One recommendation is to explicitly consider climate change projections and scenarios when mines pay into the fund.
Can the existing suite of programs enhance the capacity of actors within each sector to undertake the anticipated adaptation actions?	1	No recommendation.
Was multistakeholder deliberation used in the design of the policies?	1	No recommendation.
Program's Ability to Enable Sector Responses to Unanticipated Events (Autonomous Adaptability, score out of 10)	6	
Is multistakeholder deliberation used in the implementation of the policy?	1	Consultation is not always part of the process. Mines may choose to do it voluntarily for "social license." Recommend it becomes more standard and include climate change considerations (e.g., projections, scenarios).
Does the policy enable self-organization and social networking?	1	No recommendation. This policy offers a good example of adaptation being included through "progressive decommissioning," which allows for the opportunity to adapt and learn, including to climate change. Techniques can be improved upon while the mine is still operational.
Is decision making for policy implementation adequately decentralized?	2	The present level of decentralization is appropriate for the policy; no recommendation.
Is there adequate variety in the suite of policies and programs directed at the policy issue?	n/a	No recommendation.
Do the policies have a regular formal policy review?	1	Recommend more frequent formal review, to ensure all that is possible is done to keep policy updated. Otherwise, there could be the risk that the policy could be reactive rather than proactive.

Published by the International Institute for Sustainable Development.

International Institute for Sustainable Development
Head Office
161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba, Canada R3B 0Y4
Tel: +1 (204) 958-7700 | Fax: +1 (204) 958-7710 | Website: www.iisd.org