Assessing Climate Risks – The BC Example

Presentation at Adaptation Canada 2020

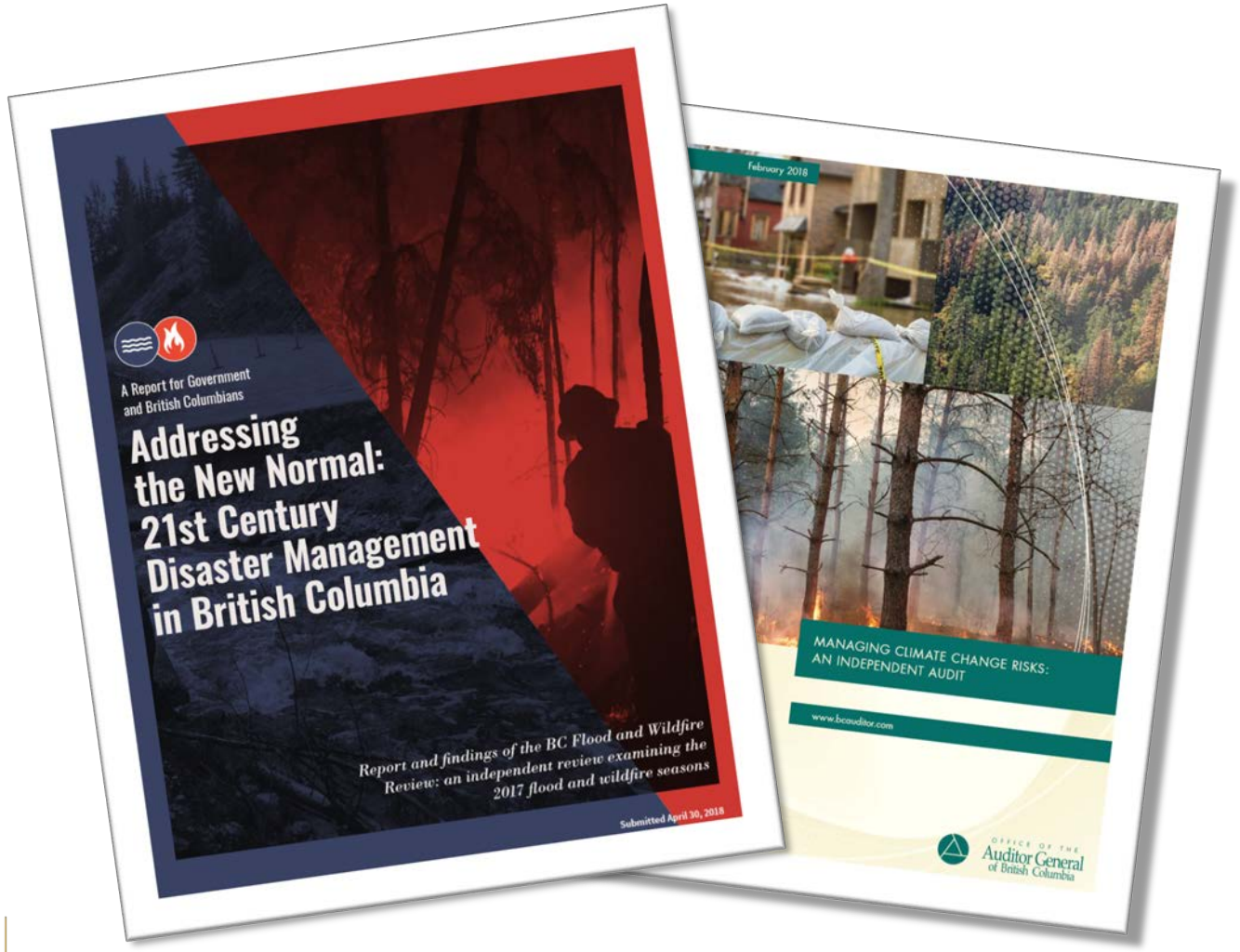
Climate Risk Management Team

BC Climate Action Secretariat

Ministry of Environment and Climate Change Strategy

Why a Climate Risk Assessment?

- Response to BC Office of the Auditor General Report "Managing Climate Change Risks"
- Chapman & Abbott report
- Annual report required under Climate Change Accountability Act
- Understanding what climate risks means for the provincial government



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Project Overview

Objective

- Assess, compare, and prioritize potential climate-related risks that could impact fundamental qualities of life in BC at a provincial scale
- Inform BC Deputy Ministers' Council about climate risks

Components

- *Framework (method)*
- *Preliminary Strategic Climate Risk Assessment (results)*

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What is B.C.'s Climate Risk Assessment Framework?

- A consistent method for conducting risk assessments
- Aligned with other risk assessments in BC government
- First attempt using this method to assess climate risks
- Limited in scope by feasibility and funding

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Key Features of the Framework/Approach

- Convened government internal advisory committee
- Focus on “provincially significant” risk events
- Identified 15 risk events
- Scenario-based approach
- Rate likelihood and consequence
- Assess uncertainty and knowledge gaps

Criteria for provincially significant

Loss of life	Widespread injuries or disease outbreaks
Widespread damage to infrastructure, personal property, or other resources	Long-term disruption to a significant economic sector
Significant disruption to daily life	Widespread psychological impacts
Significant loss of natural resources	Significant loss of cultural resources

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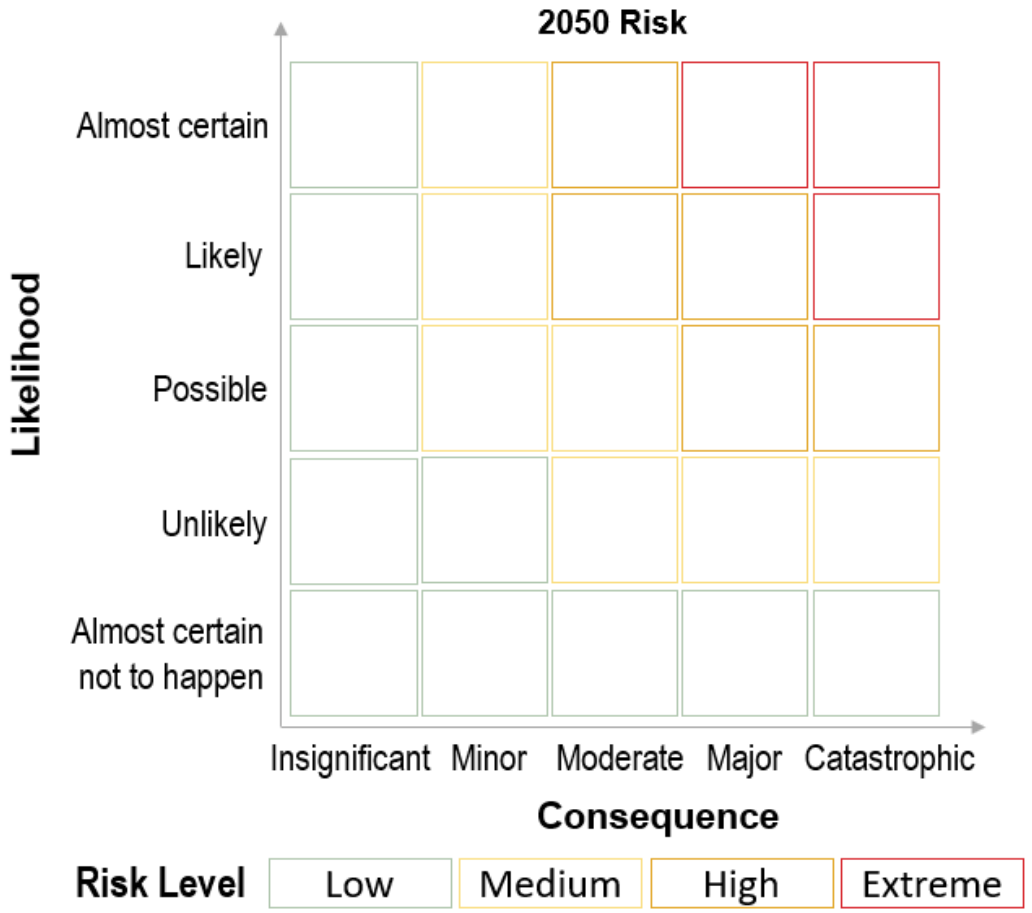
End Goal: Overall Risk Scores

Standard risk assessment methods define risk as:

Risk = Likelihood x Consequence



Risk Events and Scenarios: Discrete Events

1. **Severe Riverine Flooding:** 500-year flood on the Fraser River
2. **Moderate Flooding:** Moderate flood in a single community
3. **Extreme Precipitation and Landslide:** Significant landslide in Hope triggered by extreme precipitation
4. **Seasonal Water Shortage:** Months-long summer water shortage affecting two or more regions
5. **Severe Coastal Storm Surge:** 3.9 m storm surge during a king tide along the B.C. coast
6. **Heat Wave:** Heat wave of at least three days that affects human health
7. **Severe Wildfire Season:** At least one million hectares burned that affect human settlements and significant infrastructure

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Risk Events and Scenarios: Slow-onset Risks

8. **Long-term Water Shortage:** Multi-year water shortage in at least one region
9. **Glacier Mass Loss:** 25% decline in glacier area by 2050
10. **Ocean Acidification:** 0.15 reduction in pH by 2050
11. **Saltwater Intrusion:** At least seasonal saltwater intrusion into the Fraser River delta and surrounding communities by 2050
12. **Loss of Forest Resources:** 25% decline in timber growing stock by 2050
13. **Reduction in Ecosystem Connectivity:** Reduction in ecosystem connectivity in the Okanagan-Kettle region by 2050
14. **Increase in Invasive Species:** Expansion of knotweed by 2050
15. **Increased Incidence of Vector-borne Disease:** At least a doubling of Lyme disease cases

Confidence Ratings

How robust was the knowledge base?

Low confidence

- Varying amounts and quality of evidence and/or little agreement between experts; or assessment made only using expert judgment.

Medium confidence

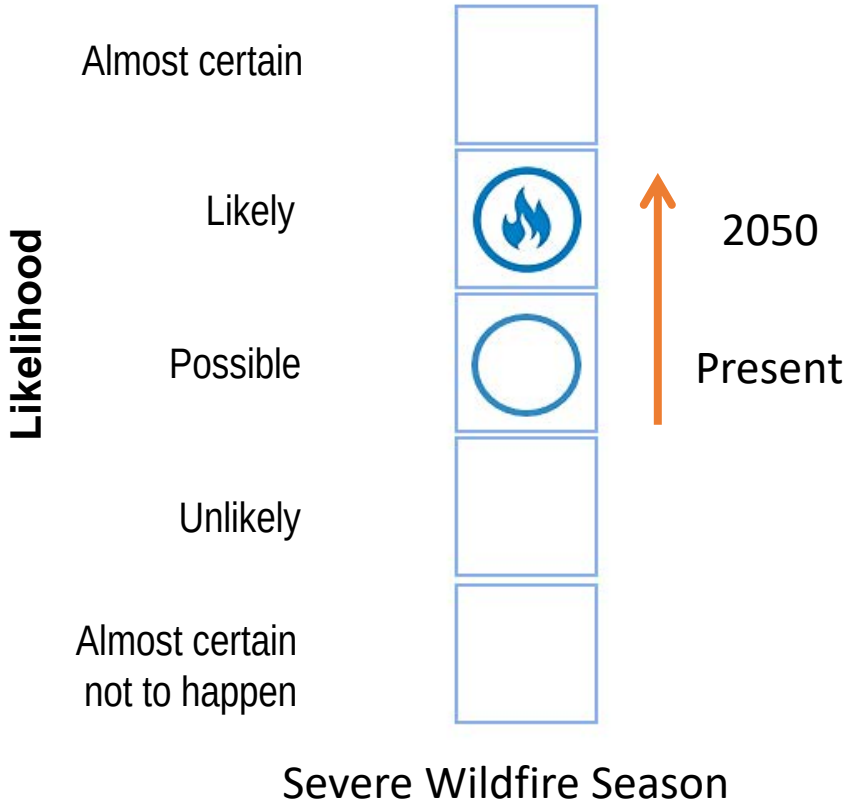
- Several sources of high-quality independent evidence, with some degree of agreement.

High confidence

- Multiple sources of independent evidence based on reliable analysis and methods, with widespread agreement.

Evaluating Likelihood

- Purpose: How does likelihood of risk change over time?
- Assessed risk scenarios on two timeframes:
  - Present day – 20-year period centered around 2010 (2000 to 2019)
  - Mid-century – 20-year period centered around 2050 (2040 to 2059)
  - Future climate based on high scenario of global greenhouse gas emissions (RCP 8.5)



Evaluating Consequences

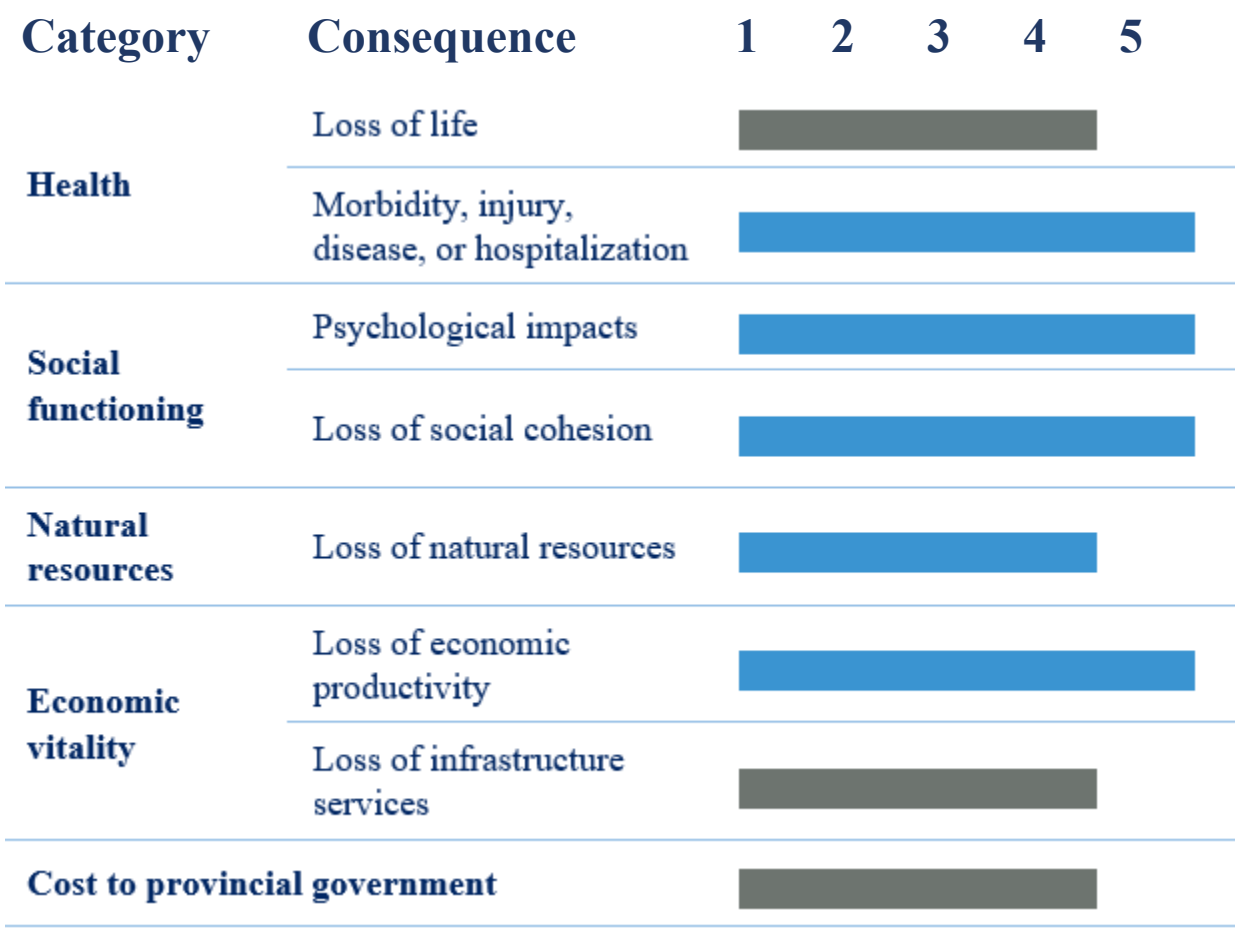
Review of existing evidence:

- Peer-reviewed literature
- Gray literature
- Input from scientific experts
- Expert judgement from workshop participants

Draft results on 5-point scale:

- Workshop participants provided feedback
- Removed cultural consequence category
- Adjusted risk scores

Average consequence score used for final results.

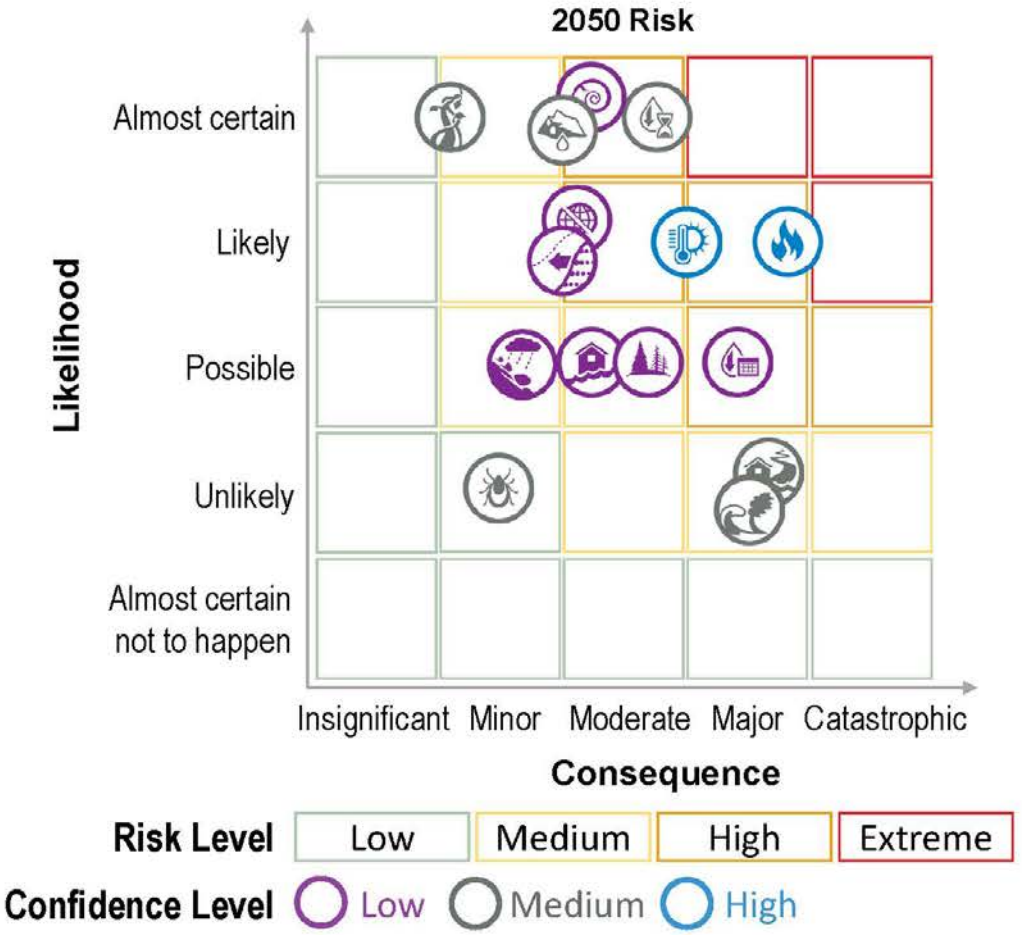


Caveats to Risk Assessment Findings

- Findings intended to inform senior BC government decision makers
- All climate risks assessed have provincially significant consequences
- Assessment does not consider local or regional risks
- Risks are assessed in isolation but many risks are linked
- Comparison of climate risks with other types of risks not included

Key Findings

Overall Results



Highest-ranked Risks

- Severe wildfire season – High
- Seasonal water shortage – High
- Heat wave – High
- Ocean acidification – High
- Glacier mass loss – High
- Long-term water shortage – High

Lowest-ranked Risks

- Increased incidence of vector-borne disease (Lyme disease) – Low

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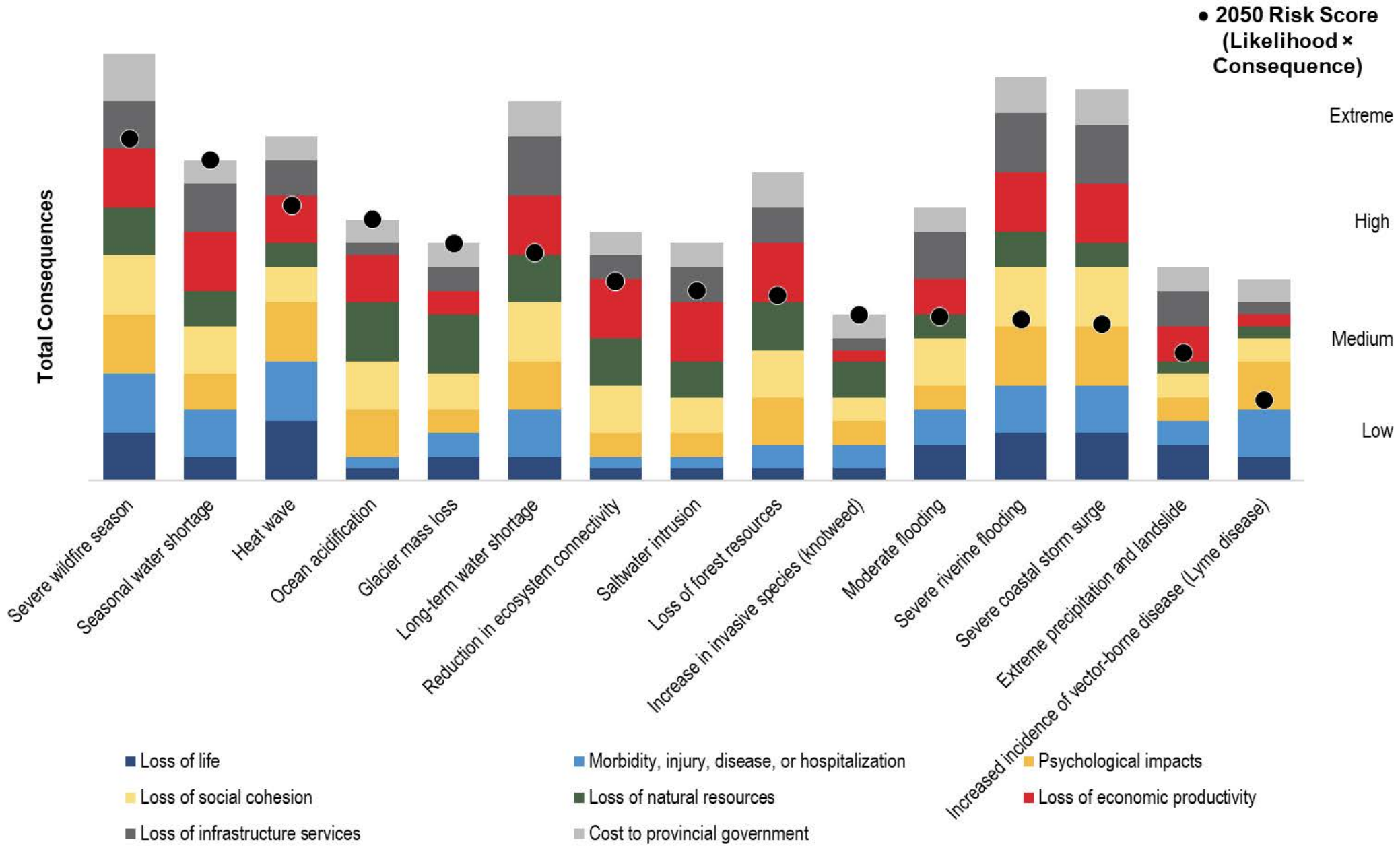
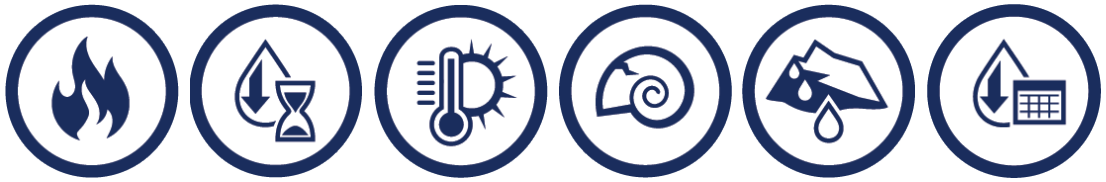
Risk consequences



*Individual consequences are rated on a scale of 1 to 5 (Insignificant to Catastrophic). The size of the bar indicates individual consequence ratings.

Key Findings

- Greatest overall risks:



- Highest consequences:

- High risk events include both discrete events and slow-onset climate changes

- Wildfire and heat wave aside, other top risks are driven significantly by their high likelihood

- Most risks have very significant psychosocial and economic consequences

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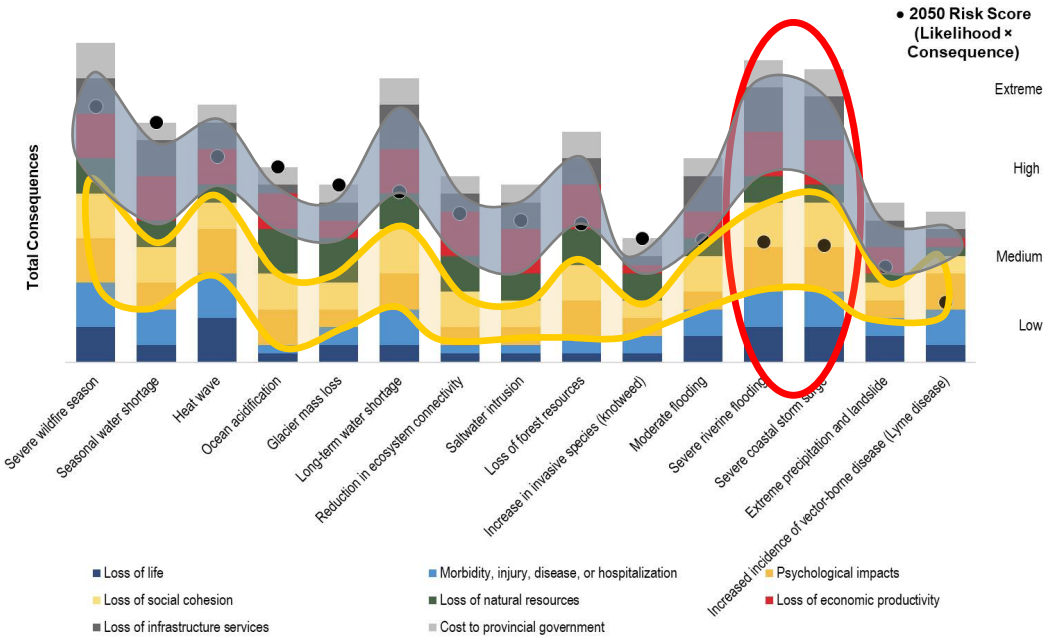
Lessons Learned: Process and Method

- First attempt using this method
- Fixed magnitude events are… just that!
- Risk prioritization should consider overall risk scores and consequences
- Nuancing risk consequences opens insight into pervasive need to prepare

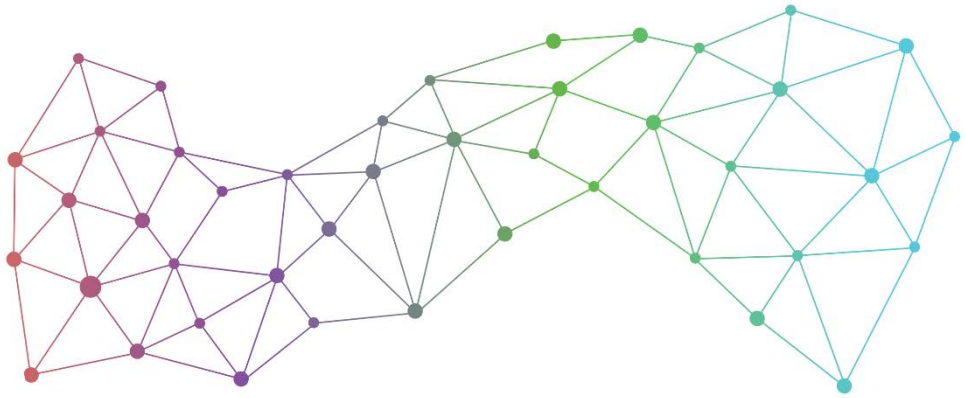


Lessons Learned: Strategic Connection

- Effective communication tool for risk management audiences
- Benefits of involving business and financial sectors
- Climate Change Accountability Act prompts 5-year iteration of climate risk assessment
- Alignment with other government initiatives

Lessons Learned: Complexities

- Standardized methods are reductionist in approach
- Assessing cultural dimensions of climate risks difficult
- Climate change affects Indigenous people disproportionately and their values and experiences need to be included



Next Steps

- Culturally appropriate approaches to climate risk assessment
- Pilot to customize assessment framework for use at different scales
- Examine risks to specific populations and gender-specific risks
- Inform climate preparedness and adaptation strategy

Supported by Natural Resources Canada's Building Regional Adaptation Capacity and Expertise (BRACE) Program

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Thank you

Supplemental Slides

Overall Results

RISK EVENT	PRESENT-DAY LIKELIHOOD	2050 LIKELIHOOD	CONSEQUENCE	RISK SCORE AND RATING	
Severe wildfire season	3	4	4.5	**18.0**	**High**
Seasonal water shortage	4	5	3.4	**16.9**	**High**
Heat wave	3	4	3.6	**14.5**	**High**
Ocean acidification	2	5	2.8	**13.8**	**High**
Glacier mass loss	1	5	2.5	**12.5**	**High**
Long-term water shortage	3	3	4.0	**12.0**	**High**
Reduction in ecosystem connectivity	3	4	2.6	**10.5**	**Medium**
Saltwater intrusion	1	4	2.5	**10.0**	**Medium**
Loss of forest resources	1	3	3.3	**9.8**	**Medium**
Increase in invasive species (knotweed)	4	5	1.8	**8.8**	**Medium**
Moderate flooding	2	3	2.9	**8.6**	**Medium**
Severe riverine flooding	1	2	4.3	**8.5**	**Medium**
Severe coastal storm surge	1	2	4.1	**8.3**	**Medium**
Extreme precipitation and landslide	2	3	2.3	**6.8**	**Medium**
Increased incidence of vector-borne disease (Lyme disease)	1	2	2.1	**4.3**	**Low**

Icon colour denotes overall confidence level in the final risk rating: **Low**, **Medium**, or **High**

Likelihood Rating Scale for Discrete and Ongoing Climate-Related Risk Events

LIKELIHOOD	RATING	CRITERIA FOR DISCRETE CLIMATE-RELATED RISK EVENTS	CRITERIA FOR ONGOING CLIMATE-RELATED RISK EVENTS
Almost certain	5	Event is expected to happen about once every two years or more frequently (i.e., annual chance ≥ 50%*).	Event is almost certain to cross critical threshold.
Likely	4	Event is expected to happen about once every 3 to 10 years (i.e., 10% ≤ annual chance < 50%).	Event is expected to cross critical threshold. It would be surprising if this did not happen.
Possible	3	Event is expected to happen about once every 11 to 50 years (i.e., 2% ≤ annual chance < 10%).	Event is just as likely to cross critical threshold as not.
Unlikely	2	Event is expected to happen about once every 51 to 100 years (i.e., 1% ≤ annual chance < 2%).	Event is not anticipated to cross critical threshold.
Almost certain not to happen	1	Event is expected to happen less than about once every 100 years (i.e., annual chance <1%).	Event is almost certain not to cross critical threshold.

Consequence Rating Scale for Climate-Related Risk Events

	HEALTH		SOCIAL FUNCTIONING		CULTURAL RESOURCES	NATURAL RESOURCES	ECONOMIC VITALITY		COST TO PROVINCIAL GOVERNMENT[x]
	Loss of life	**Morbidity, injury, disease, or hospitalization**	**Psychological impacts**	**Loss of social cohesion**	**Loss of cultural resources**	**Loss of natural resources**	**Loss of economic productivity**	**Loss of infrastructure services**	
Catastrophic - 5	100+ people or >25% of a single community	1,000+ people affected or >25% of a single community	Widespread and severe disturbance resulting in long-term psychological impacts (e.g., post-traumatic stress disorder (PTSD))	Months-long disruption to daily life (e.g., inability to access employment, education) Widespread, permanent loss of livelihoods or way of life Severe, widespread erosion in public confidence in government Erosion of community institutions and community cohesion	Resource can never recover; destruction is permanent and irreversible (e.g., destruction of an irreplaceable artifact or knowledge)	Resource can never recover; destruction is permanent and irreversible (e.g., extinction of a species within the province)	Potential direct and indirect economic losses of over $1 billion* Long-term disruption or loss of an economic sector and associated job losses	Months-long disruption in infrastructure services Major impediment to day-to-day life	Added cost is far beyond Contingency Reserve Fund (e.g., > $1.5 billion)
Major - 4	10 to 100 people or > 15% of a single community	100 to 1000 people affected or > 15% of a single community	Localized severe disturbance resulting in long-term psychological impacts (e.g., loss of home, identity, or sense of place)	Weeks-long disruption to daily life (e.g., inability to access employment, education) Localized, permanent loss of livelihoods or way of life Moderate erosion of public trust in government or community cohesion	Recovery of the resource will take decades	Recovery of the resource will take decades	Potential direct and indirect economic losses of over $100 million* Months-long disruption to a major economic sector and associated job losses	Weeks-long disruption in infrastructure services Major impediment to day-to-day life	Significant added cost; up to 2x Contingency Reserve Fund amount (e.g., $750 million to $1.5 billion)
Moderate - 3	2 to 10 people or > 5% of a single community	10 to 100 people affected or > 5% of a single community	Widespread moderate disturbance resulting in temporary psychological impacts (e.g.,	Days-long disruption to daily life (e.g., inability to access employment, education) Seasonal loss of livelihoods or way of life	Recovery of the resource will take years	Recovery of the resource will take years	Potential direct and indirect economic losses of over $10 million* Weeks-long disruption to a major	Days-long disruption in infrastructure services Major impediment to day-to-day life	Added costs can be covered within Contingency Reserve Fund but would detract from other priorities (e.g., >50% of

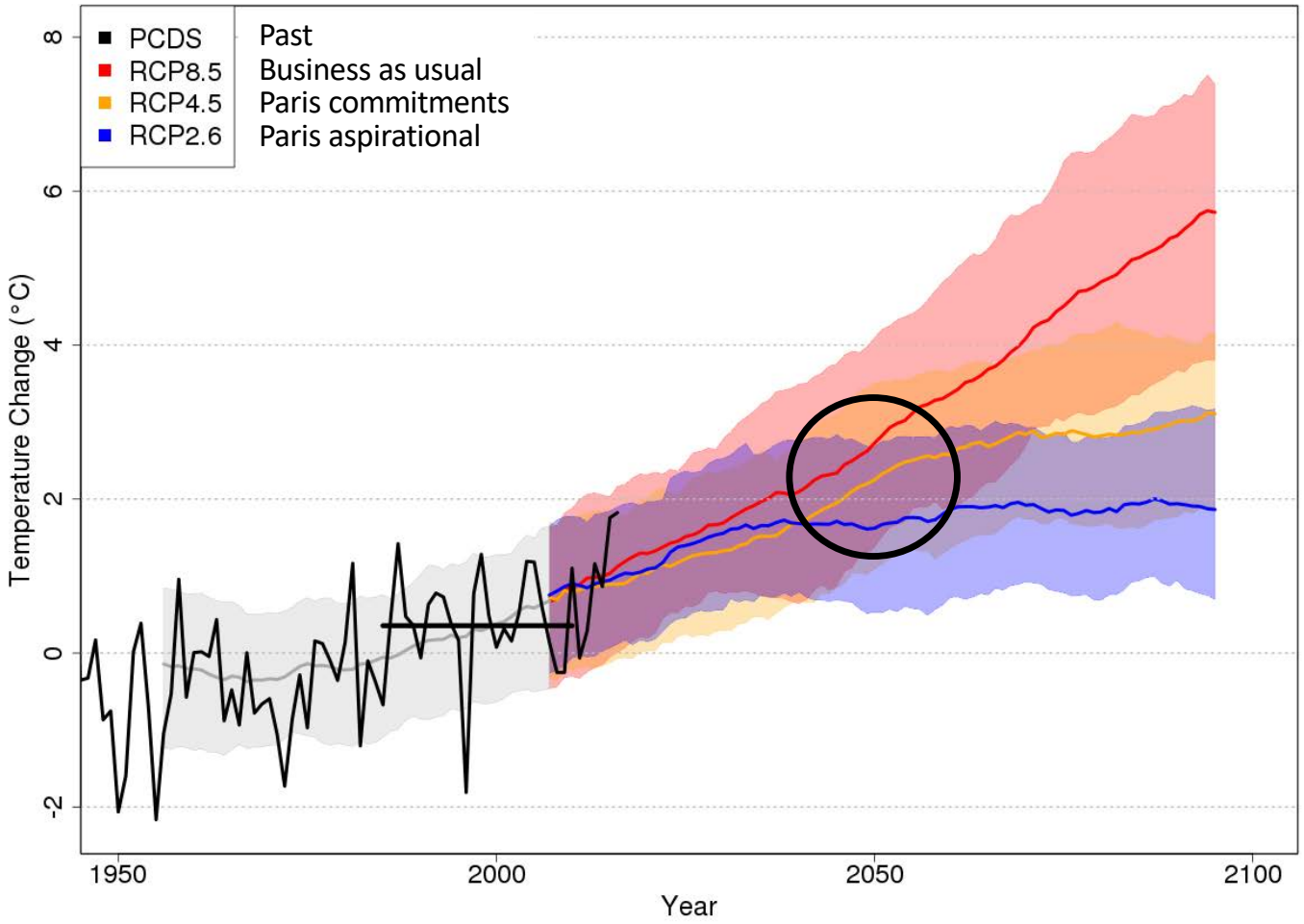
Consequence Rating Scale (continued)

	HEALTH		SOCIAL FUNCTIONING		CULTURAL RESOURCES	NATURAL RESOURCES	ECONOMIC VITALITY		COST TO PROVINCIAL GOVERNMENT[x]
	Loss of life	**Morbidity, injury, disease, or hospitalization**	**Psychological impacts**	**Loss of social cohesion**	**Loss of cultural resources**	**Loss of natural resources**	**Loss of economic productivity**	**Loss of infrastructure services**	
			feelings of fear and anxiety)	Minor erosion of public trust in government or community cohesion			economic sector and employment		Contingency Reserve Fund or > $375 million)
Minor - 2	Low potential for multiple loss of life	<10 people affected	Localized moderate disturbance resulting in temporary psychological impacts (e.g., feelings of fear and anxiety)	Hours-day-long disruption to daily life (e.g., inability to access employment, education) Low potential for erosion of public trust in government or community cohesion	Recovery of the resource will take months	Recovery of the resource will take months	Potential direct and indirect economic losses of over $1 million* Days-long disruption to a major economic sector and employment	Hours-long disruption in infrastructure services	Added costs can be covered within Contingency Reserve Fund
Insignificant - 1	No possibility of loss of life other than through unforeseeable misadventure	No possibility for morbidity, injury, disease, or hospitalizations other than through unforeseeable misadventure	Minimal expected reactions of fear anxiety or disruption to daily life	Minimal disruption to daily life Trust in government remains unchanged	Little impact or resource can recover within days	Little impact or resource can recover within days	Potential direct and indirect economic losses less than $1 million*	Temporary nuisance	No expected additional costs to government

*Chained 2007 dollars. All dollar figures are in CAD unless otherwise specified.

[x]Based on a Contingency Reserve Fund of approximately $750 million (B.C. Ministry of Finance, 2018).

2050 in B.C.: High vs Low Global Emissions



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