



July 2019

Preliminary Strategic Climate Risk Assessment for British Columbia - Summary of Results



Ministry of Environment and Climate Change Strategy

Acknowledgments

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OVERVIEW

This report summarizes the first phase of an initiative to better understand and prioritize climate-related risks in British Columbia in the 2050s and to help government develop appropriate measures to address those risks.

British Columbia developed a strategic climate risk assessment framework to provide a consistent, replicable and scalable approach for climate risk assessment. Using this framework, the Province conducted a preliminary assessment of provincially significant, climate-related risks to residents, industries, infrastructure, natural resources, and ecosystems in British Columbia. As a high-level assessment, the results are intended for use at a provincial level and do not fully capture risks at other levels, such as local or Indigenous communities or a specific sector or region of the province.

The assessment analyzed the likelihood and consequence of specific scenarios for 15 distinct climate risks that could occur in the 2050s. Findings suggest that the greatest risks to B.C. are severe wildfire, seasonal water shortage, and heat wave events. Risk events with the highest consequences, such as severe coastal storm surge and severe river flood, do not necessarily rank highest in overall risk as they tend to have relatively low likelihood.

INTRODUCTION

British Columbia is experiencing the effects of climate change: temperatures are increasing, sea levels are rising, and variable and extreme weather is becoming more frequent. Scientists expect these changes to accelerate and intensify in the years and decades ahead. Understanding and managing these risks is necessary to help prepare for the changes ahead and protect B.C.'s residents, industries, and infrastructure while improving prosperity and reducing costs to future generations. The provincial risk assessment is a critical first step towards achieving this.

The need for the assessment is recognized in the Province's CleanBC plan, which commits government to developing a new climate adaptation strategy, for release in 2020, based on a provincial assessment of climate risks. In 2018, the B.C. Office of the Auditor General recommended that the provincial government undertake a province-wide climate risk assessment, building on existing assessments and case studies.

B.C.'s Climate Action Secretariat (CAS) worked with the consulting firm ICF and a 20-person project advisory committee composed of representatives from eight B.C. ministries, as well as more than 70 experts to develop a strategic risk assessment framework and apply it in an initial assessment of climate risks at the provincial level.

“Provincially significant” risks defined:

- 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*

*Not presented in results

CLIMATE RISK ASSESSMENT METHODOLOGY

A risk assessment framework is a consistent methodology for conducting risk assessments, designed to be transparent in its approach to guide fair and open decision making. To ensure compatibility with existing standards, CAS developed the strategic climate risk assessment framework to be consistent with the *Risk Management Guideline for the B.C. Public Sector*, which is based on the International Organization for Standardization (ISO) 31000 Risk Management standard, and with the B.C.'s Risk Register, which the province's Risk Management Branch uses to record and manage information for identified risks.

The framework provides a consistent, repeatable, and scalable approach that can be customized to analyze climate risks at multiple levels (from small communities to the entire province) and for multiple climate-related risks.

Why use RCP8.5?

- Representative Concentration Pathways describe different possible futures based on atmospheric concentrations of greenhouse gases. RCP8.5 is a high global emissions scenario.
- Projected temperature changes for BC are similar for each RCP for the 2050s and key findings would likely be unaffected by using a different RCP. The difference between the RCPs becomes substantive towards the end of the century.
- The aim of this assessment was to characterize, at a strategic level, the most problematic climate-related risks that could potentially occur in BC in coming decades, using best available evidence. Using RCP8.5 helps to identify such significant risks.
- Prudent assessment of risk involves explicit consideration of uncertainties.

“Major” consequences include, for example:

- **Health:** Loss of life of 10-100 people, 100-1000 people hospitalized
- **Psychological:** Localized disturbance resulting in long-term impacts
- **Social:** Weeks-long disruption to daily life. Permanent loss of livelihoods or way of life
- **Environmental:** Resources recovery will take decades
- **Infrastructural:** Weeks-long disruption. Major impediment to day-to-day life.
- **Economic:** Months-long disruption, losses of over \$100 million, added cost \$750 Million to \$1 Billion

Using the framework, 15 illustrative provincially significant risk events were identified and a specific scenario of fixed magnitude for each event was defined. The scenarios were designed to be provincially significant, involving major consequences in at least one of nine categories representing health, psychological, social, environmental, infrastructural, and economic consequences. This risk assessment assumes high global emissions growth to 2050 based on Representative Concentration Pathway (RCP) 8.5 by the Intergovernmental Panel on Climate Change (IPCC).

Using a combination of desk-based research, expert consultations, and risk assessment workshops, the team estimated the likelihood (the annual percent chance) of each scenario occurring both in the present day and in 2050, to determine how climate change influences the likelihood of the scenarios. Present day refers to the 20-year time period centred around 2010 (i.e., 2000 to 2019), although some scenarios use an earlier “present day” time period. 2050 refers to the 20-year time period centred around 2050 (i.e., 2040 to 2059).

Following the same process, the project team estimated the consequences for each risk scenario. The team then multiplied

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the estimates of likelihood by the average consequence scores to arrive at an overall risk score for each scenario. As this assessment was based on defined risk scenarios, the likelihood and consequence ratings for each risk event are specific to the chosen scenario.

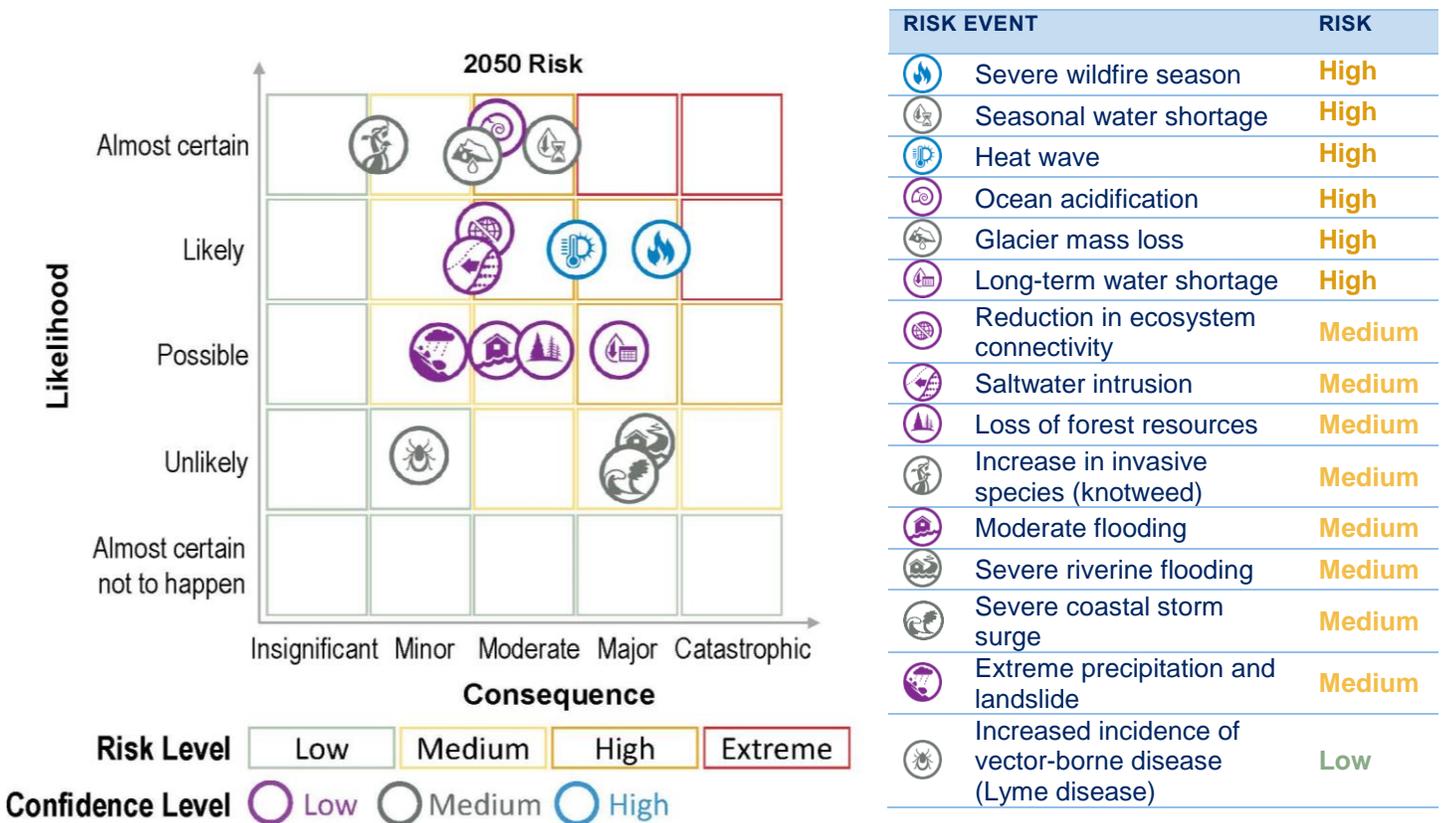
Some risk events have a more robust evidence base than others. The project team assigned a confidence level to each risk score based on the quality of the evidence base for each risk event and noted areas where information is currently lacking. The team plotted the likelihood and consequence ratings on a risk matrix to arrive at an overall rating for each event.

For additional information and details, see the full report at:

www2.gov.bc.ca/gov/content/environment/climate-change/adaptation/risk-assessment

CLIMATE RISKS TO BC

The following provides an overview of the risk assessment findings for 15 illustrative scenarios of climate risks to B.C. A summary of findings for each of the risk events is presented in more detail in the appendices.

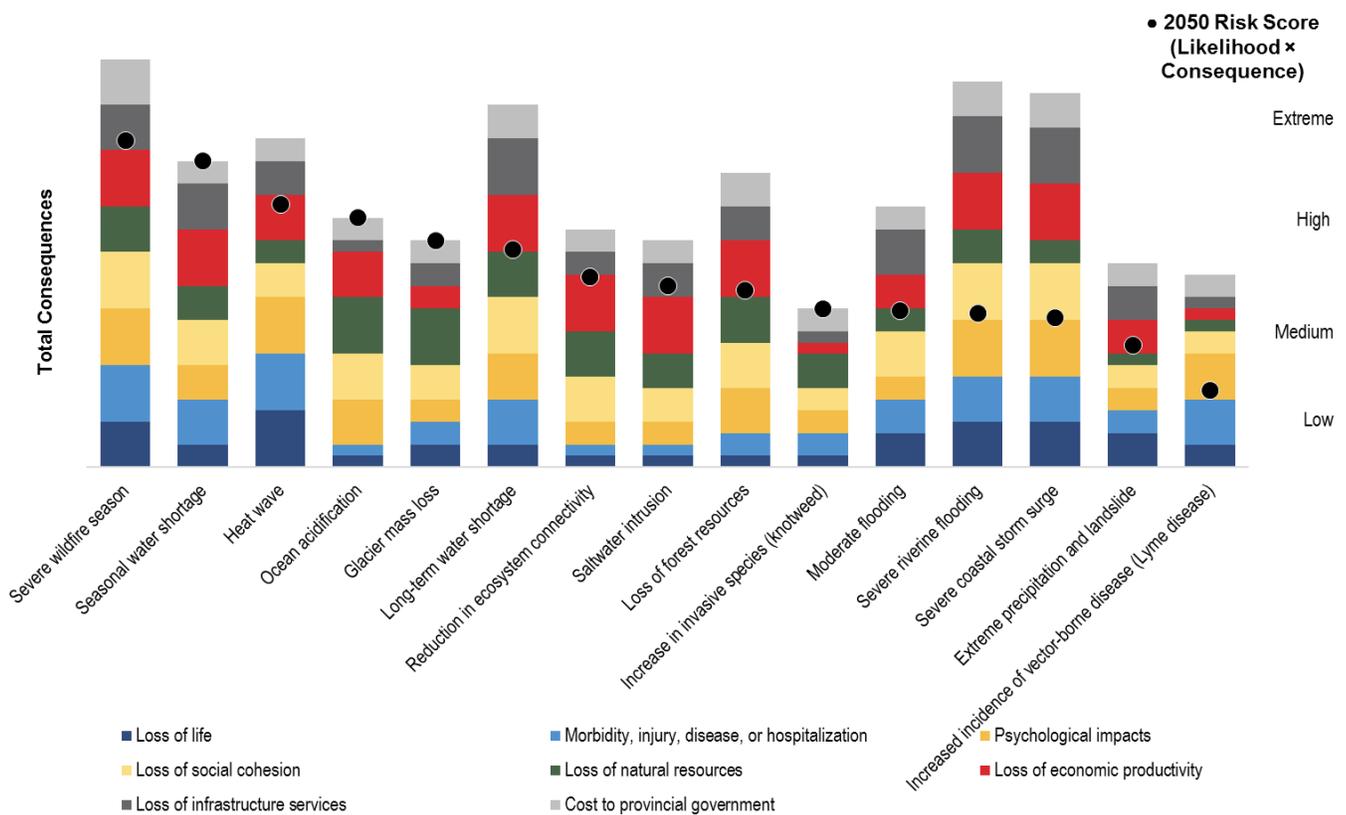


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Key findings:

- Severe wildfire season, seasonal water shortage, and heat wave events are the three greatest climate risks to B.C., followed by ocean acidification, glacier mass loss, and long-term water shortage.
- Severe riverine flooding and severe coastal storm surge risk events would have among the highest overall consequences, but their relatively low likelihood reduces their overall risk relative to other events.
- The majority of risk events would have “catastrophic” economic consequences.
- High-risk events include both discrete events (such as wildfires, water shortage, and heat waves), as well as slower-onset, gradual climate changes (such as ocean acidification and glacier mass loss).
- Risk events with the highest overall consequences do not necessarily rank highest in overall risk as they tend to have relatively low likelihood.

Consequences Associated with Climate Risk Events



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

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Caveats that Apply to the Climate Risk Assessment Findings

- The 15 risk event scenarios do not comprehensively cover how climate change could affect B.C. nor represent the only provincially significant climate risks. Additionally, potential events were excluded that may be likely and could be significant for individual communities or sectors of the province but may not meet the definition of provincially significant.
- Lower-ranked risks should not be considered unimportant. The 15 risks assessed all have provincially significant consequences.
- Each scenario represents one version of a risk event. The project team analyzed how climate change would influence the likelihood of an event of a specific magnitude. As such, the consequence rating is determined by the specific details of the scenario used in the assessment, assumed to occur in or by 2050.
- To facilitate analysis, the risk assessment considers risk events in isolation. However, many risks are interrelated; the consequences of compounding or cascading events could be significantly greater than any single event alone.
- Similarly, climate-related risks may occur in conjunction with other risks (such as economic risks, public health risks, or seismic hazards) that B.C. may face during the same periods.

Future Work and Next Steps

This report is intended to be used to inform decisions made by the Deputy Ministers' Council and Cabinet relating to government priorities that may be at risk due to climate change. It will also inform the development of a provincial climate change adaptation and preparedness strategy, as committed to in the CleanBC plan. In addition, it is a first step toward meeting reporting requirements under *the B.C. Climate Change Accountability Act*, to report on climate risks to B.C., actions and progress toward reducing them, and plans to continue reducing risks.

Additional work is needed to build on this assessment, including:

- This initial assessment could not adequately consider Indigenous perspectives or cultural values without appropriate engagement. A second phase of work is planned to consider Indigenous perspectives on the effects of climate change. In the spirit of reconciliation, Indigenous perspectives shared during the engagement will be used to inform the upcoming provincial climate change adaptation and preparedness strategy.
- Impacts to cultural resources, including Indigenous and non-Indigenous cultures, were included in the framework as one of the nine consequence categories, and were initially considered for analysis. However, a robust assessment of the range of impacts to cultural resources in B.C. in each risk event scenario could not be completed within the scope of the existing project. As a result, an assessment of impacts to cultural resources is not included in this report. This work is planned and will be informed by the engagement process described above.

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- The risk assessment does not fully capture risks to local governments, ethnic minorities, low-income/marginalized populations or gender-specific risks. The Climate Action Secretariat plans to address these gaps in future risk assessments.
- An important next step is to further evaluate the adequacy of existing risk mitigation efforts, considering the risk scores. The B.C. government already has several programs in place to address some of the climate risk events included in this assessment, including strategies to explicitly adapt to climate change as well as programs to address existing hazards.
- To build on this assessment, address gaps, and capture a broader range of potential risks, the following additional work would be useful: expand the analysis of each risk event to include a range of future scenarios; further explore the interactions and implications of cascading and compounding events; and conduct or encourage research to fill noted data gaps.
- The Climate Action Secretariat will engage with other ministries and stakeholders including public sector organizations to determine how the risk assessment framework could be used at different scales.

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APPENDICES: RISK ASSESSMENT FINDINGS BY RISK EVENT

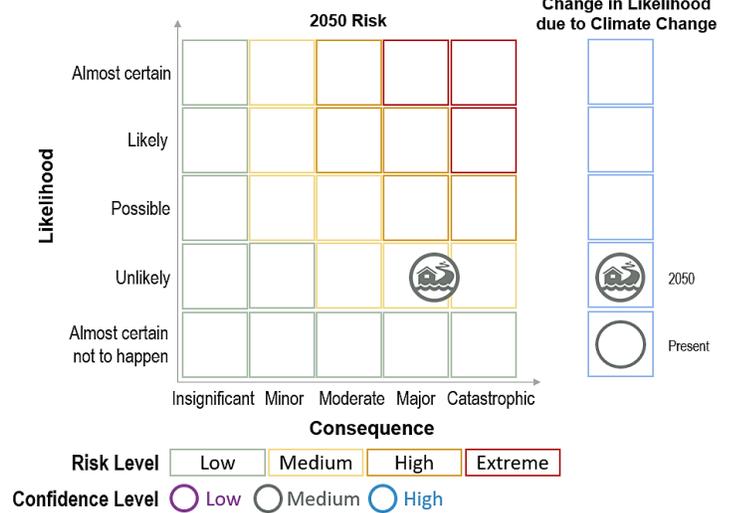
Severe Riverine Flooding

Medium Risk

Scenario analyzed: 500-year flood on the Fraser River

Key Findings

Today's 500-year Fraser River flood event would result in extensive flooding in the B.C. Lower Mainland and affect more than 30% of the province's total population. In addition, this event threatens the integrity of existing flood management infrastructure. If this event occurred today, it would be the costliest natural disaster to date in Canadian history. Though by definition this is a low-likelihood, high-consequence event, climate change could make today's one-in-500-year Fraser River flood up to five times more likely by 2050.



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION	Confidence level indicated by bar color: Low Medium High
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC		
Health	Loss of life						10 to 100 potential fatalities	High
	Morbidity, injury, disease, or hospitalization						100+ people at risk of injuries, water-borne disease, environmental contamination, limited access to critical infrastructure and services	High
Social functioning	Psychological impacts						Widespread evacuations, damages, and impacts to transportation or utility services causing stress, anxiety, depression, PTSD	High
	Loss of social cohesion						Months-long disruptions to daily life for individuals with direct damages; weeks-long disruptions to critical institutions and services	High
Natural resources	Loss of natural resources						Ecosystem stress or damage due to inundation, debris, and water and soil contamination	Medium
Economic vitality	Loss of economic productivity						\$22.9 billion in economic losses including agriculture, transportation, and energy sectors; potential loss of ecosystem services	High
	Loss of infrastructure services						\$4.7 billion in infrastructure and institutional losses; months-long disruption to transportation, water, and other infrastructure services	High
Cost to provincial government							Flood response, post-event cleanup, health services, and financial assistance program costs; significant financial assistance from the federal government	High

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

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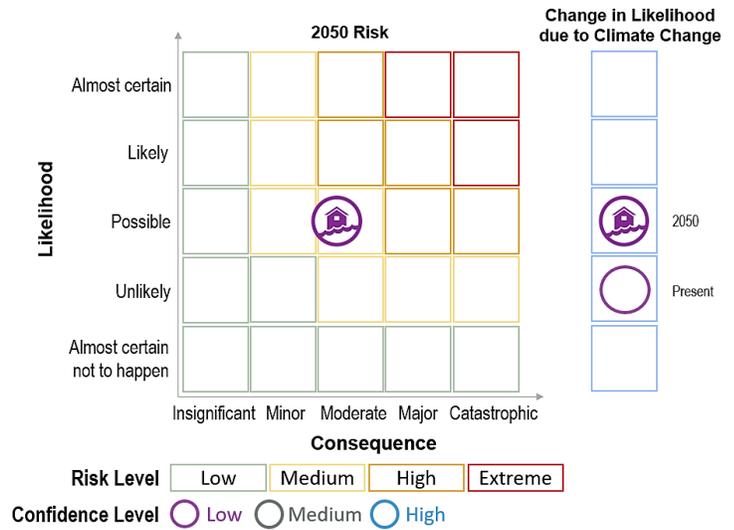
Moderate Flooding

Scenario analyzed: Moderate flood in a single community

Key Findings

B.C. experiences multiple flood events across the province each year. Although the location and severity of flooding varies from year to year, climate change is expected to increase the frequency of both major and moderate flood events. This could include repeat flooding in certain locations, or more flood seasons with simultaneous flooding occurring in multiple communities. The consequences evaluated here are for a single moderate flood event. Individually and cumulatively, more frequent moderate flood events can put a strain on both local and provincial government resources.

Medium Risk



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC	
Health	Loss of life			■			2 to 10 potential fatalities
	Morbidity, injury, disease, or hospitalization			■			Risk of injuries, environmental contamination, limited access to critical infrastructure and services
Social functioning	Psychological impacts		■				Stress, fear, or anxiety due to flood damage, temporary displacement, disruptions to utility services
	Loss of social cohesion			■	■		Weeks-long disruptions to daily life due to flooded roadways, damage to homes and businesses
Natural resources	Loss of natural resources			■			Ecosystem stress or damage due to inundation, debris, and water and soil contamination
Economic vitality	Loss of economic productivity			■			Weeks-long disruption to at least one economic sector, such as tourism or agriculture
	Loss of infrastructure services			■	■		Weeks-long disruption to transportation, water, and other infrastructure services
Cost to provincial government			■				Flood response, post-event cleanup, health services, and financial assistance program costs

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

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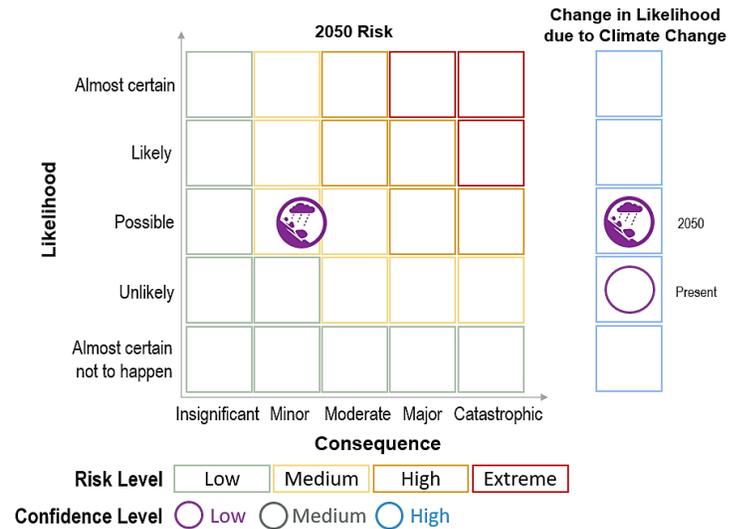
Extreme Precipitation and Landslide

Medium Risk

Scenario analyzed: Significant landslide in Hope triggered by extreme precipitation

Key Findings

The majority of precipitation-driven landslides in B.C. are smaller debris flows or rock slides, which are likely to become more frequent due to climate change. This scenario represents an extreme case in which Hope experiences a large and provincially significant precipitation-driven landslide that affects transportation across the province. Disruptions to transportation hubs, such as Hope, can cause significant delays and disruptions to the movement of goods and services. Furthermore, due to the volume of vehicles and trains passing through Hope, there is also a risk for injuries, deaths, property losses, and other damages.



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC	
Health	Loss of life						2 to 10 potential fatalities
	Morbidity, injury, disease, or hospitalization						Fewer than 10 injuries, disease, or hospitalizations from falling debris or compromised drinking water supplies
Social functioning	Psychological impacts						Localized, temporary psychological impacts for those directly affected
	Loss of social cohesion						Hours to days-long disruption to transportation affecting daily life; Localized, permanent loss of homes, businesses, other property
Natural resources	Loss of natural resources						Minimal overall impacts to natural resources in Hope; significant impacts within path of landslide
Economic vitality	Loss of economic productivity						Weeks-long disruptions to major economic sectors due to damage or destruction of key transportation and utility infrastructure
	Loss of infrastructure services						Days-long disruption to transportation and utility infrastructure
Cost to provincial government							Response, recovery, health services, and financial assistance program costs

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

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Seasonal Water Shortage

Scenario analyzed: Months-long summer water shortage affecting two or more regions of the province

Key Findings

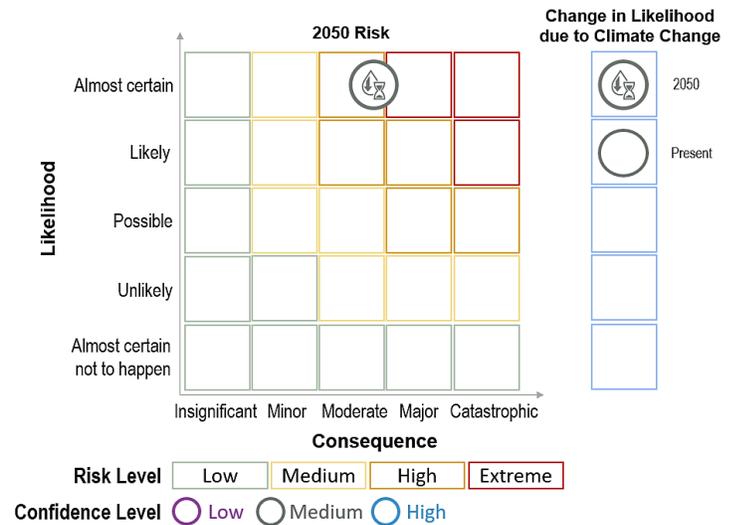
The risk of water shortage in B.C. is projected to increase with climate change due to rising temperatures and changes in precipitation that could affect both rain- and snowmelt-dominated systems. By 2050, water shortages could happen about once every two years or more frequently. The impacts can be wide-ranging and affect drinking water quality, ecosystem health, and water-dependent industries, including agriculture and tourism. Recovery from seasonal water shortages may take months and cost the provincial economy and government millions of dollars.

Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC	
Health	Loss of life						Low potential for multiple losses of life
	Morbidity, injury, disease, or hospitalization						Over 100 people could experience negative health outcomes due to contaminated water sources, vector-borne disease, or fungal diseases
Social functioning	Psychological impacts						Temporary widespread psychological impacts due to water usage restrictions, economic hardship, and seasonal loss of livelihood
	Loss of social cohesion						Weeks-long disruptions to daily life
Natural resources	Loss of natural resources						Wetland and forest habitats species could take years to recover; fish spawning sites and migration patterns could be affected
Economic vitality	Loss of economic productivity						Over \$1 billion in total economic losses
	Loss of infrastructure services						Weeks-long disruption in electricity production and water treatment
Cost to provincial government							Cost for emergency response, recovery, and lost revenue could be tens of millions of dollars

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

High Risk



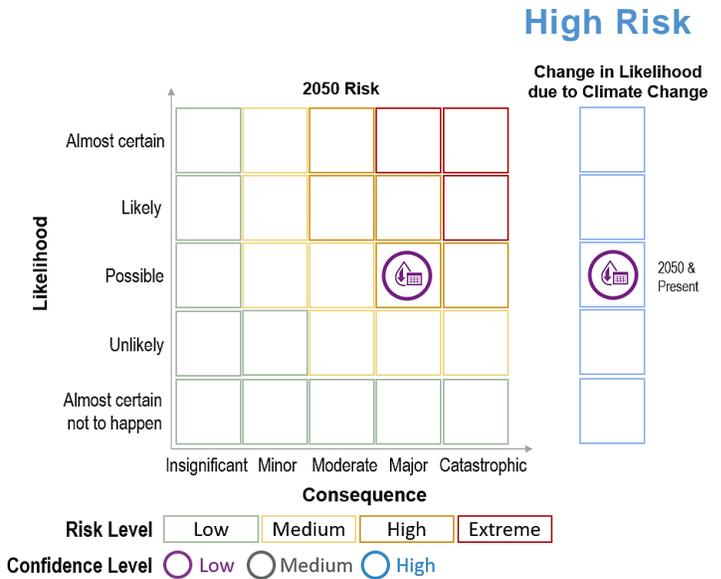
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Long-term Water Shortage

Scenario analyzed: Multi-year water shortage that results in insufficient supplies of both blue water (i.e., liquid surface water) and green water (i.e., moisture in soil and vegetation) in at least one region of the province

Key Findings

The interior of B.C. is particularly susceptible to water shortages, which could be exacerbated due to higher temperatures and below-average seasonal precipitation or streamflow. Multi-year water shortages can reduce agricultural productivity and make land and forests more susceptible to other risks, such as wildfires and insect outbreaks. Recovery of some resources from severe water shortage may take years or decades and cost the provincial economy and government billions of dollars.



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC	
Health	Loss of life	█					Low potential for multiple losses of life
	Morbidity, injury, disease, or hospitalization	█	█				Hundreds of people could suffer from water-borne, vector-borne, or fungal diseases or respiratory ailments
Social functioning	Psychological impacts	█	█				Localized disturbance with long-term psychological impacts
	Loss of social cohesion	█	█				Months-long disruptions to daily life and permanent loss of livelihood in agriculturally dependent areas
Natural resources	Loss of natural resources	█	█				Soil erosion, wetland loss, habitat destruction, and forest degradation that could take decades to recover
Economic vitality	Loss of economic productivity	█	█				Over \$1 billion in total economic losses
	Loss of infrastructure services	█	█				Months-long disruption to electricity production and water treatment
Cost to provincial government		█					Costs for emergency response and recovery, and lost revenue

Confidence level indicated by bar color: Low | Medium | High

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

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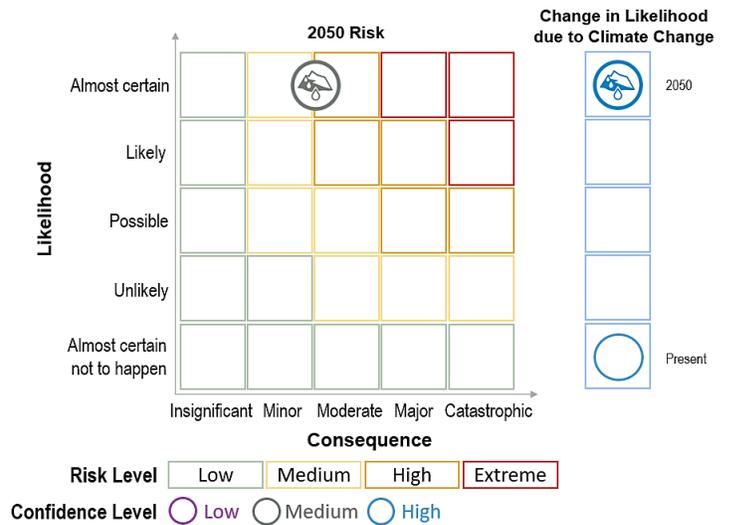
Glacier Mass Loss

Scenario analyzed: 25% decline in glacier area by 2050, relative to 2005

Key Findings

Glacier area declined by approximately 11% between 1985 and 2005. Due to projected increases in temperature, glacier area is projected to decline an additional 30 to 50% by 2050. Glaciers represent a vital freshwater resource for the province. By the 2050s, the contribution of glaciers to streams and rivers will decline, and associated streamflow is projected to decrease. Timing, amount, and temperature of flow could affect natural ecosystems and communities. Particularly during summer months, water supply could be reduced for agriculture, power generation, and industry.

High Risk



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC	
Health	Loss of life						Low potential for multiple losses of life
	Morbidity, injury, disease, or hospitalization						Minor risk due to reduced water quantity and quality from glacier-fed sources
Social functioning	Psychological impacts						Localized psychological impacts due to loss of identity and livelihood
	Loss of social cohesion						Seasonal loss of livelihoods or way of life
Natural resources	Loss of natural resources						Permanent losses to glacier-dependent resources, including streamflow and aquatic ecosystems
Economic vitality	Loss of economic productivity						Over \$1 million in total economic losses to agriculture and recreation
	Loss of infrastructure services						Minor disruptions to transportation, hydropower, agriculture, and other services due to reductions in seasonal water supply
Cost to provincial government							Potential costs include lost revenue, reduced hydroelectric capacity, and reduced water rental fees

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

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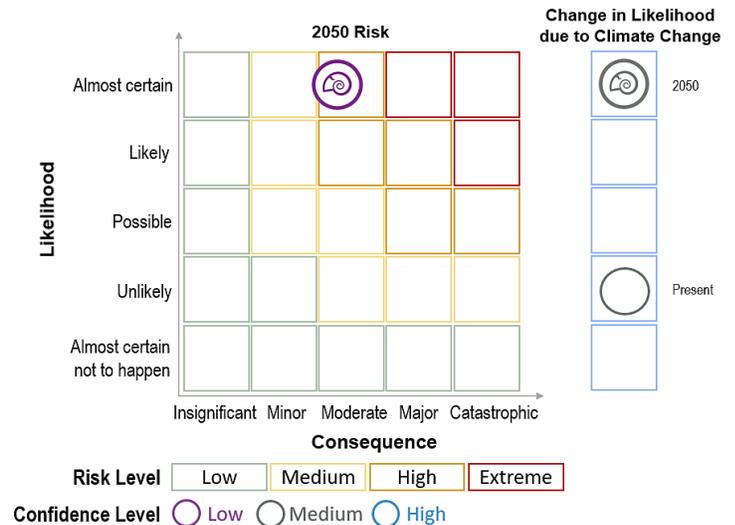
Ocean Acidification

Scenario analyzed: 0.15 reduction in pH by 2050

Key Findings

B.C.'s aquaculture industry represents more than half of total aquaculture production in Canada. However, ocean pH levels are at their lowest in 20 million years, threatening B.C.'s shellfish industry and other marine life. For example, ocean acidification prevents or decreases the calcification of shells and skeletons, disrupting shellfish growth and development. A 0.15 reduction in pH, which is projected by 2050, would cause decreased calcification and population decline for a majority of marine shellfish, including oysters, clams, scallops, mussels, pteropods and snails.

High Risk



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION	Confidence level indicated by bar color: Low Medium High
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC		
Health	Loss of life						No expected loss of life	Low
	Morbidity, injury, disease, or hospitalization						No evidence of morbidity, injury, disease, or hospitalization	Low
Social functioning	Psychological impacts						Severe, long-term impacts such as depression or loss of identity for those directly connected to the ocean	High
	Loss of social cohesion						Permanent loss of livelihoods of way of life for coastal communities and those reliant on the shellfish industry	High
Natural resources	Loss of natural resources						Decreased calcification and altered behavioural and chemical responses; species permanently weakened and unable to recover	High
Economic vitality	Loss of economic productivity						Higher mortality of shellfish, decreased growth and productivity, and job losses within shellfish industry	High
	Loss of infrastructure services						No evidence of loss of infrastructure services	Low
Cost to provincial government							Costs include lost revenue, lost taxes, and resources and programs to help shellfish industry cope with acidification	High

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

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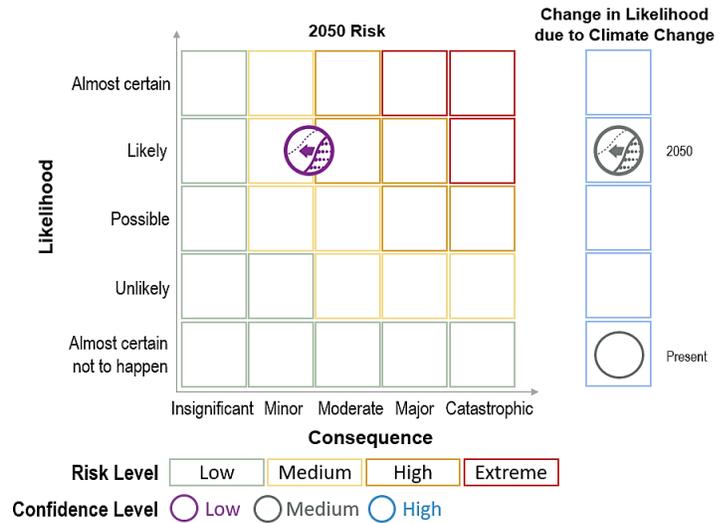
Saltwater Intrusion

Medium Risk

Scenario analyzed: At least seasonal saltwater intrusion into the Fraser River delta and surrounding communities by 2050

Key Findings

Over the course of the 21st century, sea level rise is expected to eventually lead to coastal inundation of low-lying areas. By 2050, the freshwater/saltwater interface is expected to extend farther up the Fraser River, which may also cause saltwater intrusion of groundwater and freshwater aquifers in low-lying areas of the Fraser River delta region. Saltwater intrusion is expected to have the most significant impacts on freshwater supplies and agriculture, which is a significant component of the delta's economy.



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION	Confidence level indicated by bar color: Low Medium High
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC		
Health	Loss of life						No evidence of loss of life if freshwater is accessible from other sources	High
	Morbidity, injury, disease, or hospitalization						No evidence of morbidity, injuries, diseases, or hospitalizations if freshwater is accessible from other sources	High
Social functioning	Psychological impacts						Moderate and temporary psychological impacts on farmers	Medium
	Loss of social cohesion						Seasonal losses of livelihoods; potential loss of trust in the government or water utility	Medium
Natural resources	Loss of natural resources						Decline in plant health and soil fertility; change in ecosystem composition and health near saltwater/freshwater interface	Medium
Economic vitality	Loss of economic productivity						Decreases in agricultural productivity and impacts on ecosystem services	Low
	Loss of infrastructure services						Permanent loss of existing freshwater wells and aquifers; corrosion of pipelines and pumps	Medium
Cost to provincial government							Management of sensitive ecosystems and protected areas; supplying emergency water supplies to affected communities	Medium

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

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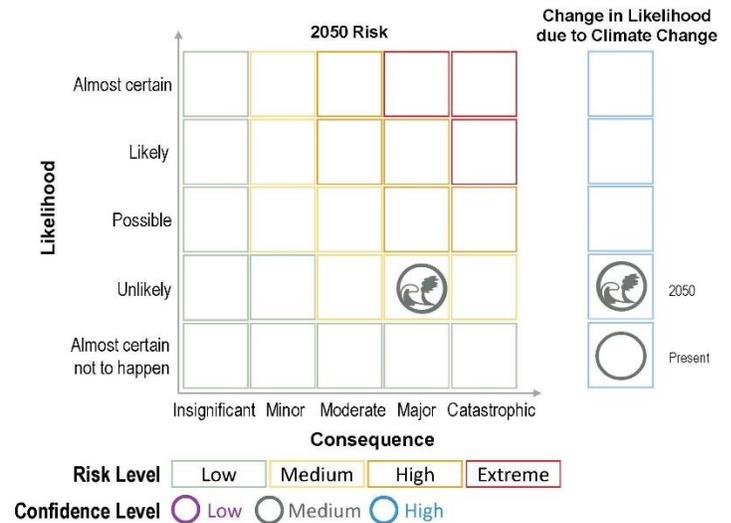
Severe Coastal Storm Surge

Scenario analyzed: 3.9 m storm surge during a king tide along the B.C. coast

Key Findings

B.C. has more than 27,200 km of coastline and already experiences coastal flooding from storms and king tides. A present-day 500-year winter storm arriving at king tide, combined with 0.5 m of sea level rise, would result in significant flooding along the coast. A 2016 flood vulnerability assessment for the lower mainland revealed that a major coastal flood event would become the costliest natural disaster to date in Canadian history. Approximately four out of five B.C. residents live in coastal areas, increasing the risk of significant impacts to critical infrastructure and daily life.

Medium Risk



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION	Confidence level indicated by bar color: Low Medium High
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC		
Health	Loss of life						10 to 100 potential fatalities	High
	Morbidity, injury, disease, or hospitalization						100+ people at risk of injuries, disease, limited access to critical infrastructure and services, or environmental contamination	High
Social functioning	Psychological impacts						Widespread evacuations, damages, and impacts to transportation or utility services causing stress, anxiety, or depression	High
	Loss of social cohesion						Months-long disruptions to daily life for individuals with direct damages; weeks-long disruptions to critical institutions and services	High
Natural resources	Loss of natural resources						Ecosystem stress or damage due to inundation, debris, and water and soil contamination	High
Economic vitality	Loss of economic productivity						\$24.7 billion in economic losses including agriculture, transportation, and energy sectors; potential loss of ecosystem services	High
	Loss of infrastructure services						\$1.8 billion in infrastructure and institutional losses; months-long disruption to transportation, electrical, and other infrastructure services	High
Cost to provincial government							Flood response, post-event cleanup, health services, and financial assistance program costs	High

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

Preliminary Strategic Climate Risk Assessment for British Columbia

Heat Wave

Scenario analyzed: Heat wave of at least three days that affects human health

Key Findings

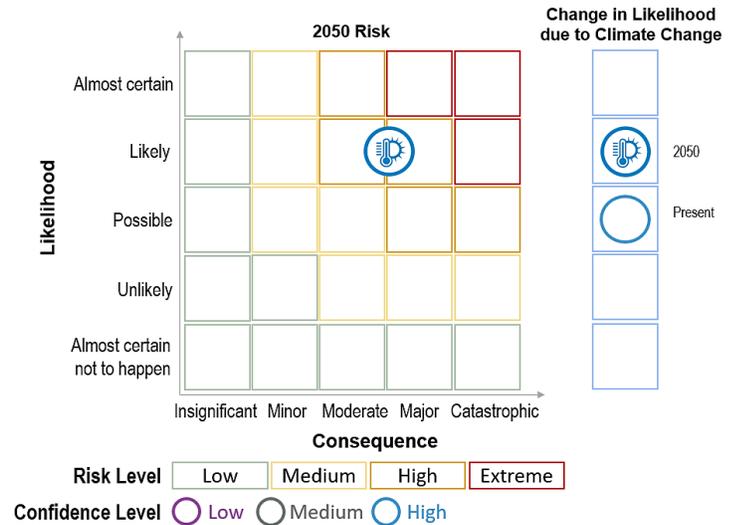
In Canada, extreme heat events are the leading weather-related cause of death. People tend to adapt to gradually rising temperatures, but extreme heat events relative to average temperatures can manifest in dire health consequences. Heat waves are projected to become more common, and occur every three to ten years by 2050. In addition to health consequences—particularly to vulnerable populations—a heat wave could result in stress to infrastructure and transportation systems, economic productivity, and ecosystems.

Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION	Confidence level indicated by bar color: Low Medium High
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC		
Health	Loss of life	[High]					Over 100 potential fatalities	[High]
	Morbidity, injury, disease, or hospitalization	[High]					Over 1,000 people with negative health impacts, ranging from dehydration to heat stroke and respiratory illnesses	[High]
Social functioning	Psychological impacts	[High]					Widespread and severe mental, behavioral, and cognitive disorders	[High]
	Loss of social cohesion	[Medium]					Days-long disruption to daily life, along with marginalization of vulnerable populations and the possibility of violent crime	[Medium]
Natural resources	Loss of natural resources	[Low]					Heat stress or damage to wildlife, forests and fish; recovery could take months	[Low]
Economic vitality	Loss of economic productivity	[High]					Over \$100 million in total economic losses	[High]
	Loss of infrastructure services	[Low]					Days-long disruption to electricity and transportation systems	[Low]
Cost to provincial government		[Low]					Potential costs include emergency management and response and short-term losses in productivity and associated tax revenue	[Low]

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

High Risk



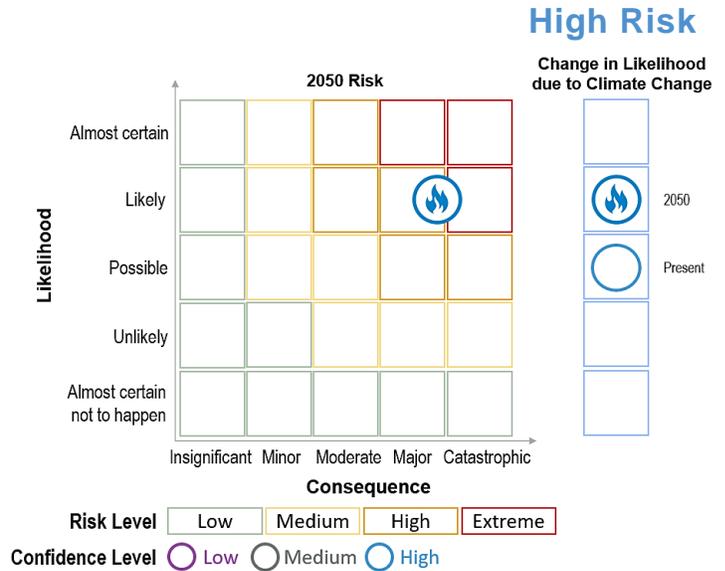
Preliminary Strategic Climate Risk Assessment for British Columbia

Severe Wildfire Season

Scenario analyzed: At least one million hectares burned that affect human settlements and significant infrastructure

Key Findings

Recent years have seen record-breaking wildfires, and the annual area burned in B.C. is projected to increase by 2050. Severe wildfires could contribute to negative health outcomes due to exposure to smoke, particulate matter, and other hazardous substances. Displacement due to wildfires, along with loss of possessions and livelihoods, could contribute to extreme psychological distress as well as economic losses to thousands of citizens. Severe wildfires may also disrupt operations and damage infrastructure across multiple sectors.



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC	
Health	Loss of life						Over 100 potential fatalities due to direct and indirect exposure
	Morbidity, injury, disease, or hospitalization						Risk of short-lived smoke irritation, severe respiratory and cardiovascular symptoms, and other illnesses for more than 1,000 people
Social functioning	Psychological impacts						Major losses and displacement could lead to long-term psychological impacts
	Loss of social cohesion						Months- to years-long disruptions to daily life for tens of thousands of people; agricultural and forestry livelihoods lost
Natural resources	Loss of natural resources						Damage to forests and forest ecosystems, displacement of wildlife, and degradation of water quality could take decades to recover
Economic vitality	Loss of economic productivity						Over \$1 billion in total economic losses due to operational disruption and physical damages to businesses
	Loss of infrastructure services						Months-long disruption in transport, electricity supply, telecommunications, water and wastewater treatment
Cost to provincial government							Costs include fire suppression and emergency management

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

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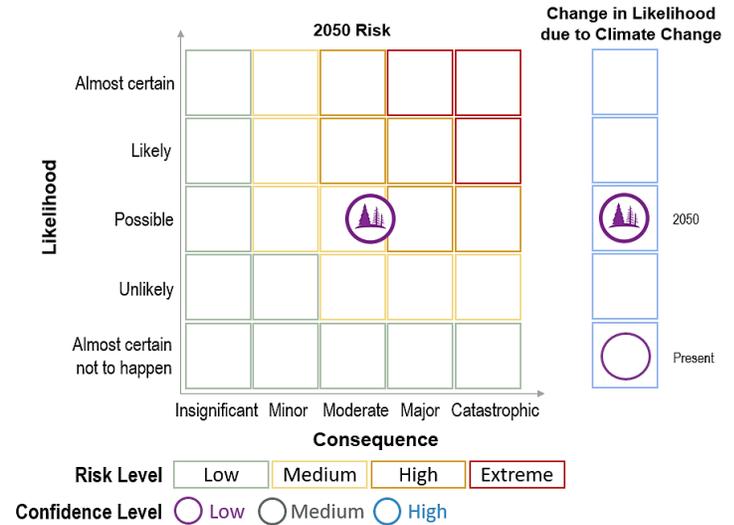
Loss of Forest Resources

Medium Risk

Scenario analyzed: 25% decline in timber growing stock by 2050

Key Findings

With warmer temperatures and precipitation changes, B.C.'s forests could experience greater losses due to pests and wildfire, which have already destroyed millions of hectares of forest in past decades. Loss of forest resources could have detrimental effects to natural resources and economic productivity. Many species depend on forests for habitat and ecosystem regulation. In addition, the scenario could result in rising unemployment, loss of livelihoods for forestry-dependent communities, and significant economic losses to the provincial economy.



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC	
Health	Loss of life						Loss of life is unlikely
	Morbidity, injury, disease, or hospitalization						Mild impacts from changes in pollen and allergens, reduced water quality, and disruption to ecosystem services
Social functioning	Psychological impacts						Mild widespread effects due to loss of aesthetic value and recreation; more severe impacts for those with forest-dependent livelihoods
	Loss of social cohesion						Localized, permanent losses of livelihood in the forestry industry
Natural resources	Loss of natural resources						Reduced habitat and biodiversity, increased erosion and sedimentation, and a decline in ecosystem services
Economic vitality	Loss of economic productivity						Over \$1 billion in total economic losses to forestry, logging, and supported industries
	Loss of infrastructure services						Disruptions to daily life from abandoned forest roads
Cost to provincial government							Costs include losses in tax revenue, stumpage fees, and tourism revenue

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

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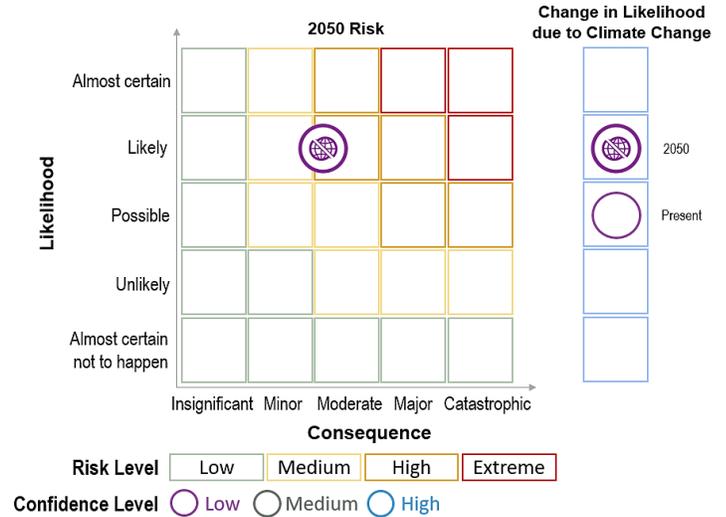
Reduction in Ecosystem Connectivity

Medium Risk

Scenario analyzed: Reduction in ecosystem connectivity in the Okanagan-Kettle region by 2050

Key Findings

Ecosystem connectivity is vital for facilitating movements of wildlife populations, maintaining species diversity, and maintaining high-quality habitats. Climate change and human development threaten ecosystem connectivity in the Okanagan-Kettle region by disconnecting and changing species' habitat and causing ecosystem shifts. For areas with decreasing habitat suitability for a species, these changes can cause further isolation of habitats and decline of habitat quality. These changes can affect ecosystem services and biodiversity.



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION	Confidence level indicated by bar color: Low Medium High
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHI		
Health	Loss of life						No evidence of loss of life	High
	Morbidity, injury, disease, or hospitalization						No evidence of morbidity, injuries, diseases, or hospitalizations	High
Social functioning	Psychological impacts						Moderate psychological impacts (e.g., fear, anxiety, grief); loss of identity or sense of place for individuals whose identify or livelihoods are embedded in the land	Medium
	Loss of social cohesion						Localized and permanent loss of livelihood or way of life	Medium
Natural resources	Loss of natural resources						Climatic shift and changes in ecosystem connectivity for all ecosystems with implications for ecosystem services and biodiversity	Medium
Economic vitality	Loss of economic productivity						Long-term disruption and job losses for agriculture, forestry, and tourism industries; significant losses in ecosystem services	Medium
	Loss of infrastructure services						Loss of ecosystem services benefits (e.g., water filtration or flood control)	Medium
Cost to provincial government							Costs include replacing lost ecosystem services, damage compensation for increased wildlife pressure on agricultural land, and recovery efforts for declining species or ecosystems	Medium

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

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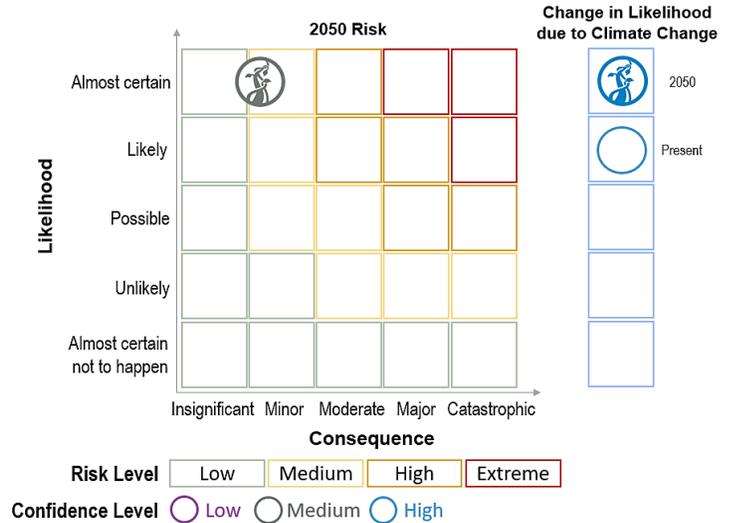
Increase in Invasive Species (knotweed)

Medium Risk

Scenario analyzed: Expansion of knotweed by 2050

Key Findings

Knotweed is identified by the International Union for Conservation of Nature as one of the world’s 100 worst invasive species. Knotweed is one of the primary invasive species B.C. is working to control, in part due to its ability to grow through concrete and asphalt. Knotweed currently occupies only a small fraction of its total potential range, which could expand as temperatures increase, leading to negative consequences for infrastructure integrity and the health and abundance of native species. The potential consequences of knotweed expansion can be managed as long as its spread is controlled, which could be costly.



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION	Confidence level indicated by bar color: Low Medium High
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHI		
Health	Loss of life						No expected loss of life	High
	Morbidity, injury, disease, or hospitalization						Fewer than 10 people could experience injury or hospitalization due to poor knotweed management	Medium
Social functioning	Psychological impacts						Localized and moderate fear and anxiety due to knotweed found on or near property	Medium
	Loss of social cohesion						Minimal impact on daily life; minor erosion of public trust in government	Medium
Natural resources	Loss of natural resources						Negative impacts on species or ecosystems; damage to surrounding ecosystem from prolonged herbicide treatment	Medium
Economic vitality	Loss of economic productivity						Limited loss of productivity; damage/disruption to infrastructure, agriculture, and goods movement	Medium
	Loss of infrastructure services						Nuisance knotweed treatment for transportation asset owners; no disruption to infrastructure services or daily life if treated	Medium
Cost to provincial government							Treatment and disposal costs on Crown lands	Medium

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.

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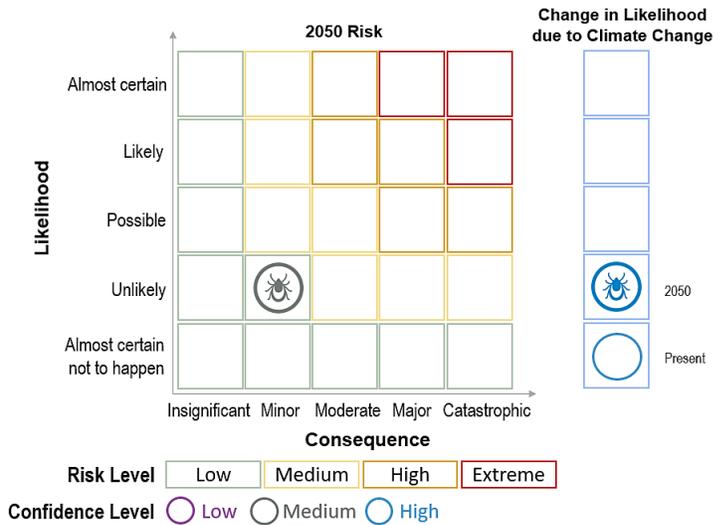
Increased Incidence of Vector-borne Disease (Lyme disease)

Low Risk

Scenario analyzed: At least a doubling of Lyme disease cases within B.C. over three years, occurring before 2050

Key Findings

The risk of Lyme disease in B.C. has remained relatively low while the infection has spread rapidly in the eastern part of the country. Although a rapid increase in infection in B.C. is unlikely to occur by 2050, it would result in major impacts to a relatively small number of people. Lyme disease can lead to severe and chronic health symptoms in addition to potential disenfranchisement and depression due to misdiagnosis or persistent morbidity. Individuals affected by Lyme disease may not be able to participate in day-to-day activities, contributing to economic losses. Costs of public education and patient treatment could increase.



Consequences

CATEGORY	CONSEQUENCE	RATING					DESCRIPTION
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC	
Health	Loss of life						Low potential for multiple losses of life
	Morbidity, injury, disease, or hospitalization						22-120 people could experience a range of symptoms, from mild fever, rash, and headaches to more severe and chronic issues
Social functioning	Psychological impacts						Patients could experience symptoms similar to psychiatric disorders
	Loss of social cohesion						Public outrage and erosion of public trust
Natural resources	Loss of natural resources						No evidence of impacts to natural resources
Economic vitality	Loss of economic productivity						Over \$1 million in total economic losses due to losses in productivity and revenue from outdoor recreation
	Loss of infrastructure services						No evidence of impacts to infrastructure services
Cost to provincial government							Increased cost to the health system; losses in revenue and costs for public outreach

Confidence level indicated by bar color: Low | Medium | High

Additional engagement with Indigenous communities would be needed to understand potential consequences from their perspectives.