

HAZARD REFERENCE GUIDE FOR LOCAL AUTHORITIES AND FIRST NATIONS

A COMPANION TO THE HAZARD RISK
AND VULNERABILITY ANALYSIS TOOL

Edition 1, Aug 2019



Emergency
Management **BC**























Hazard Reference Guide









A COMPANION TO THE HAZARD RISK AND VULNERABILITY ANALYSIS TOOL




Table of Contents

Introduction	9
How to Use This Guide	9
SECTION 1 - Hazard List	11
1.2 Identifying Local Hazards	17
1.3 Hazard Groupings	17
Atmospheric	19
1. Air Quality Incident 	20
2. Extreme Heat 	21
3. Extreme Cold 	22
4. Fog 	23
5. Freezing Rain or Drizzle 	24
6. Space Weather 	25
7. Hail 	26
8. Hurricane/Typhoon/High Wind Event 	27
9. Lightning 	28
10. Snowstorms and Blizzards 	29
11. Tornado 	30
Disease and Epidemic.....	31
12. Animal Disease 	32
13. Human Disease 	33
(Including Pandemic & Epidemic)	33
14. Plant Disease & Pest Infestation 	34
15. Public Health Crisis 	35
Fire.....	37
16. Structure Fire 	38
17. Wildfire 	39
Geological.....	41
18. Avalanche 	42
19. Landslide/Debris Flow 	43
20. Land Subsidence 	44



(and Sinkholes)	44
21. Submarine Slides 	45
Geological - Seismic	47
22. Earthquake	48
23. Liquefaction.....	49
24. Tsunami	50
(Telegenic and Terrestrial)	50
Geological- Volcanic	51
25. Ash Fall.....	52
26. Volcanic Flow.....	53
Hazardous Materials and Explosions.....	55
27. Explosions	56
28. Hazardous Materials Spill.....	57
29. Mine Incident.....	58
30. Nuclear Incident.....	59
31. Oil or Gas Pipeline Spill	60
32. Space Debris	61
Hydrological.....	63
33. Drought 	64
34. Seiche 	65
35. Storm Surge 	66
Hydrological - Flooding.....	67
36. Lake, River, Stream Flooding 	68
37. Coastal Flooding 	69
38. Storm Water Flooding 	70
39. Flash Flooding 	71
Infrastructure Failure.....	73
40. Dam and Spillways Failure.....	74
41. Dike Failure.....	75
42. Structure Failure	76
Interruptions to Critical Services	77
43. Electrical Outage.....	78



44. Food Source Interruption 	79
45. Telecommunications Interruption	80
46. Transportation Route Interruption	81
47. Wastewater Interruption	82
48. Water Service Interruption	83
49. Fuel Source Interruption	84
Security	85
50. Cyber Security Threat	86
51. National Security Threat	87
52. Public Order	88
53. Major Planned Event	89
Transportation	91
54. Aircraft Incident	92
55. Marine Vessel Incident	93
56. Motor Vehicle Incident	94
57. Rail Incident	95
SECTION 2 - Appendices	97
Appendix 1a - Glossary of Terms	99
Appendix 1b - Glossary of Acronyms	107
Appendix 2a – EMBC Regional Offices & Map	109
Appendix 2b – First Nations Regional Boundaries Map	111
Appendix 3 – Agency Contacts by Hazard Group	113
Appendix 4a – Resource Links by Hazard Group	115
Appendix 4b - Additional Links & Documents	125



Introduction

The Hazard Reference Guide was developed as a companion document to the [Hazard Risk and Vulnerability Analysis Tool for Local Authorities and First Nations](#). It is intended to support the HRVA process by providing terminology, definitions, data sources, and subject matter expert guidance for each hazard. It is a stand-alone document intended to be updated more regularly than the HRVA Tool.

The HRVA Tool is also supplemented by the [Companion Guide to the HRVA Tool](#), which is designed to further assist Emergency Program Coordinators and Local Authorities with identifying and developing risk reduction strategies for hazards affecting their community. All forms and worksheets referenced in the HRVA Tool, Hazard Reference Guide, or Risk Reduction Measures Resource Guide, are available separately for download and printing.

How to Use This Guide

The [Hazard Reference Guide](#) is intended to support section 2 of the HRVA Tool; Identifying Hazards. While it may be used throughout the HRVA process, it is designed to provide Emergency Program Coordinators and Local Authorities with the basic information to help them identify and begin to understand the hazards that may affect their community.

The guide contains 2 sections:

1. [Specific Hazard Definitions & Information Resources](#)
2. [Appendices – Glossary, Resource Links, and Contacts](#)

[Section 1](#) contains the 57 specific hazards identified by EMBC in the [All Hazards Plan](#), as well as references to related hazards that may occur as a result of a larger cascading event. The section includes a note about climate change impacts, and also lists a variety of resources and contacts intended to help local authorities connect with subject matter experts to obtain initial hazard data for their region. It may contain links to recognized resources for forecasting, monitoring, and alerting systems that may assist Emergency Managers in gaining an initial awareness of the ongoing hazards that can affect their community.

[Section 2](#) includes a quick reference to common terms and acronyms used throughout the HRVA literature. It provides information on the six EMBC Regional Offices, as well as boundary maps for Communities and First Nations to reference. Finally, the section includes a summary of the contact information found throughout this guide by agency, as well as a consolidated list of resource links and data sources for quick reference.

If you are using this document in its original electronic format (PDF), you will find most titles, names, and references are clickable hyperlinks that can be used to instantly navigate within the guide, as well as open any external links found within the subject material. The reference tables at the back of the document contain a “Return” button that will allow you to quickly return to the section of the document where that link was initially found.



SECTION 1 - Hazard List

This hazard list is an adaptation of hazards identified within the BC Emergency Management Regulation.

Atmospheric

1. Air Quality ↗
2. Extreme Heat ↗
3. Extreme Cold ↗
4. Fog ↗
5. Freezing Rain or Drizzle ↗
6. Space Weather ↗
7. Hail ↗
8. Hurricane/Typhoon/High Wind Event ↗
9. Lightning ↗
10. Snowstorms and Blizzards ↗
11. Tornado ↗

Disease and Epidemic

12. Animal Disease ↗
13. Human Disease (Including Pandemic & Epidemic) ↗
14. Plant Disease and Pest Infestation ↗
15. Public Health Crisis

Fire

16. Structure Fire
17. Wildfire ↗

Geological

18. Avalanche ↗
19. Landslide/Debris Flow ↗
20. Land Subsidence (and Sinkholes) ↗
21. Submarine Slides

Seismic

22. Earthquake
23. Liquefaction
24. Tsunami (Telegenic and Terrestrial)

Volcanic

25. Ash Fall
26. Pyroclastic Flow, Lava Flow, Lahar, Mudflow

Hazardous Materials and Explosions

27. Explosions
28. Hazardous Materials Spill
29. Mine Incident

30. Nuclear Incident
31. Oil or Gas Pipeline Spill
32. Space Debris

Hydrological

33. Drought ↗
34. Seiche ↗
35. Storm Surge ↗

Flooding

36. Lake, River, and Stream Flooding ↗
37. Coastal Flooding ↗
38. Storm Water Flooding (urban, local, pluvial) ↗
39. Flash Flooding ↗

Infrastructure Failure

40. Dam and Spillways Failure ↗
41. Dike Failure ↗
42. Structure Failure ↗

Interruptions to Critical Services

43. Electrical Outage ↗
44. Food Source Interruption (supply chain, or community food stores) ↗
45. Telecommunications Interruption ↗
46. Transportation Route Interruption ↗
47. Wastewater Interruption ↗
48. Water Service Interruption (Includes shortage and contamination) ↗
49. Fuel Source Interruption ↗

Security

50. Cyber Security Threat
51. National Security Threat
52. Public Order
53. Major Planned Event

Transportation

54. Aircraft Incident
55. Marine Vehicle Incident
56. Motor Vehicle Incident
57. Rail Incident (Includes passenger, cargo, light rail)

Note: Climate change is recognized as having impacts on the frequency and intensity of many hazards and may also cause new hazards to emerge. Those hazards identified as being impacted by changing climatic conditions are indicated with a "↗".

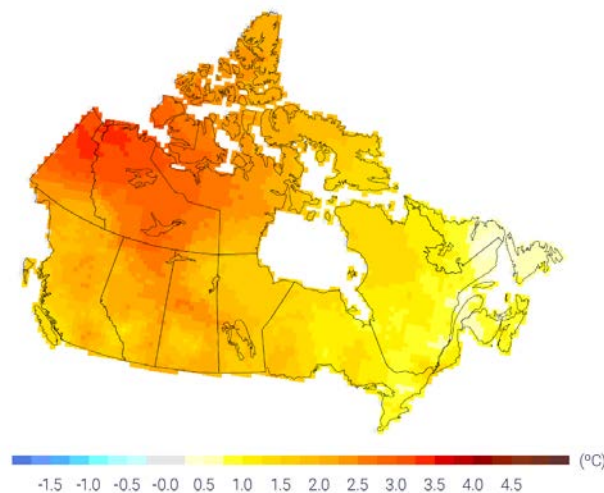


1.1 Changing Climatic Conditions

The climate in British Columbia has changed and will continue to change in the future. This has implications for emergency management, as the climate conditions and related hazards that have been planned for in the past are not what we can expect to see in the present or in the future.

Since 1948, British Columbia has seen an annual average warming of 1.9°C. This is largest in winter (3.7°C) and smallest in fall (0.7° C).¹ This has the greatest impact on disasters during weather extremes, where changing climatic conditions will further intensify some weather extremes.

Observed changes (°C) in annual temperature across Canada between 1948 and 2016, based on linear trends.²



As extreme hot temperatures become more frequent and more intense, there will be an increase in the severity of heatwaves, increased drought, and wildfire risks. More intense rainfalls will increase flood risks, coastal flooding may occur due to local sea level rise, and storms may cause increasing amounts of damage³.

The changes are also projected to intensify in the future so it's important to think about how and when to revisit the planning process to incorporate climate scenarios and emerging information.

Climate change adaptation (also referred to as climate risk management or disaster risk reduction) involves learning about the risks from a changing climate and taking proactive measures to address those risks. It can include any activity that reduces the negative impacts of climate change or that builds resilience⁴. For more information, see the [Companion Guide to the HRVA](#).


¹ Canada's Changing Climate Report: <https://changingclimate.ca/CCCR2019/chapter/8-0/>

² From CCCR2019 - Chapter 4 Figure 4.3

³ Canada's Changing Climate Report: https://changingclimate.ca/site/assets/uploads/sites/2/2019/03/CCCR_HeadlineStatements.pdf

⁴ Adaptation Library: Resources for climate adaptation <http://www.adaptationlibrary.ca/new-to-adaptation/>



Climate change is a risk driver, and is not included in this guide as a specific hazard. Those hazards identified as being impacted by changing climatic conditions are indicated on the hazard list with a 

Resources:

- [Clean BC](#) - CleanBC helps us use more clean and renewable energy in how we get around, heat our homes, and fuel our industry — setting us on the path to a cleaner, brighter future.
- [ClimateData.ca](#) – Climate Data Canada. The portal includes over 25 different indicators for temperature and precipitation across Canada, including extremes; historical and projected climate data at the daily level available to download at a resolution of about 10x10km; updated historical Intensity-Duration-Frequency (IDF) Curves; and a Health Sector Module, the first of a series which will include data, information and case studies relevant for specific sectors.
- [Plan2Adapt](#) – Pacific Climate Impacts Consortium. Climate change impacts do not affect every region of B.C. the same way. The Plan2Adapt tool generates maps, plots, and data describing projected future regional B.C. climate conditions.
- [Adaptation Library](#) – Natural Resource Canada. The Adaptation Library is a publicly accessible and searchable collection of community, forestry, and energy related adaptation products. The goal of the Library is to connect community and industry users with relevant information related to climate change adaptation in Canada.
- [ReTooling for Climate Change](#) – Fraser Basin Council. Adaptation tools and resources for B.C. local governments, First Nations and the natural resource sectors to prepare for the impacts of climate change.
- [BC Climate Action Toolkit](#) - Fraser Basin Council. Toolkit to inspire action in B.C.'s diverse local governments to advance emission reductions and adaptation planning.
- [PCIC data portal](#) – Pacific Climate Impacts Consortium. Provides access to B.C. station data, high-resolution climatology and downscaled climate scenarios data collected.
- [Climate Change Indicators](#) - Environmental Reporting BC. Information on indicators including changes in river flow, sea level, temperature, precipitation and more.

Reports:

- [Preliminary Strategic Climate Risk Assessment \(2019\)](#) - The Province has completed a Preliminary Strategic Climate Risk Assessment for B.C. This is the first phase of an initiative to better understand climate-related risks in B.C. and help government develop appropriate measures to address those risks.
- [Canada's Changing Climate Report \(2019\)](#) - Environment and Climate Change Canada. This report is about how and why Canada's climate has changed and what changes are projected for the future.
- [Indicators of Climate Change for BC \(2016 Update\)](#) - Environmental Reporting BC. Updated report on key indicators of climate change in B.C.
- [Sea Level Rise Adaptation Primer \(2013\)](#) - Toolkit to build adaptive capacity on Canada's south coasts.



Climate Research Organizations:

- **Pacific Climate Impacts Consortium (PCIC)** - A regional climate service provider that conducts quantitative studies on the impacts of climate change and climate variability in the Pacific and Yukon region. Results from this work provide regional stakeholders with the information needed to develop plans for reducing the risks associated with climate change.
- **Pacific Institute for Climate Solutions (PICS)** - Supporting solutions-oriented research to assist British Columbia with meeting the climate change challenge. Current initiatives include five major projects dealing with transportation, energy efficiency, forest carbon management, natural gas, and low carbon pathways.
- **The Columbia Basin Trust** - Helping communities in the Columbia Basin identify their vulnerabilities and develop adaptation plans.
- **The Fraser Basin Council** - Managing the BC Regional Adaptation Collaborative (RAC) —21 collaborative projects across the province supporting decision-making on water allocation and use, forest and watershed management, flood protection and floodplain management and community planning.



Pacific Institute
for Climate Solutions
Knowledge. Insight. Action.

Columbia
Basin **trust**



Fraser Basin Council



1.2 Identifying Local Hazards

To support the initial identification of hazards in your community, it is helpful to review and understand events that have taken place in the past. Sources of this information can include official records, local archives and museums, service groups, or community elders and long serving employees or residents.


Collecting oral history and formal data on historic events in your area is a useful way to begin to compile a list of proven hazards, including their potential severity, frequency, and risk.

Some additional sources to support this include:

- [BC Archives](#)
- [Canadian Disaster Database](#)
- [EMBC Incident Summaries and Yearly Statistics](#)

This section provides hazard definition and additional information for each of the 57 identified hazards laid out in the following format:

1.3 Hazard Groupings

The [Hazard List](#)  includes a number of general categories for the 57 specific hazards. These categories are intended to group similar hazards with some common cause and effect, as well as related subject matter and resource material. Under the header of each hazard grouping you may find a number of common links and definitions that are shared across that particular category.

Disease and Epidemic

- 12. [Animal Disease](#) ↗
 - 13. [Human Disease \(Including Pandemic & Epidemic\)](#) ↗
 - 14. [Plant Disease and Pest Infestation](#) ↗
 - 15. [Public Health Crisis](#)
- ### ***Fire***
- 16. [Structure Fire](#)
 - 17. [Wildfire](#) ↗

- 39. [Flash Flooding](#) ↗

Infrastructure Failure

- 40. [Dam and Spillways Failure](#) ↗
- 41. [Dike Failure](#) ↗
- 42. [Structure Failure](#) ↗

Interruptions to Critical Services


- 43. [Electrical Outage](#) ↗
- 44. [Food Source Interruption \(supply chain, or community food stores\)](#) ↗

It is also important to note that a particular hazard may be related to several others on the list, and may arise either as a result of, or cause of, another hazard event. Some hazards have the potential to cause a number of cascading events, particularly during larger occurrences. Each Hazard information block contains a list of potentially related hazards for special consideration during your analysis and scenario building exercises, but this list should not be considered exhaustive. The online HRVA Tool allows you to include your own custom hazards as identified during the local information gathering process, or can be used to help separate a large hazard into a number of smaller elements that may be more applicable to your community.

Tip: Click this [Green !\[\]\(1f56542a42e2413e44a2b2023033aa2e_img.jpg\) Icon](#) anywhere in the document to jump directly to the Hazard List



Hazard Information Block:



Hazard ↗
Hazard Definition

Additional Information:

- ↗ Items with this symbol could be subject to Climate Change Considerations
- Supplemental definitions, hazard descriptions, and special considerations where available
- Cross references to potential source, concurrent, or cascading hazards

Notable Incidents:

- Additional information on notable historic events by hazard⁵

Resource Links:

- Links and contact information for subject matter experts in your region
- Key Forecasting, Monitoring, and Alerting Tools for the specific hazard

(See Appendix for all Links)

Links to Local, Provincial, and Federal Programs or Resources as well as Subject Matter Experts and additional source information can be found in the [Appendices](#) of this document.

⁵ Historic Events are intended only to enhance understanding of the specific hazard descriptions with realistic and relatable examples. The frequency, severity, and risk of a particular hazard will vary by region. Consult your subject matter expert for information on calculating the specific level of risk for your region.



Atmospheric

1. Air Quality Incident ↗
2. Extreme Heat ↗
3. Extreme Cold ↗
4. Fog ↗
5. Freezing Rain or Drizzle ↗
6. Space Weather ↗
7. Hail ↗
8. Hurricane/Typhoon/High Wind Event ↗
9. Lightning ↗
10. Snowstorms and Blizzards ↗
11. Tornado ↗

Atmospheric hazards are a category of hazards relating to the atmosphere and meteorology of the Earth⁶.

For a historic record of atmospheric events in your area, refer to:

- [Environment and Climate Change Canada \(ECCC\), Historical Climate Data](#)

For assistance in calculating the likelihood of atmospheric hazards, reach out to:

- Meteorological Service of Canada (MSC) [Warning Preparedness Meteorologists](#)

Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.


⁶ Risk and Emergency Management City of Burnaby, "Hazard Definitions" (Burnaby, n.d.).



1. Air Quality Incident

Solids, liquids, or gases which, if discharged into the air, may result in statutory air pollution.

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Examples include: Smoke, Haze, Smog, Chemical Release
- Related Hazards: [Human Disease](#) / [Public Health Crisis](#) / [Structure Fire](#) / [Wildfire](#) / [Ash Fall](#) / [Explosions](#) / [Hazardous Materials Spill](#) / [Oil or Gas Pipeline Spill](#)

Notable Incidents:

- [Seasonal Wildfires](#)

Resource Links:


- Province of BC - [BC Air Quality Management](#)
- Environment & Climate Change Canada (ECCC) - [Weather Information](#)
- Communities can reach out to subject matter experts at - Meteorological Service of Canada (MSC) - [Warning Preparedness Meteorologists](#)
- Environment & Climate Change Canada (ECCC) - [Air Quality Forecasts](#)
- Hazard Bulletins & Alerting Services are available through - [Emergency Info BC](#)



2. Extreme Heat

Heat waves can be characterized by temperatures significantly above the mean for an extended period, or by a combination of high temperatures with high humidity and a lack of air motion. Heat waves impact upon the very young, the elderly and those with cardiovascular conditions. Heat waves also impact upon agriculture.⁷

Additional Information:

 Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.

- Related Hazards: [Lightning](#) / [Animal Disease](#) / [Human Disease](#) / [Plant Disease and Pest Infestation](#) / [Public Health Crisis](#) / [Structure Fire](#) / [Wildfire](#) / [Drought](#) / [Food Source Interruption](#) / [Water Service Interruption](#)

Notable Incidents:

- [North American Heat Wave 2018](#)
- [Quebec Heat Wave 2018](#)

Resource Links:

- Environment & Climate Change Canada (ECCC) - [Weather Information](#)
- Communities can reach out to subject matter experts at - Meteorological Service of Canada (MSC) - [Warning Preparedness Meteorologists](#)
- Hazard Forecasting & Monitoring is available at - [Weather Information](#)
- Hazard Bulletins & Alerting Services are available through – [BC Weather Warnings, Emergency Info BC](#)


⁷ IRDR.



3. Extreme Cold

A period of abnormally cold weather. Typically a cold wave lasts two or more days and may be aggravated by high winds. The exact temperature criteria for what constitutes a cold wave vary by location⁸.

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Related Hazards: [Electrical Outage](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#) / [Wastewater Interruption](#) / [Water Service Interruption](#) / [Fuel Source Interruption](#)

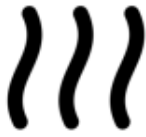
Notable Incidents:

- [Health Canada Extreme Cold Guidelines](#)
- [Winter 2019](#)

Resource Links:

- Environment & Climate Change Canada (ECCC) - [Weather Information](#)
- Communities can reach out to subject matter experts at - Meteorological Service of Canada (MSC) - [Warning Preparedness Meteorologists](#)
- Hazard Forecasting & Monitoring is available at - [Weather Information](#)
- Hazard Bulletins & Alerting Services are available through – [BC Weather Warnings, Emergency Info BC](#)


⁸ IRDR, "Peril Classification and Hazard Glossary," IRDR DATA Publication No. 1 1, no. 1 (2015): 28, <https://doi.org/10.1017/CBO9781107415324.004>.



4. Fog

A cloud based at the earth's surface, consisting of tiny water droplets, or under very cold conditions, ice crystals or ice fog. It is generally found in calm or low wind conditions. Under foggy conditions, visibility is reduced to less than 1 kilometre⁹.

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Fog often affects travel and transportation networks, and may cause supply chain delays and increases in transportation related incidents.
- Related Hazards: [Extreme Cold](#) / [Freezing Rain or Drizzle](#) / [Transportation Route Interruption](#) / [Aircraft Incident](#) / [Marine Vehicle Incident](#) / [Motor Vehicle Incident](#)

Notable Incidents:

- [Airport Closures 2017](#)
- [Highway 401 crash 1999 \(ON\)](#)

Resource Links:

- Environment & Climate Change Canada (ECCC) - [Weather Information](#)
- Communities can reach out to subject matter experts at - Meteorological Service of Canada (MSC) - [Warning Preparedness Meteorologists](#)
- Hazard Forecasting & Monitoring is available at - [Weather Information](#)
- Hazard Bulletins & Alerting Services are available through – [BC Weather Warnings, Emergency Info BC](#)


⁹ Environment and Climate Change Canada, "Weather and Meteorology - Glossary," 2017, <https://www.canada.ca/en/environment-climate-change/services/weather-general-tools-resources/glossary.html>.



5. Freezing Rain or Drizzle

Rain that freezes on impact to form a coating of clear ice (glaze) on the ground and on exposed objects.¹⁰

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Related Hazards: [Extreme Cold](#) / [Fog](#) / [Hail](#) / [Snowstorms and Blizzards](#) / [Electrical Outage](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#) / [Aircraft Incident](#) / [Motor Vehicle Incident](#)

Notable Incidents:

- [1998 North American Ice Storm](#)
- [Ice Storm 2017 \(BC\)](#)

Resource Links:

- Environment & Climate Change Canada (ECCC) - [Weather Information](#)
- Communities can reach out to subject matter experts at - Meteorological Service of Canada (MSC) - [Warning Preparedness Meteorologists](#)
- Hazard Forecasting & Monitoring is available at - [Weather Information](#)
- Hazard Bulletins & Alerting Services are available through – [BC Weather Warnings, Emergency Info BC](#)


¹⁰ Public Safety Canada, "Canadian Disaster Database Reference - Reference Table for Symbols and Definitions," 2015, <https://www.publicsafety.gc.ca/cnt/rsrscs/cndn-dsstr-dtbs/frnc-tbl-smbls-dfntns-en.aspx>



6. Space Weather

A disturbance or fluctuation in the earth's magnetic field, associated with solar flares. The impact may include disruption of electrical grids, communications systems, navigation equipment, and satellite operations. Resource operations including surveying, drilling, and pipelines may also be negatively affected¹¹.

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Natural Resources Canada (NRCAN) - [Space Weather Effects on Technology Information Sheet](#)
- Related Hazards: [Cyber Security Threat](#) / [Telecommunications Interruption](#) / [Electrical Outage](#) / [Transportation Route Interruption](#)

Notable Incidents:

- [ANIK Satellite 1994](#)
- [Geomagnetic Storm 1989 \(Quebec Blackout\)](#)
- [Carrington Event 1859](#)

Resource Links:

- Natural Resources Canada – [NRCAN Space Weather Canada](#)
- Communities can reach out to subject matter experts at - [NRCAN Space Weather Canada - Contacts](#)
- Hazard Forecasting & Monitoring is available at – [NRCAN Space Weather Forecasting](#)
- Hazard Bulletins & Alerting Services are available through – [NRCAN Space Weather Forecasting, Emergency Info BC](#)


¹¹ Natural Resources Canada, “Space Weather – Effects on Technology”



7. Hail

Precipitation in the form of lumps of ice mainly associated with thunderstorms. Hail ranges in size from that of a small pea to the size of cherries, but has been observed as large as grapefruit. Hail in Canada occurs most frequently during the summer when thunderstorm activity is at its peak.¹²

Additional Information:

 Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.

- Related Hazards: [Lightning](#) / [Food Source Interruption](#)

Notable Incidents:

- [Calgary Hail Storm 2010](#)
- [BC Hail Storms 2017](#)

Resource Links:

- Environment & Climate Change Canada (ECCC) - [Weather Information](#)
- Communities can reach out to subject matter experts at - Meteorological Service of Canada (MSC) - [Warning Preparedness Meteorologists](#)
- Hazard Forecasting & Monitoring is available at - [Weather Information](#)
- Hazard Bulletins & Alerting Services are available through – [BC Weather Warnings, Emergency Info BC](#)


¹² Public Safety Canada, "Canadian Disaster Database Reference - Reference Table for Symbols and Definitions."



8. Hurricane/Typhoon/High Wind Event

Hurricanes are tropical cyclones with maximum sustained surface winds of at least 64 knots (118 km/h). Hurricanes are known as typhoons in the western Pacific, very severe cyclonic storms in the North Indian Ocean, and severe tropical cyclones in Australia. There are five classes of hurricane intensity as outlined by the Saffir-Simpson Scale.¹³

Additional Information:

 Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.

- Related Hazards: [Hail](#) / [Lightning](#) / [Snowstorms and Blizzards](#) / [Tornado](#) / [Landslide/Debris Flow](#) / [Explosions](#) / [Hazardous Materials Spill](#) / [Seiche](#) / [Storm Surge](#) / [Lake, River, and Stream Flooding](#) / [Coastal Flooding](#) / [Storm Water Flooding](#) / [Flash Flooding](#) / [Dam and Spillways Failure](#) / [Dike Failure](#) / [Structure Failure](#) / [Electrical Outage](#) / [Food Source Interruption](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#) / [Wastewater Interruption](#) / [Water Service Interruption](#) / [Fuel Source Interruption](#) / [Aircraft Incident](#) / [Marine Vehicle Incident](#) / [Motor Vehicle Incident](#) / [Rail Incident](#)

Notable Incidents:

- [Typhoon Freda 1962](#)
- [BC Wind storm 2018](#)
- [BC Wind Storm 2015](#)

Resource Links:

- [Environment & Climate Change Canada \(ECCC\) - Weather Information](#)
- [Communities can reach out to subject matter experts at - Meteorological Service of Canada \(MSC\) - Warning Preparedness Meteorologists](#)
- [Hazard Forecasting & Monitoring is available at – ECCC Hurricane Forecasting](#)
- [Hazard Bulletins & Alerting Services are available through – BC Weather Warnings, Emergency Info BC](#)


¹³ Public Safety Canada.



9. Lightning

Generally, any and all of the various forms of visible electrical discharge that are produced by thunderstorms; often seen as a bright flash of light in the sky.¹⁴ Lightning impacts air transportation, powerlines and communications infrastructure and causes forest fires.¹⁵

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Related Hazards: [Hail](#) / [Wildfire](#) / [Storm Water Flooding](#) / [Flash Flooding](#) / [Electrical Outage](#) / [Telecommunications Interruption](#)

Notable Incidents:

- [Lightning Related Damage Report Review](#)

Resource Links:

- Environment & Climate Change Canada (ECCC) - [Weather Information](#)
- Communities can reach out to subject matter experts at - Meteorological Service of Canada (MSC) - [Warning Preparedness Meteorologists](#)
- Hazard Forecasting & Monitoring is available at – [ECCC Lightning Danger Map](#)
- Hazard Bulletins & Alerting Services are available through – [BC Weather Warnings, Emergency Info BC](#)

¹⁴ Public Safety Canada.


¹⁵ Ministry of Public Safety and Solicitor General, *Hazard, Risk and Vulnerability Analysis Tool Kit*, 2004, <http://hrva.embc.gov.bc.ca/toolkit.html>.



10. Snowstorms and Blizzards

Meteorological disturbance giving rise to a heavy fall of snow, often accompanied by strong winds.¹⁶ Snowstorm and blizzards impact upon transportation, powerlines and communications infrastructure, and agriculture.¹⁷

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Related Hazards: [Extreme Cold](#) / [Freezing Rain or Drizzle](#) / [Avalanche](#) / [Structure Failure](#) / [Electrical Outage](#) / [Food Source Interruption](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#) / [Fuel Source Interruption](#) / [Aircraft Incident](#) / [Motor Vehicle Incident](#)

Notable Incidents:

- [Terrace 2015](#)
- [Vancouver Island 1996](#)

Resource Links:

- Environment & Climate Change Canada (ECCC) - [Weather Information](#)
- Communities can reach out to subject matter experts at - Meteorological Service of Canada (MSC) - [Warning Preparedness Meteorologists](#)
- Hazard Forecasting & Monitoring is available at - [Weather Information](#)
- Hazard Bulletins & Alerting Services are available through – [BC Weather Warnings, Emergency Info BC](#)

¹⁶ City of Burnaby, "Hazard Definitions."

¹⁷ Ministry of Public Safety and Solicitor General, *Hazard, Risk and Vulnerability Analysis Tool Kit*.




11. Tornado



A violently rotating column of air that extends from a cumuliform cloud to the surface. The pressure deficit in a tornado often results in the formation of a funnel cloud that extends fully or partially from the cumuliform cloud to the surface.

A tornado is typically also made visible by rotating debris near the ground or a spray ring near the water surface.¹⁸

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- A tornado can be tens to hundreds of metres wide and have a lifespan of minutes or hours. In terms of size and area, it is one of the least extensive of all storms, but in terms of how violent storms can be, it is the world's most severe.
- Damaging tornadoes are rare in British Columbia, but have been reported in a number of communities
- Related Hazards: [Structure Failure](#) / [Electrical Outage](#) / [Telecommunications Interruption](#)

Notable Incidents:

-





Resource Links:

- Environment & Climate Change Canada (ECCC) - [Weather Information](#)
- Communities can reach out to subject matter experts at - Meteorological Service of Canada (MSC) - [Warning Preparedness Meteorologists](#)
- Hazard Forecasting & Monitoring is available at - [Weather Information](#)
- Hazard Bulletins & Alerting Services are available through – [BC Weather Warnings, Emergency Info BC](#)

¹⁸ Public Safety Canada, "Canadian Disaster Database Reference - Reference Table for Symbols and Definitions."



Disease and Epidemic

12. Animal Disease 
13. Human Disease (Including Pandemic & Epidemic) 
14. Plant Disease and Pest Infestation 
15. Public Health Crisis 

Diseases and Epidemics

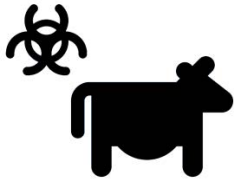
For a historic record of disease and epidemic events in your area, refer to:

- [British Columbia Center for Disease Control \(BCCDC\)](#)

For assistance in calculating the likelihood of disease and epidemic hazards, reach out to:

- For region-specific inquiries, contact your - [Local Health Authority](#)
- For First Nations-specific inquiries, contact - [First Nations Health Authority \(FNHA\)](#)


Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.



12. Animal Disease

Animal diseases can be spread between animals and sometimes to humans. The threat of foreign animal disease, such as foot and mouth disease, is catastrophic impact on the economy¹⁹

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- See the [BC Foreign Animal Disease Emergency Support Plan \(FADES\)](#)
- For further information on [emergency management in the agriculture sector](#)
- Related Hazards: [Human Disease](#) / [Plant Disease and Pest Infestation](#) / [Public Health Crisis](#) / [Food Source Interruption](#)

Notable Incidents:

- [Avian Influenza Cull 2004](#)

Resource Links:

- Communities can reach out to subject matter experts at - [BC Ministry of Agriculture](#)
- Hazard Forecasting & Monitoring is available at - [BC Animal Health Center](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

¹⁹ Ministry of Public Safety and Solicitor General, *Hazard, Risk and Vulnerability Analysis Tool Kit*.



13. Human Disease


(Including Pandemic & Epidemic)



Diseases that are caused by pathogenic microorganisms and are spread directly, or indirectly, from one person to another. Diseases can impact public health, cause death, have economic implications, and result in mass casualty response. These include epidemics such as meningitis, pandemic flu, hepatitis, E. coli, and other communicable diseases.

- A pandemic is the worldwide spread of a new disease. The total number of people who get severely ill can vary. However, the impact or severity tends to be higher in pandemics in part because of the much larger number of people in the population who lack pre-existing immunity to the new virus.²⁰

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- For information on the likelihood of a specific disease, refer to the [British Columbia Center for Disease Control \(BCCDC\)](#) or,
- The [World Health Organization \(WHO\)](#)
- Related Hazards: [Animal Disease](#) / [Plant Disease and Pest Infestation](#) / [Public Health Crisis](#)

Notable Incidents:

- [H1N1 Flu Pandemic \(2009\)](#)
- [SARS Outbreak \(2003\)](#)

Resource Links:

- For region-specific inquiries, contact your - [Local Health Authority](#)
- For First Nations-specific inquiries, contact - [First Nations Health Authority \(FNHA\)](#)
- Hazard Forecasting & Monitoring is available at - [BC Center for Disease Control](#)
- Hazard Bulletins & Alerting Services are available through – [BC Provincial Health Services Authority](#)


²⁰ WHO Website



14. Plant Disease & Pest Infestation

Plant diseases include Invasive pests including insects and mites, and plant pathogens including fungi, bacteria and viruses impact upon crops, forests and urban environments. New introductions and/or widespread outbreaks could have severe economic and environmental consequences.

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- BC Ministry of Agriculture - [Plant Health website](#)
- [Invasive Species Council of BC website](#)
- BC Ministry of Forest Lands, Natural Resource Operations (FLNRO) - [Forest Health website](#)
- Canadian Food Inspection Agency (CFIA) - [Plant Pests and Invasive Species](#)
- Related Hazards: [Animal Disease](#) / [Human Disease](#) / [Public Health Crisis](#) / [Drought](#) / [Food Source Interruption](#)

Notable Incidents:

-

Resource Links:


- Communities can reach out to subject matter experts at – [AgriService BC – Inquiries and Information](#)
- Hazard Forecasting & Monitoring is available at - [AgriService BC – Plant Health Information](#)
- Hazard Bulletins & Alerting Services are available through - [AgriService BC – Plant Health Alerts](#)



15. Public Health Crisis

TBD...

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- For information on the likelihood of a specific disease, refer to the [British Columbia Center for Disease Control \(BCCDC\)](#) or,
- The [World Health Organization \(WHO\)](#)
- Related Hazards: [Air Quality](#) / [Extreme Heat](#) / [Extreme Cold](#) / [Animal Disease](#) / [Human Disease](#) / [Plant Disease and Pest Infestation](#) / [Explosions](#) / [Hazardous Materials Spill](#) / [Structure Failure](#) / [Electrical Outage](#) / [Food Source Interruption](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#) / [Wastewater Interruption](#) / [Water Service Interruption](#) / [Fuel Source Interruption](#)

Notable Incidents:



- [Current Health Topics in BC](#)

Resource Links:

- For region-specific inquiries, contact your - [Local Health Authority](#)
- For First Nations-specific inquiries, contact - [First Nations Health Authority \(FNHA\)](#)
- Hazard Forecasting & Monitoring is available at - [BC Center for Disease Control](#)
- Hazard Bulletins & Alerting Services are available through – [BC Provincial Health Services Authority](#)



Fire

16. Structure Fire 
17. Wildfire 

For a historic record of fire events in your area, refer to:

- [BC Office of the Fire Commissioner \(OFC\)](#)

For assistance in calculating the likelihood of fire, reach out to:

- [Your Community Fire Department](#)
- [BC Wildfire Prevention Officers by Fire Centre](#)


Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.



16. Structure Fire

Urban fires are fires that occur in a residential, commercial or industrial community. Rural and urban fires occur on a frequent basis in many parts of the province, and of provincial concern are the fires that cause a large number of deaths or injuries, those that are beyond the ability of the local resources to respond or those that cause severe economic losses. For interface fires, see wildfires.²¹

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- For information on structure fire risk and history in your community, contact your [Community Fire Department](#).
- Historical data of fires is recorded by the [BC Office of the Fire Commissioner \(OFC\)](#)
- The [Fire Underwriters Survey \(FUS\)](#) identifies community fire risk.
- Related Hazards: [Air Quality](#) / [Lightning](#) / [Wildfire](#) / [Explosions](#) / [Structure Failure](#) / [Electrical Outage](#) / [Telecommunications Interruption](#) / [Water Service Interruption](#)

Notable Incidents:

-

Resource Links:

- Communities can reach out to subject matter experts at – [BC Office of the Fire Commissioner \(OFC\)](#)
- Contact your [Community Fire Department](#) for more information
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

²¹ Ministry of Public Safety and Solicitor General.




17. Wildfire



An unplanned fire - including unauthorized human-caused fires - occurring on forest or range lands, burning forest vegetation, grass, brush, scrub, peat lands, or a prescribed fire set under regulation which spreads beyond the area authorized for burning.

The wildland urban interface (WUI) is any area where combustible forest fuel is found adjacent to homes, farm structures or other outbuildings. This may occur at the interface, where development and forest fuel (vegetation) meet at a well-defined boundary, or in the intermix, where development and forest fuel intermingle with no clearly defined boundary.²²

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- To identify the likelihood of a wildfire impacting your community, consider:
 - History of wildfire in your community and surrounding communities as outlined in the fire history maps from the [Provincial Strategic Threat Analysis \(PSTA\)](#) or your local Community Wildfire Protection Plan.
 - Review the [Wildland Urban Interface \(WUI\) Risk Class Maps](#) and the [Provincial Strategic Threat Analysis for Wildfires](#)
- Related Hazards: [Air Quality](#) / [Extreme Heat](#) / [Lightning](#) / [Structure Fire](#) / [Explosions](#) / [Drought](#) / [Structure Failure](#) / [Electrical Outage](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#) / [Water Service Interruption](#)

Notable Incidents:

- [Okanagan Park 2003](#)
- [Fort McMurray \(AB\) Wildfire 2016](#)





Resource Links:

- Communities can reach out to subject matter experts at – [BC Wildfire Prevention Officers by Fire Centre](#)
- Hazard Forecasting & Monitoring is available at – [BC Fire Danger Rating](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

²² BC Wildfire Service, "Wildfire Glossary," 2018, <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcwg/glossary?keyword=glossary#W>.



Geological

18. Avalanche 
19. Landslide/Debris Flow 
20. Land Subsidence (and Sinkholes) 
21. Submarine Slides 

For a historic record of geological events in your area, refer to:

- Emergency Management British Columbia (EMBC) - [EMBC Seismic Team](#)

For assistance in calculating the likelihood of geological events, reach out to:

- Emergency Management British Columbia (EMBC) - [EMBC Seismic Team](#)
- [Natural Resources Canada Seismologists](#)


Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.



18. Avalanche

Avalanche is a movement of snow and ice in response to the force of gravity down an incline. Factors such as the type or nature of snow, ambient temperature and wind conditions are critical in avalanche potential. Conditions such dense, wet snow falling on dry, loosely packed snow may give risk to an avalanche. Avalanches impact upon people engaged in recreation as well as transportation and communications infrastructure²³.

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- The Ministry of Transportation and Infrastructure (MOTI) maintains an [Avalanche Safety Plan](#) and has highway avalanche technicians distributed throughout the province as well as data available to assess likelihood.
- MOTI may also have some avalanche mapping data which is available upon request
- Related Hazards: [Extreme Cold](#) / [Snowstorms and Blizzards](#) / [Landslide/Debris Flow](#) / [Land Subsidence](#) / [Tsunami](#) / [Lake, River, and Stream Flooding](#) / [Structure Failure](#) / [Electrical Outage](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#)

Notable Incidents:

- [Rogers Pass 1910](#)
- [Kangiqsualujuaq QC 1999](#)

Resource Links:

- Communities can reach out to subject matter experts at – Senior Manager of Avalanche & Weather Programs at the Ministry of Transportation & Infrastructure ([Robb Andersen](#)), to be put in touch with the appropriate local technician
- Hazard Forecasting & Monitoring is available at - [Canadian Avalanche Association website](#)
- Hazard Bulletins & Alerting Services are available through - [Avalanche.ca](#)

²³ Ministry of Public Safety and Solicitor General, *Hazard, Risk and Vulnerability Analysis Tool Kit*.




19. Landslide/Debris Flow

Debris avalanches and debris flows.

Debris avalanches are extremely rapid debris flows of mud, rock, brush, trees, and other debris propelled by torrential rains.

Debris flows are a form of rapid mass down-slope movement of a slurry of loose soils, rocks, and organic matter.

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- About one half of damaging landslides in British Columbia are debris flows which impact life and/or property.²⁴
- See the [Review of Landslide Management in BC \(2013\)](#)
- Related Hazards: [Avalanche](#) / [Land Subsidence](#) / [Submarine Slides](#) / [Tsunami](#) / [Seiche](#) / [Lake, River, and Stream Flooding](#) / [Flash Flooding](#) / [Structure Failure](#) / [Electrical Outage](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#)

Notable Incidents:

- [Johnsons Landing 2012](#)
- [Fairmont Debris Flow 2012](#)
- [Hope Slide 1965](#)

Resource Links:

- Communities can reach out to subject matter experts at – Emergency Management British Columbia (EMBC) - [EMBC Seismic Team](#)
- Hazard Forecasting & Monitoring is available at –
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)


²⁴ Ministry of Public Safety and Solicitor General.



20. Land Subsidence (and Sinkholes)

The sinking or caving-in of the ground.²⁵

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Related Hazards: [Avalanche](#) / [Landslide/Debris Flow](#) / [Submarine Slides](#) / [Earthquake](#) / [Liquefaction](#) / [Structure Failure](#) / [Transportation Route Interruption](#) / [Wastewater Interruption](#) / [Water Service Interruption](#) / [Motor Vehicle Incident](#)

Notable Incidents:

- [Lantzville 2018](#)
- [Sechelt Seawatch Community 2015](#)

Resource Links:

- Communities can reach out to subject matter experts at – Emergency Management British Columbia (EMBC) - [EMBC Seismic Team](#)
- Hazard Forecasting & Monitoring is available at –
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)


²⁵ City of Burnaby, "Hazard Definitions."



21. Submarine Slides

Submarine landslides, like their terrestrial counterparts, involve the movement of slope materials in response to gravitational forces. The gravity-driven movement of slope material involves water-charged and coarse-grained material flowing rapidly on submarine slopes or channels.²⁶

Additional Information:

 Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.

- Related Hazards: [Avalanche](#) / [Landslide/Debris Flow](#) / [Land Subsidence](#) / [Submarine Slides](#) / [Earthquake](#) / [Tsunami](#) / [Seiche](#) / [Coastal Flooding](#) / [Marine Vehicle Incident](#)

Notable Incidents:

- [Grand Banks 1929](#)

Resource Links:

- Communities can reach out to subject matter experts at – Emergency Management British Columbia (EMBC) - [EMBC Seismic Team](#), or
 - [Natural Resources Canada Seismologists](#)
- Hazard Forecasting & Monitoring is available at –
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

²⁶ Justice Institute of BC, "Hazard Risk Analysis (HRA)," Aboriginal Disaster Resilience Planning, 2015, <https://adrp.jibc.ca/hazard-risk-analysis-hra/>.



Geological - Seismic

22. Earthquake
23. Liquefaction
24. Tsunami (Telegenic and Terrestrial)

For a historic record of seismic events in your area, refer to:

- [Emergency Management British Columbia \(EMBC\) - EMBC Seismic Team](#)

For assistance in calculating the likelihood of seismic events, reach out to:

- [Emergency Management British Columbia \(EMBC\) - EMBC Seismic Team](#)
- [Natural Resources Canada Seismologists](#)

Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.



22. Earthquake

An earthquake is defined as the shaking of the ground due to movement along a fault rupture. When a large magnitude earthquake occurs, energy traveling in seismic waves may cause damage to structures, trigger landslides, liquefaction or other geologic hazards and, in certain circumstances, generate tsunamis. Impacts from earthquakes can be widespread and severe.

Additional Information:

- In BC, a magnitude 5 and above earthquake is estimated to occur every 5-20 years.
- In BC, a magnitude 8.5 and above, also called a Megathrust earthquake is predicted to occur within the next 100 years.
- For estimates of the distribution of earthquake shaking probabilities, see the Natural Resources Canada (NRCAN) [Seismic Hazard Map](#)
- For earthquake scenarios, see the - [BC Immediate Response Plan \(BCIRP\)](#) - Section 3
- Natural Resources Canada monitors and researches earthquake activity - [Frequently asked questions](#)
- Related Hazards: [Structure Fire](#) / [Avalanche](#) / [Landslide/Debris Flow](#) / [Land Subsidence](#) / [Submarine Slides](#) / [Liquefaction](#) / [Tsunami](#) / [Explosions](#) / [Hazardous Materials Spill](#) / [Mine Incident](#) / [Oil or Gas Pipeline Spill](#) / [Seiche](#) / [Dam and Spillways Failure](#) / [Dike Failure](#) / [Structure Failure](#) / [Electrical Outage](#) / [Food Source Interruption](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#) / [Wastewater Interruption](#) / [Water Service Interruption](#) / [Fuel Source Interruption](#) / [Marine Vehicle Incident](#) / [Motor Vehicle Incident](#) / [Rail Incident](#)

Notable Incidents:

- [Vancouver Island 1946](#)
- [Alaska 1964](#)
- [Cascadia Subduction 1700](#)

Resource Links:

- Communities can reach out to subject matter experts at – Emergency Management British Columbia (EMBC) - [EMBC Seismic Team](#), or,
 - [Natural Resources Canada Seismologists](#)
- Hazard Forecasting & Monitoring is available at - [Oceans Network Canada Early Warning Project](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)



23. Liquefaction

Liquefaction is the transformation that occurs when earthquake shaking (or other disturbance) causes a saturated granular soil to lose its strength and behave like a liquid and can be one of the major causes of damage during an earthquake.

Additional Information:

- Related Hazards: [Landslide/Debris Flow](#) / [Land Subsidence](#) / [Submarine Slides](#) / [Earthquake](#) / [Liquefaction](#) / [Tsunami](#) / [Seiche](#) / [Structure Failure](#) / [Electrical Outage](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#)

Notable Incidents:

- [Alaska 2018](#)
- [Loma Prieta 1989 \(San Francisco Marina District\)](#)
- [Alaska 1964](#)

Resource Links:

- Communities can reach out to subject matter experts at – [Emergency Management British Columbia \(EMBC\) - EMBC Seismic Team](#), or,
 - [Natural Resources Canada Seismologists](#)
- [Hazard Forecasting & Monitoring](#) is available at –
- [Hazard Bulletins & Alerting Services](#) are available through – [Emergency Info BC](#)



24. Tsunami

(Telegenic and Terrestrial)



Tsunami: Japanese term meaning wave ("nami") in a harbour ("tsu"). A series of travelling waves of extremely long length and period, usually generated by disturbances associated with earthquakes occurring below or near the ocean floor. A tsunami is an ocean wave produced by a submarine earthquake, landslide, or volcanic eruption. These waves may reach enormous dimensions and have sufficient energy to travel across entire oceans. They proceed as ordinary gravity waves with a typical period between 5 and 60 minutes. Tsunamis become steeper and increase in height as they approach shallow water, inundating low-lying areas. Where local submarine topography causes extreme steeping, they may break and cause great damage.

Additional Information:

- The popular term, tidal wave, is incorrect because tsunamis have no connection with tides.²⁷
- Most tsunamis expected along the west coast of BC will typically follow large offshore earthquakes, submarine landslides, or landslides into a local body of water.
- For historic data on tsunamis, see the [Global Historic Tsunami Database](#)
- For an overview of the tsunami threat to BC, see the Appendix 2 of the [BC Tsunami Notification Process Plan](#)
- Related Hazards: [Earthquake](#) / [Submarine Slides](#) / [Seiche](#) / [Electrical Outage](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#) / [Wastewater Interruption](#) / [Water Service Interruption](#) / [Marine Vehicle Incident](#)

Notable Incidents:

- [Port Alberni 1964](#)
- [Canadian Geographic Tsunami Events](#)

Resource Links:

- Communities can reach out to subject matter experts at – Emergency Management British Columbia (EMBC) - [EMBC Seismic Team](#), or
 - [Canadian Hydrographic Service Tsunami Monitoring Specialist](#)
 - [Natural Resources Canada \(NRCAN\) Seismologists](#)
- Hazard Forecasting & Monitoring is available at - [Oceans Network Canada Early Warning Project](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

²⁷ Province of British Columbia, "Tsunami Notification Process Plan," 2013, <https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/provincial-emergency-planning/tsunami-notification-process-plan.pdf>.



Geological- Volcanic

25. Ash Fall

26. Volcanic Flow

While volcanic eruptions in BC are extremely rare, BC has several active volcanoes. Only communities located within a few kilometres would be impacted by most hazards related to volcanoes, while volcanic ash could affect a much larger area.

For a historic record of volcanic events in your area, refer to:

- [Natural Resources Canada's website](#)

For assistance in calculating the likelihood of volcanic events, reach out to:

- [Emergency Management British Columbia \(EMBC\) - EMBC Seismic Team](#)
- [Natural Resources Canada Seismologists](#)

The BC Climate Action Secretariat has produced [the Climate Action Toolkit](#)



25. Ash Fall



Ash falls occur where fine volcanic ash has been ejected out of a volcanic vent into the atmosphere, possibly transported by upper level winds, and deposited on the earth. Impacts may include health hazards, damage to crops, harm to wild and domestic animals, reduced visibility, contamination of water supplies, disruption of transportation (with particularly serious consequences for aircraft), damage to power production and distribution systems, damage to many types of machinery, and structural collapse.

Additional Information:

- The annual probabilities of volcanic ash falling vary across British Columbia. See A Preliminary [Volcanic Ash Fall Susceptibility Map](#) from the Geological Survey of Canada
- Related Hazards: [Air Quality](#) / [Animal Disease](#) / [Human Disease](#) / [Plant Disease and Pest Infestation](#) / [Public Health Crisis](#) / [Pyroclastic Flow, Lava Flow, Lahar, Mudflow](#) / [Seiche](#) / [Structure Failure](#) / [Electrical Outage](#) / [Food Source Interruption](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#) / [Wastewater Interruption](#) / [Water Service Interruption](#) / [Aircraft Incident](#) / [Marine Vehicle Incident](#) / [Motor Vehicle Incident](#) / [Rail Incident](#)

Notable Incidents:

- [Mount St. Helens 1980 \(WA\)](#)
- [Eyjafjallajökull 2010 \(IC\)](#)

Resource Links:

- Communities can reach out to subject matter experts at - Emergency Management British Columbia (EMBC) - [EMBC Seismic Team](#), or,
 - [Volcanoes Canada Information](#)
 - [Natural Resources Canada \(NRCAN\) Seismologists](#)
- Hazard Forecasting & Monitoring is available at – [Montreal Volcanic Ash Advisory Centre \(VAAC\)](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)



26. Volcanic Flow

Volcanic Flow includes *Pyroclastic, Lava, and Lahars*.



- **Pyroclastic flows** are sudden and very rapid flows of hot gas, ash and rock particles down the slopes of a volcano associated with explosive eruptions. They destroy everything in their path.
- **Lava flows** are slow speed flows of molten rock. People can evacuate, but structures are usually destroyed when in the path of a lava flow.
- **Lahars** are volcanic mud flows and debris flows, consisting of hot or cold mixtures of water and volcanic debris that form when volcanic materials interact with water, ice, snow, or loose wet sediments. Lahars are most dangerous close to a volcano, but large lahars may rapidly travel many tens of kilometres from a volcano, along river valleys, so they can pose a threat to people and infrastructure far beyond the volcano's slopes.

Additional Information:

- Volcanic Flows in BC are rare, occurring less than every 100 years.
- Related Hazards: [Structure Fire](#) / [Wildfire](#) / [Ash Fall](#) / [Explosions](#) / [Structure Failure](#) / [Electrical Outage](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#)

Notable Incidents:

- [Mount St. Helens 1980 \(WA\)](#)
- [The Volcano ~1800 \(Lava Fork, BC\)](#)

Resource Links:

- Communities can reach out to subject matter experts at – Emergency Management British Columbia (EMBC) - [EMBC Seismic Team](#), or,
 - [Volcanoes Canada Information](#)
 - [Natural Resources Canada Seismologists](#)
- Hazard Forecasting & Monitoring is available at:
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)



Hazardous Materials and Explosions

27. Explosions
28. Hazardous Materials Spill
29. Mine Incident
30. Nuclear Incident
31. Oil or Gas Pipeline Spill
32. Space Debris

For a historic record of hazardous material and explosion events in your area, refer to:

- [BC Office of the Fire Commissioner \(OFC\)](#)

For assistance in calculating the likelihood of hazardous material and explosion incidents, reach out to:

- [Your Community Fire Department](#)

Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.



27. Explosions

An explosion affecting a residential or non-residential area, resulting in partial or total destruction of the structure and/or bodily injury, smoke inhalation or death.²⁸

Additional Information:

- Local fire departments should have pre-planning documents for areas identified as high-risk
- Related Hazards: [Structure Fire](#) / [Hazardous Materials Spill](#) / [Structure Failure](#) / [Electrical Outage](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#) / [National Security Threat](#) / [Public Order](#) / [Major Planned Event](#) / [Aircraft Incident](#) / [Marine Vehicle Incident](#) / [Motor Vehicle Incident](#) / [Rail Incident](#)

Notable Incidents:

-

Resource Links:

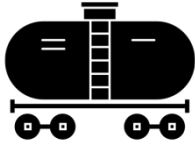
- Communities can reach out to subject matter experts at – [BC Office of the Fire Commissioner \(OFC\)](#)
- Contact your [Community Fire Department](#) for more information
- Contact your [Local RCMP Detachment](#) for more information.
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

²⁸ Public Safety Canada, "Canadian Disaster Database Reference - Reference Table for Symbols and Definitions."



28. Hazardous Materials Spill

In Canada, hazardous material spills can happen under two circumstances:



- 1) spills, leakage, or accidents involving materials on site; and,
- 2) spills, leakage, or accidents that happen when hazardous materials are transported by aircraft, rail, ship or truck

Hazardous materials can involve any materials that are considered dangerous by Transport Canada. These involve toxic gases, radioactive material, acids, and any number of chemicals and goods. Hazardous materials can also include gas or oil spills when they pose a risk of fire, explosion, or damage to the environment.²⁹

Additional Information:

- The likelihood of hazardous material spills will depend the type of industry in the community, transportation corridors, and the presence of hazardous waste.
- Contact your [Community Fire Department](#) for information on specific locations of dangerous goods in the community.
- Related Hazards: [Air Quality](#) / [Animal Disease](#) / [Human Disease](#) / [Plant Disease and Pest Infestation](#) / [Public Health Crisis](#) / [Explosions](#) / [Oil or Gas Pipeline Spill](#) / [Transportation Route Interruption](#) / [Water Service Interruption](#) / [Aircraft Incident](#) / [Marine Vehicle Incident](#) / [Motor Vehicle Incident](#) / [Rail Incident](#)

Notable Incidents:

- [Trail Sulphuric Acid Spill 2018](#)
- [English Bay Fuel Spill 2015](#)

Resource Links:

- Communities can reach out to subject matter experts at – [BC Office of the Fire Commissioner \(OFC\)](#)
- Contact your [Community Fire Department](#) for more information
- Contact your [Local RCMP Detachment](#) for more information
- Ministry of Environment - [Spills and Environmental Emergencies website](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

²⁹ Justice Institute of BC, “Hazard Risk Analysis (HRA).”



29. Mine Incident



Mines in BC range from open pit coal and metal mines, underground coal and metal mines, placer operations or gravel pits and quarries. Each mining operation presents unique hazards with incidents ranging from structure failure, tailings dam failure, sediment pond or other containment failure, hazardous materials spill, or explosion. These incidents may be generated by other hazards such as flood or seismic activity.

Additional Information:

- Mines are required to have Mine Emergency Response Plans and a risk assessment, as regulated by the [Health, Safety and reclamation Code for Mines in British Columbia](#).
- Related Hazards: [Animal Disease](#) / [Human Disease](#) / [Plant Disease and Pest Infestation](#) / [Structure Fire](#) / [Landslide/Debris Flow](#) / [Land Subsidence](#) / [Earthquake](#) / [Explosions](#) / [Hazardous Materials Spill](#) / [Oil or Gas Pipeline Spill](#) / [Dam and Spillways Failure](#) / [Dike Failure](#) / [Structure Failure](#) / [Water Service Interruption](#)

Notable Incidents:

- [Mount Polley Mine Disaster 2014](#)

Resource Links:

- Communities can reach out to the mine's owner/operator for risk information. You can locate mines in BC with the - [BC Mine Information website](#), or the [BC Mineral Titles Online Tool](#)
- Hazard Forecasting & Monitoring is available at –
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)



30. Nuclear Incident

There are two categories of Nuclear incident that have potential to affect BC:



- A Category C incident is an emergency involving a nuclear powered Vessel. This includes emergencies involving nuclear powered vessels or vessels carrying fissionable material in port or in transit in Canadian waters. Category C events could require the implementation of emergency plans by affected municipalities, including the application of urgent protective actions. In B.C., there are only two ports authorized to host a military nuclear powered vessel – Canadian Forces Base Esquimalt and the Canadian Forces Maritime Experimental and Test Ranges at Nanoose Bay.
- A Category D incident is any other emergencies or potential threats in North America. Category D includes other nuclear emergencies or potential threats in North America that may require a multi-departmental or multi-jurisdictional response to deal with radioactive contamination or exposure of people, property and the environment.

Additional Information:

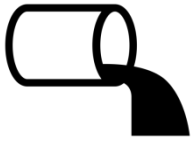
- Foreign nuclear powered vessels occasionally dock at Esquimalt or Canadian Forces Maritime Experimental and Test Range outside Nanoose Bay on Vancouver Island, a few times a year on average.
- Nuclear incident can be rated as “rare” in the likelihood scale for communities located near either of the identified threats.
- See the [BC Nuclear Emergency Response Plan \(BCNEP\)](#)
- Related Hazards: [Air Quality](#) / [Animal Disease](#) / [Human Disease](#) / [Plant Disease and Pest Infestation](#) / [Public Health Crisis](#) / [Structure Fire](#) / [Explosions](#) / [Hazardous Materials Spill](#) / [Space Debris](#) / [Aircraft Incident](#) / [Marine Vehicle Incident](#) / [Motor Vehicle Incident](#) / [Rail Incident](#)

Notable Incidents:

- [Canadian Nuclear Safety Commission \(CNSC\) Nuclear-related Events Reports](#)
- [British Columbia B-36 Crash 1950](#)

Resource Links:

- Communities can reach out to subject matter experts at –
- For region-specific inquiries, contact your - [Local Health Authority](#)
- For First Nations-specific inquiries, contact - [First Nations Health Authority \(FNHA\)](#)
- Hazard Forecasting & Monitoring is available at –
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)



31. Oil or Gas Pipeline Spill

Pipeline and gas well leaks and explosions occur when natural gas or gasoline pipelines, valves or components rupture, by accident, by mechanical failure or corrosion. Gas leaks can also be caused by natural hazards such as earthquakes or landslides.³⁰

Additional Information:

- Contact the [infrastructure owner](#) to discuss risks
- See the [BC Oil and Gas Commission Website](#) for more information and location of projects, including the incident map
- Related Hazards: [Animal Disease](#) / [Human Disease](#) / [Plant Disease and Pest Infestation](#) / [Public Health Crisis](#) / [Explosions](#) / [Hazardous Materials Spill](#) / [Fuel Source Interruption](#)

Notable Incidents:

- [Enbridge Natural Gas Line Explosion 2018](#)

Resource Links:

- Communities can reach out to subject matter experts at – [BC Oil and Gas Commission](#)
- Hazard Forecasting & Monitoring is available at – [BC Oil and Gas Commission incident map](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

³⁰ Ministry of Public Safety and Solicitor General, *Hazard, Risk and Vulnerability Analysis Tool Kit*.



32. Space Debris

Debris from satellites and space vehicles, as well as natural objects like meteorites and planetary particles that travel through the solar system.³¹

Additional Information:

- The likelihood of a space debris incident in BC is rare. While on average about one inert satellite reenters the Earth's atmosphere every day, the majority burn up completely and any surviving debris lands harmlessly in the ocean or remote areas³²
- Space debris information can be obtained from the [European Space Agency \(ESA\) website](#), or [NASA Orbital Debris Office website](#)
- Related Hazards: [Space Weather](#)

Notable Incidents:

- [Northwest Territories 1978 \(Russian Kosmos 954\)](#)

Resource Links:

- Communities can reach out to subject matter experts at – [Canadian Space Agency \(ASC-CSA\) Contact Information](#)
- Hazard Forecasting & Monitoring is available at –
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

³¹ Public Safety Canada.

³² European Space Agency -

http://www.esa.int/Our_Activities/Operations/Space_Debris/ESA_reentry_expertise



Hydrological

- 33. Drought ↗
- 34. Seiche ↗
- 35. Storm Surge ↗

For a historic record of hydrological events in your area, refer to:

- Emergency Management British Columbia (EMBC)

For assistance in calculating the likelihood of hydrological events, reach out to:

- Emergency Management British Columbia (EMBC)


Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.



33. Drought

Drought is a recurrent feature of climate involving a deficiency of precipitation over an extended period, resulting in a water shortage for activities, communities or aquatic ecosystems. In British Columbia (BC), combinations of insufficient snow accumulation, hot and dry weather, or a delay in rainfall may cause drought.³³

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Historical drought records can be obtained through the BC Drought information Portal (DIP) – [Historical British Columbia Drought Information](#)
- Individual water purveyors are responsible for having an Emergency Response and Contingency Plan, according to the [Drinking Water Protection Act](#)
- The "[Dealing with Drought: A Handbook for Water Suppliers in BC](#)" provides information for communities and operators
- Government of British Columbia - [Drought Response Plan](#)
- Government of British Columbia - [Drought Information Page](#)
- Government of British Columbia - [Drought Information Portal](#)
- Related Hazards: [Extreme Heat](#) / [Lightning](#) / [Animal Disease](#) / [Human Disease](#) / [Plant Disease and Pest Infestation](#) / [Public Health Crisis](#) / [Wildfire](#) / [Food Source Interruption](#) / [Water Service Interruption](#)

Notable Incidents:

-

Resource Links:

- Communities can reach out to subject matter experts at – bcdrought@gov.bc.ca
- Hazard Forecasting & Monitoring is available at – [BC Drought Information Portal \(DIP\) Drought Levels Map](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)


³³ BC Ministry of the Environment, "British Columbia Drought Response Plan," no. July (2016), <https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/drought-info/drought-response-plan-update-june-2015.pdf>.



34. Seiche

A standing wave of water in a large semi- or fully-enclosed body of water (lakes or bays) created by seismic activity, strong winds, and /or a large barometric pressure gradient.³⁴

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- See the [National Oceanic & Atmospheric Administration \(NOAA\) Atmospheric Seiche Fact Sheet](#) or, [Pacific Northwest Seismic Network \(PNSN\) Seismic Seiche Description](#)
- Related Hazards: [Hurricane/Typhoon/High Wind Event](#) / [Avalanche](#) / [Landslide/Debris Flow](#) / [Land Subsidence](#) / [Submarine Slides](#) / [Earthquake](#) / [Tsunami](#) / [Storm Surge](#) / [Lake, River, and Stream Flooding](#) / [Coastal Flooding](#) / [Storm Water Flooding](#) / [Flash Flooding](#) / [Dam and Spillways Failure](#) / [Dike Failure](#)

Notable Incidents:

- [Lake Union \(WA\) 2002](#)
- [San Juan Harbour](#)
- [Lake Erie 1844](#)

Resource Links:

- Communities can reach out to subject matter experts at – [Meteorological Service of Canada \(MSC\) - Warning Preparedness Meteorologists](#), or, [Emergency Management British Columbia \(EMBC\) - EMBC Seismic Team](#)
- Hazard Forecasting & Monitoring is available at –
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)


³⁴ UNISDR, "Quick Risk Estimation Tool," 2017, http://www.unisdr.org/campaign/resilientcities/assets/documents/guidelines/QRE_Tool_UNISDR_May 2017.xlsm.



35. Storm Surge

A deviation (either positive or negative) in the height of the sea surface from normal tidal levels. Triggered by wind stress and low atmospheric pressure. Often associated with tropical cyclones. Positive storm surges often cause coastal area flooding.³⁵

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Related Hazards: [Hurricane/Typhoon/High Wind Event](#) / [Seiche](#) / [Lake, River, and Stream Flooding](#) / [Coastal Flooding](#) / [Storm Water Flooding](#) / [Flash Flooding](#) / [Dam and Spillways Failure](#) / [Dike Failure](#) / [Structure Failure](#) / [Electrical Outage](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#) / [Wastewater Interruption](#) / [Water Service Interruption](#) / [Marine Vehicle Incident](#) / [Motor Vehicle Incident](#) / [Rail Incident](#)

Notable Incidents:

- [Beach Grove, Delta - Storm Surge 2006](#)

Resource Links:

- Communities can reach out to subject matter experts at – [Meteorological Service of Canada \(MSC\) - Warning Preparedness Meteorologists](#)
- Hazard Forecasting & Monitoring is available at – [Storm Surge BC Website](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

³⁵ Public Safety Canada, "Canadian Disaster Database Reference - Reference Table for Symbols and Definitions."



Hydrological - Flooding

- 36. Lake, River, and Stream Flooding ↗
- 37. Coastal Flooding ↗
- 38. Storm Water Flooding (urban, local, pluvial) ↗
- 39. Flash Flooding ↗

Flooding is the overflow of natural drainage channels, natural shorelines and/or human-made facsimiles leading to partial or complete inundation from the overflow of inland or tidal waters, and/or the accumulation or runoff of surface waters from any source³⁶

Flooding is a significant natural hazard in BC that can damage important infrastructure, cause serious economic losses, and create social disruption. Flooding in BC is often due to:

- Climatic conditions – intense rainfall, rain on snow, ice jams, rapid snowmelt, storm surges, etc.
- Geomorphic processes – debris flows, tsunamis, landslides
- Structural failures – dike failure, dam failure, culvert failure

Additionally, climate change will impact the frequency and magnitude of flooding in BC through changes to precipitation patterns and sea level rise. It is estimated that sea levels along the coastline will increase by approximately 1m by the year 2100 (Ausenco-Sandwell 2010). Therefore, it is important for local authorities to understand the flood hazards they face and how to mitigate these risks.³⁷

Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.

Flooding can be classified in a number of different ways. This tool identifies four types of flooding to help keep your hazard scenarios manageable and unique to your community. Tools that will help you identify likelihood and consequences for all flooding types include:

- Floodplain maps identify areas that experience periodic flooding from nearby rivers, lakes, streams, the sea and provide information on the spatial distribution of flood construction levels.
- Areas of B.C. that are highly susceptible to flooding have been designated as floodplains by the federal and provincial governments. These designated flood maps are somewhat dated but serve as useful reference until the community can update their respective maps.
- The government of BC maintains website resources to help create [floodplain maps](#)
- Floodplain maps of the extent of the [Fraser River floodplain](#) are available for the purposes of flood emergency planning
- See also the [Professional Practice Guidelines - Legislated Flood Assessments in BC](#) which guides professional practice for flood assessments

³⁶ Public Safety Canada, "National Disaster Mitigation Program Terms and Conditions," 2016, <https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr-prvntn-mtgtn/ndmp/trms-cndtns-en.aspx>.


³⁷ UBCM and Province of British Columbia, "Flood Risk Assessment, Flood Mapping, & Flood Mitigation Planning 2019 Program & Application Guide," *Community Emergency Preparedness Fund*, 2018, <https://www.ubcm.ca/EN/main/funding/lgps/community-emergency-preparedness-fund/flood-risk-assessment-mapping-mitigation-planning.html>.



36. Lake, River, Stream Flooding

Flooding is the overflow of natural drainage channels, natural shorelines and/or human-made facsimiles leading to partial or complete inundation from the overflow of inland or tidal waters, and/or the accumulation or runoff of surface waters from any source³⁸

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Floods are caused by natural or human-made conditions and geography. Communities might experience flooding due to:
 - Heavy rains or rain-on-snow events in fall/winter months;
 - Spring freshet flooding from rapid snow melt;
 - Intense precipitation at any time of the year;
 - Ice jams;
 - Reservoir releases;
 - Failure of dams or flood protection works;
 - Debris flows on the fans of steep mountain stream channels.³⁹
- See the [BC Flood Response Plan](#)
- The BC Government funds flood risk assessment projects, including LiDAR projects through the National Disaster Mitigation Program (NDMP) and the Community Emergency Preparedness Fund (CEPF). Find out if you have undergone an updating flood risk assessment, or if a neighbouring community has by looking at the successfully funding projects:
 - [Community Emergency Preparedness Fund \(CEPF\)](#)
 - [National Disaster Mitigation Program \(NDMP\)](#)

Related Hazards: [Hurricane/Typhoon/High Wind Event](#) / [Landslide/Debris Flow](#) / [Storm Water Flooding](#) / [Flash Flooding](#) / [Dam and Spillways Failure](#) / [Dike Failure](#)

Notable Incidents:

-

Resource Links:

- Communities can reach out to subject matter experts at -
- Hazard Forecasting & Monitoring is available at – [BC River Forecast Center](#)
- Hazard Bulletins & Alerting Services are available through – [BC River Forecast Center Warnings](#), or [Emergency Info BC](#)

³⁸ Public Safety Canada, "National Disaster Mitigation Program Terms and Conditions."


³⁹ Province of British Columbia, "The British Columbia Flood Response Plan," 2013, https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/provincial-emergency-planning/bc_flood_response_plan-final.pdf.



37. Coastal Flooding

Flooding from the ocean is influenced by tides and storm surge which raises sea level due to barometric pressure effects and wind. A particularly sensitive period occurs if a storm coincides with spring tides (the annual tide cycle peaks around the equinox in December and June).⁴⁰

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- The outer coast (including deep fjords), is also infrequently affected by tsunami (tidal waves). These are water level changes caused by tectonic activity, and/or landsliding and may occur at any time of year.⁴¹ Tsunamis are covered as a separate hazard under Geological: [Seismic - Tsunamis](#)
- The government of BC maintains website resources to help create [Coastal Floodplain Maps](#)
- Related Hazards: [Hurricane/Typhoon/High Wind Event](#) / [Tsunami](#) / [Seiche](#) / [Storm Surge](#) / [Lake, River, and Stream Flooding](#) / [Storm Water Flooding](#) / [Marine Vehicle Incident](#)

Notable Incidents:

-

Resource Links:

- Communities can reach out to subject matter experts at –
- Hazard Forecasting & Monitoring is available at – [BC Storm Surge Forecasting Program](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁴⁰ Government of British Columbia, *Guidelines for Management of Flood Protection Works in British Columbia*, 1999.


⁴¹ Government of British Columbia.



38. Storm Water Flooding

Storm Water Flooding or Local Flooding may be associated with an extreme hydrologic event such as a record rainfall or by poor or blocked drainage. Flooding impacts upon transportation, property and agriculture.⁴²

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Various departments within the local authority or First Nation such as public works, engineering, or other maintenance workers, may have detailed information on the areas of the community that typically flood.
- See the [BC Flood Response Plan](#)
- Related Hazards [Storm Surge](#) / [Lake, River, and Stream Flooding](#) / [Flash Flooding](#) / [Transportation Route Interruption](#)

Notable Incidents:

-

Resource Links:

- Communities can reach out to subject matter experts at –
- Hazard Forecasting & Monitoring is available at – [BC River Forecast Center](#)
- BC Storm Surge Forecasting Program: [BC Storm Surge Forecasting Program](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁴² Ministry of Public Safety and Solicitor General, *Hazard, Risk and Vulnerability Analysis Tool Kit*.




39. Flash Flooding



Flash flooding is heavy or excessive rainfall in a short period of time that produce immediate runoff, creating flooding conditions within minutes or a few hours during or after the rainfall.⁴³ Flash flooding may occur locally particularly on small to moderate sized streams throughout the province due to spring, summer, or fall/winter rainstorms. Coastal streams of all sizes commonly rise rapidly to their greatest annual peaks during intense fall and winter rainstorms.⁴⁴

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- The government of BC maintains website resources to help create [floodplain maps](#)
- See the [BC Flood Response Plan](#)
- Related Hazards: [Hurricane/Typhoon/High Wind Event](#) / [Landslide/Debris Flow](#) / [Tsunami](#) / [Seiche](#) / [Storm Surge](#) / [Lake, River, and Stream Flooding](#) / [Coastal Flooding](#) / [Storm Water Flooding](#) / [Dam and Spillways Failure](#) / [Dike Failure](#) / [Transportation Route Interruption](#) / [Motor Vehicle Incident](#)

Notable Incidents:

-

Resource Links:

- Communities can reach out to subject matter experts at –
- Hazard Forecasting & Monitoring is available at – [BC River Forecast Center](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁴³ IRDR, "Peril Classification and Hazard Glossary."

⁴⁴ Government of British Columbia, *Guidelines for Management of Flood Protection Works in British Columbia*.



Infrastructure Failure

40. Dam and Spillways Failure
41. Dike Failure
42. Structure Failure

For a historic record of infrastructure failure events in your area, refer to:

- Emergency Management British Columbia (EMBC)

For assistance in calculating the likelihood of infrastructure failure events, reach out to:

- Emergency Management British Columbia (EMBC)

Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.



40. Dam and Spillways Failure

A breach in the foundations, abutments, or spillways of a dam, which results in a sudden, rapid, and uncontrolled release of the impounded water.⁴⁵

Additional Information:

- For support in identifying the likelihood and consequences of a dam or spillways failure, contact the owner of the infrastructure.
- The location of all fresh water dams regulated by the Ministry of Forests, Lands, Natural Resource Operations (FLNRO) can be found by accessing the [BC Dam Safety Data BC Map](#) or utilizing the Google Earth KMZ file
- The Dam Safety Regulation indicates that all dam owners are required to have a Dam Emergency Plan (DEP) for all dams except low failure consequence dams. A section of the DEP that provides information such as the downstream inundation zone, in the case of a dam failure, must be submitted to the local emergency authority in which the dam is located. Neighbouring communities may also reach out to the dam owner for the same information. If a local emergency authority or First Nation cannot obtain sufficient information in the DEP for their planning purposes, they can contact the FLNRO Dam Safety Section through the [BC Dam Safety website](#)
- Related Hazards: [Hurricane/Typhoon/High Wind Event](#) / [Landslide/Debris Flow](#) / [Earthquake](#) / [Mine Incident](#) / [Storm Water Flooding](#) / [Flash Flooding](#) / [Dike Failure](#) / [Structure Failure](#) / [Electrical Outage](#) / [Water Service Interruption](#)

Notable Incidents:

- [Mount Polley Mine Disaster 2014](#)
- [Cannon Creek Dam 1995](#)

Resource Links:

- Communities can reach out to subject matter experts at –
- Hazard Forecasting & Monitoring is available at – [BC River Forecast Center](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁴⁵ City of Burnaby, "Hazard Definitions."



41. Dike Failure



As defined in the Dike Maintenance Act, a dike is an embankment, wall, fill piling, pump, gate, floodbox, pipe, sluice, culvert, canal, ditch, drain, or any other thing that is constructed, assembled, or installed to prevent the flooding of land. In British Columbia, dikes are works that address major flood hazards.⁴⁶ Dike failure can occur due to local overtopping, excessive slope seepage and saturation of dike fill material, active boils, riverside erosion, internal drainage problems, debris, ice and sedimentation accumulations and due to structural integrity failure due to seismic activity.⁴⁷

Additional Information:

- For support in identifying the likelihood and consequences of a dike failure, contact the owner of the dike, or diking authority.
- Diking authorities and dam owners are required to actively monitor the condition of their infrastructure to ensure that such things as electrical connections are functional, that any gates or valves are operational, spillways are clear and to assess dam or dike integrity. Poor maintenance can elevate the risk of a failure and consequent flooding⁴⁸
- For more information on Dike Maintenance, see the [BC Dike Management website](#)
- [Lower Mainland Dike Inventory Maps](#) show flood protection works regulated under the Dike Maintenance Act
- In 2015, the BC Government underwent an assessment of dikes in the lower mainland. See the [Lower Mainland Dike Assessment](#)
- Related Hazards: [Hurricane/Typhoon/High Wind Event](#) / [Earthquake](#) / [Mine Incident](#) / [Lake, River, and Stream Flooding](#) / [Storm Water Flooding](#) / [Flash Flooding](#) / [Dam and Spillways Failure](#) / [Structure Failure](#) / [Transportation Route Interruption](#)

Notable Incidents:

- [Grand Forks Flooding 2018](#)

Resource Links:

- Communities can reach out to subject matter experts at –
- Hazard Forecasting & Monitoring is available at – [BC River Forecast Center](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁴⁶ Province of British Columbia, “Dike Management,” accessed September 5, 2018, <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management>.

⁴⁷ Government of British Columbia, *Guidelines for Management of Flood Protection Works in British Columbia*.

⁴⁸ Province of British Columbia, “The British Columbia Flood Response Plan.”



42. Structure Failure

Structural failure occurs when a building or structure collapses due to engineering or construction problems, metal fatigue, changes to the load bearing capacity of the structure, human operating error or other cause such as earthquake, flood, fire, explosion, snow or ice buildup.⁴⁹

Additional Information:

- Follow up with the infrastructure owners of any structures of note
- Reach out internally to your government regarding structural information, such as the engineering or your [Community Fire Department](#).
- Related Hazards: [Hurricane/Typhoon/High Wind Event](#) / [Snowstorms and Blizzards](#) / [Structure Fire](#) / [Avalanche](#) / [Landslide/Debris Flow](#) / [Land Subsidence](#) / [Earthquake](#) / [Liquefaction](#) / [Tsunami](#) / [Explosions](#) / [Dam and Spillways Failure](#) / [Dike Failure](#)

Notable Incidents:

-


Resource Links:

- Communities can reach out to subject matter experts at – [BC Office of the Fire Commissioner \(OFC\)](#)
- Hazard Forecasting & Monitoring is available at –
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁴⁹ Ministry of Public Safety and Solicitor General, *Hazard, Risk and Vulnerability Analysis Tool Kit*.



Interruptions to Critical Services

- 43. Electrical Outage
- 44. Food Source Interruption 
- 45. Telecommunications Interruption
- 46. Transportation Route Interruption
- 47. Wastewater Interruption
- 48. Water Service Interruption
- 49. Fuel Source Interruption

For a historic record of interruptions to critical services events in your area, refer to:

For assistance in calculating the likelihood of interruptions to critical services events, reach out to:

- Emergency Management British Columbia (EMBC)

Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.



43. Electrical Outage

A deficit, interruption or failure of electricity or power systems, services, supplies or resources.⁵⁰ Power outages occur on a regular basis, however, they become a concern when the power outage is for a significant amount of time, when the temperatures are very low, or critical infrastructure, persons, livestock or businesses are affected.⁵¹

Additional Information:

- For advice on outages, contact the public affairs department of your electricity provider.
- Related Hazards: [Space Weather](#) / [Lightning](#) / [Telecommunications Interruption](#)

Notable Incidents:

-

Resource Links:

- Communities can reach out to subject matter experts at – Contact your local Utility Operator
- Hazard Forecasting & Monitoring is available at – Contact your local Utility Operator
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁵⁰ City of Burnaby, "Hazard Definitions."


⁵¹ Ministry of Public Safety and Solicitor General, *Hazard, Risk and Vulnerability Analysis Tool Kit*.



44. Food Source Interruption

Food shortages occur when the population of a community undergoes a severe shortage of food. A severe shortage of food can lead to starvation, illness and, in extreme cases, death.⁵²

Additional Information:

-  Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.
- Consider what are the main food sources in your community (i.e. grocery stores, subsistence farming, hunting, fishing) and how the supply chain could be disrupted.
- See the Aboriginal Disaster Resilience Program (ADRP) [Food Shortage Risk Analysis](#)
- Related Hazards: [Extreme Heat](#) / [Extreme Cold](#) / [Snowstorms and Blizzards](#) / [Animal Disease](#) / [Plant Disease and Pest Infestation](#) / [Public Health Crisis](#) / [Drought](#)

Notable Incidents:

-

Resource Links:

- Communities can reach out to subject matter experts at –
- Hazard Forecasting & Monitoring is available at –
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁵² Justice Institute of BC, “Hazard Risk Analysis (HRA).”



45. Telecommunications Interruption

The unavailability of services provided by the communications infrastructure resulting in significant inconvenience or disaster caused by human error, equipment malfunction or breakdown.⁵³

Additional Information:

- For information on the likelihood and consequences of a telecommunications interruption, contact the infrastructure provider.
- Related Hazards: [Freezing Rain or Drizzle](#) / [Space Weather](#) / [Hurricane/Typhoon/High Wind Event](#) / [Lightning](#) / [Snowstorms and Blizzards](#) / [Tornado](#) / [Landslide/Debris Flow](#) / [Earthquake](#) / [Electrical Outage](#)

Notable Incidents:

-

Resource Links:

- Communities can reach out to subject matter experts at – Contact your local telecommunications provider(s)
- Hazard Forecasting & Monitoring is available at – Contact your local telecommunications provider(s)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁵³ Public Safety Canada, "Canadian Disaster Database Reference - Reference Table for Symbols and Definitions."



46. Transportation Route Interruption

An interruption or failure of transportation infrastructure or systems. This can include road, rail, or waterway damage, transportation delays due to weather and/or infrastructure failure. Transportation Route Interruptions often accompany other large scale disaster events.

Additional Information:

- Information on highway projects, status, emergency information, and contacts can be found on the [TranBC website](#)
- Related Hazards: [Snowstorms and Blizzards](#) / [Wildfire](#) / [Avalanche](#) / [Landslide/Debris Flow](#) / [Earthquake](#) / [Liquefaction](#) / [Tsunami](#) / [Lake, River, and Stream Flooding](#) / [Aircraft Incident](#) / [Marine Vehicle Incident](#) / [Motor Vehicle Incident](#) / [Rail Incident](#)

Notable Incidents:

-

Resource Links:

- Communities can reach out to subject matter experts at – [TranBC Website](#)
- Hazard Forecasting & Monitoring is available at – [Drive BC website](#)
- Hazard Bulletins & Alerting Services are available through – [TranBC Emergency information](#), or [Emergency Info BC](#)



47. Wastewater Interruption

A deficit, interruption or failure of waste water or sewer systems, services, supplies, or resources.⁵⁴

Additional Information:

- The owner or operator of the community's wastewater system should have an understanding of any associated risks
- Related Hazards: [Hurricane/Typhoon/High Wind Event](#) / [Animal Disease](#) / [Human Disease](#) / [Public Health Crisis](#) / [Earthquake](#) / [Water Service Interruption](#)

Notable Incidents:

-

Resource Links:

- Communities can reach out to subject matter experts at – Contact your local Utility Operator
- For region-specific inquiries, contact your - [Local Health Authority](#)
- For First Nations-specific inquiries, contact - [First Nations Health Authority \(FNHA\)](#)
- Hazard Forecasting & Monitoring is available at – Contact your local Utility Operator
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁵⁴ City of Burnaby, "Hazard Definitions."



48. Water Service Interruption

A deficit, interruption or failure of water systems, services, supplies or resources.⁵⁵

Additional Information:

- Individual water purveyors are responsible for having an Emergency Response and Contingency Plan, according to the [Drinking Water Protection Act](#)
- The "[Dealing with Drought: A Handbook for Water Suppliers in BC](#)" provides information for Water Purveyors
- Related Hazards: [Animal Disease](#) / [Human Disease](#) / [Plant Disease and Pest Infestation](#) / [Public Health Crisis](#) / [Structure Fire](#) / [Wildfire](#) / [Drought](#) / [Wastewater Interruption](#)

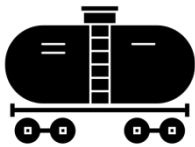
Notable Incidents:

- [Ahousaht First Nation 2018](#)
- [Cape Town 2018 \(SA\)](#)
- [Walkerton 2000 \(ON\)](#)

Resource Links:

- Communities can reach out to subject matter experts at – Contact your local Utility Operator
- For region-specific inquiries, contact your - [Local Health Authority](#)
- For First Nations-specific inquiries, contact - [First Nations Health Authority \(FNHA\)](#)
- Hazard Forecasting & Monitoring is available at – Contact your local Utility Operator
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁵⁵ City of Burnaby.



49. Fuel Source Interruption

A deficit, interruption or failure of fuel systems, services, supplies or resources. ⁵⁶ This can include pipeline damage, transportation delays due to weather and/or shipping infrastructure damage, or general shortages due to market supply problems, or panic fuel hoarding during emergencies. Fuel Source Interruptions often accompany other large scale disaster events.

Additional Information:

- Related Hazards: [Hurricane/Typhoon/High Wind Event](#) / [Snowstorms and Blizzards](#) / [Wildfire](#) / [Landslide/Debris Flow](#) / [Earthquake](#) / [Oil or Gas Pipeline Spill](#) / [Transportation Route Interruption](#) / [Rail Incident](#)

Notable Incidents:

- [Prince George Pipeline Rupture 2018](#)
- [Okanagan Fuel Shortage 2016](#)

Resource Links:

- Communities can reach out to subject matter experts at – Contact your local Utility Operator
- Hazard Forecasting & Monitoring is available at – Contact your local Utility Operator
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁵⁶ City of Burnaby.



Security

50. Cyber Security Threat
51. National Security Threat
52. Public Order
53. Major Planned Event

For a historic record of security events in your area, refer to:

- Your [Local RCMP Detachment](#) or Municipal Police Force for more information

For assistance in calculating the likelihood of security events, reach out to:

- Your [Local RCMP Detachment](#) or Municipal Police Force for more information

Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.



50. Cyber Security Threat

A circumstance or event with the potential to interrupt or adversely impact organizational operations, assets, or Individuals (including mission, functions, image, or reputation). Cyber Threats occur through information systems via unauthorized access, destruction, disclosure, modification of information, and/or denial of service. Also, the potential for a threat-source to successfully exploit a particular information system vulnerability

Additional Information:

- Related Hazards: [Telecommunications Interruption](#) / [National Security Threat](#)

Notable Incidents:

- [Midland \(ON\) Ransomware Attack 2018](#)
- [Calgary \(AB\) Ransomware Attack 2016](#)

Resource Links:

- Communities can reach out to subject matter experts at – Contact your [Local RCMP Detachment](#) or Municipal Police Force for more information
- Hazard Forecasting & Monitoring is available at – Contact your [Local RCMP Detachment](#) or Municipal Police Force for more information
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)



51. National Security Threat

Any threat directed at the security and safety of Canada and Canadians, and mainly concerned with Counter Terrorism, Cyber Security, Counter Proliferation and Critical Infrastructure.

Additional Information:

- National Security threats fall under the purview of the RCMP [Integrated National Security Enforcement Team \(INSET\)](#)
- Ongoing threat assessment and analysis is conducted by INSET and is also coordinated at the National level.
- INSET is actively engaged with local Police agencies and are proactive in exchange of information to support ongoing analysis of the threat and risks that may impact public safety in BC.
- Related Hazards: [Explosions](#) / [Oil or Gas Pipeline Spill](#) / [Structure Failure](#) / [Transportation Route Interruption](#) / [Cyber Security Threat](#) / [Public Order](#) / [Major Planned Event](#) / [Aircraft Incident](#) / [Marine Vehicle Incident](#) / [Motor Vehicle Incident](#) / [Rail Incident](#)

Notable Incidents:

-

Resource Links:

- Communities can reach out to subject matter experts at – Contact your [Local RCMP Detachment](#) or Municipal Police Force for more information
- Hazard Forecasting & Monitoring is available at – Contact your [Local RCMP Detachment](#) or Municipal Police Force for more information
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)



52. Public Order

An act or interruption that interferes with the operation of society and the ability of people to function efficiently. Examples include riots and demonstrations.

Additional Information:

- Public Order is generally the responsibility of your [Local RCMP Detachment](#) or Municipal Police Force
- There is continued analysis of risk and threats by local Police Agencies and where required supported by specialised units such as the Critical Incident Unit.
- A proportional response plan and engagement of any Public Order event is in place with corresponding resources if and when required with ability to request mutual aid if needed.
- Related Hazards: [Structure Fire](#) / [Explosions](#) / [Telecommunications Interruption](#) / [Transportation Route Interruption](#) / [Cyber Security Threat](#) / [National Security Threat](#) / [Major Planned Event](#)

Notable Incidents:

- [Vancouver Riot 2011](#)
- [Clayoquot Protests 1993](#)

Resource Links:

- Communities can reach out to subject matter experts at – Contact your [Local RCMP Detachment](#) or Municipal Police Force
- Hazard Forecasting & Monitoring is available at – Contact your [Local RCMP Detachment](#) or Municipal Police Force
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)



53. Major Planned Event

A Major Planned Event (MPE) is any planned event whose nature, expected attendee level, duration, or location challenges the normal response capability of a community and requires special planning by one or more agencies to mitigate impact to public health and safety.⁵⁷

Additional Information:

- See the British Columbia [Major Planned Event Guidelines](#)
- Related Hazards: [Extreme Heat](#) / [Extreme Cold](#) / [Explosions](#) / [Transportation Route Interruption](#) / [National Security Threat](#) / [Public Order](#) / [Motor Vehicle Incident](#)

Notable Incidents:

- [Vancouver Olympics 2010](#)
- [Shambhala Festival 2017](#)

Resource Links:

- Communities can reach out to subject matter experts at – Contact your [Local RCMP Detachment](#) or Municipal Police Force
- Hazard Forecasting & Monitoring is available at – Contact your [Local RCMP Detachment](#) or Municipal Police Force
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁵⁷ Emergency Management British Columbia, “British Columbia Major Planned Events Guidelines” 1 (2013): 57, <https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/local-government/majorplannedeventsguidelines.pdf>.



Transportation

54. Aircraft Incident
55. Marine Vessel Incident
56. Motor Vehicle Incident
57. Rail Incident

For a historic record of transportation events in your area, refer to:

- Your [Local RCMP Detachment](#) or Municipal Police Force for more information

For assistance in calculating the likelihood of transportation events, reach out to:

- Your [Local RCMP Detachment](#) or Municipal Police Force for more information

Climate change impacts do not affect every region of B.C. the same way. The Pacific Climate Impacts Consortium (PCIC) - [Plan2Adapt Tool](#) - generates maps, plots, and data describing projected future regional B.C. climate conditions.



54. Aircraft Incident

Air crash is an accident involving one or more aircraft that results in damage to aircraft, property or human injury or death. Most crashes occur near airports; however, they can occur anywhere in the rugged terrain of British Columbia.⁵⁸

Additional Information:

- Reach out to any neighbouring airport authority for additional risk assessment information
- General Information is available from the [Transportation Safety Board of Canada \(TSB\)](#)
- Related Hazards: [Fog](#) / [Snowstorms and Blizzards](#) / [Ash Fall](#) / [Explosions](#) / [Hazardous Materials Spill](#) / [Structure Failure](#) / [Transportation Route Interruption](#)

Notable Incidents:

- Data on [past aviation incidents](#) is available from the Transportation Safety Board of Canada

Resource Links:

- Communities can reach out to subject matter experts at – [Transportation Safety Board of Canada \(TSB\)](#), or your neighbouring airport authority
- Hazard Forecasting & Monitoring is available at – [Transportation Safety Board of Canada \(TSB\)](#)
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁵⁸ Ministry of Public Safety and Solicitor General, *Hazard, Risk and Vulnerability Analysis Tool Kit*.



55. Marine Vessel Incident

Shipping and nautical events that threaten human life, property and natural resources.⁵⁹

Additional Information:

- Contact the Canadian Coast Guard or the [Transportation Safety Board of Canada \(TSB\)](#) for more information.
- Port or Harbour Authorities may also have additional information on marine transportation related risks
- Related Hazards: [Explosions](#) / [Hazardous Materials Spill](#) / [Transportation Route Interruption](#)

Notable Incidents:

- Data on [past marine incidents](#) is available from the Transportation Safety Board of Canada
- [George H Ledcor 2018](#)
- [Nathan E Stewart 2016](#)
- [Queen of the North 2006](#)

Resource Links:

- Communities can reach out to subject matter experts at – [Canadian Coast Guard](#), or the [Transportation Safety Board of Canada \(TSB\)](#)
- Hazard Forecasting & Monitoring is available at – [Global Marine Traffic Website](#)
- Hazard Bulletins & Alerting Services are available through – [Canadian Coast Guard Navigational Warnings](#), or [Emergency Info BC](#)

⁵⁹ City of Burnaby, Risk and Emergency Management “Hazard Definitions” (Burnaby, n.d.).



56. Motor Vehicle Incident

An incident whenever a vehicle, be it a truck, passenger car, bus, farm vehicle or any other motor- or person-powered vehicle collides with another vehicle, train or other obstruction; or loses control and incurs damage.⁶⁰

Additional Information:

- Contact your [Local RCMP Detachment](#) or Municipal Police Force for information on the likelihood of motor vehicle incidents in your community
- Your community's government may also have a traffic management group that has additional data
- Related Hazards: [Fog](#) / [Freezing Rain or Drizzle](#) / [Snowstorms and Blizzards](#) / [Explosions](#) / [Hazardous Materials Spill](#) / [Transportation Route Interruption](#)

Notable Incidents:

- The Insurance Bureau of Canada has [incident statistics and crash maps](#) available

Resource Links:

- Communities can reach out to subject matter experts at – [TranBC Website](#)
- Hazard Forecasting & Monitoring is available at – [Drive BC website](#)
- Hazard Bulletins & Alerting Services are available through – [Drive BC Major Event Map](#)

⁶⁰ City of Burnaby.



57. Rail Incident

Events threatening human life, property and natural resources, involving train derailment or collision with another train, motor vehicle or obstruction on the rail tracks.⁶¹

Additional Information:

- Communities with rail lines within or adjacent their jurisdiction can contact the rail line operator for more information on local hazards and materials in transport
- Local Emergency Response Agencies are eligible to obtain training and access to the live rail information and monitoring system ([askrail](#)) through their rail operator
- You can contact the [Transportation Safety Board of Canada \(TSB\)](#) for more information
- For regulatory questions, contact the [Transportation of Dangerous Goods](#) department of [Transport Canada](#)
- Related Hazards: [Avalanche](#) / [Landslide/Debris Flow](#) / [Explosions](#) / [Hazardous Materials Spill](#) / [Transportation Route Interruption](#) / [Fuel Source Interruption](#)

Notable Incidents:

- Data on [past rail incidents](#) is available from the Transportation Safety Board of Canada

Resource Links:

- Communities can reach out to subject matter experts at – Contact your local rail line operator
- Hazard Forecasting & Monitoring is available at – Contact your local rail line operator
- Hazard Bulletins & Alerting Services are available through – [Emergency Info BC](#)

⁶¹ City of Burnaby.



SECTION 2 - Appendices

The attached appendices contain consolidated contact information and resource links found throughout this guide.

Appendix 1a - Glossary of Terms

Appendix 1b - Glossary of Acronyms

Appendix 2a – EMBC Regional Offices & Map

Appendix 2b – First Nations Regional Boundaries Map

Appendix 3 – Agency Contacts by Hazard Group

Appendix 4a – Resource Links by Hazard Group

Appendix 4b - Additional Links & Documents



Appendix 1a - Glossary of Terms

The following terms are defined throughout the HRVA process and accompanying documentation. For hazard definitions see the next [section](#).

Term	Definition	Source
ACTION PLANNING	A means of capturing and communicating the overall incident response priorities in a concise and coherent way.	BCEMS
AFTER ACTION REVIEW (AAR)	A professional discussion of an event that focuses on performance standards and enables those involved in the event to review what happened and why, and discuss how to maintain identified strengths and address identified weaknesses. [Adapted from: Keyes, Jessica, <i>Enterprise 2.0: Social Networking Tools to Transform Your Organization</i> , CRC Press, 2012.]	BCEMS
ALL-HAZARDS APPROACH	An approach to emergency management that “increases efficiency by recognizing and integrating common elements across all hazard types, and then supplementing these common elements with hazard-specific sub-components to fill gaps only as required.” [from <i>Emergency Management Training: The Core Participant Guide</i>]	BCEMS
BUSINESS CONTINUITY	An ongoing process supported by senior management and funded to ensure that the necessary steps are taken to determine the impact of potential losses and maintain viable recovery strategies, recovery plans, and continuity of services.	BCEMS
CAPACITY	The combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience.	United Nations Office for Disaster Risk Reduction (UNISDR)
CASCADING EVENT	An event that may occur as a direct or indirect result of an initial event.	FEMA
COMMUNITY	Everyone who is or could be affected by an emergency/disaster. This includes all levels of government, agencies, not-for-profit organizations, businesses, and individuals.	BCEMS
COMMUNITY RESILIENCE CENTRE	A model that may be used to assist individuals through the recovery process. The community resilience centre provides the space for and coordination of the various agencies and groups offering guidance, advice, and assistance to those affected by an emergency/disaster. (Also known as community recovery office and/or community recovery centre)	BCEMS
CONSEQUENCE	The physical/environmental, social, economic, and political impact or adverse effects that may occur as the result of a hazardous event.	Adapted from British Columbia Emergency Management System (BCEMS)



Term	Definition	Source
CONTEXT	The circumstances in which an emergency/disaster may occur. It includes factors such as geographical location, population, and available funding, resources, and capabilities. These circumstances have an effect on the impact of the emergency/disaster and thus help determine the scope of the emergency plan, the range and types of activities the plan covers, and what can be expected of the target populations in terms of engagement and participation.	BCEMS
CONTINUITY OF OPERATIONS	The initiative that ensures that agencies are able to continue operating their essential functions under a broad range of circumstances, including all hazard emergencies and national security emergencies.	BCEMS
CRITICAL INFRASTRUCTURE	Assets that are essential for the functioning of government and society, namely, water, food, transportation, health, energy and utilities, safety, telecommunications and information technology, government, finance, and manufacturing.	BCEMS
CRITICAL INFRASTRUCTURE IMPACT	An impact to critical infrastructure, including its processes, systems, facilities, technologies, networks, assets, and/or services, that results in consequences to the health, safety, security or economic well-being of community members and the effective functioning of the government.	Adaption of Ontario Hazard Identification and Risk Assessment (HIRA) 2018
CULTURAL IMPACT	Loss of cultural heritage and/or identity. May include loss of works, objects, places, practices and ecology that are directly associated with an important aspect or aspects of human history and culture.	Adaption from Parks Canada
CSA Z1600	A comprehensive standard for emergency management and business continuity programs developed by the Canadian Standards Association (CSA).	BCEMS
DISASTER	“A calamity that (a) is caused by accident, fire, explosion, or technical failure or by the forces of nature, and (b) has resulted in serious harm to the health, safety, or welfare of people, or in widespread damage to property.” [Emergency Program Act]	BCEMS
DISASTER FINANCIAL ASSISTANCE (DFA) PROGRAM	A program administered by EMBC that provides financial assistance to those affected by a disaster in situations where the losses could not be insured or where other assistance programs are not available.	BCEMS
DISASTER RISK REDUCTION	Measures taken to decrease the potential for future losses arising from emergencies/disasters.	BCEMS
ECONOMIC IMPACT	The negative economic consequences of a hazard, including those that impact businesses, industries or regional economies.	Ontario HIRA
EMERGENCY [EMERGENCY PROGRAM ACT]	“A present or imminent event or circumstance that (a) is caused by accident, fire, explosion, technical failure, or the forces of nature, and (b) requires prompt coordination of action or special regulation of persons or property to protect the health, safety, or welfare of a person or to limit damage to property.”	BCEMS
EMERGENCY MANAGEMENT BC (EMBC)	The provincial government’s lead coordinating agency for all emergency management and business continuity activities. It is responsible for reviewing BCEMS every four years to ensure that the system continues to reflect best practice and meet the needs in the field.	BCEMS



Term	Definition	Source
EMERGENCY MANAGEMENT PROGRAM	A specific department or group within an organization that assumes overall responsibility for emergency planning and facilitates the implementation of activities during each phase of the emergency management process.	BCEMS
EMERGENCY OPERATIONS CENTRE (EOC)	A facility where key personnel can gather to coordinate, plan, and manage overall response activities. It provides support to the site by facilitating long-term operations, providing centralized access to information, and assisting in the identification, prioritization, and allocation of resources.	BCEMS
EMERGENCY PLAN	A document that describes the actions that will be taken when an emergency/ disaster occurs. It describes how people, property, and the environment will be protected in an emergency/disaster.	BCEMS
EMERGENCY PROGRAM ACT	Provincial legislation that provides a framework for emergency management in the province and requires the province and local authorities to develop emergency plans.	BCEMS
EMERGENCY PROGRAM COORDINATOR	The person responsible for the day-to-day management of an organization's emergency management program. May also be referred to as planner, manager, or director.	BCEMS
EMERGENCY PROGRAM MANAGEMENT REGULATION	Provincial regulation that describes the roles and responsibilities of the Provincial Emergency Program (PEP), Emergency Management British Columbia (EMBC), and government ministries and corporations in regard to emergency management planning at the provincial level	BCEMS
ENVIRONMENTAL DAMAGE	The negative consequences of a hazard on the environment, including the soil, water, air and/or plants and animals.	Ontario HIRA
EXERCISE PROGRAM	An organization's opportunity to enhance its emergency management operational readiness through structured and scheduled testing of its emergency plan. The exercise program helps ensure that the plan is workable and helps identify – before an emergency/disaster occurs – any implementation issues that must be resolved.	BCEMS
EXPOSURE	People, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas.	UNISDR
FATALITIES	Potential number of people killed as a result of the hazard.	Ontario HIRA
FREQUENCY	The number of occurrences of an event in a defined period of time.	Public Safety Canada (PSC)
HAZARD	A source of potential harm, or a situation with a potential for causing harm, in terms of human injury; damage to health, property, the environment, and other things of value; or some combination of these.	BCEMS
HAZARD AND VULNERABILITY IDENTIFICATION	The process of recognizing that a hazard exists and defining its characteristics, and identifying current vulnerabilities in the community or organization.	BCEMS



Term	Definition	Source
HAZARD, RISK, AND VULNERABILITY ANALYSIS (HRVA)	<p>An assessment of:</p> <ul style="list-style-type: none"> • Hazards: These are sources of potential harm, or situations with a potential for causing harm, in terms of human injury; damage to health, property, the environment, and other things of value; or some combination of these. • Risk: This refers to the likelihood that a hazard will occur, as well as the severity of possible impact to health, property, the environment, or other things of value. • Vulnerability: This refers to the people, property, infrastructure, industry, resources, or environments that are particularly exposed to adverse impact from a hazardous event. 	BCEMS
IMPACT	The physical/environmental, social, economic, and political consequences or adverse effects that may occur as the result of a hazardous event.	BCEMS
INJURIES, DISEASE, OR HOSPITALIZATION	Potential number of people injured or ill because of the hazard.	Ontario HIRA
INTEROPERABILITY	The ability of emergency personnel to communicate between jurisdictions, disciplines, and levels of government, using a variety of systems as needed and authorized.	BCEMS
LAND-USE PLANNING	The process by which lands are assessed so that informed decisions can be made regarding their use and development.	BCEMS
LIKELIHOOD	The chance of an event or an incident happening. It can be defined or measured objectively or subjectively.	Adapted from PSC
LOCAL AUTHORITY EMERGENCY MANAGEMENT REGULATION	Provincial regulation that outlines the legislated requirements for local authority emergency plans within the province and lists the specific components that must be included in a local authority's emergency plan.	BCEMS
LONG-TERM RECOVERY STRUCTURE	A recovery model that is supported by the Recovery Steering Committee under the direction of the recovery director and the policy group of the Recovery Operations Centre until such time that the Recovery Operations Centre is deactivated or demobilized.	BCEMS
MITIGATION	The phase of emergency management in which proactive steps are taken to prevent a hazardous event from occurring by eliminating the hazard, or to reduce the potential impact of such an event before it occurs.	BCEMS
MITIGATION PLAN	A document that sets forth the long-term measures that a community or organization will take in order to eliminate hazards, thus preventing an emergency/disaster from occurring, or to reduce the effects of an emergency/disaster should one occur.	BCEMS
MUTUAL AID AGREEMENT	An agreement or contract between groups or agencies that defines the terms under which these parties agree to provide each other with assistance in an emergency/disaster. The agreement describes the services to be provided, insurance and liability arrangements, workers' compensation coverage for personnel, and compensation and reimbursement arrangements.	BCEMS
PREPAREDNESS	The phase of emergency management during which action is taken to ensure that individuals, businesses, and the jurisdiction/organization are ready to undertake emergency response and recovery.	BCEMS
PROBABILITY	A measure of the chance of an event or an incident happening.	Adapted from PSC



Term	Definition	Source
PROPERTY DAMAGE	The direct negative consequences of a hazard on buildings, structures and other forms of property, such as crops and livestock.	Ontario HIRA
PROVINCIAL CENTRAL COORDINATION LEVEL	The response level that prioritizes provincial government objectives and leads the overall provincial response. It also serves as the coordination and communication link with the other response levels and the federal disaster support system. Central coordination and provincial leadership are provided by the Provincial Emergency Coordination Centre (PECC).	BCEMS
PROVINCIAL REGIONAL COORDINATION LEVEL	The response level that provides and coordinates provincial support for local authorities and First Nations within designated regional boundaries. Support and coordination at this level are provided by a Provincial Regional Emergency Operations Centre (PREOC).	BCEMS
PSYCHOSOCIAL	Psychological and sociological aspects of the well-being of an individual, family group, organization, and/or community.	BCEMS
PSYCHOSOCIAL IMPACT	Impacts to the emotional and social well-being of an individual, family group, and/or community.	Disaster Psychosocial
PSYCHOSOCIAL SERVICES	Efforts to provide, after a disaster, the necessary support for people to re-establish their ability to meet their emotional and psychological needs as well as those of others.	BCEMS
PUBLIC/STAKEHOLDER EDUCATION	Efforts geared towards empowering the members of a community or organization to understand risks and hazards, prepare themselves for an emergency/disaster, participate meaningfully in emergency management initiatives, and develop the skills they need to mitigate their personal risk.	BCEMS
RECOVERY	The phase of emergency management in which steps and processes are taken/ implemented to: <ul style="list-style-type: none"> • Repair communities affected by a disaster • Restore conditions to an acceptable level or, when feasible, improve them • Restore self-sufficiency and increase resilience in individuals, families, organizations, and communities 	BCEMS
REPUTATIONAL IMPACT	A negative change in the perception of the government or organization, in the minds of the community, its stakeholders, and others who are vital to its success. This can result in socioeconomic damage or disruption such as loss of community or stakeholder trust and an increase in negative media attention.	Adaptation from CSA Z1600
RESILIENCE	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management.	UNISDR
RESOURCES	Equipment, supplies, personnel, volunteers, and facilities available for assignment or staging in support of emergency management activities.	BCEMS
RESPONSE	The phase of emergency management during which actions are taken in direct response to an imminent or occurring emergency/disaster in order to manage its consequences.	BCEMS



Term	Definition	Source
RISK	A concept that takes into consideration the likelihood that a hazard will occur, as well as the severity of possible impact to health, property, the environment, or other things of value.	BCEMS
RISK ANALYSIS	The systematic use of information to estimate the chance and severity of injury or loss to people, property, the environment, or other things of value.	BCEMS
RISK AVOIDANCE	Effectively removing the exposure to a risk. With risk avoidance, a decision is made to completely remove the sources of a particular risk or remove oneself from a particular risk.	BCEMS
RISK ACCEPTANCE	Doing nothing and accepting the risk. Risk acceptance is an explicit or implicit decision to accept the consequences of a given risk.	BCEMS
RISK CONTROL/REDUCTION/ MITIGATION	Reducing the likelihood of a threat or hazard being experienced; reducing the likelihood that damage will result should the hazard or threat be experienced; or minimizing harm once a hazard or threat has been experienced.	BCEMS
RISK EVALUATION	The process by which a risk is examined in terms of a cost/benefit analysis and evaluated in terms of whether it is an “acceptable” risk based on the needs and concerns of stakeholders.	BCEMS
RISK REDUCTION MEASURES	<p>Actions, projects, and policies aimed at reducing disaster risks through efforts to analyse and reduce the causal factors of disaster including reducing exposure to hazards, lessening vulnerability of people and property, wise management of land and the environment, and improving preparedness and early warning for adverse events.</p> <p><i>Note: Sometimes referred to risk treatment measures, control measures, and mitigation measures. Climate change adaptation strategies also overlap.</i></p>	Adapted from UNISDR
RISK TOLERANCE	The willingness of an organization to accept or reject a given level of residual risk. Note: Risk tolerance may differ across an organization, but must be clearly understood by those making risk-related decisions.	PSC
RISK TRANSFER	Shifting some or all of the risk to another entity, asset, system, network, or geographic area. Risk transfer may not reduce the overall likelihood of a particular threat or hazard being experienced but it should make the consequences easier to bear.	BCEMS
SCALABILITY	The ability to adapt to increasing demands.	BCEMS
SCENARIO	A narrative description of a hypothetical situation that may impact the community.	EMBC
SHELTER	In the context of the recovery phase, housing that is provided during the initial emergency response phase. It involves the shortest period of time, typically ranging from three to six months maximum.	BCEMS
SITUATIONAL AWARENESS	Knowing what is going on and what has happened with respect to the current incident, what could go on in terms of future impact or outcomes, and what options exist in terms of response actions.	BCEMS
SUBJECT MATTER EXPERT (SME)	Regional experts with knowledge on specific hazard(s) likelihood, consequences, environmental and economic impacts.	IPREM



Term	Definition	Source
SUPPORT SYSTEM IMPACT	Loss of accessibility to supports/networks or community groups, community reciprocity, trust, and cooperation between community members.	Adapted from Ontario HIRA
UNDERLYING DISASTER RISK DRIVERS	Processes or conditions, often development-related, that influence the level of disaster risk by increasing levels of exposure and vulnerability or reducing capacity.	UNISDR
VOLUNTEERS	People who offer their services without expecting financial compensation and are a critical component of emergency management.	BCEMS
VULNERABILITY	The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards.	UNISDR



Appendix 1b - Glossary of Acronyms

The following common Acronyms are found throughout the HRVA and supporting documentation. For hazard definitions see the next [section](#).

AAFC	Agriculture and Agri-Food Canada
ADRP	Aboriginal Disaster Resilience Program
AGRI	Ministry of Agriculture
BCCDC	British Columbia Center for Disease Control
CEMS	British Columbia Emergency Management System
BCNEP	British Columbia Nuclear Emergency Response Plan
CEPF	Community Emergency Preparedness Fund
CFIA	Canadian Food Inspection Agency
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CNSC	Canadian Nuclear Safety Commission
DEP	Dam Emergency Plan
DFA	Disaster Financial Assistance
DFO	Department of Fisheries and Oceans
DIP	Drought Information Portal
ECCE	Environment and Climate Change Canada
EMBC	Emergency Management BC
EOC	Emergency Operation Centre
EPA	Emergency Program Act
EPC	Emergency Program Coordinator
ESA	European Space Agency
ESS	Emergency Support Services
FADES	Foreign Animal Disease Emergency Support Plan
FLNRORD	Ministry of Forests, Lands, Natural Resource Operations & Rural Development
FNHA	First Nations Health Authority
FSR	Forest Service Roads
FUS	Fire Underwriters Survey
GIS	Geographic Information Systems
HECC	Health Emergency Coordination Centre
HRVA	Hazard, Risk, and Vulnerability Analysis
ICS	Incident Command System
IEPC	Inter-Agency Emergency Preparedness Committee
INSET	Integrated National Security Enforcement Team
JTFP	Joint Task Force Pacific
LiDAR	Light Detection and Ranging
MAH	Ministry of Municipal Affairs and Housing
MOECCS	Ministry of Environment and Climate Change Strategy
MOTI	Ministry of Transportation and Infrastructure
MROC	Ministry Regional Operation Centre
MSC	Meteorological Service of Canada
NASA	National Aeronautics and Space Administration
NDMP	National Disaster Mitigation Program



NOAA	National Oceanic and Atmospheric Administration
NRCAN	Natural Resources Canada
OFC	Office of the Fire Commissioner
PECC	Provincial Emergency Coordination Centre
PHCC	Provincial Highway Condition Centre
PNSN	Pacific Northwest Seismic Network
PREOC	Provincial Regional Emergency Operation Centre
PS	Public Safety Canada
PSTA	Provincial Strategic Threat Analysis
RCMP	Royal Canadian Mounted Police
RFC	River Forecast Centre
SAR	Search and Rescue
TAC	Ministry of Tourism, Arts, and Culture
TSB	Transportation Safety Board of Canada
VAAC	Volcanic Ash Advisory Center
WHO	World Health organization
WSC	Water Survey of Canada
WUI	Wildland Urban Interface



Appendix 2a – EMBC Regional Offices & Map

EMBC has its headquarters in Victoria and incorporates six regional offices. During emergencies, one or more of the PREOCs will activate as required, in support of Local Authorities, First Nations and provincial ministries. PREOCs are responsible for the provision and coordination of provincial support for Local Authorities and First Nations within designated regional boundaries.

The following map illustrates the emergency management regional boundaries:





EMBC Regions:

Region	PREOC Location	Regional Districts within Regional Boundaries
Vancouver Island	Victoria	Capital; Cowichan Valley; Nanaimo; Alberni-Clayoquot; Powell River; Comox Valley; Strathcona and Mount Waddington
Southwest	Surrey	Sunshine Coast; Squamish Lillooet; Greater Vancouver and Fraser Valley.
Central	Kamloops	Thompson – Nicola; Okanagan –Similkameen; Central Okanagan; North Okanagan; District of Lillooet and a portion of Columbia-Shuswap
Southeast	Nelson	Kootenay Boundary; Central Kootenay; East Kootenay; and a portion of Columbia-Shuswap
Northeast	Prince George	Northern Rockies; Peace River; Fraser-Fort George; Cariboo and Central Coast.
Northwest	Terrace	Bulkley-Nechako; Kitimat-Stikine; Skeena-Queen Charlotte and Stikine (unincorporated).

EMBC Regional Office Locations & Contact Information:

<p>South West Region 14292 Green Timbers Way Surrey, B.C. V3T 0J4 Tel: 604 586-4390 Fax: 604 586-4334 EMBC.SWEAdmin@gov.bc.ca</p>	<p>Central Region 1255-D Dalhousie Drive Kamloops, B.C. V2C 5Z5 Tel: 250 371-5240 Fax: 250 371-5246 EMBC.CTLAdmin@gov.bc.ca</p>
<p>South East Region 101-333 Victoria Street Nelson, B.C. V1L 4K3 Tel: 250 354-5904 Fax: 250 354-6561 EMBC.SEAAdmin@gov.bc.ca</p>	<p>North East Region 3235 Westwood Drive Prince George, B.C. V2N 1S4 Tel: 250 612-4172 Fax: 250 612-4171 EMBC.NEAAdmin@gov.bc.ca</p>
<p>North West Region Suite 1B - 3215 Eby Street Terrace, B.C. V8G 2X8 Tel: 250 615-4800 Fax: 250 615-4817 EMBC.NWEAdmin@gov.bc.ca</p>	<p>Vancouver Island Region Block A - Suite 200 2261 Keating Cross Road Saanichton B.C. V8M 2A5 Tel: 250 952-5848 Fax: 250 952-4304 EMBC.VIRAdmin@gov.bc.ca</p>
<p>Headquarters Block A - Suite 200 2261 Keating Cross Road Saanichton B.C. V8M 2A5 Tel: 250 952-4913 Fax: 250 952-4888 EMBCAdmin@gov.bc.ca</p>	<p>Recovery and Funding Programs Block A - Suite 200 2261 Keating Cross Road Saanichton B.C. V8M 2A5 Tel: 250 952-5505 Toll Free: 1 888 257-4777 Fax: 250 952-5542</p>



Appendix 2b – First Nations Regional Boundaries Map

For information on First Nations within each region, please see the [First Nations within EMBC Regional Boundaries Map](#).



Appendix 3 – Agency Contacts by Hazard Group

Agency / Position	Name	Email
<i>Atmospheric</i>		
Meteorological Service of Canada (MSC) Warning Preparedness Meteorologists	National Inquiry Response Team	
Meteorological Service of Canada (MSC) Warning Preparedness Meteorologist	Armel Castellan	armel.castellan@canada.ca
Meteorological Service of Canada (MSC) Warning Preparedness Meteorologist	Matt MacDonald	matt.macdonald@canada.ca
Ministry of Transportation & Infrastructure (MOTI)		
<i>Disease & Epidemic</i>		
Ministry of Agriculture		
AgriService BC	Information	AgriServiceBC@gov.bc.ca
<i>Fire</i>		
Office of the Fire Commissioner		
<i>Geological</i>		
Ministry of Transportation & Infrastructure (MOTI) Senior Manager of Avalanche & Weather Programs	Robb Andersen	robb.andersen@gov.bc.ca
Emergency Management British Columbia Seismic Team		
Emergency Management British Columbia Seismic Team	Robert White	Robert.White@gov.bc.ca
Emergency Management British Columbia Seismic Team	Samara Aitken	Samara.Aitken@gov.bc.ca
Canadian Hydrographic Service Tsunami Monitoring Specialist	Denny Sinnott	Denny.Sinnott@dfo-mpo.gc.ca
NRCAN Seismologists	Information	EarthquakeInfo@canada.ca
Volcanoes Canada	Information	nrcan.essvanvolcano-volcanvansse.nrcan@canada.ca



Agency / Position	Name	Email
<i>Hazardous Materials & Explosions</i>		
Office of the Fire Commissioner		
<i>Hydrological</i>		
<i>Infrastructure Failure</i>		
<i>Interruptions to Critical Services</i>		
<i>Security</i>		
<i>Transportation</i>		



Appendix 4a – Resource Links by Hazard Group

General [Click to Return to Hazard List Page]		
Emergency Management British Columbia (EMBC)	https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery	
Emergency Information BC	https://www.emergencyinfobc.gov.bc.ca/	
Environment and Climate Change Canada (ECCC) – Historic Climate Data	http://climate.weather.gc.ca/	
Climate Action Toolkit	https://www.toolkit.bc.ca/	
Alert Ready – Emergency Alert System	https://www.alertready.ca/	
Atmospheric		
Environment and Climate Change Canada (ECCC)	https://www.canada.ca/en/environment-climate-change.html	
Historic Climate Data	http://climate.weather.gc.ca/	
BC Air Quality Management	https://www2.gov.bc.ca/gov/content/environment/air-land-water/air/air-quality	
Meteorological Service of Canada	https://weather.gc.ca/mainmenu/weather_menu_e.html	
Space Weather Forecasting & Monitoring	http://www.spaceweather.gc.ca/index-en.php	
BC Storm Surge Forecasting Program	http://stormsurgebc.ca/index.html	
Air Quality Forecasts	https://weather.gc.ca/mainmenu/airquality_menu_e.html	
Weather Information	https://www.canada.ca/en/services/environment/weather.html	
BC Weather Warnings	https://weather.gc.ca/warnings/index_e.html?prov=bc	
Space Weather Effects on Technology Information Sheet	http://ftp.maps.canada.ca/pub/nrcan_nrcan/publications/ess_sst/292/292124/gid_292124.pdf	
Natural Resources Canada (NRCAN) - Space Weather	http://www.spaceweather.gc.ca/index-en.php	
NRCAN Space Weather Monitoring	http://www.spaceweather.gc.ca/sc-en.php	
NRCAN Space Weather Forecasting	http://www.spaceweather.gc.ca/forecast-prevision/sf-en.php	
ECCC Hurricane Forecasting	https://www.canada.ca/en/environment-climate-change/services/hurricane-forecasts-facts.html	
ECCC Lightning Danger Map	https://www.canada.ca/en/environment-climate-change/services/lightning/danger-map.html	
Calgary Hail Storm 2010	https://www.cbc.ca/news/canada/calgary/calgary-hailstorm-sets-damage-record-1.925450	



BC Hail Storms 2017	https://globalnews.ca/news/3611009/photos-hail-the-size-of-medium-tomatoes-causes-damage-in-b-c-town/ https://www.cbc.ca/news/canada/british-columbia/hail-coquitlam-1.4295921	
Typhoon Freda 1962	http://www.climate.washington.edu/stormking/October1962.html https://en.wikipedia.org/wiki/Columbus_Day_Storm_of_1962	
BC Wind storm 2018	https://globalnews.ca/news/4780352/ferry-cancellations-bc-wind-warning/	
BC Wind Storm 2015	https://www.ctvnews.ca/canada/thousands-without-power-after-windstorm-slams-southwestern-b-c-1.2539170	
Lightning Related Damage Report Review	https://static1.st8fm.com/en_CA/content_pages/1/pdf/ca/Damage.pdf	
Terrance 2015	https://globalnews.ca/news/1818221/worst-is-over-for-terrace-and-kitimat-after-massive-blizzard/	
Vancouver Island 1996	https://www.cbc.ca/archives/entry/1996-bc-digs-out-from-massive-blizzard	
Seasonal Wildfires	https://www.canada.ca/en/environment-climate-change/services/air-quality-health-index/wildfire-smoke.html https://en.wikipedia.org/wiki/2018_North_American_heat_wave	
North American Heat Wave 2018	https://en.wikipedia.org/wiki/2018_North_American_heat_wave	
Quebec Heat Wave 2018	https://globalnews.ca/news/4321912/quebec-heat-wave-70-deaths-2018/	
Health Canada Extreme Cold Guidelines	https://www.canada.ca/en/health-canada/services/healthy-living/your-health/environment/extreme-cold.html	
Winter 2019	https://www.cbc.ca/news/canada/british-columbia/extreme-cold-and-snowfall-warnings-in-effect-across-b-c-1.5004397	
Airport Closures 2017	https://bc.ctvnews.ca/flights-cancelled-for-3rd-day-due-to-dense-fog-over-vancouver-1.3713367	
Highway 401 crash 1999	https://en.wikipedia.org/wiki/1999_Ontario_Highway_401_crash	
1998 North American Ice Storm	https://en.wikipedia.org/wiki/January_1998_North_American_ice_storm	
Ice Storm 2017	https://www.ctvnews.ca/canada/ice-storms-strike-b-c-much-of-canada-under-extreme-cold-alert-1.3740061	
ANIK Satellite 1994	https://www.researchgate.net/publication/258723423_Anik-E1_and_E2_satellite_failures_of_January_1994_revisited	
Geomagnetic Storm 1989 (Quebec Blackout)	https://www.nasa.gov/topics/earth/features/sun_darkness.html	
Carrington Event 1859	http://www.lloyds.com/~media/lloyds/reports/emerging%20risk%20reports/solar%20storm%20risk%20to%20the%20north%20american%20electric%20grid.pdf	
Disease & Epidemic		
Agriculture Emergency Planning	http://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/farm-management/emergency-preparedness	
BC Foreign Animal Disease Emergency Support Plan	https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/farm-management/emergency-management/fades/bc_fades_main_plan2012.pdf	
Emergency management in the agriculture sector	https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/business-market-development/emergency-preparedness	



BC Ministry of Agriculture	https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/animals-and-crops	
BC Animal Health Center	https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/animals-and-crops/animal-health/reportable-notifiable-diseases	
Avian Influenza Cull (2004)	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3323407/	
British Columbia Center for Disease Control (BCCDC)	http://www.bccdc.ca/health-info	
World Health Organization (WHO)	http://www.who.int/emergencies/diseases/en/	
H1N1 Flu Pandemic (2009)	https://www.britannica.com/event/influenza-pandemic-H1N1-of-2009	
SARS Outbreak (2003)	https://en.wikipedia.org/wiki/Severe_acute_respiratory_syndrome	
Local Health Authority	https://www2.gov.bc.ca/gov/content/health/about-bc-s-health-care-system/partners/health-authorities/regional-health-authorities	
First Nations Health Authority (FNHA)	http://www.fnha.ca/contact-us	
BC Provincial Health Services Authority	http://www.phsa.ca/current-outbreaks	
Ministry of Agriculture Plant Health website	http://www.gov.bc.ca/planthealth	
Invasive Species Council of BC	http://www.bcinvatives.ca/	
Forest, Lands, Natural Resource Operations (FLNRO)	https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-health	
Canadian Food Inspection Agency (CFIA)	http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/eng/1300388388234/1300388449143	
AgriService BC	https://www2.gov.bc.ca/gov/content/industry/agriservice-bc	
AgriService BC Plant Health Information	https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/animals-and-crops/plant-health	
AgriService BC Plant Health Alerts	https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/animals-and-crops/plant-health/pest-alerts	
Current Health Topics in BC	https://www2.gov.bc.ca/gov/content/health/about-bc-s-health-care-system/office-of-the-provincial-health-officer/current-health-topics	
Fire		
BC Office of the Fire Commissioner (OFC)	https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/fire-safety	
BC Wildfire Service	https://www2.gov.bc.ca/gov/content/safety/wildfire-status	
BC Fire Departments	https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/fire-safety/fire_dept_listing.pdf	
Fire Underwriters Survey (FUS)	http://www.fireunderwriters.ca/municipal-portal.html	
Provincial Strategic Threat Analysis for Wildfires	https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/fire-fuel-management/psta	
Wildland Urban Interface Risk Class Maps	https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/fire-fuel-management/wui-risk-class-maps	
Okanagan Park Wildfire 2003	https://en.wikipedia.org/wiki/2003_Okanagan_Mountain_Park_fire	



Fort McMurray Wildfire 2016	https://en.wikipedia.org/wiki/2016_Fort_McMurray_wildfire	
BC Wildfire Prevention Officers by Fire Center	https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/fire-fuel-management/fuel-management	
BC Fire Danger Rating	https://www2.gov.bc.ca/gov/content/safety/wildfire-status/wildfire-situation/fire-danger	
Geological		
Ministry of Transportation & Infrastructure (MOTI) Avalanche Safety Plan	https://www2.gov.bc.ca/gov/content/transportation/transportation-infrastructure/contracting-to-transportation/highway-bridge-maintenance/highway-maintenance/avalanche-safety-plan	
Rogers Pass 1910	https://en.wikipedia.org/wiki/1910_Rogers_Pass_avalanche	
Kangiqsualujuaq QC 1999	https://www.thecanadianencyclopedia.ca/en/article/avalanche-in-quebec	
Canadian Avalanche Association (CAA)	https://www.avalancheassociation.ca/	
Avalanche Canada	https://www.avalanche.ca/map	
Review of Landslide Management in BC (2013)	http://www.env.gov.bc.ca/wsd/public_safety/flood/pdfs_word/Review_of_Landslide_Management_in_BC-2013.pdf	
Johnsons Landing 2012	https://theyee.ca/News/2012/07/27/Johnsons-Landing-Landslide/	
Fairmont Debris Flow 2012	https://nationalpost.com/news/canada/second-b-c-landslide-cuts-off-300-campers-just-45-kilometres-from-fatal-incident-at-johnsons-landing	
Hope Slide 1965	http://www.empr.gov.bc.ca/Mining/Geoscience/SurficialGeology/Landslides/Pages/default.aspx	
Lantzville 2018	https://vancouverisland.ctvnews.ca/it-s-filling-up-with-water-woman-rescued-from-20-metre-sinkhole-shares-terrifying-story-1.3782656	
Sechelt Seawatch Community 2015		
Grand Banks 1929	https://en.wikipedia.org/wiki/1929_Grand_Banks_earthquake	
(NRCAN) Seismic Hazard Map	http://www.seismescanada.nrcan.gc.ca/hazard-alea/simphaz-en.php#BC	
BC Earthquake Immediate Response Plan 2015	http://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/provincial-emergency-planning/irp.pdf	
NRCAN Earthquake Frequently Asked Questions	http://www.earthquakescanada.nrcan.gc.ca/info-gen/faq-en.php#frequency	
Vancouver Island 1946	https://en.wikipedia.org/wiki/1946_Vancouver_Island_earthquake	
Alaska 1964	https://en.wikipedia.org/wiki/1964_Alaska_earthquake	
Cascadia Subduction 1700	https://en.wikipedia.org/wiki/1700_Cascadia_earthquake	
Oceans Network Canada Early Warning Project	https://www.oceannetworks.ca/innovation-centre/smart-ocean-systems/earthquake-early-warning	
Alaska 2018	https://www.usgs.gov/news/2018-anchorage-earthquake	
Loma Prieta 1989 (San Francisco Marina District)	https://en.wikipedia.org/wiki/1989_Loma_Prieta_earthquake	



Alaska 1964	https://en.wikipedia.org/wiki/1964_Alaska_earthquake	
Global Historic Tsunami Database	https://www.ngdc.noaa.gov/hazard/tsu_db.shtml	
BC Tsunami Notification Process Plan	https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/provincial-emergency-planning/tsunami-notification-process-plan.pdf	
Port Alberni 1964	https://opentextbc.ca/geography/chapter/case-study-2-6/	
Canadian Geographic Tsunami Events:	http://www.canadiangeographic.com/tsunami/tsunamis_canada.asp	
Natural Resources Canada's website	http://chis.nrcan.gc.ca/volcano-volcan/index-en.php	
Volcanic Ash Fall Susceptibility Map from the Geological Survey of Canada	ftp://ftp.geogratis.gc.ca/pub/nrcan_nrcan/publications/ess_st/296/296973/of_7679.pdf	
Mount St. Helens 1980 (WA)	https://pubs.usgs.gov/gip/msh/ash.html	
Eyjafjallajökull 2010 (IC)	https://en.wikipedia.org/wiki/Air_travel_disruption_after_the_2010_Eyjafjallaj%C3%B6kull_eruption	
Montreal Volcanic Ash Advisory Centre (VAAC)	https://weather.gc.ca/eer/vaac/index_e.html	
Mount St. Helens 1980 (WA)	https://volcanoes.usgs.gov/volcanoes/st_helens/geo_hist_18may1980.html	
The Volcano ~1800 (Lava Fork, BC)	https://en.wikipedia.org/wiki/The_Volcano_(British_Columbia)	
Hazardous Materials & Explosions		
Local RCMP Detachments	http://www.rcmp-grc.gc.ca/detach/en	
Trail 2018	https://www.cbc.ca/news/canada/british-columbia/trail-spill-write-offs-1.4813610	
English Bay 2015	http://www.ccg-gcc.gc.ca/folios/00018/docs/Marathassa_Report-eng.pdf	
Spills and Environmental Emergencies, Ministry of Environment website	http://www2.gov.bc.ca/gov/content/environment/air-land-water/spills-environmental-emergencies	
BC Nuclear Emergency Response Plan (BCEP)		
Canadian Nuclear Safety Commission (CNSC) Nuclear-related Events Reports	https://nuclearsafety.gc.ca/eng/acts-and-regulations/event-reports-for-major-nuclear-facilities/index.cfm	
B-36 Bomber Crash 1950	https://www.timescolonist.com/entertainment/books/the-lost-nuke-of-bomber-075-1.20252067	
BC mine Information	http://mines.nrs.gov.bc.ca/	
Health, Safety and reclamation Code for Mines in British Columbia	https://www2.gov.bc.ca/gov/content/industry/mineral-exploration-mining/health-safety/health-safety-and-reclamation-code-for-mines-in-british-columbia	
Mount Polley Mine 2014	https://www.mountpolleyreviewpanel.ca/	
BC Mines Information Website	https://mines.nrs.gov.bc.ca/	



BC Mineral Titles Online Search Tool	https://www2.gov.bc.ca/gov/content/industry/mineral-exploration-mining/mineral-titles/mineral-placer-titles/mineraltitlesonline	
BC Oil & Gas Commission	www.bcogc.ca	
Enbridge Natural Gas Line Explosion 2018	https://www.timescolonist.com/news/b-c/natural-gas-customers-asked-to-limit-use-after-pipeline-rupture-fire-near-prince-george-1.23458017	
BC Oil & Gas Commission Incident Map	https://www.bcogc.ca/public-zone/bcogc-incident-map	
Petroleum Industry Search Tool	https://a100.gov.bc.ca/pub/ipsweb/mainPage.html	
Northwest Territories 1978 (Russian Kosmos 954)	https://en.wikipedia.org/wiki/Kosmos_954 https://web.archive.org/web/20110929125210/http://gsc.nrcan.gc.ca/gamma/ml_e.php	
European Space Agency (ESA)	https://www.esa.int/Our_Activities/Operations/Space_Safety_Security/Space_Debris	
NASA Orbital Debris Office	https://orbitaldebris.jsc.nasa.gov/	
Canadian Space Agency (ASC-CSA) Contact Information	http://www.asc-csa.gc.ca/eng/contact.asp	
Hydrological		
Historical BC Drought Information	https://governmentofbc.maps.arcgis.com/apps/MapSeries/index.html?appid=838d533d8062411c820eef50b08f7ebc	
Drinking Water Protection Act	http://www.bclaws.ca/civix/document/id/lc/statreg/01009_01	
Dealing with Drought: A Handbook for Water Suppliers in BC	https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/drought-info/suppliers_drought_handbook_2009.pdf	
BC Drought Response Plan	https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/drought-info/drought-response-plan-update-june-2015.pdf	
Government of British Columbia Drought Information page	https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/drought-information	
BC Drought Information Portal	http://bcgov03.maps.arcgis.com/apps/MapSeries/index.html?appid=9042807690964463b268dfd91949d65b	
BC Drought Levels Map	https://governmentofbc.maps.arcgis.com/apps/MapSeries/index.html?appid=838d533d8062411c820eef50b08f7ebc	
NOAA Atmospheric Seiche Fact Sheet	https://oceanservice.noaa.gov/facts/seiche.html	
PNSN Seismic Seiche Description	https://pnsn.org/outreach/earthquakehazards/tsunami/seiche	
Lake Union (WA) Seiche 2002	https://pubs.er.usgs.gov/publication/70027549	
San Juan Harbour Seiche 1972	http://www.nrcresearchpress.com/doi/abs/10.1139/f79-176#.XG8y6k2ouUk	
Lake Erie Seiche 1844	https://www.buffalohistorygazette.net/2010/09/the-lake-erie-seiche-disaster-of-1844.html	
Delta BC Storm Surge 2006	http://www.pac.dfo-mpo.gc.ca/sci/juandefuca/storm_surge/project.pdf	
Storm Surge BC Website	http://stormsurgebc.ca/index.html	



BC Floodplain Mapping Tool	https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/flood-hazard-land-use-management/floodplain-mapping	
Fraser River Floodplain Maps	https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/flood-hazard-land-use-management/floodplain-mapping/emergency-planning	
Professional Practice Guidelines - Legislated Flood Assessments in BC	https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/integrated-flood-hazard-mgmt/apegbc-legislated-flood-assessments.pdf	
BC Flood Response Plan	https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/provincial-emergency-planning/bc_flood_response_plan-final.pdf	
Community Emergency Preparedness Fund (CEPF)	https://www.ubcm.ca/assets/Funding~Programs/LGPS/CEPF/cepf-2018-summary-funded-projects.pdf	
National Disaster Mitigation Program (NDMP)	https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/emergency-management-bc/bc-disaster-mitigation/national-disaster-mitigation-program	
BC River Forecast Center	https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/river-forecast-centre	
BC River Forecast Center Warnings	http://bcRFC.env.gov.bc.ca/warnings/index.htm	
BC Storm Surge Forecasting Program	http://stormsurgebc.ca/index.html	
BC Coastal Floodplain Maps	https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/flood-hazard-land-use-management/floodplain-mapping/coastal	
Infrastructure Failure		
BC Government Dam Safety website	www.gov.bc.ca/damsafety	
Data BC Dam Safety Map	http://apps.gov.bc.ca/pub/dmf-viewer/?siteid=8557625973044922147	
Cannon Creek Dam 1995	https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-resource-use/land-water-use/water-use/dam-safety/failure_of_cannon_creek_dam-1995.pdf	
BC Dike Management	https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management	
BC Dike Inventory Maps	https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management/flood-protection-structures/dike-inventory	
Lower Mainland Dike Assessment	https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/integrated-flood-hazard-mgmt/nhc_final_lower_mainland_dike_assessment.pdf	



Grand Forks Dike Failure 2018	https://www.crestonvalleyadvance.ca/local-news/video-volunteers-pack-thousands-of-sandbags-as-grand-forks-battles-flooding/ https://globalnews.ca/news/4265189/grand-forks-homes-uninhabitable-clean-up-continues/	
Interruptions to Critical Services		
Aboriginal Disaster Resilience Program (ADRP) Food Shortage Risk Analysis	https://adrp.jibc.ca/wp-content/uploads/2016/01/HRA_FoodShortages.pdf	
Drive BC website	www.drivebc.com	
TranBC Website	https://www.tranbc.ca/	
TranBC Emergency Information	https://www.tranbc.ca/category/emergency-information/	
Drinking Water Protection Act	http://www.bclaws.ca/civix/document/id/lc/statreg/01009_01	
Ahousaht First Nation 2018	https://www.cbc.ca/news/canada/british-columbia/ahousaht-water-shortage-1.4894845	
Cape Town 2018 (SA)	https://www.theguardian.com/cities/2018/feb/03/day-zero-cape-town-turns-off-taps	
Walkerton 2000 (ON)	http://www.walkertoninquiry.com/	
Prince George 2018	https://www.ctvnews.ca/business/pipeline-explosion-may-leave-parts-of-b-c-with-prolonged-natural-gas-shortage-1.4152691	
Okanagan 2016	https://globalnews.ca/news/2741751/petro-canada-fuel-shortage-continues-spread-in-the-okanagan/	
Security		
Midland ON 2018	https://globalnews.ca/news/4433389/town-midland-pay-ransom-cyberattack/	
Calgary 2016	https://www.cbc.ca/news/canada/calgary/university-calgary-ransomware-cyberattack-1.3620979	
Royal Canadian Mounted Police (RCMP – GRC)	http://www.rcmp-grc.gc.ca/en	
Canadian Security Intelligence Service (CSIS)	https://www.canada.ca/en/security-intelligence-service.html	
Integrated National Security Enforcement Team (INSET)	www.rcmp-grc.gc.ca/secur/insets-eisn-eng.htm	
Vancouver Riot 2011	https://web.archive.org/web/20140513021950/http://www.psgov.bc.ca/vancouverriotreview/docs/riot-review-report.pdf	
Clayoquot Protests 1993	https://en.wikipedia.org/wiki/Clayoquot_protests	
British Columbia Major Planned Event Guidelines	https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/local-government/majorplannedeventsguidelines.pdf	
Vancouver Olympics 2010	https://library.olympic.org/Default/doc/SYRACUSE/76494/vanoc-official-games-report-rapport-officiel-des-jeux-covan-comite-d-organisation-des-jeux-olympique?_lg=en-GB#_ga=2.200636202.589249092.1548961578-745116370.1548961578	



Shambhala Festival 2017	https://www.cbc.ca/news/canada/british-columbia/shambhala-evacuation-alert-1.4245152	
Transportation		
Transport Canada	https://www.tc.gc.ca/eng/tdg/safety-menu.htm	
Transportation Safety Board of Canada	http://www.bst-tsb.gc.ca/eng/index.html	
TSB Data on past aviation incidents	http://www.tsb.gc.ca/eng/aviation/index.asp	
TSB Data on past marine incidents	http://www.tsb.gc.ca/eng/stats/marine/index-ff.asp	
George H Ledcor 2018	http://www.northarmresponsebc.ca/	
Nathan E Stewart 2016	https://www.nts.gov/investigations/AccidentReports/Reports/MAB1738.pdf	
Queen of the North 2006	http://www.tsb.gc.ca/eng/rapports-reports/marine/2006/m06w0052/m06w0052_index.asp	
Canadian Coast Guard	http://www.ccg-gcc.gc.ca/eng/CCG/Contact_Us	
Global Marine Traffic Website	https://www.marinetraffic.com/	
Canadian Coast Guard	http://nis.ccg-gcc.gc.ca/public/rest/messages/en/search	
ICBC Insurance Bureau Stats	https://www.icbc.com/about-icbc/newsroom/Pages/Statistics.aspx	
Drive BC Major Events Map	http://www.drivebc.ca/#listView&severity=Major&xtg=Major%20Events	
TSB Rail Incidents	http://www.tsb.gc.ca/eng/stats/rail/index-ff.asp	
AskRail Emergency Responder Link	https://www.railcan.ca/rac-initiatives/askrail/	
Transportation of Dangerous Good Department of Transport Canada	https://www.tc.gc.ca/eng/tdg/safety-menu.htm	
Plan2Adapt Analysis Tool	https://www.pacificclimate.org/analysis-tools/plan2adapt	
NRCAN Adaptation Library	http://www.adaptationlibrary.ca/	
Fraser Basin Council Retooling Essentials	https://www.retooling.ca/retooling_essentials.html	
BC Climate Action Toolkit	http://www.toolkit.bc.ca/adaptation-challenges-and-opportunities	
PCIC Data Portal	https://pacificclimate.org/data	
BC Climate Change Indicators	https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/reporting/environmental-reporting-bc/climate-change-indicators	
Canada's Changing Climate Report	https://changingclimate.ca/	
Indicators of Climate Change for BC	https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/reporting/envreportbc/archived-reports/climate-change/climatechangeindicators-13sept2016_final.pdf	



Sea Level Rise Adaptation Primer	https://www.pacificclimate.org/news-and-events/news/2013/sea-level-rise-adaptation-primer-released	
Pacific Climate Impacts Consortium	https://www.pacificclimate.org/about-pcic	
Pacific Institute for Climate Solutions	https://pics.uvic.ca/	
Columbia Basin Trust	https://ourtrust.org/	
Fraser Basin Council	https://www.fraserbasin.bc.ca/	



Appendix 4b - Additional Links & Documents

Hazard Risk and Vulnerability Analysis Tool for Local Authorities and First Nations
HRVA Hazard Reference Guide
Companion Guide to the HRVA Tool
HRVA User Guide
HRVA Hazard List
HRVA Document Library
HRVA Training Library
HRVA Frequently Asked Questions (FAQ's)
British Columbia Emergency Management System (BCEMS) http://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/bcems/bcems_guide_2016_final_fillable.pdf
BC All Hazards Plan https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/provincial-emergency-planning/embc-all-hazard-plan.pdf
Emergency Management British Columbia (EMBC) https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/emergency-management-bc
BC Archives https://search-bcarchives.royalbcmuseum.bc.ca/sn-1BEAB7F/bsearch/Library
Canadian Disaster Database https://www.publicsafety.gc.ca/cnt/rsrscs/cndn-dsstr-dtbs/index-en.aspx
EMBC Incident Summaries and Yearly Statistics https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/emergency-response-and-recovery/incident-summaries