

Climate Change 101

What is Climate Change and What Does it Mean?

Climate change is the altering of long-term patterns of weather identified by changes in temperature, precipitation, wind, and other indicators. The term 'weather' refers to what happens each day, while 'climate' is the trend over a long period of time.

The image below illustrates the difference between weather and climate by showing the path taken by a man walking his dog. If you look at the path taken by the dog (representing 'weather'), at any point, he is travelling north, then south, then north.



If you were just to look at the dog at a single point in time, or over a short period of time, you might conclude "he is moving south" or "he is moving north." However, if you look at the long-distance path of the man (representing 'climate'), you would conclude that regardless of the dog's movements south and north, they are both moving in a northeast direction. This is the same difference between weather and climate.

What is Causing Climate Change?

There are two causes of global climate change: natural causes and human causes. Natural causes can be defined as factors that occur naturally, such as volcanic activity and the Earth's orbit around the sun. In contrast, human causes do not occur naturally and are a result of human activity, such as the burning of fossil fuels. Human influences on the climate system have significantly increased in correlation with rapid growth in industrialization. Human activities

contribute to climate change primarily by emitting greenhouse gases (GHG) into the atmosphere.

Common GHGs (greenhouse gases) include carbon dioxide, methane, and nitrous oxide. GHGs surround our planet and function as a barrier or blanket to prevent the loss of heat and energy into the outer space, in turn causing the atmosphere to warm. GHGs occur naturally and are required to support life on earth; however, in excess quantity, the gases can change the Earth's climate and negatively impact the health of the environment and humans.

Science is showing that natural causes do not account for recent climate change. The climate science community is made up of researchers from geology, astrophysics, oceanography, atmospheric physics, and many other disciplines. Surveys show that 97% or more of these scientists agree that the planet is warming and that human beings are the cause.

		Possible Explanations					
Observations		The Sun	Orbital Changes	El Niño	Volcanos	Natural GHGs	Human GHGs
	Global CO2 higher than any time in past 10-15 million years	✗	✗	✗	✗	✗	✓
	Nights warming faster than days	✗	✗	✗	✗	✓	✓
	Winters warming faster than summers	✗	✗	✗	✗	✓	✓
	More CO2 in the air with a fossil fuel signature	✗	✗	✗	✗	✗	✓
	Less oxygen in the air	✗	✗	✗	✗	✗	✓
	Long-term stratospheric cooling	✗	✗	✗	✗	✓	✓

(Source: [Climate Change: The Basics](#) | [Climate Atlas of Canada](#))

What are the impacts of a changing climate?

As global temperatures climb, widespread shifts in weather systems occur, making storm, flood, wildfire events like increase storms, floods, wildfire, or poor air quality more intense and unpredictable. Not every place will experience the same effects: Climate change may cause severe drought in one region while making floods more likely in another.

Impacts could include:

- More increasing and sweltering heatwaves and extreme heat temperatures.
- Increasing daytime and nighttime temperatures.
- More severe or longer droughts.
- Increasing wildfire and wildfire seasons.
- Worsening of air quality.
- Wetter, stronger, intense storms.
- Increase inland and urban flooding.
- Coastal flooding with rising sea level waters.
- Warmer ocean waters and acidification.
- Decrease snowpack in mountainous watershed.
- Increase pests and invasive species to forests and crops.
- Reduced soil health.
- Farm crops become more unpredictable—and livestock, which are sensitive to extreme weather, become harder to raise.
- Ecosystems reaching the limits of their natural ability to adapt.
- Increased cascading ecological changes.
- Increased damage and insurance costs of impacts.
- Loss of household income.
- Increased health costs.
- The effects of climate change—and the looming threat of what is yet to come can take a significant toll on mental health from anxiety to anger.

All types of built infrastructure are at risk in the face of a wide range of climate hazards. Increased risk of damage to public and private built infrastructure: buildings, land transportation (roads, bridges, railways, runways), water supply (surface and groundwater sources, treatment facilities, dams, reservoirs, and aquifers), wastewater and stormwater (treatment facilities, culverts, sewers, storm drains, and pipes), energy and information and communication technologies (ICTs) (transmission corridors, renewable energy, oil and gas, Internet, and wireless technologies), and marine (ports, canals, wharves, piers, and seawalls).

Understanding these impacts can help us prepare for what is here, what is avoidable, and what is yet to come, and to better prepare our community.

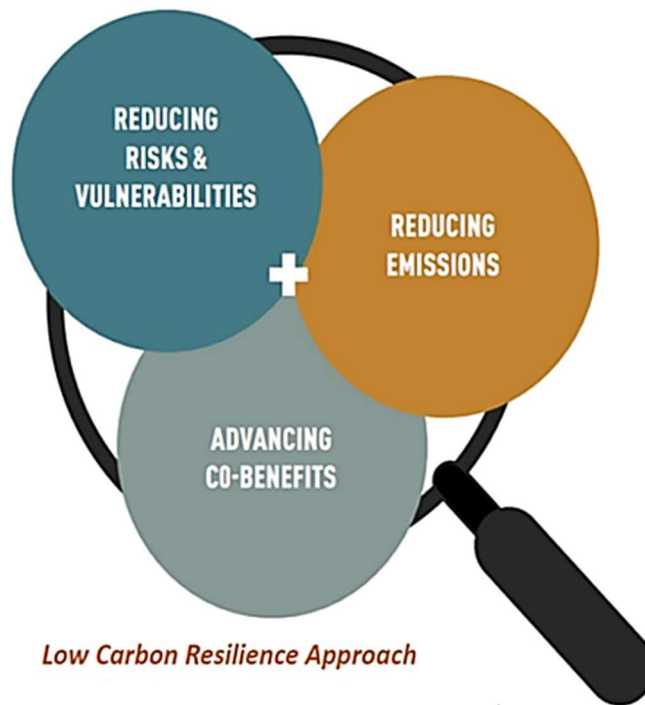
Three principles of climate action

There are three principles of climate action:

Mitigation – Reducing or preventing emissions of greenhouse gases that cause climate change.

Adaptation – Identifying and preparing for the impacts of climate change to reduce risk and improve vulnerability from climate change impacts.

Resiliency – social, natural, and economic systems being able to respond to and recover from climate change impacts and events (e.g. flooding, heatwaves).



Source: Simon Fraser University Action on Climate, 2022

A **low carbon resilience** approach to climate action coordinates and establishes (adaption (identifying and preparing for climate impacts) and mitigation (reducing or preventing greenhouse gas emissions) within municipal and community planning and decisions to enhance a community's collective ability to withstand the impacts of climate change.

It considers how climate actions intersect with community priorities, such as health, equity, biodiversity and natural systems, and economic development so that actions provide multiple benefit (advancing co-benefits) beyond just climate resilience.

What are the sources of Greenhouse Gases in British Columbia?

Greenhouse gas emissions in **British Columbia (B.C.)** arise from various sources, contributing to the warming of our global atmosphere and climate change.

1. Carbon Dioxide (CO₂): This gas constitutes 84.3% of total emissions in B.C. It primarily comes from fossil fuel combustion, including vehicle exhaust, industrial processes, and power generation.
2. Methane (CH₄): Comprising 10.5% of emissions, methane is released from agricultural activities, landfills, and natural gas production.
3. Nitrous Oxide (N₂O): Accounting for 2.6% of emissions, nitrous oxide results from agricultural soil management, fertilizer use, and industrial processes.

4. Hydrofluorocarbons (HFCs): These synthetic compounds contribute 2.5% to the total. They are commonly used in refrigeration, air conditioning, and insulation.
5. Perfluorocarbons (PFCs): Although a minor contributor at 0.1%, PFCs are used in electronics manufacturing and aluminum production. (Source: [GHG Emissions - Environmental Reporting BC \(gov.bc.ca\)](https://www2.gov.bc.ca/gov/content/sustainability/2030/ghg-emissions-environmental-reporting-bc))

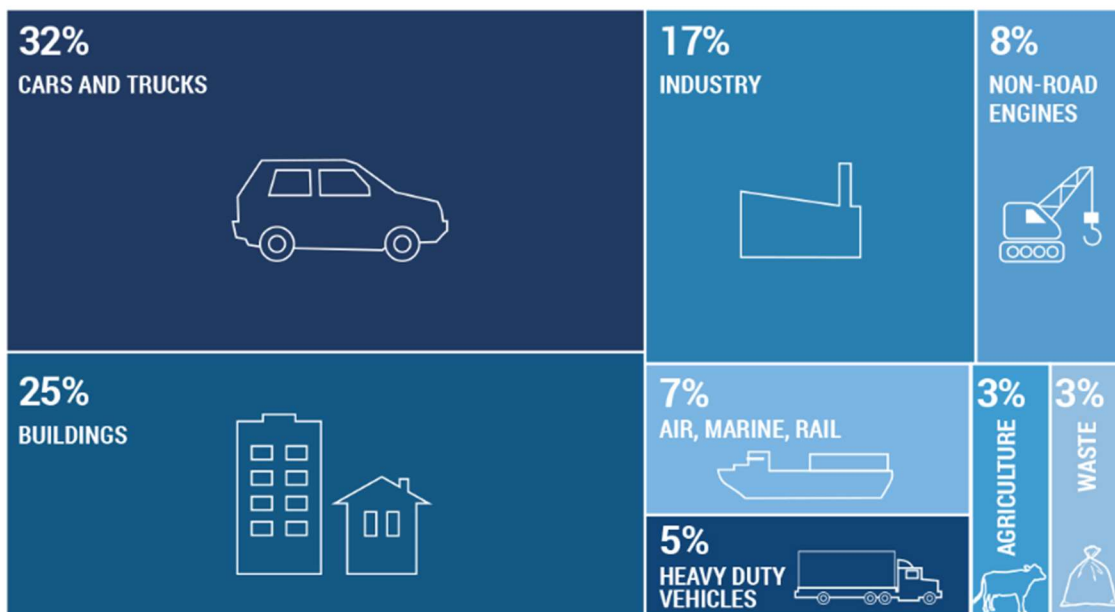
In the **Metro Vancouver** region, greenhouse gas emissions arise from various sources. Here are some key contributors:

Vehicles: Automobiles, trucks, and other forms of transportation release greenhouse gases into the atmosphere. These emissions result from burning fossil fuels like gasoline and diesel.

Buildings: Residential, commercial, and industrial structures consume energy for heating, cooling, lighting, and appliances. The energy sources (such as natural gas or electricity) used in buildings contribute to greenhouse gas emissions.

Industrial Activities: Factories, manufacturing plants, and other industrial processes emit greenhouse gases during production. These emissions can come from processes like cement production, chemical manufacturing, and metal refining. (Source: <https://metrovancover.org/services/air-quality-climate-action/climate-2050>)

Regional Sources of Greenhouse Gas Emissions



Source: Metro Vancouver 2018

(Source: [Climate Change Background – Local | Metro Vancouver](#))