Climate Change, Air Quality and You: Issues for British Columbia

Information for Teachers, Students & Community Groups

Key Ideas

Students will:

- Describe the greenhouse effect and how it works
- Understand the concept of "climate change".
- Consider the potential effects of climate change on BC and their region.
- Investigate transportation choices their families make daily, and some of the consequences of these choices
- Take informed action concerning transportation choices

Curriculum Links: Prescribed Learning Outcomes for K-7

Grade	Social Studies	Science
K-1	Care of the environment	Characteristics / diversity of plants
2-3	Environmental influences on human activity	Plant adaptations
4	Interactions of people and environments	How changes in habitat affect species survival
5	Effect of lifestyles & industry on environment; communities, transportation & technology.	Impacts on BC's living resources, human respiratory system
6	Relationships among environment, economies & resources; urbanization.	
7	Impact of past human activities on today's environment; natural disasters & impacts on communities	BC's biogeoclimatic zones, stages of recovery of a damaged local ecosystem.

Backgrounder: Climate Change –The Heat is On

What is Climate Change?

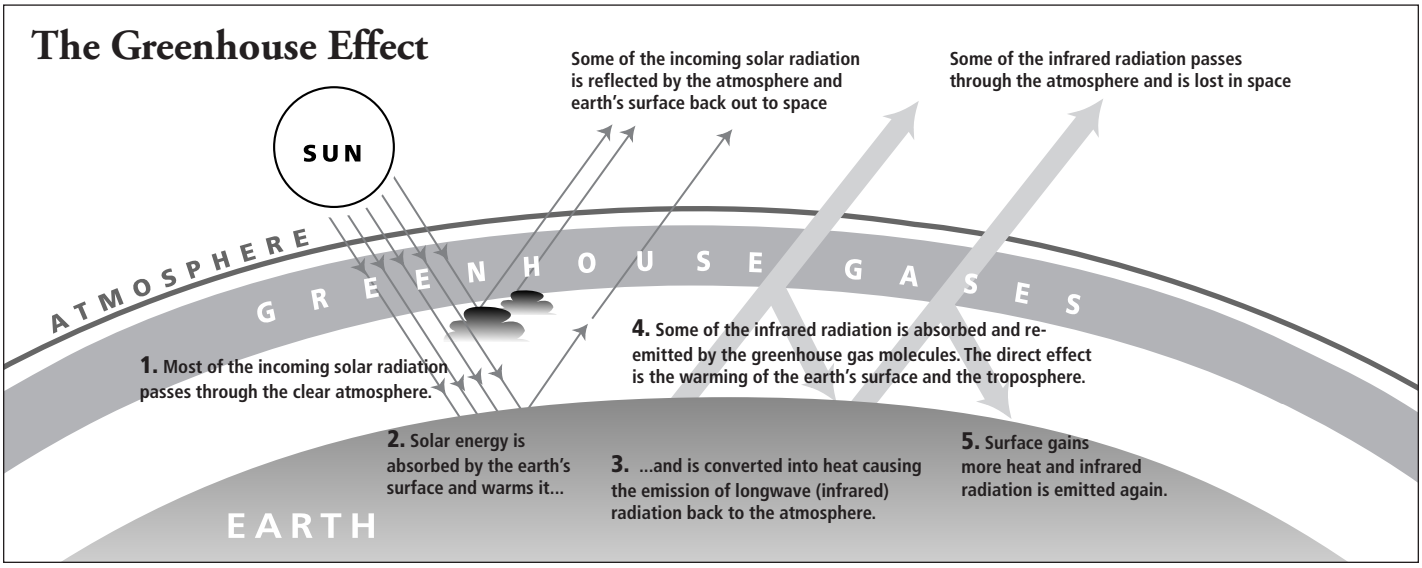
For years, scientists have been warning us of the likely changes caused by increasing emissions of greenhouse gases. Droughts, heat waves, floods and warming oceans. These are just some of the weather patterns that may be more common if we experience big changes in our climate.

The Natural Greenhouse Effect

Our atmosphere is a thin layer of gases that blankets the surface of our planet. Radiation from the sun ("solar radiation") passes through the atmosphere to be absorbed by the Earth's surface, warming it up. When the Earth's surface gets warm, it emits radiation ("infrared") out towards space. Gases in the atmosphere such as carbon dioxide, methane and nitrous oxide trap most of this infrared radiation, warming the Earth's surface and the lower atmosphere. This is roughly the same thing that happens inside a greenhouse on a sunny day (the glass acts like the greenhouse gases in the atmosphere), and why this process is called the natural greenhouse effect. Our climate is controlled by the balance between incoming solar radiation, and outgoing infrared radiation emitted from the Earth's surface. The gases in the atmosphere that trap heat are called greenhouse gases (GHGs). If it weren't for this natural greenhouse effect, the earth's surface would be about 33 degrees C cooler than it is today. To put this in perspective, consider that the temperature of the planet during the last ice age was about 5 - 7 degrees C cooler than the present.

Climate Change

However, there is growing concern about the increasing amounts of greenhouse gases in our atmosphere as a result of human activities. Human activities release large amounts of carbon dioxide, methane and nitrous oxide from the burning of fossil fuels (e.g. oil, gas and coal), from industrial activities, landfills, agricultural practices and many other processes. By adding more greenhouse gases to the atmosphere, we increase its capacity to trap heat, therefore making the whole planet warmer. This warming is changing our climate.



Adapted from UNEP ***www.grida.no/climate/vital/intro.htm***

Backgrounder: Impacts of Climate Change in BC

In Canada, the average temperature has risen by 1.1 degrees Celsius over the past 100 years. If greenhouse gases continue to build up in the atmosphere, Canada could have increases in average temperatures of as much as 4 degrees C in winter and 7 degrees C in summer. At first, warmer temperatures may sound like a good thing. But lets think about what this might do to our environment, economy and daily lives.

Changing Weather

BC's climate is expected to change as global temperatures rise. We can expect wetter, warmer winters with more rain than snow, which could cause big problems for BC's ski areas. Rivers and streams will be more swollen in winter, and spring flood levels will be higher. Hotter, drier summers would mean more droughts, which could lead to more forest fires. Dry summers could mean water shortages for the agricultural industry and populated areas. These changes will also affect where different plant species will be able to grow.

Your Health, Air Pollution and Climate Change

Burning of fossil fuels also releases other pollutants that cause local air pollution problems like urban smog. Burning fossil fuels release dangerous chemicals into the air, like carbon monoxide, nitrogen oxides, sulfur dioxide, and fine particulates. The human cost of air pollution is high – asthma, bronchitis, allergies and premature deaths. The British Columbia Medical Association (BCMA) and the David Suzuki Foundation sponsored a province-wide awareness campaign on the links between climate change and human health. Visit their Web sites **www.bcma.org/concerns** and **www.davidsuzuki.org** The BC Lung Association also has a national air quality awareness campaign, including teacher modules and a Flight for Life program using kites to raise awareness. See their website **www.bc.lung.ca**, or call 1-800-655-LUNG.

Water Blues

The warming of our atmosphere means warmer oceans and higher sea levels. Rising sea levels could cause serious flooding along the flat, low-lying deltas that make up much of southern BC's coast, such as Delta, Richmond, and White Rock. Warmer ocean water contains less oxygen, and is less able to support plankton, the base of the marine food chain. Less plankton means less food for everything that eats them, including fish, seals and whales. The warmer water may also force fish species like salmon, halibut and herring to head north in search of cooler water temperatures they prefer.

What about energy? Most of BC's electricity comes from hydroelectric facilities. A reduction in rainfall and water levels could have serious effects on our power supply. Check out BC Hydro's web site for more: **www.bchydro.com**

Forests and Climate Change

Healthy forests play an important role in the global carbon cycle. Like most plants, trees absorb carbon dioxide from the atmosphere through photosynthesis. Carbon is stored in BC's forests as the trees increase in size. Forests also provide habitat for a variety of plants and animals, protect watersheds and maintain healthy streams. Scientists predict that fires, insects, disease and drought will work together with warmer climates to change BC's forests. A warmer and drier climate will likely also result in increased numbers of forest fires. This will threaten habitat, watersheds and communities in rural areas, and restrict forestry and recreation activities.

Activity 1: High and Dry

Students work in small groups to discuss impacts and choices around a water shortage in their community.

In small groups, discuss the water needs of your community. Remember to include agriculture, urban gardens and parks, users of streams and lakes (people and animals), manufacturing and drinking water. From the list below, choose three activities you would introduce in your community.

- Start a public information campaign.
- Change crops in your area to those better suited to low water.
- Install meters to measure and charge for water use.
- Develop a school curriculum to teach about being water wise.
- Research and investigate new sources of power.
- Give farmers government money to cover their losses.
- Create rules that make people cut back on water consumption.
- Research what others have done globally in similar situations.
- Make reservoirs larger or build a new reservoir.
- Collect rain in rain barrels.
- Close recreational pools and water parks.
- Other ideas you can think of?

Start a discussion about climate change in your community. Then join another group to discuss and defend your choices. Are there other ideas not on the list? Consider the economic and environmental costs of your choices.

Activity 2: WANTED: What bugs the forest?

Students research forest pests and produce "Wanted" posters.

In small groups, research the main pests in BC's forests (see web sites below). List them. How are pests controlled? Scientists predict that the populations of forest pests might increase due to climate change, as more of them would survive the warmer winters. Create a biography of a forest pest – list its name, habits, what it eats, where it lives and how and why it might increase in number. Add an illustration and turn this document into a "WANTED" poster.

The Canadian Forest Service has a good website with information and pictures of forest pests: see **www.nrcan.gc.ca/cfs/proj/sci-tech/arena/pests** Check the BC Ministry of Forests web site: **www.gov.bc.ca/for**

(Activities #1 and #2 adapted from "What's all the fuss?", a curriculum package produced by the Greater Vancouver Regional District.)

Extension for older students

Discover your habitat! A main classification system for natural areas is called the Biogeoclimatic Zone System. There are 14 biogeoclimatic zones in BC, each with its own characteristic climate, plant life and soil type. Check the web sites below for maps, and find out what biogeoclimatic zone you live in. What are the winters/summers like where you live? What are some local plants and animals? Read the Backgrounder on Impacts of Climate Change in BC, and try and imagine how the changes described might impact your region.

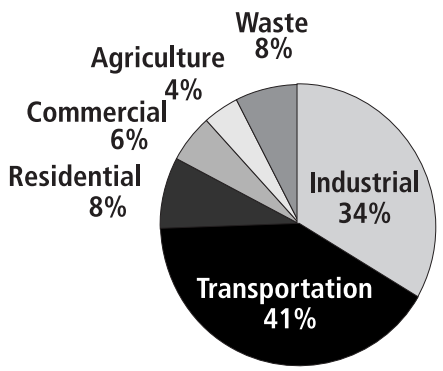
(Adapted from Protected Areas: Preserving Our Future: Ministry of Environment, Land and Parks: Wild BC .)

For Biogeoclimatic Ecosystem Classification information go to **www.for.gov.bc.ca/research/becweb/becinfo/mapping.htm**

For a map of the biogeoclimatic zones of BC and other links, go to **www.livingbasin.com/history/ecosystem%20diversity/biogeoclimaticzones.htm**

Backgrounder: Cars and the Climate Change Connection

For most of us, the car is a useful and essential part of our lives, and is part of almost everything we do. Cars take us to work, to school, to play. The number of cars on our roads is growing steadily. There are approximately 18 million automobiles in Canada – that means that if everyone in the country got into a car, no one would have to sit in the back seat! But this addiction to our cars is costing us, and not just in dollars. Cars rule transportation systems and communities so much that their own usefulness is declining – they are crowding themselves to a standstill. Cars create tonnes of exhaust, polluting our air, harming our lungs and contributing to climate change. In BC, transportation produces more greenhouse gases than any other activity. Every car annually emits about its own weight in carbon dioxide, about 2.3 kg for every litre of gas burned, or 4.5 tonnes a year.



Greenhouse gas emissions in BC by sector (Environment Canada, 1999)

Activity 3: How Do I Get Around? Moving Me from A to B

Students document and consider the transportation choices they make, problem-solve around alternatives, and pledge to implement positive change in their travel routines.

Keep a travel diary of how you get to all your activities for one week: school, social events, recreation, shopping, etc. Record where you left from, where you went to, the approximate distance, and why you made the trip. At the end of the week, tally up the total distance you traveled and the type of transportation used (car, bike, walk, etc.). Now share your diaries in small groups. Identify transportation choices, alternatives and challenges. As a class, brainstorm ways to reduce our reliance on cars, and make a class list. Could we have walked or biked some of these trips? Combined some of the car trips? What about carpooling (sharing rides with others)? What are some challenges that make alternatives difficult to choose? How can we get around these challenges?

Take the Challenge – Walk the Talk!

Decide on one thing that you can do alone or with your family to reduce car use. Set a personal and/or family goal to reduce car use over a one month period, and keep a record of your progress. Write down the changes you made, if they were easy or hard to make, and what could make them easier. Discuss this challenge as a class after the month is up.

(Adapted from "Steps to a Healthy Planet", a learning resource that accompanies the Sierra Club of BC / Gaia Projects's Sustainable Living Bus school programs. For information, resources and booking a bus visit, e-mail slbus@sierraclubbc.org or see ***www.sierraclub.ca/bc)***

Action *Calculate your family car's carbon dioxide emissions using "Tailpipe Tally" on the Environmental Defense Fund's web site, at* ***www.edf.org*** *under "interactive". Enter the model and year of any car to calculate its average yearly emissions of carbon dioxide and other pollutants.*

To find out more about climate change, visit these web sites:

- Environment Canada: **www.ec.gc.ca/**
- BC Ministry of Environment, Lands and Parks: **www.gov.bc.ca/elp/**
- UN Framework Convention on Climate Change: **www.unfccc.int**
- Better Environmentally Sound Transportation: **www.best.bc.ca**

For climate change teaching resources, visit these websites:

- Greater Vancouver Regional District: learning resources and teacher workshops: **www.gvrd.bc.ca**
- Wild BC: learning resources and teacher workshops: **www.env.gov.bc.ca/hctf/wild.htm**
- The Pembina Institute: extensive learning resources: **www. pembina.org**
- Poster on climate change in southwestern BC: **www.climatechangecanada.org**
- Way To Go!: alternative transportation program and learning resources: **www.waytogo.icbc.bc.ca**