

**A Change in the Wind:
Climate Change in Quebec**

Group Members: _____

Trivia Challenge: Search the entire poster to find answers for the following: (bonus)

1. Approximately how far apart (km) are Montreal and Quebec City?
~250 km
2. When did an ice storm hit Quebec, leaving half the population without power?
January 1998
2. Can you see anything in the landfill that could have been recycled? If so, what?
Yes! Milk carton, pop can

Did You Know? Use the pieces of information under this heading (“Did You Know?”) on the poster to answer the following true/false (T or F) questions. If the statement is false, cross out the incorrect word or number value, and write in the correct version. (10)

- ___ The two warmest years on record are ~~1988~~ and ~~1989~~. **F, 1998 and 1999**
- ___ ~~1/4~~ of greenhouse gas emissions in Quebec are the direct result of human activities. **F, 1/3**
- ___ Flooding costs \$10 - \$15 million annually in Quebec. **T**
- ___ Montreal is frequently hit by severe weather events. **T**
- ___ Methane, CH₄ can retain ~~40~~ times more heat than CO₂. **F, 21**
- ___ Zebra mussels have significantly altered Quebec’s ecosystem. **T**
- ___ The average car emits over ~~2~~ times its weight in CO₂ every year. **F, 3x**
- ___ Northern regions are likely to be most affected by a projected warmer climate. **T**
- ___ Caribou herds will ~~increase~~ with a warmer climate. **F, decrease**
- ___ The Earth’s heating more rapidly than it has at any other time during the past ~~4000~~ years. **F, 10 000**

What is Climate Change?

1. What is the average temperature at the Earth's surface? (.5) **15°C**
2. What would it be without greenhouse gases? (.5) **-18°C**
3. Which of the GHGs has increased in concentration the most since the Industrial Revolution? (1) **CH₄, increased by 145%**
4. Record the percentages of incoming solar radiation: (2)
 - a) absorbed by the atmosphere: **23%**
 - b) absorbed by the Earth's surface: **46%**
 - c) reflected by the atmosphere: **25%**
 - d) reflected by the Earth's surface: **6%**

A Climate in Constant Flux:

1. When have 10 of Quebec's warmest years of the century occurred? (1)
Since the 1980s
2. When did the Little Ice Age occur? (1)
~1400 – 1850 AD
3. What computer models are used to predict future climatic conditions? (1)
GCMs
3. Viewing the global map, what areas are projected to have the greatest temperature change in the next half century? (1)
Polar/northern regions
4. How do the 3 graphs depict the projected temperature change by the year 2100? (1)
Drastically increasing

Our Health:

1. What is the most direct health risk from warming climates? (1)
Heat stress
2. Will warming increase or decrease the amount of smog? (1)
Increase
3. Of the 4 indirect impacts on human health, decide which one will likely affect you the most. Explain. (1)

Extreme Weather – What are the Risks?

1. List examples of severe, or extreme weather events that may increase with global warming. (1)
Flooding, ice storms, winds, rain, hail
2. How could climate change affect the condition of our roads in Montreal? (1)
Increased winter warm spells and thawing produce potholes
3. Brainstorm in your group to generate a list of how more extreme weather events will impact humans. (1)

Could a Warmer Climate Mean a Shortage of Water?

1. How will the projected climate change alter precipitation patterns? (1)
Less frequent, but heavier precipitation
2. What might be the effects of droughts and reduced groundwater, as a result of climate change, on humans? (1)
Less water for consumption, agriculture, recreation; storm sewers overloaded.
3. When groundwater changes due to changes in precipitation, how does it affect fish? (1)
Groundwater is typically cool/cold, and it cools rivers that it enters. If this is altered, fish habitats will be affected.

The St. Lawrence has its Ups and Downs:

1. Fill in details of the St. Lawrence River: (3)
 - a) Distance of flow: **1500 km**
 - b) Length of shoreline: **4200 km**
 - c) The 3 sections are: **freshwater reach
estuary
gulf**
2. Why is there a concern for biodiversity/life along shorelines as the freshwater reach changes? (1)
Habitat changes
3. Describe what the coastal erosion at Rivière à Claude looks like? (1)
(Road falling into sea)
4. What is the one and only potentially positive effect of rising sea level in the gulf? (1)
Possibility of accommodating larger ships
5. What is meant by the term “riparian”? (1)
Associated with rivers

A Dynamic Forest:

1. What will happen to the tree line in Quebec? (1)
Increase northwards
2. Describe the southern Quebec forest from the picture. (1)
Lush, conifers
3. How are the following expected to be altered with global warming?
 - a) Precipitation? (1) **Increase**
 - b) Forest fires? (1) **Decrease**
4. Compare the 2 maps:
 - a) What 2 new ecoclimates may be found in Quebec with a climate of double CO₂ levels? (1) **Moderate temperate
Hudson plain**
 - b) What ecoclimate might disappear in this region? (1)
Subarctic

What about the Far North?

1. How has the permafrost been affected by climate warming? (1)
Increased temperature in this layer has led to melting
2. What specific impacts to northern communities will occur if the permafrost melts? (1)
Infrastructure – landing strips, roads, etc.
3. What tree dominates in the northern forest? (1)
Black spruce
4. How will tree growth be affected by climate warming? (1)
Improved in size and shape

Wildlife Acclimates:

1. Use the poster to describe how 3 particular species might be affected by a change in climate: (3)
 - a) _____:
 - b) _____
 - c) _____:

Our Farms:

1. How will grain crops be affected by climate warming? (1)
They will benefit
2. What will happen to the range of fruit and vegetable production in Quebec? (1)
Move northward
3. What is the maple syrup industry sensitive to? (1)
Freeze and thaw
4. Discuss the possible "+" and "-" effects to Quebec's agriculture from the poster, and decide whether the net result will be more of a positive or negative one. Explain your decision. (1)

Emissions – How Do We Measure Up?

1. Rank the following activities by their GHG (greenhouse gas) emissions: (2)
 - 3** Residential
 - 6** Electricity
 - 5** Waste
 - 1** Transportation
 - 4** Agriculture
 - 2** Industry
2. What gas is released from buried garbage? (1) **CH₄**
3. What does "hydraulically generated" mean? (1) **By water**

We Can All Help:

1. What is the "must do" to counter the effects of climate change? (1)
Consume less energy
2. Read the 6 ideas provided for energy reduction, and create a list of at least 3 more energy-saving tips that YOU can work on: (3)
 - a)
 - b)
 - c)