Climate Change: Why Worry?

Lesson Overview
Students will explore the meaning of Climate Change, with an emphasis on the impact expected on future human life, the adaptations which will be required, and our responsibility to change our behaviour to slow the process, in the context of Canada's regions.

Grade Level
Grades 9-12 (secondary)

Time Required
Two 50-minute classes plus extension time

Curriculum Connection (Province and course)
- Atlantic Provinces Education Foundation Curriculum for Social Studies – People, Place and the Environment General Curriculum Outcome:
  - Students will be expected to demonstrate an understanding of people, places and the environment.
- This lesson is intended for common curriculum for Grade Nine in Nova Scotia, Newfoundland and Labrador, and Prince Edward Island (Grade Eight in New Brunswick), "Atlantic Canada in the Global Community." It can easily be adapted to fit the following similar courses in the Atlantic Provinces:
  - Nova Scotia: Geography10, Geography 11, or Geography 12
  - Prince Edward Island: Geography of Canada 421A and World Geography 531A.
  - Newfoundland and Labrador: Canadian Geography 1202 and World Geography 3200 and 3202
  - New Brunswick: Canadian Geography120 and Physical Geography 110

Link to Canadian National Geography Standards
Essential Elements #2 (Grades 6-8) – Places & Regions
- Physical characteristics of places and regions in Canada
- Changes in places and regions over time

Essential Elements #3 (Grades 6-8) - Physical Systems
- Physical processes shape patterns in the physical environment
- Global patterns of wind and water
- Causes and patterns of extreme natural events: floods, hurricanes, earthquakes, tornadoes

Essential Element #5 (Grades 6-8) – Environment and Society
- Effects of human modification of the physical environment
- Impact of natural and technological disasters on the human and physical environment
• Perceptions of and reactions to extreme natural events
• Limits and opportunities of the physical environment for human activities
• Watershed management
• Environmental issues

**Essential Element #6 (Grades 6-8) – Uses of Geography**
• Effects of physical and human geographic factors on major historic (future) events

**Geographic Skills #1 (Grades 6-8) – Asking Geographic Questions**
• Identify geographic issues, define geographic problems and pose geographic questions

**Geographic Skills #2 (Grades 6-8) – Acquiring Geographic Information**
• Use research skills (critical reading) to locate information

**Geographic Skills #3 (Grades 6-8) – Organizing Geographic Information**
• Integrate various types of materials to organize geographic information

**Geographic Skills #4 (Grades 6-8) – Analyzing Geographic Information**
• Interpret information obtained from text, map and charts

**Geographic Skills #5 (Grades 6-8) – Answering Geographic Questions**
• Make generalizations and assess their validity

**Principal Resource**


**Additional Resources, Materials and Equipment Required**
• Computer and Internet access
• Student activity sheets (attached)
• A series of free Climate Change adaptation posters for each of the regions outlined in the Atlas theme from Natural Resources Canada Earth Sciences Sector can be obtained at: [http://adaptation.nrcan.gc.ca/posters/index_e.php](http://adaptation.nrcan.gc.ca/posters/index_e.php)
• These are particularly useful should the teacher wish to assign the Extension activity as an in-class group activity or for any other Climate Change related lessons.

**Main Objective**

The main objective of this activity is to localize (for Atlantic Canadian students) the necessity of gaining knowledge about climate change, its effects, and the adaptations that will be required.
Learning Outcomes

By completing this lesson students will be able to:

• Distinguish between climate and weather
• Cite proof that the climate is warming
• Explain why Canada is particularly susceptible to climate change
• Place climate change into an historical context
• Explain the carbon cycle and the threat posed by CO₂ emissions
• Identify possible effects of climate change on several industries
• Recognize that there are positive and negative effects of climate change
• Generalize the threat posed particularly to coastal communities

Lesson

<table>
<thead>
<tr>
<th>TEACHER ACTIVITY</th>
<th>STUDENT ACTIVITY</th>
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</thead>
<tbody>
<tr>
<td><strong>Introduction</strong></td>
<td>Distinguish between climate and weather</td>
</tr>
<tr>
<td>• Depending on previous exposure of class to the topic, the teacher may wish to use a current news item or promotional material from an action group to introduce the topic of Climate Change, and the necessity of preparing for adaptations to it, e.g., Nova Scotia Government distribution of &quot;free&quot; CFLs</td>
<td>• Students will take part in discussion expressing their personal beliefs, questions, points-of-view.</td>
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<tr>
<td><strong>Lesson Development</strong></td>
<td>Distinguish between climate and weather</td>
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<tr>
<td>• Distribute either in print or electronic form the attached student worksheet.</td>
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<td>• Assign students to computers to work on answering the questions.  (If a lab is available, there is some benefit to be derived from sharing computers with another student.)</td>
<td>Students will work as individuals or in pairs to answer the questions posed on the work sheet.</td>
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<tr>
<td>• Circulate among students and encourage questioning and discussion.</td>
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<tr>
<td><strong>Conclusion</strong></td>
<td>Distinguish between climate and weather</td>
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<tr>
<td>• Teacher will supervise the sharing of answers and introduce the extension activities</td>
<td>• Students share and discuss answers.</td>
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Lesson Extension

The Extension Activity is intended to be applicable to a wide variety of intelligences. The teacher may want to assign particular activities to students displaying particular aptitudes. Group work would seem to be a good option if class size, facilities, and resources permit. The material from NRCan Earth Sciences is of particular application to group exploration reporting back to the entire class.

Assessment of Student Learning

Students may be evaluated on the quality of their contribution to the process, and on the clarity of their understanding as indicated in their chosen extension activity.
Student Activity Sheet
Climate Change: Why Worry?

Go to http://www.canadiangeographic.ca/atlas/themes.aspx?id=climate&lang=En

1. Click on "The Basics" and choose "Introduction" from the drop-down menu.
   Read the text, and view the animations. On the "Temperature Change" animation, be sure to engage "Click here and learn more".
   a) What evidence is presented that Climate Change is occurring at an increasing rate?

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   b) How does the projected average rise in temperature (2000-2199) of North America compare to that of the Earth?

   ________________________________

2. Go to the "Human Impact" drop-down and select "North".
   a) Why will the effects of Climate Change be particularly profound for Northern Aboriginal Communities?

   ________________________________

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   b) What important effects are already evident?

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Student Activity Sheet (cont’d)

c) What might be the results of a thawing of ice in the North West Passage?

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d) What are some results of thawing permafrost?

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3. Go to the "Human Impact" drop-down and select "British Columbia"
   a) In what ways is Climate Change affecting the forestry industry?

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b) How has Climate Change contributed to the insect problem in B.C. and Alberta?

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__________________________________________________________________________
Student Activity Sheet (cont’d)

c) How large a problem is this expected to be for Canada as a whole?

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[4. Go to the “Human Impact” drop-down and select “Prairies”]

a) Use the controls to toggle between the two LandSat images. What differences do you observe between the 2001 and 2002 images?

____________________________________________________________________

____________________________________________________________________

b) What are some "positive" and "negative" effects predicted for the region?

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5. Go to the “Human Impact” drop-down and select "Ontario & Quebec".

a) What particular climate issue is important in this region due to urbanization?

____________________________________________________________________

____________________________________________________________________
b) What particular parts of the population (demographics) will be most affected as this problem increases?


c) By how much is the frequency of days over 35°C expected to increase by 2050?


6. Go to the "Human Impact" drop-down and select "Atlantic Provinces".

a) What is happening to the frequency of severe storms in the Atlantic region?


b) What causes a "Storm Surge"?


c) What effect of Climate Change will make storm surges more severe?


d) What will be the cultural and economic effects of these combined phenomena on coastal communities such as Charlottetown?
EXTENSION:
As individuals or in groups, choose one of the regions, and find some more detailed information on the climate change issue and how governments at all levels are working to slow the rate of change and prepare for its impacts.

Your results might be shared in class presentations, multi-media presentations, editorial or letter writing, a report for your local municipal government, or in an artistic expression such as a mural, cartoon, play, or other “product”.

A place to begin might be http://adaptation.nrcan.gc.ca/posters/ac/index_e.php
Student Activity: Teacher’s Answers Sheet

1 a) What evidence is presented that Climate Change is occurring at an increasing rate?
   All 10 of the warmest years on record have occurred since 1980.

b) How does the projected average rise in temperature (200-2199) of North America compare to that of the Earth?
   It is greater by 2°C; Earth 3.7°C, North America 5.7°C

2 a) Why will the effects of Climate Change be particularly profound for northern Aboriginal Communities?
   Their way of life is intimately tied to the land.

b) What important effects are already evident?
   • Shifting ice and weather conditions are already altering the range and availability of animals such as polar bears, walrus, seals and caribou
   • Hunters can no longer rely on traditional knowledge to guide them
   • Thinning ice has become a hazard to hunters
   • Earlier ice break-up is causing declining polar bear populations in the western Hudson Bay region.

c) What might be results of a thawing North West Passage?
   • Increased access to offshore oil and gas resources,
   • New economic opportunities in the North
   • Concerns over sovereignty and the environment.

d) What are some results of thawing permafrost?
   • The season for ice or winter roads is growing shorter
   • Roads and airstrips are sinking and cracking
   • Weakened homes
   • Ineffective ice cellars
   • Leaching waste
   • Thawing bogs releasing greenhouse gases

3 a) In what ways is Climate Change affecting the forestry industry?
   • Longer fire season
   • Increase in the severity and frequency of forest fires
   • More insect outbreaks

b) How has Climate Change contributed to the insect problem in B.C. and Alberta?
   More beetle larvae are surviving thanks to warmer winters in recent years.

c) How large a problem is this expected to be for Canada as a whole?
   The mountain pine beetle has crossed over into Alberta, where it is attacking Jack pine, and is poised to spread throughout Canada’s entire boreal forest.

4 a) What differences do you observe between the 2001 and 2002 images?
   The 2001 image is mostly green with several water features visible; the 2002 image is mostly brown and has water visible in only a few large features.
Student Activity: Teacher's Answers Sheet (cont’d)

4 b) What are some "positive" and "negative" effects predicted for the region?

<table>
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<tr>
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<tbody>
<tr>
<td>More water shortages</td>
<td>Longer growing season</td>
</tr>
<tr>
<td>Extreme weather conditions</td>
<td></td>
</tr>
<tr>
<td>Increased soil erosion</td>
<td>Potential for growing new crops</td>
</tr>
<tr>
<td>More insect infestations</td>
<td>Spring wheat seeded earlier; harvested earlier to avoid late-summer arid conditions</td>
</tr>
</tbody>
</table>

5 a) What particular climate issue is important in this region due to urbanization?

Increasing frequency and severity of heat waves

b) What particular parts of the population (demographics) will be most affected as this problem increases?

The elderly, young children and those with chronic lung diseases

c) By how much is the frequency of days over 35°C expected to increase by 2050?

Now = 10  
2050 = 46  
Increase = 360% (or 36 days)

6 a) What is happening to the frequency of severe storms in the Atlantic region?

Greater frequency and severity

b) What causes a "Storm Surge"?

Low pressure and strong onshore winds raise the water level up a metre or more above normal.

c) What effect of Climate Change will make storm surges more severe?

With rising sea levels, storm surges will inundate areas never before flooded.

d) What will be the cultural and economic effects of these combined phenomena on coastal communities such as Charlottetown?

- Damage to commercial and residential properties
- Damage to many heritage buildings
- Damage to roads, water pipes and sewers.