Activity 4: Graphic Encounters

Summary
In this activity, students travel around the classroom making observations about various maps and graphs related to climate change. Students are then asked to “translate” the information into an infographic, highlighting the information they found most compelling. They are also asked to provide suggestions of a target audience for this information.

Duration: two 60-75 minutes sessions

Learning outcomes
After participating in the activity, students will be able to:
- Explain how physical processes help to shape features and patterns on Earth’s surface,
- Compare and interpret maps and graphs to explain how climate change can affect physical processes on Earth, and
- Explain ways in which living things and natural systems are affected by climate change.

Competency outcomes
During this activity, students will develop or improve these abilities:
- Research
- Communication
- Creativity
- Critical thinking
- Collaboration

Teacher background

THE ADAPTATION PROCESS
Like any process involving changes in thinking and practice, adapting to a changing climate involves deepening levels of engagement (phases) and actions that can be taken in support of decision-making (steps). The figure below summarizes these phases and steps, which integrate observations on how adaptation is occurring in Canada with common elements of several adaptation planning frameworks. Although presented as a linear process, organizations may take different pathways as they transition and iterate through these phases and steps.

Phases in the adaptation process include awareness, preparation, implementation and iterative learning. The seven steps are:
1. **Awareness of climate change**: the adaptation process begins once an individual or organization becomes aware of a changing climate as a threat or opportunity.
2. **Awareness of the need to adapt**: an awareness of the magnitude of the problem helps to identify adaptation as a solution.
3. **Mobilizing resources**: awareness can lead individuals and organizations to dedicate human and/or financial resources to help clarify the nature of threats or opportunities.
4. **Building capacity to adapt**: involves applying scientific information, financial resources, and skills to focused activities such as issue screening, risk assessment and in-depth analysis to generate the understanding needed for informed decision making.
5. **Implementing targeted adaptation actions**: concrete actions are put in place to reduce vulnerability (risk or exposure) to climate change and/or to take advantage of opportunities.
6. **Measuring and evaluating progress**: measuring and evaluating the effectiveness of adaptation actions and related assumptions and uncertainties provides the feedback necessary for improved management.

7. **Learning, sharing knowledge with others and adjusting**: the last step leads to refinements in the adaptation actions implemented and transfer of lessons to future adaptation.

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### Set-up and materials

- 10 climate maps/graphs printed on legal or ledger size paper*
- 10 sheets of chart paper
- 10 copies of Guiding Questions
- One marker per student
- One pack of sticky notes per student
- One double-sided copy per student of Graphic Encounters: Assignment and Rubric (Day 2)
- Laptops or access to computer room (optional) (Day 2)

* If you have a small class, you may want to use fewer than 10 images. The ratio should be one image per team of three students.

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4 The climate maps and graphs used in this activity are taken from:

a) Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, F.J. Warren and D.S. Lemmen, editors (2014); Government of Canada, Ottawa, ON; and

b) Canada’s Marine Coasts in a Changing Climate, D.S. Lemmen, F.J. Warren, T.S. James, and C.S.L. Mercer Clarke, editors (2016); Government of Canada, Ottawa, ON.

Both reports are available at: [http://www.nrcan.gc.ca/environment](http://www.nrcan.gc.ca/environment)
What to do

Day 1

1. Hang the maps and graphs (p. 29) around the classroom, with a sheet of chart paper below each. Hang a copy of the Guiding Questions above each image.
2. Explain to students that climate change adaptation and mitigation decisions are rooted in scientific evidence. When decision-makers and scientists interpret the data, they are trying to figure out what effect it will have on the world we live in.
3. Ask students to form groups of three and place themselves under one map or graph. Give them one minute to silently contemplate the image before they start to talk to their group about it.
4. Give them three minutes to write their ideas on the first two guiding questions on the chart paper; any questions they have should go on the sticky notes. They can discuss these with their group, but each student should be writing down his or her own ideas on the chart paper (whether or not the others find it interesting).
5. Ask the students to rotate to the next map or graph and repeat steps 2 and 3. Before writing out their ideas, they should read what other students have written and put check marks next to the items they agree with rather than re-writing an idea.
6. After several rounds (choose the number of rounds based on the time available), discuss the discoveries made by the students.

Tip: Ask the last group of students to have analyzed the map or graph to lead the discussion.

7. Before the end of class, ask each student to put his or her name under the map or graph they found most compelling and that they would like to continue exploring. The students are free to form new groups based on their preferred image.

Day 2

1. Introduce the “create an infographic” assignment to the students. It is strongly recommended that you spend some time analyzing a few existing infographics with the students so that they know what is expected of them, starting with the six infographics that accompany this resource.

Tip: To learn more about using infographics as a teaching and assessment tool, visit Kathy Schrock’s Infographics as a Creative Assessment at http://bit.ly/schrockinfographics.

2. Download the two Natural Resources Canada reports that the maps and graphs in this assignment are taken from (Canada in a Changing Climate; and Canada’s Marine Coasts in a Changing Climate) so that they are readily available to students.

We’d love to see your students’ creations! Send photographs or short videos of your class’s infographics to:

jarmstrong@techno-science.ca
Click on the thumbnail to open a high-resolution image. It is recommended that you leave the image descriptor as it appears in the document to challenge students’ interpretation skills.

**FIGURE 3:** Projected relative sea-level change (cm) at 2100 for the median of a high-emissions scenario (RCP8.5) for coastal locations in Canada and the northern United States. See Chapter 2 for information on methodology and the climate change scenarios used in this report. Graphs showing projected change in sea level through this century for each of the Canadian sites shown in this figure are found in the relevant regional chapter (Chapter 4, 5 or 6).

**FIGURE 26:** Projected global sea-level change from 2100 to 2500, based on carbon dioxide concentrations at 2100 (based on Figure 13.13 of Church et al., 2013a, see footnote 2).

**FIGURE 5:** Trends in seasonal mean temperature for 1960-2010 (isotherm) and downward and upward triangles indicate positive and negative trends respectively. The size of the triangles is proportional to the magnitude of the trend. The legend may not include all areas shown in the figure (Source: Wintenberg et al., 2013).
Canada’s Marine Coasts in a Changing Climate, p. 171

FIGURE 16: Permafrost temperatures at 15 m depth for 10 communities in Nunavut (from Edna and Smith, 2015). Steady increases are seen at all sites during the period of observation, ranging from 0.04°C/year in Iqaluit to 0.29°C/year in Resolute. The average increase is 0.15°C/year for all sites.

Canada’s Marine Coasts in a Changing Climate, p. 177

FIGURE 18: Dangerous travel areas (red) identified by residents of Makkovik and Postville, Nunatsiavut, NL (from Riedlsperger, 2013). Abandoned sea-ice travel routes are depicted as dark red lines. Inland trails (grey lines) now provide safer and more dependable travel routes.
Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, p. 8

FIGURE 8: Seasonal trend precipitation trends for 1950-2009 (upward- and downward-pointing triangles indicate positive and negative trends, respectively. Filled triangles correspond to trends significant at the 5% level. The size of the triangle is proportional to the magnitude of the trend). The legend may not include all icons shown in the figure (Source: Meko and Vincent, 2011).

Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, p. 30

FIGURE 2: Patterns of change in annual total precipitation over the period 1960–2010. Upward (green) and downward (red) pointing triangles indicate positive and negative trends, respectively. Filled triangles correspond to trends significant at the 5% level (Source: Meko and Vincent, 2011). Annual total precipitation anomalies expressed in % of the 1961–1990 average for Canada, 1960–2010 (Source: Meko and Vincent, 2011; Environment Canada, 2011).

Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, p. 10

Figure 9: Vulnerability to heat in Toronto (Source: Toronto Public Health, 2014)
Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, p. 34

FIGURE 19: Trends in Arctic sea ice extent over the period 1979-2012 shown as time series of the percentage difference in ice extent in March and September relative to the mean values for the period 1979-2000. The rate of decrease for the March and September ice extents is -2.6% and -1.3% per decade, respectively (as determined by least squares linear regression). Both trends are statistically significant (Source: Perovich et al., 2012).

Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, p. 165.
FIGURE 3: Risk maps for establishment and spread of the Lyme disease vector Ixodes scapularis under (1971-2000) and projected future climate (2020s to 2080s) after Ogden et al., 2008a. The green zone indicates the main extent of locations where *I. scapularis* may become established. The orange and red zones indicate areas with increasingly high risk for *I. scapularis* population emergence. The grey zone indicates areas where the risk of *I. scapularis* population emergence is very low (Source: Ogden et al., 2008a).

<table>
<thead>
<tr>
<th>WEATHER</th>
<th>Northern Development Region</th>
<th>Northeast</th>
<th>Northwestern Development Region</th>
<th>Southern Development Region</th>
<th>Yukon/ Northwest Territories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing variability and decreased predictability of weather</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Changes in total precipitation, increasing volumes of extreme rainfall</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Increased frequency of thunderstorms and extreme weather events</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Differences in snowfall: less snow in some areas, more snow in other areas in spring, earlier in the fall</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Increased storm surges and coastal erosion</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEMPERATURE</th>
<th>Northern Development Region</th>
<th>Northeast</th>
<th>Northwestern Development Region</th>
<th>Southern Development Region</th>
<th>Yukon/ Northwest Territories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warmer summers (in some communities)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cooler summers (in some communities)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Fewer cold days, winter starting later</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Canada’s Marine Coasts in a Changing Climate, p. 172.

Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, p. 201.
Activity 4–Teacher BLM: Guiding Questions

Guiding Questions

1. In your own words, what is this image trying to convey?

2. What do you notice? Is there anything strange or surprising?
   Do you see trends?

3. Can you think of any environmental, economic, or social consequences of this data?

4. On sticky notes, write down any questions you have about this image.
Activity 4–Student BLM: Assignment and Rubric

The first step towards adaptation implementation is awareness of climate change, potential impacts, and the need to adapt. Increased awareness of climate change can occur spontaneously (e.g. through the experience of extreme events) or through planned activities (e.g. workshops, awareness-raising campaigns, learning modules or publications).  

In this assignment, your team will “translate” the map or graph you chose into an infographic that clearly communicates its message and importance to an audience. The infographic must convey both the information contained in the image as well as a summary of further research your team will conduct to support your ideas. Start with the two reports produced by Natural Resources Canada (Canada in a Changing Climate; and Canada’s Marine Coasts in a Changing Climate) that your teacher has downloaded for you.

Graphic Encounters Rubric

<table>
<thead>
<tr>
<th>Main idea</th>
<th>Exemplary</th>
<th>Proficient</th>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infographic conveys the main idea in a clear and compelling manner</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Research</th>
<th>Exemplary</th>
<th>Proficient</th>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infographic reflects research into the environmental and/or social significance of the data</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Graphics</th>
<th>Exemplary</th>
<th>Proficient</th>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphics are relevant, chosen to enhance and support the data</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Layout and design</th>
<th>Exemplary</th>
<th>Proficient</th>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
</tr>
</thead>
<tbody>
<tr>
<td>The layout of the graphics and text purposely enhances the communication of the main ideas. The flow of information is uncluttered and well organized.</td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Language</th>
<th>Exemplary</th>
<th>Proficient</th>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language is used in a precise and concise manner with no errors in spelling, grammar or punctuation.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Audience</th>
<th>Exemplary</th>
<th>Proficient</th>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infographic clearly identifies and supports the relevance of the information for at least two socio-economic sectors.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Infographic elements</th>
<th>Exemplary</th>
<th>Proficient</th>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contains a title that reflects the main idea of the infographic</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Contains at least 5 images</td>
<td></td>
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<tr>
<td>Each image contains a concise statement to help audience understand it</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contains (on the back) a reference list for research and images, with references cited properly</td>
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<td></td>
</tr>
</tbody>
</table>

See reverse for team worksheet.

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5 From Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, p. 274.
Names: 

Image chosen: 

Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, p. _______

OR

Canada’s Marine Coasts in a Changing Climate, p._______

Further research notes (environmental and/or social relevance of the data):

Information to include:

On the back of the infographic, please answer the following:

In your opinion, which of the following sectors should be concerned by this information? (Choose at least two.) Why?

1. Energy (oil and gas, wind, solar)
2. Food production
3. Mining
4. Forestry
5. Tourism
6. Housing/construction
7. Insurance
8. Manufacturing
9. Biodiversity
10. Infrastructure and transportation
11. Health and social well-being