Exploring Climate Change in my Community

March 2019

esri Canada

Lesson Overview

This overview contains the background information about this lesson, along with the **associated curriculum connections**, skills learned, and materials required for students to complete the lesson.

Even though climate change is a global phenomenon, we can explore it at a local level by looking at how human actions can affect the environment. In this lesson, students will use a survey **created by their teacher to collect data collaboratively** on climate change contributors and reducers in their home neighbourhood block.

Contributors are features that emit carbon like cars and trucks and heat inducing features like dark-coloured roofs, and large paved areas that would support the urban heat island effect. Reducers include gardens, solar panels, trees, rainwater tanks, green space, and light-coloured roofs.

Students will collect data, **create a Web map, and analyze the results** of the survey. They will also **create a story map** to highlight the findings of climate change contributors and reducers in their community and make recommendations on how to increase the health and sustainability of their community.

Grade Range:

- 7 – 12

Topics and Themes:

- Climate Change
- Urban Issues
- Interrelationships: Human impact on the environment
- Patterns and Trends: Comparing neighbourhoods
- Collaborative field study

Geographic Scope:

- Your community in Canada

GIS Skills:

- Collecting data
- Creating a Web map
- Creating a heat map
- Analyzing data
- Creating a story map application.

Materials Required:

- An ArcGIS Online organization account. If you or your students do not have an account, you can request accounts here: k12.esri.ca/#access. Please allow up to two business days for accounts to be created. For more information on ArcGIS Online, visit: www.arcgis.com.
- For data collection students are required to download the **Survey123 for Field App** on their smartphone or tablet - https://bit.ly/2H19vNp
- An electronic version of this lesson is available at https://bit.ly/2TTrziG.

Lesson Contents and Time Required

GIS lessons are assembled for teachers as a collection of resources that are needed to facilitate learning a specific topic or issue using mapping and spatial data. This lesson contains the following resources:

- **Lesson Plan**
  A teacher's resource that outlines the suggested workflow for using the contents of a lesson. This workflow is the same across all Esri Canada Education's lessons. To download a copy, visit: http://bit.ly/2nsY0Dg
- **Presentation (10 – 15 minutes)**
  A Story Map presentation in ArcGIS Online for the teacher to introduce the GIS skills that will be studied. To view the Story Map, visit: http://arcg.is/2a2CfVt
- **Tutorial(s)**
  Hands-on documents referenced in this overview including step-by-step instructions for learning GIS skills.
  1. **Teachers** (30-45 minutes): Survey123 for ArcGIS Web Designer: http://bit.ly/2rEigkg
  2. **Students** (75-105 minutes):
     - Create map notes: https://bit.ly/1mZ7aUP (5 minutes)
     - Heat Map analysis: https://bit.ly/2rZfGbG (10 minutes)
     - Creating a Map Journal Story Map Tutorial: http://bit.ly/2oQkKej (60-90 minutes)
- **Assignment**
  - **Teacher**: 30-45 minutes
  - **Student**: 180 minutes
- A student activity intended to be the final part of a lesson. Students can complete the tasks by applying the GIS skills learned through tutorials that are relevant to the lesson outcomes.
- **Data**
  The data required for this assignment are created by the students by completing a survey. Additional data can be found in ArcGIS Online.

Note: For a complete learning experience, it is highly recommended that students complete the tutorials associated with this lesson. However, if the tutorials have already been taught, students can use them as a point of reference to complete the assignment.

Learning Outcomes

By completing this lesson, students will gain the following curriculum-focused knowledge:

1. **Contemporary issues in urban studies: environmental factors to climate change**
   (**Manitoba** - Grade 7-10 Social Studies, Grade 12 Geography; **Ontario** - Grade 7 Social Studies, Grade 10-12 Geography; **Newfoundland and Labrador** - Grade 8 Social Studies, Grade 12 Geography; **New Brunswick** – Grade 8 Social Studies, Grade 12 Geography; **Saskatchewan** - Grade 8 Social Studies, Grade 10 Social Studies; **British Columbia** - **British Columbia** – Grade 12 Urban Studies; **Yukon** Grade 12 Urban Studies; **Quebec**- Secondary, Cycle 1 Geography)

2. **Identify and assess how human and environmental factors influence each other**
   (**Manitoba** - Grade 7-10 Social Studies, Grade 12 Geography; **Ontario** - Grade 7-12 Geography; **Newfoundland and Labrador** - Grade 8 Social Studies, Grade 12 Geography; **New Brunswick** – Grade 8 Social Studies, Grade 12 Geography; **Saskatchewan** - Grade 8 Social Studies, Grade 10 Social Studies; **British Columbia** - Grade 11 Social Studies, Grade 12 Physical Geography, Grade 12 Human Geography; **Quebec**- Secondary, Cycle 1 Geography; **Yukon** - Grade 12 Physical Geography, Grade 12 Human Geography)

Background Sources Used

Using the following sources of information, students will learn about local contributors and reducers of climate change and how they can mitigate their carbon footprint. Students are not limited to using these sources of information to complete the assignment.

Review the following Web links for background information on climate change on a local level and understanding how humans can affect their environment. All links were last accessed March 2019.

- Collaborative for Advanced Landscape Planning (CALP) –Climate Change Coolkit Lesson
  http://calp2016.sites.olt.ubc.ca/files/2019/01/Lesson-Plan-Signs-of-Climate-Change-Coolkit_CALP-UBC.pdf

- Urban Heat Island Effect
  https://climateatlas.ca/urban-heat-island-effect

- David Suzuki Organization – 10 ways to stop climate change
  https://davidsuzuki.org/what-you-can-do/top-10-ways-can-stop-climate-change/

- Prairie Climate Centre: Building a Climate-Resilient City:Urban ecosystems
  http://prairieclimatecentre.ca/wp-content/uploads/2017/04/pcc-brief-climate-resilient-city-urban-ecosystems.pdf

- Urban Forests
  https://climateatlas.ca/urban-forests-and-climate-change

Exploring Climate Change in your Community – Teacher Instructions

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Overview

In this lesson, you will create a survey using Survey123 for ArcGIS for your students to use to gather data on features in their community that are contributors and reducers of climate change. Contributors are features that emit carbon like cars and trucks and heat inducing features like dark-coloured roofs, and large paved areas that would support the urban heat island effect. Reducers include gardens, solar panels, trees, rainwater tanks, green space, and light-coloured roofs.

It is recommended that each student collects data on and in their home block to ensure there are more data for the class to analyse.

The following tutorials should be referenced to help you create the survey:

- Survey123 for ArcGIS Web Designer: http://bit.ly/2rEigkg

Create the Survey

Below are sample questions that you can use to create your class survey. The question type is included in brackets. You may also brainstorm with your students to determine the survey questions.

- Date (date)
- Time (time)
- Car and truck count (number)
- Paved areas (number)
- Hybrid car count (number)
- Electric vehicle count (number)
- Garden count (number)
- Solar panels count (number)
- Tree count (number)
- Light-coloured roof count (number)
- Location of Feature (geopoint)

1. When you have completed your survey **save and share** it with your class. You will also share the survey results, allowing students to create a Web map with the data.
2. The students will use the Survey123 field app https://bit.ly/2H19vNp to access the survey and to collect data in in their home neighbourhood block.

Assignment Overview

In this assignment, you will use a survey your teacher created to gather data on features in your home neighbourhood block that are contributors and reducers of climate change. Contributors are features that emit carbon, such as cars and trucks, and paved areas and dark-coloured roofs that support the urban heat island effect. Reducers are features that help to reduce the vulnerability of an area to damage by either environmental or human-caused threats such as climate change. These features include, gardens, solar panels, light-coloured roofs and trees.

The following tutorials should be referenced to help you complete this assignment:

- Create map notes: https://bit.ly/1mZ7aUP
- Heat Map analysis: https://bit.ly/2rZfGbG
- Creating a Map Journal Story Map Tutorial: https://bit.ly/2N4RjCk

For data collection:

- On your smartphone or tablet, download the **Survey123 for Field App** to collect the data - https://bit.ly/2H19vNp

Assignment Tasks

Part 1 - Acquire: Collect Data

In this part of the assignment, use the **Survey123 for Field App** and the survey created by your teacher to collect the data on your smartphone or tablet in the field.

1. Sign into the app.
2. Search for the survey the teacher has shared with you.
3. Collect data on features in your neighbourhood block that are contributors to and reducers of climate change.

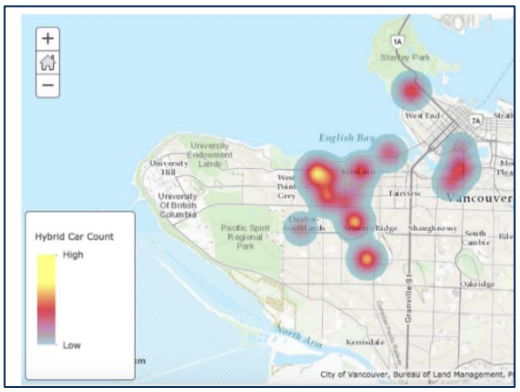
Part 2a – Explore and Analyze: The Results of the Survey

In this part of the assignment you will create a Web map and analyze the survey results.

1. **Create Web map**
    a. **Sign into ArcGIS Online**
    b. **Click on Map** to open the *Map Viewer*
    c. Search for the survey results layer of the climate change study. Ask your teacher what the name of this layer is. Add it to your map.
    d. **Save the Web map**

Create a heat map with a variable you would like to display. For example, display all answers that include the number of solar panels in your neighbourhood block.

To the right is a heat map showing the hybrid car count collected by a class from Vancouver, BC.



You will include the following information in your final story map (see Part 3):

Q. Explore the heat map you created and answer: How does your neighbourhood compare to the other neighbourhoods?

Q. Develop a plan on how you can encourage local government to support sustainability in your city. Use examples of climate change reducers you have found in your own neighbourhood block. Your plan should include: The issue, why it matters, recommendations and action items on how to solve the issue.

Part 2b – Vulnerability Mapping your Neighbourhood Block

In this exercise, you will view your home neighbourhood block from a different perspective in ArcGIS Online. You will use an imagery basemap to explore your block for high and low risk features to climate change and then, using map notes, you will include four (4) climate change features on your map.

Image from CALP's Coolkit Climate Change Lesson (page 23-24) https://bit.ly/2H2hmdp.

1. Open a **New Map** in the *Map Viewer* and navigate to your neighbourhood block.
2. Change the **Basemap** to one of the **imagery** basemaps.
3. Assess the vulnerability of your neighbourhood block by identifying features that are considered high risk and low risk features of climate change. For example, you can look at the tree canopy, and the roof tiles (dark or light) on your block. Consider the interrelationships between the features and how they are related to the threat of climate change.
    a. Using **Map Notes**, add at least two (2) features that are high and two (2) that are low risk threats to climate change in your neighbourhood block.

Part 3 - Act: Create a Story Map

A story map is a great tool to communicate and act on your findings. It's a combination of maps, multi-media such as photos and videos, and text that can be used to tell a story.

1. Using the Web maps created from your survey and the vulnerability mapping activity, **create a map journal story map** to present and communicate your investigation of climate change in your neighbourhood block and include recommendations that would support a sustainable community. Include the following slides:
    a. Introduction – Outline the topic
    b. Analysis map 1 – Heat map and include information about your analysis and findings
    c. Analysis map 2 – Vulnerability mapping and include information about your analysis and findings
    d. Recommendations to your local government/community in support of a sustainable community
2. **Save** your story map with an appropriate **title**, **description** and **tags** (keywords). **Share** your story map with your teacher's class/project **Group** in ArcGIS Online, if applicable. With your teacher's permission, share the story map with your school or community by adding it to a Website, or sharing it to social media.