

# MY CLIMATE TOOLKIT

Climate Change Activities for Secondary School Students



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## LAND ACKNOWLEDGEMENT

The sacred lands upon which we operate, and the built communities and cities across the country, are the traditional territories, homelands and nunangat of the respective First Nations, Métis Nations and Inuit who are the long-time caretakers of these lands.

These are occupied lands and subject to inherent rights, covenants, treaties, and self-government agreements to peaceably share and care for the lands and resources across Turtle Island. These regions are still home to diverse Indigenous peoples, and we are grateful to have the opportunity to live and work on these lands.

The Evergreen Brick Works site is built on occupied Indigenous territory – the traditional homelands of the Wendat (Wen-dat) and Petun (Pah-toon) First Nations, the Haudenosaunee (Ho-den-O-Show-nee), and the Mississaugas of the Credit. The territory is governed by Treaty 13 and is subject of the Dish with One Spoon Wampum Belt Covenant, an agreement between the Haudenosaunee (Ho-den-O-Show-nee) and Anishinaabek (A-Nish-Naw-bek) Confederacies and allies to peaceably share and care for the resources around the Great Lakes.

Today, the meeting place of Toronto, including the Waasayishkodenayosh\* area of the Lower Don River, is still the home to many Indigenous peoples from across Turtle Island and we are grateful to have the opportunity to work within this territory and the community.

\* Waasayishkodenayosh is one name for the area along the Lower Don River, interpreted to mean 'burning bright point' in Anishinaabemowin. The spelling and meaning of the name are still being decided on by a Language Circle of First Nations knowledge and language-carriers and allies.

## ABOUT THIS RESOURCE

Climate change is the most pressing issue of our time and perhaps the most complex challenge we face as a global community. Conversely, climate change remains a vague and distant concern for many of us, particularly in the Global North; it can seem to be more of an intangible concept than a concrete problem, which can hinder climate action.

The global climate crisis can feel intimidating, overwhelming, or unsettling. This is particularly the case for many young people, who are experiencing high levels of **eco-anxiety** – extreme concern about the health of the planet in the face of climate change.

This resource is written for **Secondary School Educators** and contains four multi-part modules for students in Grades 9 to 12 to guide them in building their understanding of the impacts of climate change at the personal, community, and global levels. Students will also build on essential skills and ways of thinking which **empower** them to contribute to climate solutions and other forms of social change. By completing these activities, students will develop a deeper sense of **empathy** for themselves, others, and the planet.

The activities contained in this resource connect with diverse areas of the Ontario Curriculum, challenging students to develop their **creative, critical, and cross-disciplinary** thinking and problem-solving skills, and preparing them to be leaders and changemakers as they pursue post-secondary studies and employment.

# HOW TO USE THIS RESOURCE

This resource includes four modules, each focused on the development of different skills and building student understanding of various themes related to climate change. You may complete one or all of these modules. While they are presented in a logical sequence, and build off each other, they can also act as standalone modules.

## Modules

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Each module begins with an introductory page which includes the following components:

- **Description** – This may be shared with students to provide them with an overview of the multi-part module’s flow.
- **Duration** – This is broken down to show the approximate time needed to complete each activity in the module.
- **Learning Goals** – Key takeaways and big ideas covered in the module.
- **Topics** – This is not an exhaustive listing of topics; we encourage you to explore and expand on other connections that can be made.

## Educator Overview

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Each module is broken down into multiple activities. Within a module, each activity builds upon the previous one, so they can be completed consecutively across multiple classes or weeks. Each activity begins with an Educator Overview which includes the following components:

- **Summary** – A brief, general description of what the students will be doing.
- **Delivery Method** – Suggested locations and groupings for students. Some activities are full class activities or brainstorms; others can be completed by students individually or in groups, in class or at home.
- **Materials** – What you and the students will require to complete this activity.
- **Adaptations** – Possible modifications or extensions.

## Student Activities

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Following the Educator Overview is the actual activity. This section is written for students, even in the case of class-wide activities, and therefore can be printed or shared digitally with students. Each activity includes the following components:

- **Introduction** – A brief description of the activity designed to help frame it for students.
- **Key Terms** – Helpful vocabulary that you may wish to review with students.
- **Instructions** – How to complete the activity.

In some cases, like in *Module 2: Our World in Data*, the activity section can serve as a worksheet, which guides students through the module while also providing space for them to record their answers.

## FRAMING THE ISSUE: CLIMATE CHANGE

Climate change refers to the long-term shift in the Earth's temperature and weather patterns; these shifts occur over years, decades, and centuries, not over days, weeks, and months.

While climate change occurs naturally and has indeed occurred many times throughout Earth's history, the climate change we are experiencing today is a new kind: it is **anthropogenic**, or human-induced climate change. How have humans contributed to climate change?

The burning of **fossil fuels** (coal, oil, natural gas) began during the Industrial Revolution, which originated in Great Britain in the 1750s. Fossil fuels are now the primary energy source that we use to power our world. To produce usable energy to power our cars, factories, homes, schools, and businesses, we burn these fossil fuels, and this process releases carbon dioxide (CO<sub>2</sub>) as a by-product. Carbon dioxide is also released through other human activities like land-use change (for example, deforestation).

**Carbon dioxide** is a greenhouse gas. There are other greenhouse gases as well including methane and nitrous oxide, however carbon dioxide is the primary contributor to climate change. Greenhouse gases trap the Sun's heat, instead of letting it go back out to outer space. As these gases accumulate in the atmosphere, they cause an increase in the Earth's surface temperatures. The Earth's global average temperature has warmed by 1.1 degrees above pre-industrial levels.

Climate change has a range of impacts on Earth's natural systems: sea levels are rising, extreme weather events are more frequent and intense, and glaciers and ice sheets are melting. These changes have significant consequences for life on Earth – including humans.

Climate change touches all aspects of human life:

- Physical and mental health
- Safety
- Housing and infrastructure
- Food-security
- Education and employment
- Culture and traditions

Climate change not only presents new problems in our communities and around the world, but also reinforces existing inequalities. For example, it could push a family who is already living in poverty even further into poverty if an extreme weather event damages their home and if the cost of food rises due to drought. Therefore, vulnerable populations such as unhoused neighbours, the elderly, children, women and people living with disabilities are more susceptible to the impacts of climate change than others.

At the same time, the species we share the planet with are also negatively impacted by climate change. Entire ecosystems are being transformed, which impacts all the species that make their homes there.

Climate change is a complex and pressing issue that requires cooperation and action at the local, national, and international level to put in place climate solutions. These solutions must both **mitigate** and allow us to **adapt** to climate change, to protect life on Earth.

### **Additional Readings & Resources:**

- [Intergovernmental Panel on Climate Change Reports](#)
- [NASA Climate Change](#)
- [Environment and Climate Change Canada](#)

# Module 1:

# MY CLIMATE STORY

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## Description

Climate change may be an issue you think about often, or one that you think about very rarely. You may have learned about it in school, on social media, or from friends. You may live close to a river and have experienced flooding. You may have watched the news and seen wildfires in British Columbia. We all have different experiences that have shaped our thoughts, feelings, and perceptions of climate change. In our day-to-day lives, we may not stop and take time to think about these experiences or share them with others. This first module involves tuning into our feelings and senses, reflecting on our beliefs and experiences, and sharing with our peers.

In Activity 1.1: Reflection – Looking Inward, we reflect individually on how we know what we know about climate change. In Activity 1.2: Environmental Journaling – Looking Outward, we practice an important method of nature connection – environmental journaling – to observe and document our surroundings across time. In Activity 1.3: Sharing – Human Library, we weave together our reflections, experiences, and observations by sharing our personal climate stories with our peers through a ‘Human Library’ activity.

## Learning Goals

Students will:

- Understand the ecological, socioeconomic, and psychological effects of climate change.
- Identify and express their own personal experiences and views of climate change.
- Identify and understand the factors that have influenced their perceptions of climate change.
- Use storytelling as a method to share their thoughts and experiences.

## Duration

Activity 1:	1 hour
Activity 2:	Open; determined by class
Activity 3:	3+ hours
<b>Total:</b>	<b>4+ hours</b>

## Topics

Geography  
(Natural Disasters)

Media Arts, Visual Arts

English



## Activity 1.1: Reflection – Looking Inward

### Educator Overview

<b>Summary:</b>	Students will reflect on their personal experience with and feelings about climate change.
<b>Delivery Method:</b>	Individual; can be done at home or in class.
<b>Materials:</b>	A notebook or paper and pen or pencil for each student
<b>Adaptations:</b>	Instead of reflecting on all the questions at once, which takes some time and could be overwhelming for students, you may choose to have a series of journaling opportunities, where students reflect on just one set of questions each time.

# Activity 1.1: Reflection – Looking Inward

## Introduction

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Climate change is a term we likely hear often, but it can be less often that we take the time to think about what it means to us, how our perceptions of climate change have been shaped, and how climate change impacts ourselves and others. In Activity 1.1: Reflection – Looking Inward, we will reflect on these questions.

## Key Terms

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- Climate change
- Influence
- Impacts

## Instructions

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Take some time to reflect on the following questions and record your reflections in a journal, notebook, or document. You may return to these questions at any time to record additional thoughts. You may not know the answer to every question – that’s ok! Try not to fixate on any one question, just write freely!

### First impressions:

- What do you think of when you hear the term climate change?
- How do you feel when you hear the term climate change?
- How often do you think or talk about climate change?

### Climate change and the world:

- What causes climate change?
- What are the impacts of climate change around the world?
- Are these impacts felt equally across people and regions of the world? Why or why not?
- What is being done about climate change at global and national levels?

### Climate change and your community:

- What are the impacts of climate change in your community?
- Are these impacts felt equally by everyone? Why or why not?
- What is being done about climate change at a local level?

### Climate change and you:

- How do you play a role in contributing to climate change?
- How do you play a role in preventing climate change?
- Do you experience the impacts of climate change? If so, how?

### Spheres of influence:

Who influences the way you think about climate change? How? Consider the following:

- Friends and peers
- Family
- Teachers, coaches, and instructors
- Community members
- Celebrities
- Media: social media, books, music, news articles and videos

## Activity 1.2: Environmental Journaling – Looking Outward

### Educator Overview

<b>Summary:</b>	Through “sit-spots”, students will document observations and changes in the environment around them and consider these in relation to climate change.
<b>Delivery Method:</b>	Individual, outdoors; can be done at home, in the neighbourhood (i.e., at a local park) or on school ground.
<b>Materials:</b>	<ul style="list-style-type: none"><li>• A notebook or paper and pen or pencil for each student</li><li>• A camera (optional)</li><li>• Additional art supplies (optional)</li></ul>
<b>Adaptations:</b>	N/A

### Introduction

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In the 21st century, especially living in cities and towns, we often feel a sense of disconnect from the land. We buy our food in grocery stores; our garbage is collected each week and our buildings are heated and cooled to maintain a comfortable temperature. In many ways, this loss of connection with the land and the nature all around us has contributed to climate change, because when we forget our connection with the land, and how much we depend on it, the more likely we are to fail to take care of it. Spending time in nature and taking time to connect with the land can help us better understand and observe the impacts of climate change and inspire us to address it, to protect and sustain the environment.

A ‘sit-spot’ is a place outdoors that you return to, time and time again, to observe, reflect and journal. There is so much going on around us that we don’t typically have the chance to notice in the busyness of the everyday. A sit-spot provides an opportunity to tune into our senses – sight, sound, smell, feel – and really take in the world around us.

### Key Terms

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- Sit-spot
- Observation
- Senses
- Journaling

## Activity 1.2: Environmental Journaling – Looking Outward

Returning to a sit-spot repeatedly, we can begin to better know the land and record changes in the environment. In a sit-spot, journaling or drawing can help us to look closer, harder, and take note of details and thoughts that might slip away otherwise. Journaling is both an important reflective practice and an important documentation tool. Activity 1.2: Environmental Journaling – Looking Outward provides a chance to step outside, do a sit-spot and journal.

### Instructions

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1. As a class, decide how long, how often, and how many times you will do a sit-spot. Will this be a 5-minute, 20-minute, or an hour-long activity? Will it take place weekly, bi-weekly, or monthly throughout the semester or school year?
2. Decide where these observations will take place. This could be in a “natural” environment like a nearby ravine or park, or an environment with many human-made features, like a city or town square. Either way, it must be outdoors!
3. Go to your sit-spot and observe! Grab a mat to sit on to make this observation and journaling process a comfortable one. Engage with your senses during this time and fire up those inquiry muscles:
  - What can you hear, see, smell and feel? Assess the environment you’re in; does the air feel humid or crisp? What are the different layers of sounds in this space? Which ones are closer? Which ones are further away? What are the sources of the smells you encounter?
  - What living and nonliving elements are in this space? What are they doing? How does their presence affect the things around them? How do these elements contribute to (positively or negatively) and how are they impacted by climate change?
  - Make simple sketches, maps, and diagrams in your journal: this will help you remember more easily what you encountered on different occasions and notice what has changed.
  - Consider collecting artifacts to add to your journal. This can be in the form of photographs, fallen leaves, or pinecones, for example. Please do not pick any live plants.
4. Repeat this observation and journaling activity as often as decided by the class. For future observation and journaling sessions, you may wish to begin by reviewing and reflecting on your previous journal entries. Once you arrive at your sit-spot, revisit the questions above! Some additional questions to consider are:
  - How has the environment changed since your last visit?
  - What has caused these changes to occur?

## Activity 1.3: Sharing – Human Library

### Educator Overview

**Summary:** Students will share their 'Climate Story' to others by setting up a 'Human Library'.

**Delivery Method:**

- Individual preparation; in-class or at home
- Human Library during lunch time or after school
- Set library stations throughout the school (i.e., cafeteria, gymnasium, classrooms, school grounds, teacher's office, administration office, etc.)

**Materials:**

- Sets of chairs, positioned to face each other; you may set up as many of these library stations throughout the school as you wish
- Notebook and pen/pencil for each student to plan out their story outline
- Art supplies (as needed)

**Adaptations:** N/A

## Activity 1.3: Sharing – Human Library

### Introduction

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Oral storytelling is an important tradition in many cultures around the world. Storytelling is a way of sharing experiences, knowledge, and teachings, and connecting with others. A good story is a treat for the listener – informative but also intriguing and compelling. In Activity 1.3: Sharing - Human Library, you will put your storytelling skills to practice by sharing your learnings and reflections from Activity 1.1: Environmental Journaling – Looking Inward and Activity 1.2: Environmental Journaling – Looking Outward with the larger school community.

Specifically, we're going to tell our own stories using a method that has been used around the world as a way to understand and empathize with the lived experiences of others: the Human Library!

You will set up 'reading nook' stations around your school where you will act as 'books' that 'readers' (other students, teachers and administrators) can 'borrow'. To 'borrow' your 'book' essentially is to sit down and listen to your climate change story.

In Activity 1.3: Sharing - Human Library, you will first prepare to tell your story and then have a chance to share it with the broader school community.

### Instructions

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1. Explore the following links to get inspiration for how you might want to tell your climate story:
  - [My Climate Story](#)
  - [Enduring the Heat](#)
  - [Lessons from Indigenous Storytelling](#)
  - [Storytelling - TED](#)
2. Create an outline for your story! This is not a written assignment where each line of your story must be carefully written and determined ahead of time. Therefore, preparing for the Human Library will involve reflection and planning out an outline of what you would like to convey. To prepare your story, think about:
  - The main point(s): For your climate story, these points should consist of the key learnings and observations you made about climate change in Activity 1.1 and 1.2.
  - The arc of the story: A story has a beginning, middle and end. Take the 'reader' on a journey!

### Key Terms

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- Conflict
- Story arc

## Activity 1.3: Sharing – Human Library

- The conflict: Consider what type of conflict exists within your climate story. This conflict may be resolved at the end of your story, or it may not and that is okay! Your climate story is an evolving one.
  - Paint a picture: Use descriptive language to help the ‘reader’ visualize elements of your story.
  - Non-verbal communication: How can you use eye contact and body language to better connect with your ‘reader’?
3. Create a title for your ‘book’ that will give ‘readers’ an idea of what your Climate Story is about. Make it unique and reflective of the thoughts you’ve had and the understandings you’ve come to through Activity 1.1 and Activity 1.2.
  4. **Optional:** Create an artistic element to support and share your climate change story with ‘readers’. Some ideas for artistic elements include botanical sketches, mixed media artwork incorporating artifacts collected from Activity 1.2 and [blackout poems on newspaper](#). Be as creative and dynamic as you want!
  5. Discuss the parameters and plan for the Human Library as a class.
    - Decide when you would like to host your Human Library initiative: Date and time, lunchtime or after school? For example, you could have 6 ‘books’ on rotation every lunch period for a designated week if you are a class of 30.
    - How long can each ‘reader’ spend with a ‘book’ – is it 3 minutes, 5 minutes, or 10 minutes? What feels like an adequate amount of time for ‘books’ to share their climate story and be able to answer a few questions from the ‘reader’?
    - Where will you set up your ‘reading nooks’? ‘Reading nooks’ are stations with two chairs facing one another anywhere on school grounds where you are visible to others. Be strategic about how and where you set up your ‘reading nook’; while they should be visible you also want to be in a fairly quiet location!
    - How will you advertise or announce the Human Library? Consider making a sign and/or an announcement on the Public Announcement (PA) System.
  6. Begin the Human Library, according to the parameters you set! While the Human Library mostly consists of the ‘book’ (you) telling their climate story, before, during or after your story, ‘readers’ may ask questions to better understand your experiences and perceptions of climate change and the reflective journey you’ve been on.

### Types of conflict:

- Self vs. Self
- Self vs. Peer
- Self vs. Society
- Self vs. Nature

## Module 2:

# OUR WORLD IN DATA

### Description

Climate change is a global issue, one that transcends decades and borders. Carbon emissions released by a factory in Canada 100 years ago contribute to the overall greenhouse gas emissions in our atmosphere, which then contributes to extreme weather events in Pakistan and Brazil. With so much complexity, how can we seek to understand an issue like climate change? Data has an important role to play!

In this module, we will be exploring the website Our World in Data and diving into their section on Climate Change. We will begin in Activity 2.1: Understanding Data by discussing “data” generally through a group brainstorming session, before delving into Our World in Data’s Climate Change section. Through Activity 2.2: Our World in Data Scavenger Hunt we will begin to understand how data provides evidence for climate change and can reveal important climate trends on a global scale. In Activity 2.3: Data Visualization, we will make our own graphs in Microsoft Excel to practice working with and understanding large datasets, illustrate how carbon emissions per capita have increased over time, and how they vary across countries. Finally, in Activity 2.4: Data Interpretation we will work together to understand both the important implications and limitations of this data.

### Learning Goals

Students will:

- Explore the role that data plays in understanding and solving global issues
- Expand their data analysis and visualization skills
- Develop a deeper understanding of the causes of and inequalities inherent to climate change

### Duration

Activity 1: 30 minutes

Activity 2: 1.5 hours

Activity 3: 1 hour

Activity 4: 1 hour

**Total: 4 hours**

### Topics

Mathematics

Statistics

Chemistry



## Activity 2.1: Understanding Data

### Educator Overview

<b>Summary:</b>	Students will brainstorm the topic of data, data collection and data analysis.
<b>Delivery Method:</b>	In-class, full-class activity.
<b>Materials:</b>	A place to record student ideas: Miro or Mural Boards, chart paper or a chalk board may be used.
<b>Adaptations:</b>	This brainstorm could be done in small groups and then shared back to the class, if preferred.

### Introduction

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Before jumping into data analysis, let's take a moment to understand what data is and the role it can play in our world.

### Key Terms

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- Data
- Collection
- Analysis

### Instructions

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Use the following questions to guide your brainstorm. Try to draw on personal experiences, and what you have learned through media and at school to answer these questions.

- What do you think of when you hear the word "Data"? Can we come up with a definition of "Data" together?
- How can we collect data?
- How can we analyze data? What is the goal of data analysis?
- We started off by saying that data plays a big role in our world, but let's try to think through some concrete examples of data and the role that it can play. For each example, what are possible benefits this data can provide? What are possible problems it can create?

## Activity 2.2: Our World in Data Scavenger Hunt

### Educator Overview

- Summary:** Students will complete an online scavenger hunt to explore the Our World in Data Climate Change section and begin to discover key global climate trends.
- Delivery Method:** Individual; can be done at home, at a local library or in the computer lab at school
- Materials:**
- A computer for each student, with internet access
  - Printed or digital copies of the following page to share with students
  - The answer key located at the end of this document to review Scavenger Hunt answers
- Adaptations:**
- Review the key vocabulary before students complete the Scavenger Hunt to ease comprehension.
  - Depending on your students' level of familiarity with the topic of climate change, you may wish to complete steps 1-3 of the instructions below as a class to ensure a solid understanding of key concepts before diving into the activity.

## Activity 2.2: Our World in Data Scavenger Hunt

### Introduction

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Our World in Data explores some of the most pressing issues in our world today, through data. This data originates from different, reliable sources, but through their initiative, they bring it together in a very visual and digestible way. In Activity 2.2: Our World In Data Scavenger Hunt, we will explore Our World in Data's Climate Change section and do a website scavenger hunt to familiarize ourselves with some global trends in climate change. This scavenger hunt will help us begin to answer questions like: "Which countries contribute the most to climate change, presently and historically?" and "Which countries have committed to "net zero" emissions?"

### Key Terms

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- Greenhouse gases
- CO2 emissions
- CO2 equivalent
- Carbon sink
- Fossil fuels
- Concentration
- Per-capita
- Confidence intervals
- Cumulative
- Exponential growth

### Instructions

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1. Visit the [Our World in Data](#) website, Climate Change section
2. Begin by taking some time to explore the [CO2 and GHG Emissions](#) tab along the light blue navigation bar. In the left, top section of the page, use the navy-blue Content button to open the Table of Contents. Take a moment to review the following sections:
  - Why do greenhouse gas emissions matter?
  - How are greenhouse gas emissions and concentrations changing?
  - How do we make progress in reducing emissions?
3. Using the light blue bar, navigate through the different sections of climate change data (By country, data explorer, CO2 emissions etc.)
4. Take 10 minutes to explore the tabs along the navigation bar and experiment with some of Our World in Data's Funky Features:
  - Many graphs include a blue "Play" button in the bottom, left corner. Press "Play" to see changes over time. Notice how both the x and y axes expand as time goes on.
  - Many graphs allow you to view the datasets for different countries and regions of the world. How do North American emissions compare to South American emissions over time? Take some time to compare graphs across places.

## Activity 2.2: Our World in Data Scavenger Hunt

- When you feel familiar with this section, it's time for the challenge to begin! Search the Climate Change section to answer the following questions. The scavenger hunt is divided into the sections indicated on the navigation bar. It shows you what webpage to look on for the answers, but not the specific graph. Some questions will also require you to interpret graphs and draw conclusions from the data presented. Happy searching!

### CO2 and Greenhouse Gas Emissions

By how much has the global average temperature risen compared to the 1961-1990 baseline?

#### By Country: Canada

How many tons of cumulative CO2 emissions did Canada produce between 1751 and 2020?

Around what year did cumulative CO2 emissions begin to increase exponentially in Canada?

#### Data Explorer

Compare Bolivia and France. In 1980, what was the difference between the two countries in terms of country-wide production-based CO2 emissions?

What about in 2021?

What could explain the change in emissions between the two countries between 1980 and 2021?

Tip: Look at the shape of both countries' emissions graphs.

## **CO2 Emissions**

Cumulatively, which continent has emitted the most CO2 emissions since 1751?

In which year did the United States surpass the United Kingdom in terms of their annual share of global CO2 emissions?

Which continent emitted the most CO2 emissions in 2017?

Which country was the biggest emitter in Africa in 2017?

What percentage of global CO2 emissions did this country produce in 2017?

## **CO2 Emissions by Fuel Type**

Cumulatively, which type of fuel has contributed the most to global CO2 emissions since 1751?

## **GHG Emissions**

What is the primary greenhouse gas driving global climate change?

Name 2 other greenhouse gases that are contributing to global climate change.

## **By Sector**

Globally, which sector produced the most greenhouse gas emissions in 2016?

Which sector accounts for the most methane emissions since 1990?

## **Atmospheric Concentrations**

Global, atmospheric CO<sub>2</sub> concentrations reached \_\_\_\_\_ parts per million (ppm) in 2018.

Approximately how much higher are atmospheric CO<sub>2</sub> concentrations now than in the second highest peak since 803,720 BCE?

How does the land act as a carbon sink?

## **Climate Impacts**

Which metrics show a positive relationship with time (i.e., y-value increases as we move forward in time)?

Which metrics show a negative relationship with time?

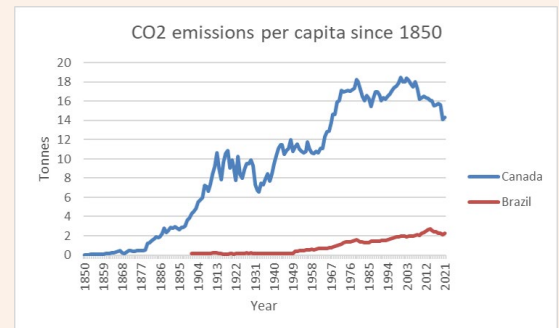
## Activity 2.3: Data Visualization

### Educator Overview

#### Summary:

Students will complete a graphing exercise using Microsoft Excel to compare Canada's CO2 emissions per capita over time to another country of their choosing.

See sample of the graph to the right.



#### Delivery Method:

Individual; can be done at home, at a local library or in the computer lab at school.

#### Materials:

- A computer for each student, with Microsoft Excel installed and internet connection.
- A download of the Our World in Data CO2 and Greenhouse Gas Emissions Dataset: This can be found [here](#) and should be downloaded as an Excel file (XLSX)
- Printed or digital copies of the following pages of instructions to share with students.
- Optional: scrap paper and writing tool

#### Adaptations:

- Review the key terms before students complete Activity 2.3 to support comprehension.
- Review basic graph elements before completing Activity 2.3.
- If students are unfamiliar with Excel, you may wish to demonstrate how to create a graph.
- If students are familiar with Excel, you may opt not to distribute step by step instructions.
- Assign countries to avoid students selecting the same ones, and ensure that countries from all continents are selected to better represent global trends in Activity 2.4: Data Interpretation

## Activity 2.3: Data Visualization

### Introduction

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Our World in Data provides an **open access data set**: this means that anyone and everyone has access to the data they have used to create their tables and graphs. We will be using this data to graph Canada's CO2 emissions per capita over time compared to another country of your choosing. To do this, we will be using Microsoft Excel. Although you may be used to coding and using advanced software, Excel remains an essential tool for storing and analyzing data, and one that you will likely use in any post-secondary studies and the workplace.

### Key Terms

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- Open access data
- Production-based emissions
- Consumption-based emissions
- Land-use change

### Instructions

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1. Open the [Our World in Data CO2 and Greenhouse Gas Emissions Dataset](#) in Microsoft Excel.
2. Freeze the top row for easier viewing of data (View --> Freeze Panes --> Freeze First Row).
3. Take a moment to orient yourself to the data:
  - What information is provided in Row 1 of the spreadsheet? Tip: Use [the Our World In Data Key](#) to find a full description of the data in each column of Row 1.
  - What information is provided in Column 1?

### Learning Check:

Using the Data Key, determine the meaning of the data in the following columns:

Column AO: ghg\_per\_capita

What unit is this measured in?

Column AE: cumulative\_luc\_co2

What unit is this measured in?



## Activity 2.3: Data Visualization

4. Prepare for graphing:

- Highlight the data sets you will be graphing: Column B (Year) and column Q (CO2 per capita).
- Choose the countries you will graph: Canada and \_\_\_\_\_
- Choose the earliest common date for the data in your graph. For example, the dataset for Canada begins in 1785 but the dataset for Brazil begins in 1850. In this case, you would begin your graph in 1850, the earliest common date.

### Learning Check:

What type of graph would work best for showing CO2 emissions per capita over time (bar graph, line graph, scatter plot, pie chart) and why?

What is the independent variable (x-axis)?

What is the dependent variable (y-axis)?

What date range will you use? Your countries' emissions must be graphed for the same date range in order to be comparable!

5. Graphing emissions over time:

- Select the emissions data for Canada, from the earliest common date to 2021: Column Q, Rows 7789 (if 1850 is the earliest common date) to 7961
- Along the navigation bar, select "Insert". Select the appropriate Graph/Chart type (Tip: It should be a line graph!).
- A graph will appear with Canada's emission data since 1850, but there is still lots of information missing!

## Activity 2.3: Data Visualization

- Select “Chart Design” along the top navigation bar. Click “Select Data”.
  - Under “Legend Entries” click “Edit” to rename the first dataset to “Canada”.
  - Under “Legend Entries” click “Add” to add the dataset for the country you selected (not Canada). Name the dataset under “Series Name” and select the country’s emissions data from the earliest common date to 2021 under “Series Value”. Under Horizontal Axis Label, click “Edit” and select the appropriate date range.
6. Under “Chart Design”, now select “Add Chart Element”. Remember to add:
    - Graph title
    - Axis titles; Double check the units on the y-axis using the Use the Our World In Data Key
    - Legend
  7. Your graph is good to go! Copy and paste the graph into a Microsoft Word document or Sheet 2 of the Excel document and save.

### Learning Check:

Describe the relationship between CO2 emissions per capita and time:

As \_\_\_\_\_ (increases/decreases/stays the same) \_\_\_\_\_ (increases/decreases/stays the same).

Compare the CO2 emissions per capita in Canada to the other country selected.

What might explain the similarities or differences between the two countries?

## Activity 2.4: Data Interpretation

### Educator Overview

<b>Summary:</b>	Students will collectively draw conclusions about climate change trends based on the data they have explored through their own graph making and the Our World in Data Scavenger Hunt.
<b>Delivery Method:</b>	In-class, full-class activity.
<b>Materials:</b>	<ul style="list-style-type: none"><li>• A place to record student ideas: Miro or Mural Boards, chart paper or a chalk board may be used</li><li>• Each student has access to their answers from Activity 2.2 and their graph from Activity 2.3</li></ul>
<b>Adaptations:</b>	If students feel more comfortable reflecting and sharing in small groups, you may break the class up into smaller groups and then have each group share back their findings. Questions 2A-2D are best completed as a whole class, however.

## Activity 2.4: Data Interpretation

### Introduction

---

In Activity 2.2: Our World in Data Scavenger Hunt, we did a deep dive into the Our World in Data Climate Change section, and explored different graphs to represent this data, from pie charts to line graphs. Through this exploration, we examined greenhouse gas emissions and more specifically CO<sub>2</sub> emissions data from as early as 1751 until present day, on a global scale but also divided by region and country. In Activity 2.3: Data Visualization, we created our own graphs to compare Canada's CO<sub>2</sub> emissions per capita over time, to those of another country in the world. Through these exercises, you hopefully learned a lot about the world and its climate history over the last 250 years. However, it can be easy to get bogged down in the details – the numbers, the per-capita vs. country-wide data, cumulative vs. per year. In Activity 2.4: Data Interpretation, we will try to see “the forest through the trees”; this means, we will identify **large scale** climate trends. We will end this activity by thinking about the value but also the limitations of data.

### Key Terms

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- Industrialization
- Wealth
- Inequality
- Zero emissions targets

### Instructions

---

Let's use the following questions to guide a group brainstorm and bring all our ideas and insights gained through this activity together! Remember, many of these are challenging questions. World leaders struggle with them and often disagree. You may not have all the answers and that's okay. You may even have more questions, and that's great too!

- 1. Understanding the Evidence at a Global Scale:** The data presented through Our World in Data provides a lot of evidence for climate change.
  - If we look at atmospheric CO<sub>2</sub> concentrations over the course of earth's history, what do we notice about the last 200 years?
  - Think of some of the key graphs we explored, for example average temperature over time, ice sheet cover over time, atmospheric CO<sub>2</sub> concentrations over time. What is the shape of these graphs? Describe the relationship between the variables.
  - Together, how does this evidence support the existence of human-caused climate change?
  - What event in history gave rise to the climate change we are facing today? Hint: It was mentioned in the Our World in Data Climate Change section.

## Activity 2.4: Data Interpretation

### 2. Global Emissions Trends: Poll

Raise your hand if in the graph you made in Activity 2.3:

- a) The country you compared to Canada had lower CO<sub>2</sub> emissions per capita throughout the whole graphed time-period?
  - Which country did you graph?
  - What common history and/or characteristics might the countries that fall in this category share?
- b) The country you compared to Canada had higher CO<sub>2</sub> emissions per capita throughout the whole graphed time-period?
  - Which country did you graph?
  - What common history and/or characteristics might the countries that fall in this category share?
- c) The country you compared to Canada began with lower CO<sub>2</sub> emissions per capita than Canada, but surpassed Canada at a certain point?
  - Which country did you graph?
  - What common history and/or characteristics might the countries that fall in this category share?
- d) The country you compared to Canada began with higher CO<sub>2</sub> emissions per capita than Canada, but Canada surpassed in in terms of CO<sub>2</sub> emissions per capita at a certain point?
  - Which country did you graph?
  - What common history and/or characteristics might the countries that fall in this category share?

### 3. Global Emissions Trends: Reflection

- Considering the results of your poll, what has traditionally been the relationship between a country's wealth and their level of emissions? Their level of industrialization and level of emissions?
- Extension: How do you think colonialism contributed to these trends?
- Do you think it is possible for a country to be wealthy and have low or zero emissions? If so, what changes might be needed for this to happen?
- Looking at cumulative emissions shows us which countries and regions have contributed the most to global CO<sub>2</sub> emissions and therefore climate change over time. Do countries that have emitted a lot throughout history have a bigger responsibility to fight climate change than those who have emitted very little?

## Activity 2.4: Data Interpretation

- 4. Climate Action:** We've noticed all these trends, but now let's think about how we can use this data to help fight climate change. How can this data be used to inspire and sustain climate action?
- 5. Limitations:** We have identified some key global trends that help us understand the relationship between countries' wealth, history, and emission levels and that can help us hold governments accountable for reducing their emissions. This is hugely important in the fight against climate change. However, as powerful as data is, what is missing from it? Who is missing from it?

Data shows us overall trends, but we don't see the stories of individual people. For example, the data tells us that sea level is rising, but what does this mean for the lives of coastal communities around the world? In Module 3: Our Climate Story – Peer Interviews, we will continue our journey from Module 1: My Climate Story of uncovering what climate change means to people – how it impacts their lives and what they see as viable solutions.

## Module 3:

# OUR CLIMATE STORY – PEER INTERVIEWS

### Description

Through Module 1: My Climate Story, you had the chance to explore the topic of climate change and reflect on how you see and experience it.

As humans, however, we see, understand, and experience the world in many different ways. These differences are the result of intersecting and diverse **identities** and **lived experiences**. Therefore, your thoughts and experiences around climate change may not be universal.

Conducting an interview is a great way to collect information regarding other’s lived experiences in order to more deeply understand an issue and to approach solutions in a way that is **empathetic** and **informed**. When thinking about an issue as complicated as climate change, it is important to consider how individuals might experience its impacts and potential solutions differently.

In this module, we will be developing and conducting interviews to understand just that – how our classmates experience climate change and think about its solutions. In addition to better understanding the experiences and perspectives of the people around us on a very important issue, we will also develop interview skills that you will be able to apply in your post-secondary studies or future jobs.

### Learning Goals

Students will:

- Develop, conduct and analyze semi-structured interviews with peers
  - o Utilize effective communication
  - o Accurately record responses
  - o Identify trends across interview responses
- Understand how individuals can perceive and experience climate change in different ways

### Duration

Activity 1: 30 minutes

Activity 2: 30 minutes

Activity 3: 1.5 hours

Activity 4: 1.5 hours

Activity 5: 30 minutes

**Total: 4.5 hours**

### Topics

English

Media studies

Journalism

Qualitative Methods

## Activity 3.1: Understanding Interviews

### Educator Overview

<b>Summary:</b>	Students will reflect on the practice of interviewing before jumping into creating, conducting, and analyzing interviews
<b>Delivery Method:</b>	In-class, full-class activity.
<b>Materials:</b>	A place to record student ideas: Miro or Mural Boards, chart paper or a chalk board may be used
<b>Adaptations:</b>	N/A



# Activity 3.1: Understanding Interviews

## Introduction

---

This section consists of a group brainstorm to draw on our existing knowledge around interviews and to frame the practice of interviewing before jumping into creating, conducting and analyzing interviews.

## Key Terms

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- Structured interview
- Unstructured interview
- Semi-structured interview

## Instructions

---

The following questions can guide this brainstorm. Try to draw on personal experiences, and what you have learned through media and at school to answer these questions.

- In what contexts do we use interviews? Where are interviews used as a tool for collecting information?
- What are the advantages of using interviews for gathering information?
- What are the limitations of using interviews for gathering information?
- Compare the key interview styles. What are the advantages and limitations of each? In what situations might each style be appropriate?

Semi-structured interviews allow for both flexibility and structure, comparability across interviewees and unique insights – it offers the “best of both worlds” in combining structured and unstructured interview styles. In Activity 3.2: How-to Interview of this activity, we will prepare to conduct a semi-structured interview.

### There are three key interview styles:

- **Structured:** Questions are prepared in advance and stuck to, like a script; all interviewees are asked the same questions
- **Unstructured:** Questions are not prepared in advance; spontaneous questions and conversation, so interviewees are asked different questions
- **Semi-structured:** Some questions prepared in advance; some questions arise spontaneously

## Activity 3.2: How-to Interview

### Educator Overview

<b>Summary:</b>	Students will review the steps needed to conduct an interview, following a semi-structured interview format.
<b>Delivery Method:</b>	In-class, full-class activity.
<b>Materials:</b>	Printed or digital copies of the following page to share with students.
<b>Adaptations:</b>	N/A

### Introduction

---

Now that we have thought a little bit about the purpose of interviews and have identified semi-structured interviews as an effective format for interviewing, let's go through the main steps and some tips for interviewing. You can review these as many times as you need to before your peer interview and have a copy handy during that interview!

### Key Terms

---

- Interviewer: The person who leads the interview and asks questions
- Interviewee: The person who shares their feelings and experiences in response to the questions
- Notetaker: The person who documents the interviewee's answers for later analysis
- Bias

### Instructions

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#### 1. Create the Interview Guide

Creating an interview guide is essential to a smooth interview. It is the pre-interview work that you do to prepare, including determining key topics and questions you will ask. Since this is a semi-structured interview, remember that this is an interview guide and not a script. We will dive into the creation of the Interview Guide in Activity 3.3: Interview Guide Preparation.

## Activity 3.2: How-to Interview

### 2. Begin the Interview

Welcome the interviewee. Introduce yourself, the topic(s) the interview will cover and the purpose of the interview. Provide the interviewee with a chance to introduce themselves.

### 3. Review Housekeeping Items

Let the interviewee know that you (or your note-taker) will be taking notes throughout the interview. Be clear about how the interview answers will be used; in this case, they will be shared within your classroom. For future interviews you do, such as in post-secondary education or a future job, you may be conducting the interview for research purposes. In cases like those it is especially important to be clear about how the information the interviewee provides will be used, and if their name will be associated with it.

### 4. Ask the Interview Questions:

- Begin with the easiest questions from your guide and then go deeper as the interview progresses.
- Remember that it is just that, a guide! If the interviewee happens to begin discussing a topic from question 5 in their first answer, you can skip right to question 5, and return to questions 2-4 afterwards. If another question comes to mind during the interview, feel free to throw that in!
- Practice active listening: nod, make eye contact with the interviewee and show enthusiasm.
- Restate the points they make to ensure you understand.
- Ask clarifying questions where needed.
- Keep an open mind: You may not agree with everything the interviewee says, but that is the point of interviewing! You are learning from the way that others see and experience the world, and it is okay if they have a different outlook than you do.

### 5. Close the Interview

Thank the interviewee for their time and for being open to sharing their insights. Clearly outline any next steps.

### 6. Following the Interview

As soon as the interview is over, work with the notetaker to clean up the interview notes. This ensures that you have a chance to clarify or fill in any gaps in your notes while the conversation is still fresh in your mind.

#### Reflection:

How can you create a welcoming environment for the interviewee, where they feel open to sharing their thoughts and personal experiences?

#### Reflection:

Consider some of the biases you might hold – we all have them! How can we overcome these when writing interview questions in Activity 3.3: Prepare an Interview Guide and conducting the interview?

## Activity 3.3: Prepare an Interview Guide

### Educator Overview

<b>Summary:</b>	Students will create an interview guide.
<b>Delivery Method:</b>	Individual; in-class or as homework.
<b>Materials:</b>	<ul style="list-style-type: none"><li>• Student notebooks and pens or pencils for creating the Interview Guide, or</li><li>• A computer with Microsoft Word for each student</li></ul>
<b>Adaptations:</b>	N/A

### Introduction

---

An interview guide is the work you do prior to conducting an interview, in order to prepare the questions you will ask the interviewee. Believe it or not, it can sometimes be tricky to come up with good questions. In Activity 3.3: Prepare an Interview Guide, we will review some helpful tips for creating interview questions and create an interview guide that will be fundamental to Activity 3.4: Peer Interviews.

### Key Terms

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- Closed-ended question
- Open-ended question
- Leading question

### Instructions

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1. Set a goal for your interview. What is the purpose of this interview? What are you hoping to take away from it? For this interview, there is a pre-set goal.
2. Make a list of key topics that you want to address in your interview. Keep in mind your goal!
3. Write a question (or multiple) associated with each key topic. When writing questions, follow these tips. Ensure you have at least 10 solid questions.

**Our goal is to:** Understand our peers' perspectives on and experiences with climate change and climate solutions.

## Activity 3.3: Prepare an Interview Guide

- Begin with an easy question: The first question is intended to get the interviewee to “warm-up” and make them feel comfortable. Gradually work your way towards more difficult questions.
- Ensure questions are open-ended: Open-ended questions are written in a way that allows the interviewee to explain their answer. These cannot be answered with a simple yes/no answer or with one word. Open ended questions allow you to gain insight into the interviewees’ thinking.  
*Option:* If you want to include a closed-ended question (a question with a yes/no answer), be sure to follow up with an open-ended question, to allow the interviewee to elaborate. For example, you could begin with “Do you believe climate change is a pressing issue?” (closed-ended question) and follow up with “Why?” (open-ended question).
- Avoid leading questions: Leading questions are written in a way that guide the interviewee towards a specific answer, often to confirm something that the interviewer is trying to prove. For example, the question, “Why is solar energy the best form of renewable energy?” is written in a way that directs the interviewee towards a desired answer (i.e., solar energy is the best because of XYZ). Instead, you can ask the interviewee: “Can you please compare the advantages and disadvantages of solar energy to those of other renewable energies?”
- Ensure questions are simple and clear: Do not include questions with multiple parts; this can make it difficult for the interviewee to follow and remember. Instead, remember that you can always ask the interviewee to expand on specific parts of their answer or ask additional questions for clarification.
- Bold, star or highlight the most important questions: If you are running low on time, you can skip to those questions!

4. Review these questions using the checklist.

5. Once you have 10 questions that meet the checklist criteria, you’re good to go!

### Checklist: This question is...

Clear – only 1 question asked

Open-ended

Not a leading question

## Activity 3.4: Peer Interviews

### Educator Overview

- Summary:** Students will interview their peers on the topic of climate change.
- Delivery Method:** Groups of 3 students (rotating roles of interviewer, interviewee and notetaker); during class-time.
- Materials:**
- A printed or digital interview guide, created in Activity 3.3
  - A notebook and pen or pencil for taking notes
- Adaptations:**
- The interview rotations may be conducted multiple times, with new groups of three formed each time, to allow students more opportunities to practice their interview skills and to collect further data
  - Peer Interviews may also be conducted with other members of the school community for a greater variety of perspectives (students from other classes, teachers, administration)

## Activity 3.4: Peer Interviews

### Introduction

---

It's time to put your interview skills and interview guide to use! In this Activity, you will have a chance to interview your classmates, in order to better understand their climate stories.

### Key Terms

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N/A

### Instructions

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1. In your group of three, assign roles to each member for the first round of interviews. Remember, the roles will be rotating so you'll get a chance to do all 3. The 3 roles to assign are:
  - **Interviewer:** The group member who leads the interview and asks questions.
  - **Interviewee:** The group member who shares their feelings and experiences in response to the questions.
  - **Notetaker:** The group member who documents the interviewee's answers for later analysis.
2. Once group roles have been decided, the interview can begin! You will have 20 minutes for each rotation.
3. After the first rotation, allow 5-10 minutes for the interviewer and the notetaker to review and clean up their notes, and to jot down any overall observations or themes that emerged during the interview.
4. Repeat twice, so that each group member has a chance to take on each role. This may take place over multiple classes if needed.
5. Store your notes in a safe place and prepare to analyze them in Activity 3.5: Interview Analysis.

## Activity 3.5: Interview Analysis

### Educator Overview

<b>Summary:</b>	Students will seek to understand and summarize the results of their interviews and share with their peers.
<b>Delivery Method:</b>	<ul style="list-style-type: none"><li>• Individual; in-class or as homework</li><li>• In-class, full-class activity</li></ul>
<b>Materials:</b>	<ul style="list-style-type: none"><li>• Notes from interviews</li><li>• Highlighters, pens</li><li>• A place to record student ideas: Miro or Mural Boards or chart paper with sticky notes (2 colours) and markers</li></ul>
<b>Adaptations:</b>	N/A

### Introduction

---

Now that we have conducted interviews with a peer, it is time to analyze the results! We will dive into the information we've gathered and try to understand and summarize it. We will also reflect on how the insights obtained are similar and/or different from our own thinking around climate change.

### Key Terms

---

- Cluster Mapping
- Summarizing

### Instructions

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Use the following procedure to first analyze individual interview responses and then to come together as a class and do a group analysis.

#### Individual Analysis:

1. Review the interview notes taken by your note-taker in Activity 3.4. Consult with them if you are having difficulty understanding what they have written at any point.



## Activity 3.5: Interview Analysis

2. As you review the notes, record the following:
  - What was the most surprising or interesting finding from your peer interview?
  - Where did the interviewee's thoughts or experiences differ from your own?
  - Where were the interviewee's thoughts or experiences similar to your own?
  - What key themes or takeaways emerge? Provide a few examples from the interview that connect with this theme or takeaway.

### **Class-wide Analysis: Cluster Mapping**

As a class, it's time to bring everyone's interview findings together, to get an overall picture of how you understand and experience climate change!

1. Record your themes or key takeaways from the Individual Analysis on sticky notes, whether a virtual sticky note in Miro/Mural or a real sticky note! Let's call these sub-themes.
2. Once everyone's sub-themes are posted on the board, take a moment to read through the stickies.
3. As a class, observe: Do you notice any higher-level themes or overall takeaways? If so, record these on a different coloured sticky.
4. Place the high-level themes/overall takeaways on the board. Cluster the sub-themes around these.
5. As a class, discuss:
  - How many key themes emerged?
  - Are there some sub-themes that don't fit into a higher-level theme? Reminder: That is totally okay! We all have unique opinions and experiences, and all are valid.
  - What do these findings tell us about the perceptions and experiences of the class as a whole with climate change?
  - Predict: How might these findings differ for a different class at your school? Students at a different school in your town or city? Students in a different country?
  - Any other observations?

### **Extended reflection:**

- How can we use interviews as a tool to better understand and solve global issues like climate change?
- How can listening to others' ideas and perspectives make us better leaders?

# Module 4:

# SOLUTIONS MAPPING

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## Description

Climate change can often feel overwhelming due to the sheer scale of the issue and the short timeframe required for drastic action. This can sometimes make us feel apathetic or hopeless in the face of climate change. When it feels like small individual actions or sweeping international measures are the only possible solutions, it can be difficult to engage with the topic without cynicism for the former and disconnect with the latter. This module aims to combat this sense of powerlessness by highlighting the possibility of local and **community-level climate change solutions**.

In this module, we will have the chance to get out and explore examples of climate solutions in our community. If you look around, you will find plenty of interesting and inspiring examples!

We will begin in Activity 4.1: Identifying Climate Resilient Spaces and Features by understanding what climate adaptation, mitigation, and multisolving mean and by mapping out the examples of climate resilient spaces and features that you might already be aware of in your community. In Activity 4.2: Field Investigation, we will investigate a chosen example of climate resilience through a site-visit. In the final section, Activity 4.3: Community Resilience Tour, we will synthesize our learnings and investigations using Google – My Maps and Google Slides, creating a climate resilience tour that can be shared with others to showcase these community-level solutions.

## Learning Goals

Students will:

- Investigate natural or human-made climate resilient features and spaces in their community
- Use digital tools to map and document examples of climate resilience

## Duration

Activity 1: 1 hour

Activity 2: 2-3 hours

Activity 3: 2 hours

Total: 5-6 hours

## Topics

Geography

World Issues

Technology

Cartography

Environment

## Activity 4.1: Identifying Climate Resilient Spaces and Features

### Educator Overview

- Summary:** Students will explore the concepts of climate change adaptation, mitigation and multisolving, and then identify natural or human-made features in their surrounding community that showcase these concepts.
- Delivery Method:**
- Full class; in-class (brainstorm).
  - Groups of up to 5 students, each assigned to one of the four multisolving examples – more than one group may be assigned to the same example; in class.
- Materials:**
- Blackboard or whiteboard, chalk or markers.
  - A computer with internet access for each student and access to a Google account.
  - Google My Maps Hyperlink: In preparation for the activity, open Google – My Maps. Click “Get Started” and then “Create a New Map”. To share, click on the “Share” button to add a title and description to the map before creating a link to share with students. Change the role from “Viewer” to “Editor” to anyone who has access to the link.  
You may demarcate the boundaries of your community using the “Line” tool. (i.e., 10km radius from the school)
  - Additional support for the multisolving FLOWER activity can be found [here](#).
- Adaptations:** N/A

# Activity 4.1: Identifying Climate Resilient Spaces and Features

## Introduction

---

Is the community you live in climate resilient? This is a great chance to see if our spaces are prepared for the growing challenges brought to us by climate change. Tap into your existing knowledge and experience to map out what features and spaces in your community are already adapting to or mitigating climate change.

## Key Terms

---

- Adaptation
- Mitigation
- Resilience
- Multisolving

## Instructions

---

### Class Brainstorm: Adaptation, Mitigation and Multisolving

Let's start by exploring some key terms as a class. This will help set us up to explore community-level climate solutions.

**Adaptation** addresses the effects of climate change. For example, an effect of climate change is more frequent extreme weather. An effort to address that might be to open more cooling centres or splash pads (human-made), or to plant more trees to increase shade canopies to reduce the heat island effect (natural).

**Mitigation** addresses the causes of climate change. For example, one cause is the burning of fossil fuels for our transportation needs. An effort to mitigate this might be to build e-charging stations (human-made) for electric vehicles to encourage switching over to a less carbon-intensive vehicle. Our food production and distribution systems produce a lot of carbon emissions. Growing and sourcing produce locally by creating community gardens (natural) would be an example of mitigation.

- What are some examples of adaptation and of mitigation that you have seen or heard of?
- Begin by thinking globally, then bring it in to the national level, and finally to the local level. What examples of adaptation and mitigation exist in your community?
- Why are both adaptation and mitigation needed?

**Multisolving** is when a project addresses many different issues or concerns through one solution. For example, creating a biking program which allows student to travel to and from school addresses concerns around student health and physical activity, reduces traffic congestion, reduces greenhouse gas emissions, and reliance on cars for pick-up and drop-off and improves the sense of safety and community in the neighbourhood.

## Activity 4.1: Identifying Climate Resilient Spaces and Features

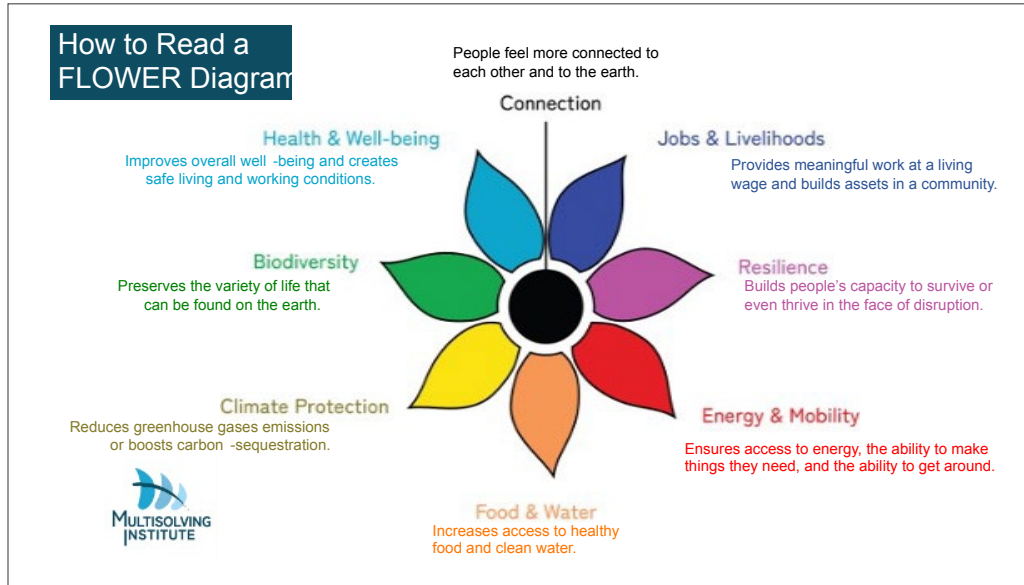
Let's look at some examples to better understand multisolving.

### Multisolving Exploration:

1. Split into 4 or more groups: Each group should be assigned one multisolving example; more than one group may explore the same example if the class is large.
  - a) Sherbourne Common
  - b) Corktown Common
  - c) The Meadoway
  - d) Irma Coulson P.S.
2. Once you are in your groups, use tablets or computers with internet access to learn about your assigned multisolving example.
  - a) [Sherbourne Common](#) – public art piece that doubles as water treatment facility to help stormwater management
  - b) [Corktown Common](#) – raised berms for recreation (sledding, physical activities), and redirecting and mitigating flood damage
  - c) [The Meadoway](#) – hydro corridors being used for community gardens, pollinator gardens, wildlife highways and habitats, and bike paths
  - d) [Irma Coulson P.S.](#) – redesigned school grounds to help stormwater management, reduce heat island effect and create an engaging public space
3. With your assigned multisolving example, let's use the FLOWER (Framework for Long-term Whole-system Equity-based Reflection) created by the [Multisolving Institute](#). This is a tool designed to analyze policies to determine if they provide co-benefits, but it can also be applied to local climate solutions. Using this framework, consider how your assigned example generates benefits indicated in each of the flower's petals. Ask yourself, how does this climate intervention contribute to health and well-being, jobs and livelihoods, biodiversity etc.?

# Activity 4.1: Identifying Climate Resilient Spaces and Features

4. Share your findings with the rest of your class.



## Identifying Climate Resilience in Our Community:

Now that we have looked at examples of features or spaces that contribute to climate adaptation and mitigation and have understood how co-benefits can be provided through one intervention, let's focus a little bit more on your community. You may already know examples of climate adaptation and mitigation within your community; in other cases, it might require a little bit of research! Remember to put your multisolving hat on and consider how elements of your community may not have been intended to act as climate solutions, but how perhaps they provide these benefits, among others!

1. Access the Google – My Maps link provided by your teacher on your device. Zoom into the desired geographic parameters for this activity; the area demarcated by your teacher on the map.
2. Identify different natural or human-made features/spaces in your community that contribute to climate adaptation and mitigation. Plot them on the map using the ["Add Marker" tool](#). Remember, this might require a little bit of research – not all features will be visible on the general overview of Google Maps. **Try to add at least 10 markers to the map!**
3. Once you have all the points you can think of on your map, reflect:
  - What surprised you?
  - Where do you see room for improvement in your community?
  - Were there certain features in your community that could be replicated elsewhere for more widespread benefits?

Consider marking trails, forested areas, retention basins, green roofs, pollinator gardens, bike paths, community kitchens diverting food waste, electric charging stations for vehicles, LEED certified buildings, etc.

## Activity 4.2: Field Investigation

### Educator Overview

- Summary:** Students will visit one of the natural or human-made features/spaces identified in Activity 4.1 and document their experience.
- Delivery Method:**
- Can be done in pairs, or groups; can be done during class time or outside of school hours.
  - Note: Please ensure you have the appropriate permissions in place for your school and schoolboard as this activity takes place off school grounds.
- Materials:**
- Paper and pencil to document observations and responses to the journal prompts.
  - Camera or phone with camera to photograph their field investigation.
- Adaptations:** N/A

## Activity 4.2: Field Investigation

### Introduction

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You have to see it to believe it! Now's your chance to go explore in-person the different features or spaces you've highlighted in your community. Go with a partner or group to investigate the multisolving climate change marvels in your neighbourhood.

### Key Terms

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- Multisolving
- LEED Certification
- Replicability

### Instructions

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1. In pairs or groups, choose one of the features or spaces that you identified in Activity 4.1: Identifying Climate Resilient Spaces and Features that you would like to visit and document further in person.
2. Plan your field investigation with your partner or group members. When will it take place? How will you get there? What will each member bring for documentation purposes?
3. When you arrive at your chosen feature or space, first spend some time exploring.
4. Record your visit by taking at least 3 photographs of the feature or space.
5. In the moment, record your impressions of the feature or space in a journal. In your journal entry, consider the following questions:
  - Describe it in detail: What is it? What does it look like? How big is it?
  - What was the intended purpose of this space/feature? What makes it climate adaptive or helps in mitigation?
  - Who or what created it?
  - Who or what is impacted by this?
  - Is this an example of multisolving? Which "petals" does it address?
  - Is this a replicable climate solution? What would be the impact of having more of these? Less of these?
  - If it is a building or other infrastructure, has it been recognized with any awards or certifications? For example, projects can earn [LEED Certification](#) by adhering to environmental criteria.



## Activity 4.3: Community Resilience Tour

### Educator Overview

- Summary:** Students will upload the information collected during Activity 4.2: Field Investigation to the collective Google - My Maps and create routes between different spaces and features to create a walking or biking tour for the school community.
- Delivery Method:**
- Can be done in pairs/groups, in class or at home (Step 1-2)
  - Split into two large teams (Team Bike and Team Walk - Step 3); can be done in classroom with tablets or computers
- Materials:**
- Access to a Google account and a computer with internet access
  - Journals and photographs from Activity 4.2: Field Investigation
- Adaptations:** N/A

## Activity 4.3: Community Resilience Tour

### Introduction

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This part of the activity is all about using digital tools to share what has been investigated in Activity 4.2! You will create a tour that links these places/features together. This tour can then be shared within your school community to help showcase the climate resilient features of your community. Google - My Maps can be used to create the tour: this is a simple tool and serves as a good introduction to mapping. You may wish to use Google Slides to complement Google - My Maps, providing a visual to go along with the tour. An excellent example of a tour from the London National Park City can be found [here](#). For an extra challenge, you may use ArcGIS/Story Maps to create this tour!

### Key Terms

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N/A

### Instructions

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1. Using the tools listed below, update the plotted markers from Activity 4.1 with the information collected during your Field Investigation.
  - Colour-code the marker based on if it is a natural or human-made feature/space
  - Add key information collected from Activity 4.2 into the description box for visited features/spaces
  - Upload photos of visited features/spaces
2. Take some time to familiarize yourself with all the markers on the map: review the descriptions and photos your peers have uploaded.
3. Say goodbye to your investigation partner or groups! Re-organize yourselves into four larger groups – Team Bike (2 groups) and Team Walk (2 groups).
  - Team Bike: You will create a biking tour.
  - Team Walk: You will create a walking tour.
4. In your respective teams, select your tour stops from the plotted markers on Google - My Maps.
  - Consider the story you want to tell through your tour. Where does the tour begin? Where does it end? What common threads can you weave through the tour stops? (Possible themes include stormwater management, combating extreme heat/cold, natural elements vs human-made elements, transportation, green buildings and infrastructure, etc.)
  - If you are on Team Bike: Be sure to take into account the existing bike routes in your community. How can you ensure a smooth transition between tour stops?

## Activity 4.3: Community Resilience Tour

- Consider the distance and terrain between tour stops. Take note of how many kilometers each route covers. Should this route be labelled easy, moderate, or hard based on how physically long and strenuous it is?
5. Create a Google Slide for each tour stop. You may add descriptions and photos. Even though you already have descriptions and pictures in the map itself, this will be an added visual element and an easier way for folks doing the tour to access information about each stop.
  6. Present and share the Google - My Maps and Google Slides links with your school community so they can participate in the tour. The links could be shared in a school newsletter or on your school website! In addition to the routes and guides that have been developed, in-person walking/ biking tours can be organized and led for members of the school community.

**Tip:** This is an ambitious project so flex those leadership and communication skills. Delegate roles and responsibilities within your Team to get this Solutions Mapping project across the finish line! The great thing about digital documentation is that you can continue updating and adding to it even after this activity.

### Using ArcGIS/StoryMaps:

For senior students, or students that are advanced in mapping and digital tools, Activity 4.3 can be done using ArcGIS and StoryMaps. For an example of an ArcGIS Story Map, click [here](#).

- Public accounts are free and have tools to create, store, and manage maps, scenes, layers, apps, and other geospatial content.
- ArcGIS StoryMaps offers a visually engaging format to present information.
- Once you create a public account, confirm via e-mail and log in.
- It would be helpful to carve out time to explore the Quick Links on the left side of the landing page: Explore Stories, Get Started, Latest News, Story Planning, Tutorials, Webinars, FAQ. This will help build familiarity around the tools and features of ArcGIS StoryMaps.
- Click on the New Story button and select the Guided Map Tour under the Quick Start options.
- Add maps that you create or ones that already exist in the database – under the Living Atlas tab, you can select filters like Region – Canada, and choose from different categories (i.e., basemap, people, infrastructure, environment, etc.)
- Build your story using text, images, and maps. When you are ready, publish and share!

## CONCLUSION

### **Thank you for joining us on this exploration of climate change impacts and solutions!**

To close out this journey, students may return to their answers from Activity 1.1 and see how their thinking may have changed through the activities. Students and educators alike can also take some time to reflect on the following questions:

- Which activity did you enjoy the most? Why?
- Which activity did you enjoy the least? Why?
- What was your biggest takeaway from the activities?
- What concept or tool would you like to explore further?
- Do you feel better equipped to approach and address climate change? Why or why not?

We would love to hear your responses to these questions and learn more about how you used the resource with your students. Please feel free to share this with us at [school@evergreen.ca](mailto:school@evergreen.ca) !

# ANSWER KEY

## Module 2, Activity 2

### CO<sub>2</sub> and Greenhouse Gas Emissions

- By how much has the global average temperature risen compared to the 1961-1990 baseline?  
1.1 degrees Celsius

### By Country: Canada

- How many tons of cumulative CO<sub>2</sub> emissions did Canada produced between 1751 and 2020?  
33.57 billion tons
- Around what year did cumulative CO<sub>2</sub> emissions begin to increase exponentially in Canada? ~1900

### Data Explorer

- Compare Bolivia and France. In 1980, what was the difference between the two countries in terms of country-wide production-based CO<sub>2</sub> emissions? 511.11 mt – 4.66 mt = 506.45 mt
- What about in 2021? 305.96 mt – 23.32 mt = 282.64 mt
- What could explain the change in emissions between the two countries between 1980 and 2021? Tip: Look at the shape of both country's emissions graphs. Possible answer: Increase in standard of living in Bolivia causing greater emissions. France slowly shifting towards renewable energy so their CO<sub>2</sub> emissions decline slightly.

### CO<sub>2</sub> Emissions

- Cumulatively, which continent has emitted the most CO<sub>2</sub> emissions since 1751? Europe
- In which year did the United States surpass the United Kingdom in terms of their annual share of global CO<sub>2</sub> emissions? ~1889
- Which continent emitted the most CO<sub>2</sub> emissions in 2017? Asia
- Which country was the biggest emitter in Africa in 2017? South Africa
- What percentage of global CO<sub>2</sub> emissions did this country produce in 2017? 1.3%

### CO<sub>2</sub> Emissions by Fuel Type

- Cumulatively, which type of fuel has contributed the most to global CO<sub>2</sub> emissions since 1751? Coal

### GHG Emissions

- What is the primary greenhouse gas driving global climate change? CO<sub>2</sub>
- Name 2 other greenhouse gases that are contributing to global climate change?  
Methane, nitrous oxide

### By Sector

- Globally, which sector produced the most greenhouse gas emissions in 2016? Energy
- Which sector accounts for the most methane emissions since 1990? Agriculture

## **Atmospheric Concentrations**

- Global, atmospheric CO<sub>2</sub> concentrations reached 408.53 parts per million (ppm) in 2018.
- Approximately how much higher are atmospheric CO<sub>2</sub> concentrations now than in the second highest peak since 803,720 BCE? Second highest peak was in 332,049 BC and reached around 280 ppm. Currently we have reached around 420 ppm, so we are 140 ppm higher than the second highest peak.
- How does the land act as a carbon sink? Carbon is sequestered in plants and in the soil, so that not all of the greenhouse gases that are emitted remain in the atmosphere and contribute to climate change. However, we are currently emitting much more than can be sequestered in sinks like the land and ocean.

## **Climate Impacts**

- Which metrics show a positive relationship with time (i.e. y-value increases as we move forward in time)? Temperature anomaly, sea surface temperature anomaly, ocean heat content, sea level rise
- Which metrics show a negative relationship with time? Ocean pH, arctic sea ice extent, mass balance of ice sheets



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