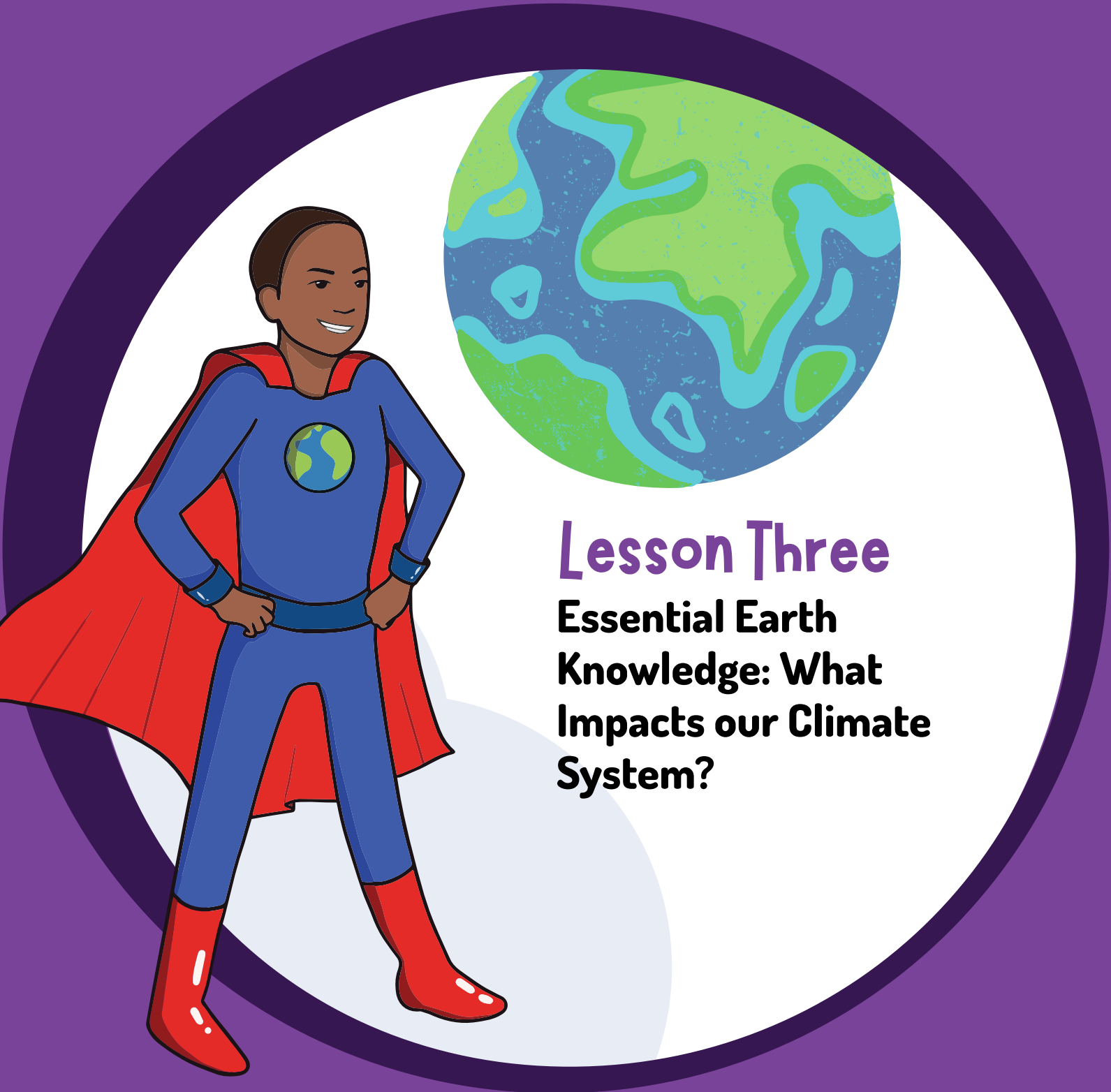




RUTGERS-NEW BRUNSWICK  
School of Environmental  
and Biological Sciences



# Lesson Three

## Essential Earth Knowledge: What Impacts our Climate System?



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## Lesson Overview

As a foundation for thinking about the relationship between food and climate change, students will develop a basic understanding of how human activity, through the greenhouse effect, is influencing the climate system. Lessons 2 and 3 ground students in an understanding of the greenhouse effect, components of the climate system, the origins of different greenhouse gasses, and how human activity, by adding greenhouse gasses to the atmosphere, is affecting the conditions for life on Planet Earth. The extended activity in this lesson enables students to begin connecting greenhouse gas emissions to food systems specifically. Lessons 4 and 5 will cover the topic of the food system in greater detail.

## Next Generation Science Standards

**5-ESS3-1:** Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.

**5-ESS2-1:** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

### Science and Engineering Practices

- Developing and using models
- Obtaining, Evaluating, and Communicating Information.

### Cross Cutting Concepts

Systems and system models

### Disciplinary Core Ideas

**ESS3.C:** Human Impacts on Earth Systems

**ESS2.A:** Earth Materials and Systems

## Driving Question(s)

- How can human activities, such as farming and eating, change the Earth's climate?
- What is being done to help? How can greenhouse gas emissions from food and farming be reduced to slow global warming?

## Observable phenomena

pg. 3 *Carbon What is Carbon? Where is Carbon Found?* from the Magazine Climate Change Phenomena.

[yumpu.com/en/document/read/62848717/climate-change-phenomena](http://yumpu.com/en/document/read/62848717/climate-change-phenomena).



*Purple italicized words are web links for more information.*



## Learning Objectives

Students will be able to:

- Identify three greenhouse gasses and their origins in human activity.
- Understand how increasing greenhouse gasses in the atmosphere changes conditions for life on Earth.
- Identify 2 activities that currently cause the emission of greenhouse gases.
- Describe 2 things that can reduce GHG emissions.

## Behavior Change Objectives

As a result of the lesson, students will:

- Discuss two new habits they will try out to reduce the amount of greenhouse gases created from their activities.
- Students will suggest specific ways that greenhouse gas emissions connected to food can be reduced.

## Keywords

**systems | components | interactions | greenhouse gasses | carbon dioxide atmospheres | methanes | energys | global warmings | climate system | fossil fuelss greenhouse effect**

## Sources used in the development of this lesson

- Baede, A.P.M., et al. 2001. “The climate system: An overview,” in Houghton, et al., eds., *Climate Change 2001: The Scientific Basis*, pp. 85-98. Intergovernmental Panel on Climate Change 2001. New York: University Press.  
*[ipcc.ch/site/assets/uploads/2018/03/TAR-01.pdf](http://ipcc.ch/site/assets/uploads/2018/03/TAR-01.pdf)*
- Environmental Protection Agency. 2022. “Greenhouse gas (GHG) emissions and removals.” *[epa.gov/ghgemissions](https://www.epa.gov/ghgemissions)*

## Before you Begin

- Review the Magazine article on Carbon.
- Review the eLearning game.
- Review the Climate Change Hero Challenge Class.
- Prepare to show slides to class.
- Make enough copies of handouts.

## Background Information

Review the background information for this lesson in the “Teacher’s Guide” including information on systems and the climate system.

*Purple italicized words are web links for more information.*



## Materials

- Presentation Slides and Worksheets.
- Computer/Chromebook/Technology
- How to be a Climate Change Hero Challenge Class and Student Point sheet.
- pg. 3 Carbon *What is Carbon? Where is Carbon Found?* from the Magazine Climate Change Phenomena. [yumpu.com/en/document/read/62848717/climate-change-phenomena](https://www.yumpu.com/en/document/read/62848717/climate-change-phenomena)
- Large Blank Poster Paper
- Markers/Crayons/Color Pencils

## Lesson

**1st** To recap what students have learned so far, play the video and have students fill out the video guide individually or together.

### 2nd Phenomenon Carbon

1. Have students read *Carbon What is Carbon? Where is Carbon Found?* from the Magazine Climate Change Phenomena (pg. 3).  
[yumpu.com/en/document/read/62848717/climate-change-phenomena](https://www.yumpu.com/en/document/read/62848717/climate-change-phenomena)
2. Once students have read the article then do a whole class reading of the article, pose these questions to the students:
  - A. What are the 4 spheres mentioned in the article? Why is Carbon important to the greenhouse effect? What is one natural example of Carbon interacting in one of the spheres?

### 3rd eLearning Game

1. Being mindful of time, have students play the eLearning game in pairs or as a class. Ensure that students understand the 4 spheres shown in the game and the different directions of the carbon molecules. Students can also be instructed to play this game again at home.

### Model of the Climate System

1. Show students the climate system slide asking them to think about where could you find the greenhouse gases? What systems are part of this image? What could you add to represent the food system influence on greenhouse gases? The next task will be for the students to create a model of what we have been learning over the past couple of lessons.
2. Have students partner up or break them up into groups. Give each group a large piece of blank paper and coloring tools. Have students create a model of 3 food system activities in an environment (such as food factories, farmers using tractors to tend to their farm, people planting a vegetable garden, etc.) then have them label where these activities may impact one or more of the Earth systems (Geosphere, biosphere, hydrosphere, and atmosphere; Teacher should remind students what these vocab words mean). Can include labels for the gases being released as well.



(continued)

3. Last, using the worksheet, write a **Claim, Evidence, Reason (CER)** on how these activities are either increasing/adding or decreasing/reducing greenhouse gases in the atmosphere.

## Exit Ticket

1. Teacher passes out Exit Ticket.
2. The teacher collects exit tickets and reviews student answers. Make minor adjustments to the next lesson based on data received.



## Additional Activity: Climate Change Hero Challenge and Student Point Sheet

1. Explain the How to be a Climate Change Hero Challenge and Student Point Sheet to students and show them that they can earn points on the sheet for playing the eLearning Activities.
2. Time permitting, explain that classes in the school (as applicable) will be trying to reduce their greenhouse gases and the class with the greatest Climate Conscientious Behavior Change (behaviors and actions that reduce greenhouse gases) during this unit will get to put the Climate Change Hero banner on their classroom door. **(Adjust price or acknowledgement for your school.)** Explain that as the program continues, they will learn about new ways to reduce their greenhouse gas impact that they can try each week. They can also think of their own ways to reduce emissions and add them to the list. They should keep track of their points on the Challenge Handout.

## Lesson Extension & Extra Resources

- Meet the Greenhouse Gases! NASA Climate Kids [climatekids.nasa.gov/greenhouse-cards](https://climatekids.nasa.gov/greenhouse-cards)
  - 6 cards hand out to students one per student to read over and better understand their gas – share out as class after learning about their gas (can also do a student sheet to fill in information or have them use computer and look at them online).
- Teacher may also decide to assign a Kahoot for students to share what they are doing at home. Students take 5 minutes in small groups to talk about which Greenhouse Gas Reducing behaviors they might try. They are encouraged to get their families involved – put the Challenge Point Sheet on the Fridge at home.
- Climate Change Phenomena e-Magazine has articles that can help with Food Waste and Greenhouse Effect. [yumpu.com/en/document/read/62848717/climate-change-phenomena](https://yumpu.com/en/document/read/62848717/climate-change-phenomena) and [agclassroom.org/matrix/resource/1014](https://agclassroom.org/matrix/resource/1014)
- The Carbon Cycle Game. [climatechangelive.org/img/fck/file/carbon\\_cycle\\_game.pdf](https://climatechangelive.org/img/fck/file/carbon_cycle_game.pdf)