

# Ecological Economics & Climate Policy



Explore the relationships  
between economics,  
policy, and climate  
change.

# Climate Policy and Economics Lesson

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## Lesson 1 Overview

### Estimated Time

180 minutes (four 45-minute periods)

### Standards Covered

**NGSS:** HS-ESS3-1

**CTE:** A2.3, A2.4, A2.5, A2.6, B1.7, A12.0, A12.1, A12.2, A12.3

**CCSS:** ELA-Literacy.RI.9-10.4, ELA-Literacy.SL.9-10.1.a, ELA-Literacy.L.9-10.6, ELA- RI.11-12.7, ELA- Literacy.RST.9-10.9, ELA-Speaking and Listening Standards .9-12.1, ELA- Literacy.SL.1a., ELA-Literacy.RST.1c., ELA- Literacy.RST.2., ELA-Literacy.RST.4., ELA-Writing Standards for Literacy in History/Social Studies, Science and Technical Subjects-10.

**CA Economics Standards:** 12.1.4, 12.2.1, 12.2.2, 12.2.4, 12.2.8, 12.3.1, 12.3.3

### Objectives:

- Students will be able to:
- Apply principles of economics, including the concept of externalities, to real-world environmental issues
  - Understand the relationship between policy and economics
  - Develop skills and strategies for civic engagement on climate change and other current issues

### Prep Time

- 1 hour

### Materials

- AV equipment to show videos
- PowerPoint presentation and projector
- Internet access

## Lesson 1: Ecological Economics & Climate Policy

In this lesson, students will explore the relationships between economics, policy, and climate change. They will apply fundamental economic principles to current environmental issues, consider current strategies for managing natural resources, and have a roundtable discussion on the pros and cons of various policy strategies related to climate change.

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### KEY WORDS

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**Dividend:** A sum of money paid on a regular basis to customers or citizens

**Externality:** A consequence, either positive or negative, of a product or service that impacts a third party but is not reflected in the product or service's cost

**Greenhouse Effect:** The warming effect caused by greenhouse gases (GHGs) trapping infrared radiation in the atmosphere. The naturally occurring Greenhouse Effect is vital to maintaining a hospitable climate for life on Earth, but increasing concentrations of GHGs in the atmosphere resulting from human activity are intensifying the Greenhouse Effect, leading to rapidly rising global temperatures

**Tragedy of the Commons:** When a common resource is destroyed or depleted because there is no individual cost or accountability for maintaining responsible levels of resource use. The individual benefits from over-use in the short term, but the collective bears the cost of the destruction of a shared resource in the long term

**Regressive Tax:** Taxes that take a proportionately greater amount from lower income people

**Microeconomics:** A branch of economics that studies individual behavior, actions and/or choices as they affect resource allocation and other changes in conditions.

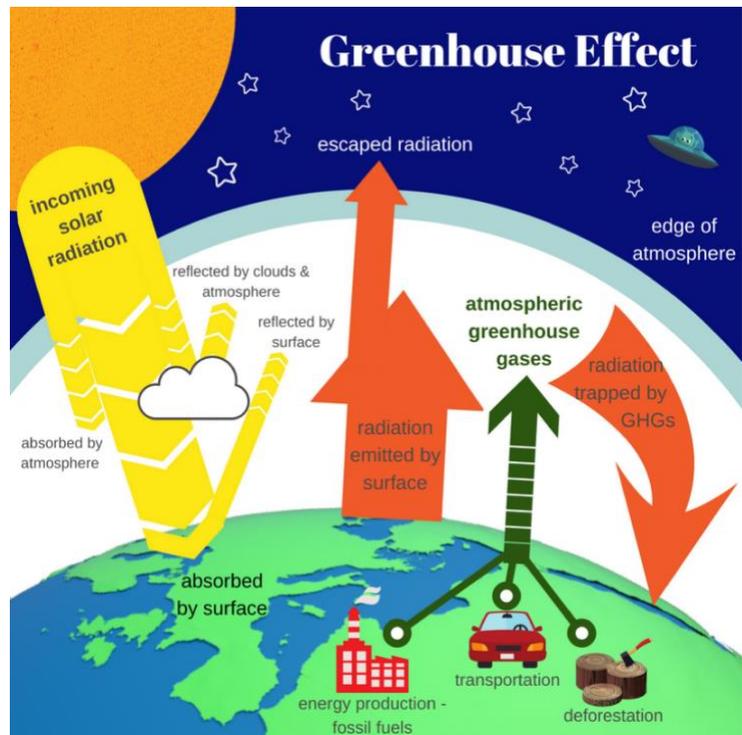
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## SETTING THE STAGE: CLIMATE CHANGE ECONOMICS

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- Energy is a vital part of our daily lives, but oftentimes we take it for granted and do not realize how reliant we are on electricity until it is no longer at our immediate disposal.
- Ask students: How does energy impact our lives? How does energy impact our economy?
  - Ask students to brainstorm a list of ways they've already used energy that day
    - E.g. To charge their phones, to make breakfast, the lights in the classroom, traffic lights, car or bus transport to get to school, etc.
  - Ask students to think about what we lose when the power goes out
    - Refrigeration, traffic lights, medical equipment in hospitals, Wi-Fi connectivity, communication, etc.
- When it comes to our current energy system, there are several key factors that drive change:
  - Energy production and distribution is costly.
  - Many of our energy sources are finite or non-renewable, meaning that we cannot make more of that energy source within a human timeframe.
  - Many of our energy sources have a negative impact on our environment, including releasing greenhouse gases that are changing the climate.
- Right now, we generate a significant amount of energy from non-renewable, fossil fuel sources – oil, coal, and natural gas, all of which are finite resources, along with being key sources of the greenhouse gases causing climate change.
  - Ask students: Why care about greenhouse gas emissions?
    - *The Greenhouse Effect is the term for the natural phenomenon that keeps Earth at a warm, habitable temperature. Greenhouse gases like carbon dioxide, methane and water vapor trap infrared radiation, or heat, as it reflects off the Earth's surface.*
    - Human activities such as burning fossil fuels for energy use in buildings, in manufacturing the products we use, and for transportation are adding more greenhouse gases to the atmosphere, which magnifies the Greenhouse Effect. This is causing changes in surface temperatures and climate patterns, leading to unpredictable precipitation, increasing strength and frequency of extreme weather events, rising ocean temperatures and more; the collective term for these effects caused by human activity is climate change.
  - In order to maintain our quality of life and preserve safely habitable conditions for the current species on Earth, we need to work to stabilize the climate. One of the most impactful ways we can do this is by switching our energy sources to sustainable energies so that our electrical grid relies less on fossil fuels.

- Electricity production and use accounts for the largest share of greenhouse gas emissions in the United States, so cleaner and more efficient energy systems can significantly reduce the harmful environmental impacts associated with non-renewables.
  - In 2016, electricity accounted for 28%<sup>1</sup> of total U.S. greenhouse gas emissions and was the top GHG emitter along with the transportation sector.
- In economics, an **externality** is a consequence (that can be positive or negative) of an activity that impacts a third party, but is not reflected in the cost of the product or service.
  - Greenhouse gas emissions are an example of a negative externality – fossil fuel combustion releases millions of tons of CO<sub>2</sub> and other greenhouse gases that negatively impact communities and ecosystems alike, yet this negative impact is not reflected in the cost of fossil fuel-derived energy.



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## ACTIVITY 1: TRAGEDY OF THE COMMONS FISHING GAME

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- In this activity, students will explore how common resources are used, or overused, by simulating the tragedy of the commons.

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<sup>1</sup> Environmental Protection Agency, Greenhouse Gas Emissions, <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>

<sup>2</sup> SEI Image: credit Gavin Siegert & Casey Fritz

➤ **Set Up:**

- Before any students enter class, fill a bowl with enough goldfish for each student in the class to have ~5-10 Goldfish if evenly distributed. The starting amount of Goldfish in the bowl represents the max population of the common resource (i.e. fishing pond).
  - Ensure you have at least double the amount of initial Goldfish to replenish the bowl at the end of the first round.
- Assign seats to students according to the order they enter the class with the first student being the closest to the front of class (works best if seats are arranged in a circle).
- Once all students have taken their assigned seats, give the students the following instructions.

➤ **Activity Part 1:**

- Note: from this point on the students are not allowed to converse with one another in any way.
- The bowl will be passed around the circle from student to student beginning with the student closest to the front of the room (i.e. the student who first entered the class).
- Students may take as many Goldfish as they wish. Remind students that they are acting as fishermen and need to harvest fish in order to survive. HOWEVER, tell the class that whatever amount of Goldfish remaining at the end of the circle will be doubled and passed around again. If there are no Goldfish left at the end of the circle, the exercise ends.
  - IMPORTANT: the ending amount of Goldfish CANNOT be doubled to an amount greater than the starting amount (i.e. if more than half the Goldfish remain at the end of the circle, it will not be doubled). This not only mimics the real-world limitation of a population maximum, but also prevents students from simply not taking any Goldfish at all and doubling the entire pot over and over. If they do not take any Goldfish, they will not survive as fishermen.
- Make sure students DO NOT start eating the Goldfish when they take their portion.

➤ **Activity Part 2:**

- **Scenario 1:** IF there are **more than half** of the Goldfish left (unlikely), simply pass the bowl around the circle again without adding any more Goldfish.
- **Scenario 2:** IF **Goldfish are left** in the bowl at the end of the circle:
  - Double the amount of Goldfish in the bowl and pass it around again in the same order. Make sure the students keep the Goldfish they take this round separate from the Goldfish they took in the last round.
  - This time around, make it ambiguous as to whether or not the amount will be doubled (make it feel to the students that this could potentially be their last chance to get anymore Goldfish).
  - When the round is over, ask how many gold fish are left in the bowl, if any. Ask the students to compare the amount of Goldfish they took the first round to amount they took the second round.