

Lesson Plan: Environmental Economics: Climate Change as Market Failure

As a **High School** or **Undergraduate Economics** teacher, you can use this set of computer-based tools to teach about national/international **environmental protection**, **negative externalities** such as global warming, and **market failure** associated with climate change.

This lesson plan allows you to teach your students about the balance between economic progress and environmental protection. It includes resources to teach your students about the influence of the environment on economic output, the role of **global warming as an externality**, and **climate change as a market failure**. Further, this lesson plan includes an engaging classroom game/activity for students to participate in decision making exercises to evaluate the tradeoff between optimal economic growth and environmental protection for proxy organizations/nations. This will enable them to learn about and apply economic concepts such as **green spending**, **green transfers**, **carbon tax**, and **carbon credits**.

Thus, the use of this lesson plan allows you to integrate the teaching of a climate science topic with a core topic in **Economics**.

Use this lesson plan to help your students find answers to:

- What is environmental protection in economics?
- What are negative externalities in economics?
- What are the negative externalities associated with climate change?
- How does market failure affect the environment?
- What type of market failure is climate change?

About the Lesson Plan

Grade Level: High School, Undergraduate

Discipline: Economics

Topic(s) in Discipline: Environmental Protection, Negative Externalities, Market Failure, Carbon Tax, Green Spending, Green Transfers, Carbon Credits

Climate Topic: Energy, Economics, and Climate Change

Location: Global, USA

Access: Online, Offline

Language(s): English

Approximate Time Required: 2 sessions, 50-60 min each

1 Contents

1. Teaching Module (35 min)

A teaching module to introduce the concept of environmental protection in economics and the negative externalities associated with it.

This can be accessed at:

<https://openstax.org/books/principles-economics-2e/pages/12-introduction-to-environmental-protection-and-negative-externalities>

2. Videos (~7 min)

Videos by renowned economists to emphasize on the concept of global warming as an international negative externality.

These can be accessed at:

<https://www.youtube.com/watch?v=9Wm8-eYdMm0&feature=youtu.be>

<https://www.nobelprize.org/prizes/economic-sciences/2018/nordhaus/speech/>

3. Reading (7 min)

A reading to explain why economists consider climate change as a market failure.

This can be accessed at:

<http://www.lse.ac.uk/granthaminstitute/explainers/why-do-economists-describe-climate-change-as-a-market-failure/>

4. Reading (30 min): Homework Assignment

A research article that evaluates greenhouse gas emissions induced global warming as an economic externality.

This can be accessed at:

https://www.researchgate.net/publication/225771842_Global_Warming_and_Economic_Externalities

5. Classroom Activity (45-60 min)

A classroom group activity/game to apply theoretical economic concepts in the context of climate change.

This can be accessed at:

https://www.economicsnetwork.ac.uk/showcase/copestake_climate#Relating_the_game_to_theoretical_issues

6. Suggested questions/assignments for learning evaluation

- What is environmental protection in economics?
- What are negative externalities in economics?
- What are the negative externalities associated with climate change?
- How does market failure affect the environment?
- What type of market failure is climate change?

2 Step-by-step User Guide

Here is a step-by-step guide to using this lesson plan in the classroom/laboratory. We have suggested these steps as a possible plan of action. You may customize the lesson plan according to your preferences and requirements.

Session 1:

1. Topic introduction and discussion

Use the teaching module, '[Introduction to Environmental Protection and Negative Externalities](#)' by OpenStax™, Rice University, to introduce your students to the concept of environmental protection in economics and the negative externalities associated with it. Navigate to the different sections to teach about topics such as 'The Economics of Pollution', 'Market -Oriented Environmental Tools', and 'The Tradeoff between Economic Output and Environmental Protection'. Use the module to explain positive and negative externalities, equilibrium price and quantity, and market failure. Finally, discuss why global warming is an international economic externality.

This can be accessed at:

<https://openstax.org/books/principles-economics-2e/pages/12-introduction-to-environmental-protection-and-negative-externalities>

2. Develop the topic further

Use the short video clip of The Carbon Brief Interview, '[Hoesung Lee on carbon pricing](#)', to reiterate the concept of global warming as a negative externality. Dr Hoesung Lee is a Professor of Economics of Climate Change, Energy, and Sustainable Development, Korea University, and has served as vice chair of the Intergovernmental Panel on Climate Change (IPCC).

This video clip can be accessed at:

<https://www.youtube.com/watch?v=9Wm8-eYdMm0&feature=youtu.be>

Use the [Nobel Laureate William D. Nordhaus' speech at the Nobel Banquet](#), 10 December 2018, to emphasize on global warming as a negative externality on economic growth and its relevance for international economic policies.

This can be accessed at:

<https://www.nobelprize.org/prizes/economic-sciences/2018/nordhaus/speech/>

3. Discuss further

Use 'The Guardian' article, '[Why do economists describe climate change as a market failure?](#)' by Alex Bowen, Simon Dietz, and Naomi Hicks, reproduced by The London School of Economics and Political Science and Grantham Research Institute on Climate Change and the Environment, to discuss 'greenhouse gas externality' and climate change as a market failure.

This can be accessed at:

<http://www.lse.ac.uk/granthaminstitute/explainers/why-do-economists-describe-climate-change-as-a-market-failure/>

4. Extend Understanding: Homework Assignment

Close the first session by instructing your students to read the research article, '[Global Warming and Economic Externalities](#)' by Armon Rezai et al., *Economic Theory*, 49(2):329-351, February 2012, to enable them to understand the role of global warming as an economic externality in economic equilibrium paths. Direct your students to use this reading to extract discussion points about the market failure of climate change and the required mitigation investment to correct it.

This can be accessed at:

https://www.researchgate.net/publication/225771842_Global_Warming_and_Economic_Externalities

Session 2:

Begin the second session by initiating a classroom discussion about climate change as a market failure (10-15 min). Encourage your students to discuss the various points extracted from the research article given as homework reading assignment to enable a broader understanding of the topic. Highlight the importance and requirement of mitigation investment to correct this market failure.

5. Apply understanding

Use 'The Economics Network' classroom activity/game, '[The Global Climate Change Game](#)' by James Copestake and Tom Ellum, University of Bath, to enable your students to apply the theoretical economic concepts discussed in this lesson plan. Use this engaging game to highlight key challenges in climate change negotiations between groups. Groups are required to assess their economic growth vis a vis contributing to global 'green spending' (public good benefit).

First, pass around copies of handouts of background information (link given in activity page) to enable understanding about global public goods, climate change and development finance. Highlight the role of negative externalities like global warming. Reiterate climate change as a market failure and thus, the need for mitigation and adaptation economic pathways. Use this reading to discuss the Kyoto Agreement, the Annex 1 and Annex 2 countries, and to explain concepts such as abatement curves, carbon debt, carbon tax, and Carbonaid.

Follow the instructions to conduct the activity. You may choose one or many of the suggestions for variations/extensions of this activity to enable students' application of diverse theoretical economic concepts.

Finally, use the activity to initiate a discussion about your nation's policies for environmental protection versus achieving optimal economic output.

This can be accessed at:

https://www.economicsnetwork.ac.uk/showcase/copestake_climate#Relating_the_game_to_theoretical_issues

6. Questions/Assignments

Use the tools and the concepts learned so far to discuss and determine answers to the following questions:

- What is environmental protection in economics?

- What are negative externalities in economics?
- What are the negative externalities associated with climate change?
- How does market failure affect the environment?
- What type of market failure is climate change?

3 Learning Outcomes

The tools in this lesson plan will enable students to:

- learn about environmental protection, negative externalities, and market failure
- discuss global warming as a negative externality in international economic growth
- describe climate change as a market failure
- explain the challenges of climate change negotiations between nations

4 Additional Resources

If you or your students would like to explore the topic further, these additional resources will be useful.

1. Teaching Module

A teaching module by © CORE Economic Education (CORE) to teach topics in Environmental Economics.

This can be accessed at:

<https://www.core-econ.org/the-economy/book/text/20.html#subheadline>

2. Reading

Chapter 2 of The Stern Review Report on the Economics of Climate Change, Cambridge University Press.

This can be accessed at:

https://webarchive.nationalarchives.gov.uk/20100407172811/http://www.hm-treasury.gov.uk/stern_review_report.htm

5 Credits/Copyrights

All the teaching tools in our collated list are owned by the corresponding creators/authors/organizations as listed on their websites. Please view the individual copyright and ownership details for each tool by following the individual links provided. We have selected and analyzed the tools that align with the overall objective of our project and have provided the corresponding links. We do not claim ownership of or responsibility/liability for any of the listed tools.

1. Teaching Module; 'Introduction to Environmental Protection and Negative Externalities'

By [OpenStax™](#), Rice University.

2. Video; 'Hoesung Lee on carbon pricing'

Interview by [Carbon Brief](#).

3. Video; 'William D. Nordhaus- Banquet Speech'

Provided by [NobelPrize.org](#).

4. Reading; 'Why do economists describe climate change as a market failure?'

[The Guardian](#) article, by Alex Bowen, Simon Dietz, and Naomi Hicks, reproduced by The [London School of Economics and Political Science](#) and Grantham Research Institute on Climate Change and the Environment.

5. Reading; 'Global Warming and Economic Externalities'

Rezai, Armon & Foley, Duncan & Taylor, Lance. (2012). Global Warming and Economic Externalities. *Economic Theory*. 49. 329-351. 10.1007/s00199-010-0592-4.

6. Classroom Activity; 'The Global Climate Change Game'

By James Copestake and Tom Ellum, University of Bath. Provided by [The Economics Network](#), UK.

7. Additional Resources

[© CORE Economic Education](#) (CORE)

[The National Archives](#), HM Treasury, UK.