

Lesson Plan: Carbon Pricing: Shadow and Market Prices

A teacher-contributed lesson plan by Megha Jacob, Jesus and Mary College (Delhi University), India.

As an **undergraduate Economics** teacher, you can use this set of computer-based tools to teach the concept of **Carbon Pricing** and the instruments to implement it- **Carbon Tax** and **Cap-and-Trade/Emissions Trading System (ETS)**. This lesson plan includes a resource to help students understand the importance of **shadow price** in the cost-benefit analysis of carbon pricing. This will enable students to understand how carbon emissions, one of the drivers of climate change, are affecting global economics.

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:

- Carbon pricing is used as an instrument for making climate policies. Explain.
- What is the difference between market prices and shadow prices?
- What is the importance of shadow pricing in evaluating the costs of greenhouse gases?
- In the context of climate change, what are discount rates, marginal abatement costs and statistical value of life?

About the Lesson Plan

Grade Level: Undergraduate

Discipline: Economics

Topic(s) in Discipline: Environmental Economics, Carbon Pricing, Carbon Tax, Emissions Trading System (ETS), Cost-Benefit Analysis, Shadow Price, Market Price, Social Cost, Marginal Abatement Cost, Discount Rate, Stabilization Goals, Internal Carbon Pricing, Externalities

Climate Topic: Energy, Economics and Climate Change; Policies, Politics and Environmental Governance; Climate Mitigation and Adaptation

Location: Global, United Kingdom

Access: Online, Offline

Language(s): English

Approximate Time Required: 90-100 min

1 Contents

1. Reading (25 min)

A reading to introduce and describe in detail, the different aspects of global carbon pricing and its importance as an instrument for climate policies.

This can be accessed at:

<https://carbonpricingdashboard.worldbank.org/what-carbon-pricing>

2. Reading (40-50 min)

A reading to introduce the topic of Shadow and Market Prices and to explain concepts such as Social Cost of Carbon (SCC), Shadow Price of Carbon (SPC), and Marginal Abatement Cost (MAC) in the context of internal carbon pricing in the UK.

This can be accessed at:

https://mpira.ub.uni-muenchen.de/74976/1/MPRA_paper_74976.pdf

3. Classroom/Laboratory Activity (25 min)

An interactive visualization tool with map, data and downloadable graphs to understand the carbon pricing initiatives of various nations over a thirty-year timeline.

This can be accessed at:

https://carbonpricingdashboard.worldbank.org/map_data

4. Suggested questions/assignments for learning evaluation

- Carbon pricing is used as an instrument for making climate policies. Explain.
- What is the difference between market prices and shadow prices?
- What is the importance of shadow pricing in evaluating the costs of greenhouse gases?

- In the context of climate change, what are discount rates, marginal abatement costs and statistical value of life?

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.

1. Topic introduction and discussion

Use the reading, '[Carbon Pricing Dashboard](#)' by World Bank to introduce the topic of carbon pricing. Play the embedded video, "[Climate Countdown: Carbon Pricing](#)" by Connect4Climate (~5 min), to explain the importance of carbon pricing. Use the sub-sections in the reading resource to describe what is carbon pricing, what are the main types of carbon pricing, and why it is important for governmental or organizational policy making. Use the text to also distinguish between international and national/subnational/regional carbon pricing. Finally, introduce the concept of internal carbon pricing and the factors that determine it.

This can be accessed at:

<https://carbonpricingdashboard.worldbank.org/what-carbon-pricing>

2. Extend the understanding

Use the reading, '[The Social Cost of Carbon and the Shadow Price of Carbon: what they are, and how to use them in economic appraisal in the UK](#)' by Richard Price and Simeon Thornton and Stephen Nelson, Economics Group, Department for Environment, Food & Rural Affairs (Defra), London, to introduce the concepts of shadow prices and market prices and explain the link between them. Use this paper to explain the need for climate informed policies in the economic assessment of a country. Given its significance in greenhouse gas emissions, use carbon as an example to explain the social costs of carbon and its shadow price in internal carbon pricing. Further, compare the marginal abatement costs and social costs of carbon for different stabilization goals as determined by the Stern Review. Finally, introduce the concept of discounting and

discount rates for calculating carbon prices. This reading uses the United Kingdom (UK) as the area of study but this reading can be discussed in the context of other regions.

This can be accessed at:

https://mpra.ub.uni-muenchen.de/74976/1/MPRA_paper_74976.pdf

3. Classroom/Laboratory Activity

Use the interactive map and data, '[Carbon Pricing Dashboard- Map & Data](#)' by World Bank, to visualize the information available on the carbon pricing initiatives implemented by several nations over the past thirty years. Use the tabs to navigate to data available on the greenhouse gas emissions, the carbon prices implemented across different countries and the value of the carbon pricing initiatives selected (ETS or Carbon Tax). Encourage your students to explore different regions or countries, download the data/graphs on their carbon pricing data and draw comparisons to improve understanding of the real-world scenario of carbon pricing across various geographies.

This can be accessed at:

https://carbonpricingdashboard.worldbank.org/map_data

4. Questions/Assignments

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

- Carbon pricing is used as an instrument for making climate policies. Explain.
- What is the difference between market prices and shadow prices?
- What is the importance of shadow pricing in evaluating the costs of greenhouse gases?
- In the context of climate change, what are discount rates, marginal abatement costs and statistical value of life?

3 Learning Outcomes

The tools in this lesson plan will enable students to:

- explain the concept and importance of pricing carbon
- evaluate carbon pricing as an instrument for climate policy packaging
- describe shadow prices in environmental economics
- distinguish between shadow price, social cost and market price
- define discount rate, marginal abatement costs and statistical value of life

4 Additional Resources

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

1. Reading

A teaching module, '[The Economics of Global Climate Change](http://www.ase.tufts.edu/gdae/education_materials/modules/The_Economics_of_Global_Climate_Change.pdf)' by Jonathan M. Harris, Brian Roach and Anne-Marie Codur, Global Development and Environment Institute, Tufts University, USA.

This can be accessed at:

[http://www.ase.tufts.edu/gdae/education_materials/modules/The Economics of Global Climate Change.pdf](http://www.ase.tufts.edu/gdae/education_materials/modules/The_Economics_of_Global_Climate_Change.pdf)

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. Reading; 'Carbon Pricing Dashboard'

By [The World Bank](#). Embedded video by [Connect4Climate](#).

2. Reading; 'The Social Cost of Carbon and the Shadow Price of Carbon: what they are, and how to use them in economic appraisal in the UK'

By Richard Price and Simeon Thornton and Stephen Nelson, Economics Group, [Department for Environment Food & Rural Affairs \(Defra\)](#), London. Provided by [Munich Personal RePEc Archive](#).

3. Classroom/Laboratory Activity; 'Carbon Pricing Dashboard- Map & Data'

By [The World Bank](#).

4. Additional Resources

A teaching module, 'The Economics of Global Climate Change' by Jonathan M. Harris, Brian Roach and Anne-Marie Codur, [Global Development and Environment Institute](#), Tufts University, USA