John F. Kennedy School of Government
Prof. Robert N. Stavins
API-135/Econ 1661

Harvard University
Spring 2018

FUNDAMENTALS OF ENVIRONMENTAL ECONOMICS AND POLICY
Monday, Wednesday, & Friday, 1:15-2:30 PM, Starr Auditorium (Belfer Room 173)
SYLLABUS

***Nature and Purpose of the Course*:**

This course provides a survey of public policy issues regarding the management of natural resources and the protection of environmental quality, from the perspective of economics. The course covers both conceptual and methodological topics and recent and current applications. A significant portion of the latter half of the course focuses on global climate change policy.

***Instructor*:** Prof. Robert N. Stavins
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***Teaching Fellows*:** A. Patrick Behrer, Ph.D. Student, Public Policy (Head Teaching Fellow)
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Office Hours: Thursday, 4-5pm. 124 Mt. Auburn St, Suite 100, Room 106

Course Assistant: TBA

***Prerequisites*:** One course in microeconomic theory, or permission of the instructor; an introductory course (such as Social Analysis 10, P-125, API-101, or M-221) is adequate preparation. Students should be familiar with basic economic concepts, such as: supply & demand functions, consumers' surplus, opportunity cost, marginal analysis, and time discounting. It may be helpful to review an introductory microeconomics textbook.

Registration:

IMPORTANT: Unless you are a Kennedy School student you must register for ECON 1661, not API-135; applies to all Harvard undergraduates and all non-Kennedy School graduate students (e.g. HLS, MIT, Tufts, etc).

***Reading Material*:**

There are two required books for the course — one text and one volume of selected readings:

Keohane, Nathaniel, and Sheila Olmstead. *Markets and the Environment. Second Edition.* Washington: Island Press, 2016. [TEXT]

Stavins, Robert N., ed. *Economics of the Environment: Selected Readings, Sixth Edition.* New York, New York: W. W. Norton & Company, 2012. [EOE]

The Keohane & Olmstead textbook (*Second Edition*) provides a concise yet comprehensive treatment of the topics covered in this course. This book will be available for purchase at the Harvard Coop, and is on reserve at the Kennedy School Library, on the ground floor of the Littauer Building**.** Students who would like a more detailed treatment of the material may consider also purchasing *Environmental and Natural Resource Economics* (Thomas Tietenberg & Lynne Lewis). A more rigorous mathematical treatment of the material, beyond the level required for the course, is found in *Environmental Economics* (Charles Kolstad).

The second required book for the course is the ***Sixth*** Edition of *Economics of the Environment*. This is available at the Harvard Coop for purchase, and is on reserve at the Kennedy School Library, on the ground floor of the Littauer Building. Students should not purchase previous editions, as many readings covered were not included in previous editions.

Extensive use will be made of other materials, particularly handouts of slides that are used in each class. These additional materials should be downloaded from the course web site and printed in advance of respective classes, because laptops and other electronic devices may not be used during class (see the **NYTimes** for an explanation). A few additional readings found in the reading list below are available for downloading at indicated web sites. The course web site is:

https://canvas.harvard.edu/courses/36588

***Course Requirements and Grading*:**

We will meet for a total of 25 class sessions. There will be: five problem sets (due at the beginning of class on February 21, February 28, April 4, April 18, and April 25); an in-class midterm exam (March 5); and an "in-class" (closed book) final exam during exam period. The final examination is scheduled by the Faculty of Arts and Sciences; the date and time of the exam will be announced by FAS later in the semester. Late problem sets will be penalized by a grade adjustment.

IMPORTANT: Classes are held on most **Mondays, Wednesdays, and some Fridays, 1:15-2:30 PM,** in Starr Auditorium (Belfer-173) at the Harvard Kennedy School. There will be no course meetings during the HKS shopping period. Please see the schedule on the next page. Also, note that some of the Monday or Wednesday classes may be cancelled in advance, and Friday classes added to make up for these. Therefore, enrolled students should be available for the class times on all three days each week.

The teaching assistants will conduct optional review sessions on specific topics. These review sessions will take place on Fridays in Starr Auditorium.

The exact schedule of classes, with topics and readings, is found on subsequent pages of the syllabus.

Here is a schematic of the schedule of mandatory lectures (bold) and optional sections (italics):

Monday, 1:15-2:30 pm	**Wednesday, 1:15-2:30 pm**	**Friday, 1:15-2:30 am**
January 22	**January 24**	*Section: January 26*
January 29	**January 31**	*Section: February 2*
February 5	**February 7**	
February 12	**February 14**	*Section: February 16*
(University Holiday)	**February 21**	*Section: February 23*
February 26	**February 28**	*Section: March 2*
March 5 (Midterm)	(No Class)	
(Spring Break, March 10-18)		
March 19	**March 21**	**March 23 (Lecture)**
March 26	**March 28**	*Section March 30*
April 2	**April 4**	**April 6 (Lecture)**
April 9	***Section: April 11***	*Section: April 13*
April 16	**April 18**	*Section: April 20*
April 23	**April 25**	

Course grading is on the following basis:

Problem Sets	15%
Midterm Exam	35%
Final Exam	50%
	100%

Academic Integrity:

Students are expected to abide by all University policies on academic honesty. While study groups are encouraged, each student must write up and submit his or her own problem sets.

API-135/ECON 1661
FUNDAMENTALS OF ENVIRONMENTAL ECONOMICS AND POLICY

COURSE OUTLINE

I. INTRODUCTION AND OVERVIEW – *Jan 22*

II. PRINCIPLES AND METHODS

A. Fundamentals
   1. Net Present Value Analysis – *Jan 24 & 29 & 31*
   2. The Costs and Benefits of Environmental Policies - *Feb 5*

B. Environmental Benefit Estimation Methods
   1. Revealed Preference I: Recreation Demand Models - *Feb 7*
   2. Revealed Preference II: Hedonic Pricing & Averting Behavior - *Feb 7*
   3. Stated Preference and Benefit Transfer – *Feb 12*
   4. Benefits of Morbidity and Mortality Risk Reduction – *Feb 14*

III. NATURAL RESOURCE ECONOMICS AND POLICY

A. Nonrenewable Resources
   1. Optimal Extraction & Use of Nonrenewable Natural Resources – *Feb 21 (Problem Set #1 Due)*
   2. Markets, Market Failure, and Public Policy – *Feb 26*

B. Renewable Resources: Common-Property Problems – *Feb 28 (Problem Set #2 Due)*

(Midterm Examination: March 5)

IV. ENVIRONMENTAL ECONOMICS AND POLICY

A. Economics of Pollution Control: An Overview - *March 19, 21, & 23*

B. Local Air Pollution – *March 26*

C. Acid Rain – *March 28*

D. Global Climate Change

   1. Overview and National Climate Policy – *April 2, 4 & 6 (Problem Set #3 is Due April 4)*

   2. International Climate Policy – *April 9, 16, & 23 (Problem Set #4 is Due April 23)*

E. Trade, Growth, and the Environment (Professor Frankel) – *April 18*

F. Global Climate Change (Concluded) – *April 25 (Problem Set #5 is Due)*

FUNDAMENTALS OF ENVIRONMENTAL ECONOMICS AND POLICY

READING LIST

Readings should be completed prior to class sessions, with selections read in the order listed.

TEXT refers to Keohane, Nathaniel, and Sheila Olmstead. *Markets and the Environment. Second Edition.* Washington: Island Press, 2016.

EOE refers to Stavins, Robert N., ed. *Economics of the Environment: Selected Readings*, Sixth Edition. New York, New York: W. W. Norton & Company, 2012.

JANUARY 22: INTRODUCTION AND OVERVIEW

TEXT, pp. 11-34, 80-90: Chapter 2 "Economic Efficiency..." and Chapter 5 "Market Failures...", through the "Public Goods" heading

EOE, pp. 3-8, Chapter 1, (Fullerton and Stavins, "How Economists See the Environment," *Nature*, 1998).

JANUARY 24 & 29 & 31: NET PRESENT VALUE ANALYSIS

TEXT, pp. 35-68: Chapter 3: "The Benefits and Costs..."

EOE, pp. 219-224, Chapter 11, (Arrow, Cropper, Eads, Hahn, Lave, Noll, Portney, Russell, Schmalensee, Smith, and Stavins, "Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?" *Science*, 1996).

EOE, pp. 225-229, Chapter 12, (Goulder and Stavins, "An Eye on the Future." *Nature*, 2002).

FEBRUARY 5: THE COSTS AND BENEFITS OF ENVIRONMENTAL POLICIES

TEXT, pp. 69-78: Chapter 4, "The Efficiency of Markets"

EOE, pp. 61-92, Chapter 4, (Pasurka, "Perspectives on Pollution Abatement and Competitiveness: Theory, Data, and Analyses," *Review of Environmental Economics and Policy*, 2008).

EOE, pp. 93-115, Chapter 5, (Porter and van der Linde, "Toward a New Conception of the Environment-Competitiveness Relationship," *Journal of Economic Perspectives*, 1995). *OPTIONAL*

EOE, pp. 116-132, Chapter 6, (Palmer, Oates, and Portney, "Tightening Environmental Standards: The Benefit-Cost or No-Cost Paradigm?", *Journal of Economic Perspectives*, 1995). *OPTIONAL*

FEBRUARY 7: REVEALED PREFERENCE I: RECREATION DEMAND MODELS

TEXT, pp. 49-52. "Measuring Benefits," in Chapter 3.

FEBRUARY 7: REVEALED PREFERENCE II: HEDONIC PRICING & AVERTING BEHAVIOR

TEXT, pp. 49-52. "Measuring Benefits," in Chapter 3.

FEBRUARY 12: STATED-PREFERENCE (CONTINGENT VALUATION) AND BENEFIT TRANSFER

TEXT, pp. 52, 53, 55. "Measuring Benefits," in Chapter 3.

EOE, pp. 133-147, Chapter 7, (Portney, "The Contingent Valuation Debate: Why Economists Should Care," *Journal of Economic Perspectives*, 1994).

EOE, pp. 148-174, Chapter 8, (Hanemann, "Valuing the Environment through Contingent Valuation," *Journal of Economic Perspectives*, 1994). *OPTIONAL*

EOE, pp. 175-195, Chapter 9, (Diamond and Hausman, "Contingent Valuation: Is Some Number Better than No Number?" *Journal of Economic Perspectives*, 1994). *OPTIONAL*

FEBRUARY 14: BENEFITS OF MORBIDITY AND MORTALITY RISK REDUCTION

EOE, pp. 196-218, Chapter 10, (Cameron, "Euthanizing the Value of a Statistical Life." *Review of Environmental Economics and Policy*, 2010).

FEBRUARY 21: OPTIMAL EXTRACTION & USE OF NONRENEWABLE NATURAL RESOURCES

NOTE: Problem Set #1 is due at beginning of class.

TEXT, pp. 99-111: Chapter 6, "Managing Stocks…," through "The Hotelling Rule"

EOE, pp. 351-373, Chapter 19, (Livernois, "On the Empirical Significance of the Hotelling Rule." *Review of Environmental Economics and Policy*, 2009.) *OPTIONAL*

FEBRUARY 26: MARKETS, MARKET FAILURE, AND PUBLIC POLICY FOR NONRENEWABLES

TEXT, pp. 94-97, or NE pp. 111-113: The remainder of Chapter 6.

EOE, pp. 374-397, Chapter 20, (Maugeri, "Understanding Oil Price Behavior through an Analysis of a Crisis." *Review of Environmental Economics and Policy*, 2009.) *OPTIONAL*

FEBRUARY 28: RENEWABLE RESOURCES & COMMON-PROPERTY PROBLEMS

NOTE: Problem Set #2 is due at beginning of class.

TEXT, pp. 91-97, 128-137: Chapter 5, "Market Failures…" from the heading "Public Good Provision…" to the end.

EOE, pp. 561-593, Chapter 30, (Stavins, "The Problem of the Commons: Still Unsettled After 100 Years." *American Economic Review*, 2011). Material related to Part I of this paper is covered in this section of the course. Part II of this paper will be covered during the section on climate change.

EOE, pp. 398-422, Chapter 21, (Olmstead, "The Economics of Managing Scarce Water Resources." *Review of Environmental Economics and Policy*, 2010.) *OPTIONAL*

MARCH 5: MIDTERM EXAMINATION

MARCH 19, 21, & 23: ECONOMICS OF POLUTION CONTROL: AN OVERVIEW

TEXT, pp. 139-198: Chapters 8, "Principles of Market-Based…: and 9, "The Case for Market-Based…"

EOE, pp. 297-322, Chapter 16, (Goulder and Parry, "Instrument Choice in Environmental Policy." *Review of Environmental Economics and Policy* 2008.)

Schmalensee, Richard, and Robert N. Stavins. "Lessons Learned from Three Decades of Experience with Cap-and-Trade." Forthcoming in *The Review of Environmental Economics and Policy*, Summer 2017. November 11, 2016.

MARCH 26: LOCAL AIR POLLUTION

EOE, pp. 423-446, Chapter 22, (Reihardt, Stavins, and Vietor, "Corporate Social Responsibility Through an Economic Lens." *Review of Environmental Economics and Policy*, 2008.) *OPTIONAL*

EOE, pp. 447-466, Chapter 23, (Portney, "The (Not So) New Corporate Social Responsibility: An Empirical Perspective." *Review of Environmental Economics and Policy*, 2008.) *OPTIONAL*

MARCH 28: ACID RAIN

TEXT, pp. 200-207: Chapter 10, "Market-Based Instruments…" through "Compliance and Enforcement"

EOE, pp. 344-350, Chapter 18, (Sandel, "It's Immoral to Buy the Right to Pollute," *New York Times*, 1997; and replies by Shavell, Stavins, Gaines, Leifman, and Maskin).

Richard Schmalensee and Robert N. Stavins. "The SO_2 Allowance Trading System: The Ironic History of a Grand Policy Experiment." *Journal of Economic Perspectives, 2013, volume 27, number 1, pages 103-122*.

EOE, pp. 323-343, Chapter 17, (Stavins, "What Can We Learn from the Grand Policy Experiment? Lessons from SO_2 Allowance Trading," *Journal of Economic Perspectives*, 1998). *OPTIONAL*

APRIL 2, 4 & 6: GLOBAL CLIMATE CHANGE – OVERVIEW AND NATIONAL POLICY

NOTE: Problem Set #3 is due at beginning of class April 4.

EOE, pp. 561-593, Chapter 30, (Stavins, "The Problem of the Commons: Still Unsettled After 100 Years." *American Economic Review*, 2011). Part II is covered here.

EOE, pp. 467-505, Chapter 24, (Aldy, Krupnick, Newell, Parry, and Pizer, "Designing Climate Mitigation Policy." *Journal of Economic Literature*, 2010).

EOE, pp. 506-510, Chapter 25, (Nordhaus, "Critical Assumptions in the Stern Review on Climate Change." *Science* 2007).

EOE, pp. 511-515, Chapter 26, (Stern and Taylor, "Climate Change: Risk, Ethics, and the Stern Review." *Science*, 2007).

EOE, pp. 516-542, Chapter 27, (Metcalf, "Market-based Policy Options to Control U.S. Greenhouse Gas Emissions." *Journal of Economic Perspectives*, 2009).

Goulder, Lawrence H. and Robert N. Stavins. "Challenges from State-Federal Interactions in U.S. Climate Change Policy." *American Economic Review Papers and Proceedings*, volume 101, number 3, May 2011, pages 253-257.

Greenstone, Michael, Elizabeth Kopits, and Ann Wolverton. "Developing a Social Cost of Carbon for US Regulatory Analysis: A Methodology and Interpretation." *Review of Environmental Economics and Policy* 7(2013):23-46.

APRIL 9, 16 & 23: GLOBAL CLIMATE CHANGE - INTERNATIONAL POLICY (NOTE: The lectures on International Policy are interrupted on the 18th by Prof. Frankel's lecture below).
NOTE: Problem Set #4 is due at beginning of class on April 23.

Stavins, Robert, and Zou Ji, *et al*. "International Cooperation: Agreements and Instruments." *Climate Change 2014: Mitigation*, Intergovernmental Panel on Climate Change, Fifth Assessment Report, Working Group III, Chapter 13. Cambridge, England: Cambridge University Press, 2015. (Read Executive Summary, and skim the rest.)

Olmstead, Sheila M. and Robert N. Stavins. Three Key Elements of a Post-2012 International Climate Policy Architecture. *Review of Environmental Economics and Policy*, Winter 2012, Volume 6, Number 1, pages 65-85.

Joseph E. Aldy and Robert N. Stavins. Climate Negotiators Create an Opportunity for Scholars. *Science*, August 31, 2012, Volume 337, Number 6098, pp. 1043-1044.

APRIL 18: TRADE, GROWTH, AND THE ENVIRONMENT (Professor Jeffrey Frankel)

NOTE: Problem Set #4 is due at beginning of class on April 23.

EOE, pp. 594-634, Chapter 31, (Frankel, "The Environment and Globalization," *Globalization: What's New*, Michael Weinstein, ed., 2004).

Frankel, Jeffrey. "Global Environmental Policy and Global Trade Policy." Discussion Paper 08-14, Cambridge, Mass.: Harvard Project on International Climate Agreements, October 2008.

APRIL 25: GLOBAL CLIMATE CHANGE – COURSE CONCLUSION

NOTE: Problem Set #5 is due at beginning of class on April 25.

Bodansky, Daniel, Seth Hoedl, Gilbert Metcalf, and Robert Stavins. "Facilitating Linkage of Climate Policies through the Paris Outcome." *Climate Policy*, August 5, 2015.

Stavins, Robert N. and Robert C. Stowe, eds. "The Paris Agreement and Beyond: International Climate Change Policy Post-2020." Harvard Project on Climate Agreements, Belfer Center, October 2016. (Read only pages 1-17.)

EOE, pp. 680-703, Chapter 33, (Freeman, "Environmental Policy Since Earth Day I: What Have We Gained?", *Journal of Economic Perspectives*, 2002). ***OPTIONAL***

EOE, pp. 704-733, Chapter 34, (Hahn, "The Impact of Economics on Environmental Policy," *Journal of Environmental Economics and Management*, 2000). ***OPTIONAL***