Environ 235: Natural Resources and Environmental Economics

Winter 2019 Course Syllabus
(Version: January 16th, 2019)

Logistics

Lecture: T/Th 10:00am - 11:20am (Angell G115)

Professor: Samuel Stolper (sstolper@umich.edu)

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Website: https://umich.instructure.com/courses/270321

Office Hours: T 4:00-5:00pm, Th 5:00-6:00pm, Dana 3006 (Prof. Stolper)

T 3:00-4:00pm, Th 4:00-5:00pm, Dana 4046 (Morgan)

About this course

In the age of climate change, environmental problems are as large and urgent as ever before. Rising temperatures induce poverty and death, and island nations face existential threats. At the same time, local air and water pollution problems persist in cities from Delhi to Detroit, often disproportionately burdening the relative poor. Economic analysis of environmental problems is valuable for a number of reasons: economics provides a framework for understanding incentives for human behavior; it facilitates the measurement of costs and benefits; and it is a language to which people listen, from the highest levels of government down to the individual household. In this course, we will use the lens of economics to characterize environmental problems and the theoretical and empirical impacts of possible solutions. We will start by reviewing some foundational economic concepts that are especially relevant to environment and energy. From there, we will set our sights on the general policy problem and learn about the design, implementation, and performance of different policy instruments along a variety of dimensions. In the second half of the course, we will take a more applied approach, focusing on climate change and the two largest sources of greenhouse gas emissions globally: electricity and transportation.

Prerequisites: none.

Class format and teaching goals

I have designed this course with several teaching goals in mind. I want you, the students, to:

- Become knowledge experts in the area of environmental economics and policy

- Develop a versatile economic intuition, for use in any environmental professional setting

- Become more comfortable with quantitative thinking and analysis

- Improve your ability to communicate, translate, and wield rhetoric in the highly divisive scientific debate about how to respond to the changing climate

I think the best way to achieve these goals is to engage you, the students, as much as possible, and in as many ways as possible. I will devote some part of most class meetings to lecture, but I will also emphasize discussion, both during lecturing and in dedicated periods of class time. I will strive to make students feel comfortable speaking up and raising questions. In-class activities will not be limited to lecture and discussion; we will also play two games simulating an open-access fishery and a wholesale electricity market, respectively, and possibly take a tour of U of M's Central Power Plant. Lastly, course assignments will give you practice in a variety of tasks to which you may be exposed in your future careers.

Readings

For most classes, you will be assigned readings from some combination of textbook, academic journals, blogs, and popular media. There is less assigned reading in this course than in many others; as a result, I expect everyone to complete it.

The textbook is Nathaniel O. Keohane and Sheila M. Olmstead, <u>Markets and the Environment</u>, 2nd Edition (2016). It is available in digital form from the University of Michigan library system, at <https://mirlyn.lib.umich.edu/Record/015159266>.

Several of the assigned readings come from the blog run by the Energy Institute at Haas, based at the University of California Berkeley, Haas School of Business. There is an excellent group of environmental and energy economists at Berkeley, and I encourage you to peruse the blog (https://energyathaas.wordpress.com/) beyond the assigned readings.

For review of key concepts in microeconomics, Jeffrey M. Perloff's <u>Microeconomics</u>, 6th Edition (2012) is a good resource. It can be freely downloaded from <https://ugess3.files.wordpress.com/2016/01/microeconomics-perloff-jeffrey.pdf>.

Assignments and grading

I have designed the assignments in this course to help you develop skills that I think will be useful in your professional environmental careers. These assignments are listed below, along with class participation and two exams. Numbers in parentheses are weights for each graded component in your final grade.

- Class participation (10%): Speaking up in class will give you valuable practice communicating in your future careers, and the course will be more fun and more thought-provoking if we all share our perspectives, our questions, our ideas.

- Problem sets (15%): Four problem sets will give you practice working through foundational models of supply and demand in different settings. Your lowest-scored problem set is not considered in final grading.

- Op-ed (10%): The format and readership of a newspaper op-ed is a good setting in which to practice written communication to a broad, non-expert audience.

- Policy analysis (10%): Here you will play the role of government analyst, assessing the impacts of a proposed policy and summarizing your findings for your superiors.

- Midterm exam (15%): You will be tested on your understanding of material covered in the first half of the course.

- Program evaluation (10%): Playing the role of an analyst at an electric utility, you will evaluate the impacts of an energy efficiency program, using data on treatment status and household electricity use over time. You will describe your findings in a short report.

- Electricity game memo (10%): With your team, detail the strategies you employed in the electricity game, what went right and wrong, and why.

- Final exam (20%): You will be tested on your understanding of material covered throughout the semester.

Problem sets and written assignments are due at the beginning of class, unless otherwise stipulated. Please submit problem sets via hard copy in class to Morgan, and writing assignments digitally to Canvas. Late (unexcused) assignments will be penalized 5 percentage-points per day. I grade this course on a curve, aiming to give A/A- grades to approximately 40% of students. The exact percentage varies from year to year.

Other course information

Attendance: You may miss up to three class meetings without excuse. Beyond this number, your participation grade will be affected by absences and lateness without timely explanation and reasonable justification. I will try my best to accommodate religious observance that affects your attendance or more generally ability to complete course activities; please try to inform me in advance of known absences or difficulties. Don't hesitate to come talk to me in person if attendance is an issue for you.

Laptops and phones: Neither laptops nor phones are allowed in class. They would inevitably draw your attention away from class lecture and discussion.

Correspondence: We (Morgan and I) will try to get back to your emails within 24 hours. Please note ENV 235 in your subject line. If you plan on asking multiple involved questions, please come to office hours or schedule a meeting.

Grade grievances: You must submit requests for a re-grade within one week of receiving the original grade. You must also attach the original graded item and provide a clear written explanation of what you would like to be re-evaluated and why. Your adjusted grade may be higher or lower than the original.

Work ethic: Do not plagiarize. If you paraphrase or copy work that is not your own, you must reference that work. The risk of plagiarizing is not worth the reward. More generally, cheating and academic dishonesty in any form will not be tolerated. Any student found to have cheated or behaved unethically or dishonestly will be given a zero on the assignment or exam involved and referred to the appropriate disciplinary committees at U of M.

Writing resources: The Sweetland Center for Writing offers three ways for undergraduates to get in-person writing assistance. It also offers mini-courses and casual conversation groups for international students or anyone wanting to improve their English.

Course calendar

Date	Day	#	Unit	Assignment Due
1/10	Th	1	Introduction	
1/15	T	2	Open-access resources	
1/17	Th	3	The problem of the commons	Fishbanks debrief
1/22	T	4	Supply, demand, costs, and benefits	
1/24	Th	5	Externalities and public goods	
1/29	T	6	Distribution and justice	Problem set 1
1/31	Th	7	Policies I: market-based instruments	
2/5	T	8	Policies II: markets vs. mandates	Op-ed
2/7	Th	9	Policies III: economic incidence	
2/12	T	10	Policies IV: political economy	Problem set 2
2/14	Th	11	Measuring costs	
2/19	T	12	Measuring benefits	
2/21	Th	13	Empirical estimation	Policy analysis
2/26	T	14	Review	
2/28	Th	15	Midterm exam	
3/5	T	–	NO CLASS – SPRING BREAK	
3/7	Th	–	NO CLASS – SPRING BREAK	
3/12	T	16	Impacts of climate change	
3/14	Th	17	Social cost of carbon	
3/19	T	18	International climate policy	Problem set 3
3/21	Th	19	Trade	
3/26	T	20	Electricity I: power systems	
3/28	Th	21	Electricity II: renewables	
4/2	T	22	Electricity III: climate policy	Problem set 4
4/4	Th	23	Energy efficiency	
4/9	T	24	Transportation I: fuel economy	
4/11	Th	25	Transportation II: ICEs and EVs	
4/16	T	26	Transportation III: ridesharing and automation	Program evaluation
4/18	Th	27	TBD	
4/23	T	28	Review	Electricity game memo
4/30	T		Final exam, 1:30-3:30pm	

Detailed course schedule

Class #1 – January 10th. Introduction

Class #2 – January 15th. Open-access resources

In-class simulation game: Fishbanks

Readings/Viewings

1. Sterman, John and Andrew King. "Introduction to Fishbanks."
2. Sterman, John. "Fishbanks: Renewable Resource Management Simulation."
3. Sterman, John. "Fishbanks Simulation: Student Instructional Video."
   <https://mitsloan.mit.edu/LearningEdge/simulations/fishbanks/Pages/Video.aspx>.

Class #3 – January 17th. The problem of the commons

Readings

1. Sterman, John and Andrew King. "Fishbanks: Debriefing Guide and Teaching Note."
   pp. 3-4.

Assignments

1. Response to Fishbanks due

Class #4 – January 22nd. Costs, benefits, supply, and demand

Readings

1. KO: Chapter 3, pp. 44-48; Chapter 4, pp. 70-79.
2. Clemente, Jude. "Yes, Americans Still Love Gasoline." *Forbes*, May 4th, 2018.

Class #5 – January 24th. Externalities and public goods

Readings

1. KO: Chapter 5, pp. 80-94.
2. "The Battle over Methane Leaks." *Energy Policy Now* podcast, October 30th, 2018.

Class #6 – January 29th. Distribution and justice

Readings

1. Schlanger, Zoe. "Choking to Death in Detroit: Flint Isn't Michigan's Only Disaster." *Newsweek*, March 30th, 2016.
2. Taylor, Dorceta E. Toxic Communities: Environmental Racism, Industrial Pollution, and Residential Mobility. New York University Press: New York, 2014. pp. 69-97.

Assignments

1. Problem Set #1 due

Class #7 – January 31st. Policies I: market-based instruments

Readings

1. KO: Chapter 8, pp. 143-162.
2. Harvey, Fiona. "China Aims to Drastically Cut Greenhouse Gas Emissions Through Trading Scheme." *The Guardian*, December 19th, 2017.

Class #8 – February 5th. Policies II: markets vs. mandates

Readings

1. KO: Chapter 9, pp. 168-184.
2. Rabe, Barry G. Can We Price Carbon? Cambridge: MIT Press, 2018.
3. Climate Justice Alliance and Indigenous Environmental Network. "Carbon Pricing: A Critical Perspective for Community Resistance." Volume 1, 2017.

Assignments

1. Op-ed due

Class #9 – February 7th. Policies III: economic incidence

Readings

1. Fullerton, Don (2011). "Six Distributional Effects of Environmental Policy." *Risk Analysis* 3(6): 923-929.
2. Guerin, Emily. "Environmental Groups Say California's Climate Program Has Not Helped Them." *National Public Radio*, February 24th, 2017.

Class #10 – February 12th. Policies IV: political economy

Readings

1. Roberts, David. "Washington votes not on a carbon tax – again." *Vox*, November 6th, 2018.
2. Roberts, David. "The Green New Deal, explained." *Vox*, December 26th, 2018.

Assignments

1. Problem Set #2 due

Class #11 – February 14th. Measuring costs

Readings

1. Gillingham, Kenneth and James H. Stock (2018). "The Cost of Reducing Greenhouse Gas Emissions." *Journal of Economic Perspectives* 32(4): 53-72.
2. Stolper, Samuel. "Who Bears the Burden of Energy Taxes?" *Sense and Sustainability.* May 4th, 2015. <http://www.senseandsustainability.net/2015/05/04/who-bears-the-burden-of-energy-taxes-the-distributional-impacts-of-environmental-policies/>.

Class #12 – February 19th. Measuring benefits

Readings

1. Muehlenbachs, Lucija, Beia Spiller, and Christopher Timmins. "The Housing-Market Impacts of Shale-Gas Development." VoxEU.org, February 9th, 2014. <http://voxeu.org/article/shale-gas-and-housing-market>.
2. McGinty, Jo Craven. "The Numbers: Why Government Puts a Dollar Value on Life." *Wall Street Journal* March 26th, 2016.
3. Krupnick, Alan and Juha Siikamaki (2007). "How People Value What Nature Provides." *Resources* magazine, pp. 14-16.

Class #13 – February 21st. Empirical estimation

Readings

1. Abdul Latif Jamil Poverty Action Lab. "Cleaner Water at the Source." J-Pal Policy Briefcase, September 2012.
2. **Introduction** in Currie, Janet and Reed Walker (2011). "Traffic Congestion and Infant Health: Evidence from E-ZPass." *American Economic Journal: Applied Economics* 3(1): 65-90.

Assignments

1. Policy analysis due

Class #14 – February 26th. Review

Class #15 – February 28th. Midterm

March 5th. NO CLASS – SPRING BREAK

March 7th. NO CLASS – SPRING BREAK

Class #16 – March 12th. The impacts of climate change

Readings

1. Heal, Geoffrey and Jisung Park (2016). "Temperature Stress and the Direct Impact of Climate Change: A Review of an Emerging Literature." *Review of Environmental Economics and Policy* 10(2): 347-362.
2. Davenport, Coral and Kendra Pierre-Louis. "U.S. Climate Report Warns of Damaged Environment and Shrinking Economy." *New York Times*, November 23rd, 2018.

Class #17 – March 14th. The social cost of carbon

Readings

1. Metcalf, Gilbert E. and James H. Stock (2017). "Integrated Assessment Models and the Social Cost of Carbon: A Review and Assessment of U.S. Experience." *Review of Environmental Economics and Policy* 11(1): 80-99.
2. Plumer, Brad. "Trump Put a Low Cost on Carbon Emissions. Here's Why It Matters." *New York Times*, August 23rd, 2018.

Class #18 – March 19th. International climate policy

Readings

1. KO: Chapter 5, pp. 94-97.
2. Evans, Simon and Jocelyn Timperley. "COP24: Key Outcomes Agreed at the U.N. Climate Talks in Katowice." *Carbon Brief*, December 16th, 2018.

Assignments

1. Problem set 3 due

Class #19 – March 21st. Trade

Readings

1. Fowlie, Meredith. "California's Carbon Border Wall." *Energy Institute at Haas* blog, May 22nd, 2017.
2. TBD

Class #20 – March 26th. Electricity I: power systems

Readings

1. "Electricity Explained: How Electricity is Deliver to Consumers." *Energy Information Administration*, last updated August 31st, 2018.
2. Sengupta, Somini. "The World Needs to Quit Coal. Why Is It So Hard?" *New York Times*, November 24th, 2018.

Class #21 – March 28th. Electricity II: renewables

Readings

1. Wolfram, Catherine. "Is the Duck Sinking?" *Energy Institute at Haas* blog, April 24th, 2017.
2. Davis, Lucas. "Why Am I Paying 65 \$/year for Your Solar Panels?" *Energy Institute at Haas* blog, March 26th, 2018.

Class #22 – April 2nd. Electricity III: climate policy

In class: electricity portfolio auction

Readings

1. Fowlie, Meredith. "Carbon Markets, Waterbeds, and You." *Energy Institute at Haas* blog, April 15th, 2018.
2. Funes, Yesenia. "California's New Solar Mandate Is For Rich White People." *Earther*, May 11th, 2018.

Assignments

1. Problem set 4 due

Class #23 – April 4th. Energy efficiency

Readings

1. Gillingham, Kenneth and Karen Palmer (2015). "Bridging the Energy Efficiency Gap: Policy Insights from Economic Theory and Empirical Evidence." *Review of Environmental Economics and Policy* 8(1): 18-38.
2. Burlig, Fiona. "Cutting Energy Use Is One Way Cash-Strapped Schools Can Save. But By How Much?" *Forbes*, September 27th, 2017.

Class #24 – April 9th. Transportation I: fuel economy

Readings

1. Robinson, Michelle. "Dear Automakers – Consumers Want Cleaner Cars this Year and Every Year!" *Union of Concerned Scientists* blog, December 19(th), 2018.
2. Allcott, Hunt and Christopher Knittel (2017). **Sections I-IV** in "Are Consumers Poorly-Informed about Fuel Economy? Evidence from Two Experiments." National Bureau of Economic Research Working Paper 23076.

Class #25 – April 11th. Transportation II: ICEs and EVs

Readings

1. Sallee, James. "Does CAFE work?" *Energy Institute at Haas* blog, April 8$^{\text{th}}$, 2018.
2. Davis, Lucas. "Are Clean Energy Tax Credits Equitable?" *Energy Institute at Haas* blog, July 20$^{\text{th}}$, 2015.

Class #26 – April 16th. Transportation III: ride-sharing and automation

Readings

1. Auffhammer, Maximilian. "The Economics of an Electrified Autonomous Future." *Energy Institute at Haas* Blog, August 21$^{\text{st}}$, 2016.
2. Bliss, Laura. "Uber and Lyft Could Do a Lot More for the Planet." *CityLab*, April 30$^{\text{th}}$, 2018.

Assignments

1. Program evaluation due

Class #26 – April 18th. TBD

Class #28 – April 23rd. Review

Assignments

1. Electricity game memo due

FINAL EXAM – April 30th, 1:30 pm – 3:30 pm