Environ 235: Environmental Economics and Policy

Winter 2020 Course Syllabus
(Version: March 6th, 2020)

Logistics

Lecture: T/Th 1:00pm - 2:20pm (Dana 1028)
Professor: Samuel Stolper (sstolper@umich.edu)
Graduate Student Instructor: Kecil John (kejohn@umich.edu)
Website: https://umich.instructure.com/courses/347214
Office Hours: T 4:00-5:00pm, Th 3:00-4:00pm, Dana 3006 (Prof. Stolper)
M 12:00-1:00pm, W 12:00-1:00pm, Dana 2560 (Kecil)

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 some of the sectors that are most responsible for greenhouse gas emissions globally: electricity, transportation, agriculture, and industry.

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. We will also play two games: one that simulates an open-access fishery, thereby prompting you to think about "commons problems"; and a second that simulates a wholesale electricity market, which will give you lived experience in a complicated sector that is central to the climate challenge. 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, Markets and the Environment, 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 Microeconomics, 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%): Three 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.
- Policy analysis (10%): Here you will play the role of congressional staffer, assessing the impacts of a proposed policy and summarizing your findings for your senator.
- Midterm exam (16%): You will be tested on your understanding of material covered in the first half of the course.
- Op-ed (5%): Use the lens of economics to construct an argument in favor of an environmental policy of your choosing.
- Cost analysis (10%): An exercise in which you will estimate the average abatement cost of different emissions reduction projects
- 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 (24%): 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 Kecil, and writing assignments digitally to Canvas. Late (unexcused) assignments will be penalized 5 percentage-points per day; please let us know if you are having trouble keeping up with deadlines.

Final grades will be given according to the following rubric: A+: 97-100; A: 92-96; A-: 88-91; B+: 84-87; B: 80-83; B-: 75-79. I may adjust final grades upwards, if assignments turn out to have been harder than expected. I will not adjust final grades downwards.

Some course groundrules

Attendance: You may miss up to three class meetings without excuse. Beyond this number, your attendance 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 (Kecil and Sam) will try to get back to your emails within 24 hours. Please note EAS 501 in your subject line. If you plan on asking multiple involved questions, please come to office hours or schedule a meeting.

Office hours: Kecil and I will each set aside two separate hours in which you are welcome to come talk to us in person. During these office hours, we are happy to answer questions about any element of the course. You are also welcome to come talk to us about other relevant subjects, such as careers, environmental issues in general, or your well-being at school or otherwise.

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.

Creating an environment of inclusion

I am actively trying to create an economics course that reflects a commitment to diversity, equity, and inclusion. To that end, I aspire to build a reading list that features diverse perspectives, create a classroom environment that promotes open and respectful dialogue, and shines a light on distributional considerations in environment and environmental policy. Please tell me if any element of your course experience does not match this stated intent. I will very much appreciate your thoughts.

Below are some resources for student support available through the University:

- The Sweetland Center for Writing offers one-on-one writing assistance, among many other services. It also offers mini-courses and casual conversation groups for international students or anyone wanting to improve their English.
- The English Language Institute provides a variety of resources for international students.
- The Services for Students with Disabilities (SSD) office coordinates accommodations for disability. Come talk to us if this applies to you, so that we can make those accommodations as soon as possible.
- Counseling and Psychological Services (CAPS) provides free and confidential support options for any issue including stress, mood changes, and problems with eating and/or sleeping.
- CEW+ provides immediate, ongoing services and financial support, especially to women and nontraditional students, but also to any students who encounter education and career obstacles based on their non-linear paths to the University community.
- The Students with Children website is dedicated to the needs of student caregivers at the University of Michigan who juggle parenting, other family care, work, and study.

- Spectrum Center works toward enhancing the campus climate and support services for LGBTQ+ students, staff, and faculty at the University through education, advocacy, and community building.
- The Diversity, Equity, and Inclusion offices at U of M and SEAS maintain a large collection of excellent resources.

Course calendar

Date	Day	#	Unit	Assignment Due
1/9	Th	1	Introduction	
1/14	T	2	Open-access resources	
1/16	Th	3	The problem of the commons	Fishbanks debrief
1/21	T	4	Markets	
1/23	Th	5	Externalities	
1/28	T	6	Distribution and justice	
1/30	Th	7	Environmental taxation	Problem set 1
2/4	T	8	Cap-and-trade	
2/6	Th	9	Markets vs. mandates	
2/11	T	10	Policy impact evaluation	
2/13	Th	11	Distributional impacts of policy	Problem set 2
2/18	T	12	Impacts of climate change	
2/20	Th	13	Social cost of carbon	Policy analysis
2/25	T	14	Review	
2/27	Th	15	Midterm exam	
3/3	T	–	NO CLASS – SPRING BREAK	
3/5	Th	–	NO CLASS – SPRING BREAK	
3/10	T	16	Electricity I: power systems	
3/12	Th	17	Electricity II: game overview	
3/17	T	18	Electricity III: renewables	
3/19	Th	19	Electricity IV: portfolio auction	Op-ed
3/24	T	20	Electricity V: climate policy	
3/26	Th	21	Electricity VI: distributed generation	
3/31	T	22	Energy efficiency	Problem set 3
4/2	Th	23	Carbon neutrality at U of M	
4/7	T	24	Offsets	
4/9	Th	25	Excel for cost analysis	
4/14	T	26	Transportation	Cost analysis
4/16	Th	27	Food and agriculture	
4/21	T	28	Review	Electricity game memo
4/28	T		Final exam, 1:30pm-3:30pm	

Detailed course schedule

Class #1 – January 9. Introduction

Class #2 – January 14. 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 16. 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 21. Markets

Readings

1. KO: Chapter 3, pp. 44-48; Chapter 4, pp. 69-79.
2. Eitches, Eliana and Vera Crain. "Using gasoline data to explain inelasticity." U.S. Bureau of Labor Statistics, Beyond the Numbers blog, March 5th, 2016.

Class #5 – January 23. Externalities

Readings

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

Class #6 – January 28. 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.

Class #7 – January 30. Environmental taxation

1. KO: Chapter 8, pp. 143-162.
2. Porter, Eduardo. "Does a Carbon Tax Work? Ask British Columbia." *New York Times*, March 1st, 2016.

Assignments

1. Problem Set #1 due

Class #8 – February 4. Cap-and-trade

Readings

1. KO: Chapter 9, pp. 168-184.
2. Timperley, Jocelyn. "Q&A: How Will China's New Carbon Trading Scheme Work?" *Carbon Brief*, January 19th, 2018.

Class #9 – February 6. Markets vs. mandates

Readings

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

Class #10 – February 11. Policy impact evaluation

No Readings

Class #11 – February 13. Distributional impacts of policy

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.

Assignments

1. Problem Set #2 due

Class #12 – February 18. 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 #13 – February 20. 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.

Assignments

1. Policy analysis due

Class #14 – February 25. Review

Class #15 – February 27. Midterm

March 3. NO CLASS – SPRING BREAK

March 5. NO CLASS – SPRING BREAK

Class #16 – March 10. Electricity I: power systems

Readings

1. (Optional) "Electricity Explained: How Electricity is Deliver to Consumers." *Energy Information Administration*, last updated August 31st, 2018.
2. Popovich, Nadja. "How Does Your State Make Electricity? *New York Times*, December 24th, 2018.
3. Sengupta, Somini. "The World Needs to Quit Coal. Why Is It So Hard?" *New York Times*, November 24th, 2018.

Class #17 – March 12. Electricity II: game overview

In-class activity: team breakouts to get familiar with the electricity game

Readings

1. Electricity game instructional materials

Class #18 – March 17. Electricity III: renewables

Readings

1. Wolfram, Catherine. "Is the Duck Sinking?" *Energy Institute at Haas* blog, April 24th, 2017.
2. Morehouse, Catherine. "Los Angeles Solicits Record Solar + Storage Deal at 1.997/1.3-cents per kWh." *Utility Dive*, July 2nd, 2019.
3. Geschwind, Max. "Council Approves Partnership with Navajo Nation to Implement Environmental Justice Measures on Ancestral Land." City of Los Angeles, District 13 website, February 19th, 2020.

Class #19 – March 19. Electricity IV: portfolio auction

In-class activity: electricity game portfolio auction

Readings (OPTIONAL)

1. Irfan, Umair. "The Best Case For and Against a Fracking Ban. *Vox*, February 19th, 2020.
2. Roberts, David. "A Beginner's Guide to the Debate Over Nuclear Power and Climate Change." *Vox*, December 19th, 2019.

Assignments

1. Op-ed due

Class #20 – March 24. Electricity V: climate policy

Readings

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

Class #21 – March 26. Electricity VI: distributed generation

Readings

1. Malewitz, Jim. "Michigan Shrinks Credits for Rooftop Solar, Clouding Industry's Future." *Bridge Michigan*, May 20th, 2019.
2. Davis, Lucas. "Why Am I Paying 65 $/year for Your Solar Panels?" *Energy Institute at Haas* blog, March 26th, 2018.

Class #22 – March 31. 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. Berkouwer, Susanna. "What causes under-adoption of profitable energy efficient technologies in Kenya?" *The World Bank* Development Impact blog, November 26th, 2019.

Assignments

1. Problem set 3 due

Class #23 – April 2. Carbon neutrality at U of M

Readings

1. President's Commission on Carbon Neutrality. "Fall 2019 Interim Progress Report." University of Michigan, December 2nd, 2019.
2. Nguyen, Terry. "More Companies Want to Be "Carbon Neutral." What Does That Mean? *Vox*, March 5th, 2020.
3. Moore, Michael, Samuel Stolper, Timothy Arvan, and Ben Rego. "An Economic Perspective on Carbon Neutrality at the University of Michigan." February 24th, 2020.

Class #24 – April 7. "Offsets."

Readings

1. Jayachandran, Seema. "Thinking Globally to Mitigate Climate Change: Paying Local Communities to Protect Forests." Data, Decisions, Public Policy talk, September 26, 2019.
2. Irfan, Umair. "Can You Really Negate Your Carbon Emissions? Carbon Offsets, Explained." *Vox*, February 27th, 2020.
3. "Giving green (BETA): short-term recommendations." IDInsight.

Class #25 – April 9. Microsoft Excel for cost analysis

In-class activity: Practice with Microsoft Excel for use with the cost analysis assignment

Class #26 – April 14. Transportation

1. Gillis, Justin. "Would You Pay Higher Gas Prices to Slow the Climate Crisis?" *New York Times*, February 28th, 2020.
2. Campbell, Andrew. "Counteracting the EPA's Tilt Away from Electric Vehicles." *Energy Institute at Haas* blog, August 20th, 2018.
3. Davis, Lucas. "An Electric Vehicle in Every Driveway?" *Energy Institute at Haas* blog, May 13th, 2019.

Assignments

1. Cost analysis due

Class #27 – April 16. Food and Agriculture

Readings

1. Noor, Dharna. "We Need to Change Every Part of Our Food System to Fight the Climate Crisis." *Earther*, February 20th, 2020.
2. Samuel, Sigal. "How to Reduce Your Food's Carbon Footprint, in 2 Charts." *Vox*, February 20th, 2020.
3. Sharp, Alastair. "Canadian Farmers Have a Plan for Tackling Climate Change." *Grist*, February 17th, 2020.

Class #28 – April 21. Review

Assignments

1. Electricity game memo due

FINAL EXAM – April 28, 1:30-3:30pm