

ECON 265: Environmental Economics, Fall 2019

TR 1:30 pm – 2:45 pm in WNS 207

Prof. Akhil Rao

Email: akhilr@middlebury.edu

Course software: Canvas, Middfiles, PollEverywhere

Office location: Warner Hall 502A

Office hours: Tuesday 11am–noon & 3pm–4pm, Wednesday 1pm–2pm,
Thursday noon–1pm, and by appointment

This syllabus will guide our class, but it is not set in stone. I will update it throughout the semester to ensure that it reflects our goals and progress.

Last updated: September 24, 2019

Executive summary:

Exams: **Thursday 10/17** and **Thursday 11/19** in class. No rescheduling.

Paper proposal: **Saturday 10/26 3pm** (Canvas).

Paper due: **Friday 12/6 3pm** (Canvas and hard copy).

“In the news” 2-3 sentences submitted **before Tuesday class** on Canvas. Allowed to miss 4 times. Due by 1pm.

Colloquium attendance written response (one page) by **Friday 12/6 3pm** (Canvas).

Course grading: 40% weight on exams, 35% weight on paper and presentation, remainder is problem sets and participation.

This course moves fast — come prepared, and ask questions. A particularly helpful question to ask: “I’m not following — could you repeat that?” (It’s very helpful when you’re feeling generally confused but not quite sure what you’re confused by, a state I often find myself in.)

Description and goals

Humans are becoming increasingly aware that our actions to improve our welfare have far-reaching consequences on our environments and resource stocks. From the use of fossil fuels to generate energy, to harvesting fish to feed our families, to launching satellites to monitor crops and weather, the environmental impacts of our actions are becoming more severe. We are living in the Anthropocene: an age of climate change and global poverty reduction; resource depletion and global supply chains; orbital debris accumulation and real-time satellite-based monitoring; mass extinction and synthetic proteins.

Understanding these issues and weighing different solutions requires a unique blend of ethical and scientific awareness. Environmental and natural resource economics provides a powerful framework in which these concerns — intra and intergenerational fairness, complex biophysics, political feasibility, economic efficiency, and more — can be unified and holistically assessed.

In this course, we will focus on developing proficiency with the fundamental issues and tools of environmental and natural resource economics. This course builds on economics principles and provides an overview of environmental and natural resource economics using a range of real world issues. It is dedicated to the proposition that economic reasoning is critical for analyzing the persistence of environmental damage and for designing cost-effective environmental policies.

This course will likely recast familiar problems in unfamiliar lights, or apply tools you know to new settings. This is the point! Don't feel discouraged if what we're doing feels at times incomprehensible, unrealistic, too simplistic, overly complex, too easy, or just plain hard. Come to my office hours — I'm here to help. With me as your environmental economics spirit guide, you'll get through this course with enough challenge to stimulate (but not overwhelm) you.

Prerequisites: ECON 155. We will review key microeconomic concepts during the first weeks of class. I assume students are comfortable with basic algebra and quantitative analysis (i.e., interpreting numbers and graphs), or are willing to brush up on these skills early in the semester. Microsoft Excel will be used for some assignments. I also assume students have a basic level of competence using Excel (simple calculations, plotting).

Course Objectives:

After taking this class, you will:

- understand the economic approach to the environment;
- be able to use microeconomics to illustrate the theory of environmental policy; and
- comprehend and be able to critically evaluate alternative environmental standards, benefits and costs of environmental protection, and incentive-based environmental policies.

Textbook and readings:

Markets and the Environment by Nathaniel O. Keohane and Sheila M. Olmstead. It is available at the bookstore. (Feel free to get whichever edition is most convenient, just follow along the appropriate topics.)

Additional materials—chapters from books, articles, podcasts, and videos from the popular press or academic journals—are posted on Canvas. A reading list is found on the last pages of this syllabus.

When in doubt, **check the syllabus**. Email me if it doesn't answer your question(s). Please allow me 48 hours to respond, but don't hesitate to follow up if I have not replied. I generally do not check my email over the weekend.

Course policies

Office hours: There are four hours of scheduled office hours per week (in the beginning of the semester we will make sure that all of you can make at least one scheduled time). Please come to my office hours with questions about problem sets, exams, research, advising, etc.

Extensions: Out of fairness to all students, extensions will generally not be granted without a dean's excuse and will not be granted retroactively. In the case of extenuating circumstances, you should have your dean contact me *before* the deadline.

Emails: In the subject line **please start with "Econ 265: "** — I use email filters to prioritize among the many emails I receive each day, and including this in the subject line will ensure I see your email quickly. I recommend you use email only for questions requiring a brief response and to set up meetings outside of my office hours.¹ For anything substantive (i.e. problem sets, research, advising, etc.), please visit me at office hours. Being able to tackle complicated questions/topics in person is much easier than via email. Sometimes my inbox gets busy and I lose track of things — if I have not replied in 48 hours, please re-send your email (replying to the email with no text is sufficient). I typically do not check my email after 6pm.

Honor Code: Middlebury Honor Code is described at go/honorcode.

Classroom etiquette: I expect you to show respect for each other: show up on time, stay focused, do not use mobile devices and laptops unless approved, and do not hold side conversations. If you need to use a laptop to take notes, you must clear it with me in advance.

Accommodations: Students who have Letters of Accommodation in this class are encouraged to contact me as early in the semester as possible to ensure that such accommodations are implemented in a timely fashion. If you are requesting extended time accommodations you must schedule your proctored exam with me *at least one week in advance*. For those without Letters of Accommodation, assistance is available to eligible students through Student Accessibility Services. Please contact Jodi Litchfield or Courtney Cioffredi, the ADA Coordinators, for more information: Courtney Cioffredi can be reached at ccioffredi@middlebury.edu or 802-443-2169 and Jodi Litchfield can be reached at litchfie@middlebury.edu or 802-443-5936. All discussions will remain confidential.

I reserve the right to modify the policies listed above.

Other notes

- I love meeting with students. But! Please make an appointment if you want to meet outside of office hours. A quick email is fine. Friday is my "research day", so I try not to schedule appointments then, and may be slow to respond.
- This course may seem daunting — we'll be covering complicated concepts, often at a very abstract level. Don't panic! With practice, repetition, and patience, it will come together. I'm here to help — don't hesitate to ask questions.
- On asking questions: sometimes a concept feels fuzzy or like it isn't quite clicking, but it's hard to frame a question precisely. Don't worry! Ask anyway. We may not get to the bottom of it right away,

¹That said, I understand you may wish to pose a more substantive question over email. I may respond if the answer is easy to type out; else, I will likely ask you to come to my office.

but we can make progress. Questions about material also tend to be correlated across students, so by asking you often provide a public good to your classmates.

- This material goes deep. I may at times limit our inquiry to keep us moving along. If you're curious, I'm happy to talk in more detail in office hours. Think of environmental economics as a very large lake, and this course as wading into the shallow area near a shore — we'll learn to swim here and have a generally fun time! — but there's a lot more to be explored.

Problem sets, exams, paper, and participation

Four problem sets: Problem sets will be posted on Canvas the week before they are due. You are encouraged to work in study groups, discuss the problems with each other, and come to my office hours. You are, however, responsible for submitting your own write-up of your solutions. Copying a peer's homework (duplicate use of written work) is considered a violation of the Honor Code. Make sure to write your name and the name(s) of students in your study group on each problem set submitted. No extensions will be granted and late problem sets will be marked down 25% per day.

Two exams: We will have two in-class exams on **October 17** and **November 19**. There will be no make-up exams. Any absence on an exam day will result in the other exam being re-weighted to include the missed exam.

Paper: There are many pressing and interesting environmental economics problems in the world, and the time does not allow to cover them all in this class. To address your interests and practice applying the tools learnt in this class, we will have one short paper (10-12 pages, double-spaced) on topics of your choice due **Friday 12/6, 3pm** (hard and electronic copy on Canvas). You will need to discuss your topic with me by email or in person and submit one-page proposal by **Saturday 10/26, 3pm** on Canvas so that I could provide feedback and guidance. We will also have in-class presentations of your papers to introduce your research projects to your fellow students. All students will be required to provide feedback on individual presentations to help with the research process. I will have a detailed assignment sheet outlining my expectations for the papers and presentations, and suggesting topics and approaches.

For the paper, I expect you to take full advantage of the many resources on offer at Middlebury while remaining true to the Honor Code. This means I fully support you in (for example) going to the writing center and working closely with people there to hone your writing, but you must ensure that you are polishing your own ideas and not someone else's. Similarly, I encourage you to go to the library and work with the librarians to find more resources, but be sure to cite what you use and provide your own insights. *Where you use someone else's ideas, you must cite them.*² I highly recommend you reach out to **Ryan Clement**, the Economics reference librarian. Ryan is a wealth of knowledge about economic data and literature. His email is rclement@middlebury.edu, and his website is at go.middlebury.edu/ryan.

I am not particular on citation format — anything reasonable will do so long as you are consistent. The main purpose of the citations is so that you can be clear about where you are providing a new contribution and where you are building on the work of others, and so that I can easily find the sources you are referencing. I *strongly* encourage you to use some type of citation manager, such as the built-in manager in Word, Zotero, or BibTeX. It seems a shame to spend your scarce time and resources manually tracking and formatting citations in 2019.

²Interestingly, self-plagiarism is a thing — you must also cite yourself if you are using an idea you developed in another work. In general I would like you to write an original paper, but if you are working on a related assignment for another class and would like to cross-reference or otherwise combine them, come talk to me.

Participation: Full engagement with this class requires attending lectures, participating in class discussions and games, reading the assigned material ahead of the lecture, and asking questions. Your participation grade will go down if you do not participate in class discussions and do not show evidence of having done readings *in advance*. We will also have 2-4 short in-class low-stakes quizzes and/or experiments throughout the semester.

In the news: You are expected to follow environmental news and debates to establish connections between the current events and our course concepts. To facilitate our class discussions, for each class you will submit a short (2-3 sentences) description of “in the news” story that states the news source (with a link if available), short description, and connection to the class material. The “in the news” writing assignments are part of your participation grade. You do not need to submit the “in the news” stories on the days of our exams and during student presentations. And you are allowed to skip this writing assignment *four times during the semester*. Due on Canvas by 1pm.

Colloquium: You are encouraged to attend the Environmental Studies Colloquium that takes place on *Thursdays, 12:30–1:20pm* at the Orchard (Room 103) of the Franklin Environmental Center at Hillcrest to learn about other disciplines’ perspectives on conservation and environmental topics. The Colloquium schedule is posted at <http://www.middlebury.edu/academics/es/news/woodincolloquiumseries>. **Attendance of one of the weekly lectures (or an alternative public lecture on an environmental topic) is required.** As part of your participation grade, submit a one-page written response (single-spaced or double-spaced) describing how the lecture relates to the material we are covering in class.

Grading

The problem sets, paper, exams, and participation carry the following weights:

Problem sets	15%
First exam	20%
Second exam	20%
Paper presentation	10%
Paper	25%
Participation	10%

Your letter grade will be based on the weighted average of these six elements. The distribution of final grades will dictate the precise cut-offs of your letter grade. If I do need to scale, I will only scale ‘upward’ so that the scale can only help your grade.

Course schedule and reading list

The schedule of classes, assignments, and readings is given below. All readings are to be done **prior** to class. They are posted on Canvas. I reserve the right to make changes but will provide ample notification if any changes are made.

1. Sep 10, 12: Thinking about the environment like an economist

- Textbook Chapter 1.
- Fullerton, Don and Robert Stavins. 1998. "How Economists See the Environment." *Nature* 395: 433-434.
- Freakonomics podcast "Two (Totally Opposite) Ways to Save the Planet (Ep. 346)." <http://freakonomics.com/podcast/save-the-planet/>.
- Resources radio podcast, "Economics in the Age of Environmental Policy, with Robert Stavins." <https://www.resourcesmag.org/resources-radio/economics-age-environmental-policy-robert-stavins/>.

2. Sep 17: Economic efficiency and environmental protection

- Chapter 2.
- Porter, Eduardo. 2015. "For Government That Works, Call In the Auditors." *The New York Times*, October 6.
- Fowlie, Meredith, Michael Greenstone, and Catherine Wolfram. 2015. "Are the Non-Monetary Costs of Energy Efficiency Investments Large? Understanding Low Take-Up of a Free Energy Efficiency Program." *American Economic Review* 105 (5): 201-4.
- Goulder, Lawrence H. and Robert N. Stavins. 2002. "An Eye on the Future." *Nature* 419: 673-674.

3. Sep 19, 24, and 26: The benefits and costs of environmental protection

- Chapter 3.
- Radiolab podcasts: <http://www.radiolab.org/story/what-dollar-value-nature/> and <http://www.radiolab.org/story/rhino-hunter/>
- *Measuring costs and benefits*
- Pizer, William, Matthew Adler, Joseph Aldy, David Anthoff, Maureen Cropper, Kenneth Gillingham, Michael Greenstone, et al. 2014. "Using and Improving the Social Cost of Carbon." *Science* 346 (6214): 1189-90.
- Krupnick, Alan J., and Juha Siikamaki. 2007. "How People Value What Nature Provides." *RFF Resources* 165: 14-16.
- *Benefit-cost analysis and critiques*
- Arrow et al. 1996. "Is There a Role for Benefit-cost Analysis in Environmental, Health, and Safety Regulation?" *Science* 272: 221-222.
- Kelman, Steven. 1981. "Cost-benefit Analysis: an Ethical Critique (with Replies)." *AEI Journal on Government and Society Regulation*: 33-40.

Due: Problem set #1 by Oct 1, 1:00pm (my door)

4. Oct 1 and 3: Market efficiency and market failure

- Chapters 4,5.
- "Externalities" in *The Concise Encyclopedia of Economics*.
- "Public Goods" in *The Concise Encyclopedia of Economics*.

5. Oct 8: Non-renewable resources

- Chapter 6.
- Covert, Thomas, Michael Greenstone, and Christopher R. Knittel. 2016. "Will We Ever Stop Using Fossil Fuels?" *Journal of Economic Perspectives* 30 (1): 117-38.

6. Oct 10: Renewable resources

- Chapter 7.
- Ostrom, Elinor. 2008. "The Challenge of Common-Pool Resources." *Environment* 50 (4): 8-20.

Due: Problem set #2 by Oct 12, 3:00pm (my door)

First exam review on Oct 15 and exam on Oct 17 in class

7. Oct 22 and 24: Policy instrument choice

- Chapters 8, 9.
- Freakonomics Radio podcast "How Efficient is Energy Efficiency?" <http://freakonomics.com/podcast/how-efficient-is-energy-efficiency-a-new-freakonomics-radio-podcast/>.
- *The Coase theorem and the Pigouvian tax*
- The Economist. 2017. "Pigouvian Taxes." Print edition, 19 August.
- Coase, Ronald. 1960. "The Problem of Social Cost." *Journal of Law and Economics* 56: 837-877. READ PAGES 837-853.
- Fullerton, Don. 2011. "Six Distributional Effects of Environmental Policy." *Risk Analysis* 31(6): 923-929.
- Resources for the Future podcast "Tax: Revisiting the Trade-Offs in Climate Policy Options" <http://tun.in/tiESmQ>

Due: Paper proposal by Oct 26, 3:00pm (Canvas)

8. Oct 29 and 31: Market-based instruments in practice

- Chapter 10.
- Carbon Tax Policies <https://youtu.be/45wuGMg1tE>
- Tietenberg, Tom H. 2013. "Reflections—Carbon Pricing in Practice." *Review of Environmental Economics and Policy* 7 (2):313-29.
- Planet Money podcast "The One-Page Plan To Fix Global Warming... Revisited (Eps. 472)." <https://www.npr.org/sections/money/2018/07/18/630267782/episode-472-the-one-page-plan-to-fix-global-warming-revisited>.
- Killeen, Grady and Arik Levinson. 2017. "Automobile Fuel Economy and Greenhouse Gas Emissions Standards." *Case Studies in the Environment*: 1-12.
- RFF podcast "What Can States Do to Reduce GHG Emissions from the Transportation Sector?" <http://www.rff.org/blog/2017/what-can-states-do-reduce-ghg-emissions-transportation-sector-podcast-virginia-mcconnell>.

Due: Problem set #3 by Nov 2, 3:00pm (my door)

9. Nov 5: Sustainability, economic growth, and trade

- Chapter 11.
- Planet Money podcast "A Bet On The Future Of Humanity (Eps. 508)." <https://www.npr.org/sections/money/2018/01/19/579192124/episode-508-a-bet-on-the-future-of-humanity>.
- Daly, Herman E. 2005. "Economics in a full world." *Scientific American*, with replies.
- The Economist. 2016. "The trouble with GDP." Print edition, 30 April.

10. Nov 7: Environment and development

- Jayachandran, Seema, Joost de Laat, Eric F. Lambin, Charlotte Y. Stanton, Robin Audy, and Nancy E. Thomas. 2017. "Cash for Carbon: A Randomized Trial of Payments for Ecosystem Services to Reduce Deforestation." *Science* 357 (6348):267-73.
- Berazneva, Julia, and Tanya S. Byker. 2017. "Does Forest Loss Increase Human Disease? Evidence from Nigeria." *American Economic Review* 107 (5):516-21.

11. Nov 12: Environmental justice

- Banzhaf, Spencer. 2010. "The political economy of environmental justice." *RFF Issues of the Day* 48.
- Muller, Nicholas Z., Peter Hans Matthews, and Virginia Wiltshire-Gordon. 2018. "The Distribution of Income Is Worse than You Think: Including Pollution Impacts into Measures of Income Inequality." *PLoS ONE* 13 (3): e0192461.
- Flint's water and environmental justice, interview with Paul Mohai at <https://www.scientificamerican.com/podcast/episode/flint-s-water-and-environmental-justice/>.

Due: Problem set #4 by Nov 16, 3:00pm (my door)

Second exam review on Nov 14 and second exam on Nov 19, in class

Due: Colloquium attendance written response by Dec 6, 3:00pm (Canvas)

Due: Paper by Dec 6, 3:00pm (Canvas and my door)

12. Nov 12 – Dec 5: Student presentations

FALL TERM, 2019

	M	TU	W	TH	F
1	9/9 Classes Begin	9/10	9/11	9/12	9/13
2	9/16	9/17	9/18	9/19 Clifford Symposium	9/20 Clifford Symposium End Add Period
3	9/23	9/24	9/25	9/26	9/27 Family Weekend
4	9/30	10/1	10/2	10/3	10/4
5	10/7	10/8	10/9	10/10	10/11 Homecoming End Drop Period
6	10/14	10/15	10/16	10/17	10/18 Classes End 4:15
7	10/21 Mid-Term Recess	10/22 Mid-term Recess	10/23 Classes Resume	10/24	10/25
8	10/28	10/29	10/30	10/31	11/1
9	11/4	11/5	11/6	11/7	11/8
10	11/11	11/12	11/13	11/14	11/15
11	11/18	11/19	11/20	11/21	11/22
B R E A K	11/25	11/26 Classes End 4:15	11/27 Thanksgiving Recess	11/28 Thanksgiving Recess	11/29 Thanksgiving Recess
12	12/2 Classes Resume	12/3	12/4	12/5	12/6 Classes End 4:15
E X A M	12/9 Reading Day	12/10 Exam Period Begins	12/11 Final Exams	12/12 Reading Day	12/13 Final Exams through Sunday 12/15 @ 10pm

For more information visit our Web page! <http://www.middlebury.edu/~learn>

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