University of Maryland - Master of Science in Applied Economics

ECON 675 (Winter 2022/2023)
Environmental Economics
November 29, 2022 – Feb 14, 2023

Office hours: Sunday 5:30-6:15 (online) 1400 16th Street, NW (Suite 140)
Class time: Tuesday 6:45-9:30 PM Washington, DC 20036

Please note that there will be one class that does not fall on a Tuesday. *This is necessary in order for us to meet 12 times during the semester.*

Online discussion:
Tuesday 9:00 AM to Friday 8:00 PM
Saturday 9:00 AM to Tuesday 8:00 PM (for Friday 1/20 class session)

Instructors

Chris Dockins Email: pdockins@umd.edu
Charles Griffiths Email: cgriff16@umd.edu

Instructor office hours: We plan to hold regular office hours on Sundays from 5:30 to 6:15 online, but we can adjust this as needed and can meet for specific appointments. We will add more details as we start the semester.

Teaching Assistant

Wantian Huang is our TA for this class.
whuang11@umd.edu
TA Office Hours: Tuesdays 5:15-6:15

Texts – Required and Supplemental

There is no required "textbook" for this course. Instead, the course relies upon chapters from the US EPA's *Guidelines for Preparing Economic Analyses*, which is freely available and will be provided as a pdf file, and on articles from the economics literature. Required and supplementary readings are provided.

Course Description

This course examines the problems of earth, air, and water pollution from an economic perspective and the nature of environmental regulation, U.S. environmental policies, and environmental policy debates. Students will use welfare economics to evaluate the inefficiencies of market failures and examine market-based policy responses to environmental problems. Students will be asked to undertake practical exercises commonly done by environmental economists, including estimating the willingness to pay for an environmental amenity and reviewing Regulatory Impact Analyses.

Objectives

Our program has 7 general learning outcomes for students:

1. Ability to understand, evaluate and analyze economic data
2: Ability to understand and interpret statistical evidence from economic data
3: Ability to apply empirical evidence to assessing economic arguments

4: Ability to apply macroeconomic theories to policy discussions
5: Ability to apply microeconomic theories to policy discussions
6: Ability to communicate economic ideas to a broader audience
7: Ability to evaluate the effectiveness of policy programs using sound economic techniques

The learning outcomes that pertain to this course are: *1, 2, 3, 5, 6, and 7*

Somewhat more specifically, at the end of the course, students should be able to:

- Statistically estimate and interpret the willingness to pay for an environmental good.
- Apply empirical evidence to assessing environmental economic arguments using benefit-cost analysis, discounting, and uncertainty analysis.
- Apply the microeconomic theories of market failure and externalities to policy discussions.
- Communicate environmental economic concepts and ideas to a broader audience.
- Evaluate the effectiveness of U.S. government pollution control policies using sound economic techniques.

Prerequisites
To enroll this course, students must have completed ECON 641 (Microeconomic Analysis), and they must have completed or be currently enrolled in ECON 645 (Empirical Analysis III: Econometric Modeling and Forecasting).

Structure of the Course

- The course will be taught in a lecture/seminar format meeting once per week on Tuesday, 6:45-9:30 PM.
- NOTE: The class will also meet on Friday, January 20 from 5:45-8:30 pm online via Zoom.
- An online discussion will be held each week on the ELMS/Canvas Discussion page from the day after the class (usually Wednesday) at 9AM for four days (ending usually Saturday at 8:00 pm). *Please note that there is one exception for the class held on Friday.* Students are expected to make two (but no more than three) substantive contributions to this discussion each week. The instructor will monitor this discussion (twice on 2nd discussion day and twice on 3rd or 4th discussion day) to respond to students and re-direct the discussion as necessary.
- Students will be given periodic quizzes at the end of class, three longer term assignments throughout the semester, and a final exam at the end of the semester. See class schedule below for due dates.

Grading
Grades will be determined based on students' performance on quizzes, homework, exam, and class participation:

15% Quizzes
Students periodically will be given questions at the end of class to test their understanding of the concepts discussed and to provide examples of the types of questions that will be used in the final exam.

15% Assignment 1 – *Example: Estimating the Efficient Level of Pollution Control*
Students will be asked develop a simple conceptual model of the economic benefits of an environmental externality. They will then be asked to collect data, populate the model, and estimate the efficient level of pollution control.

15% Assignment 2 – *Example: Estimating Willingness to Pay*
Students will be given a problem and data and will be asked to econometrically estimate the willingness to pay for an environmental amenity.

15% Assignment 3 – Policy Memorandum
Student will assume the role of a policy adviser and will be given a current environmental economic topic. They will be asked to write a short policy memo describing the problem and offering a set of recommendations for a decision-maker to consider.

30% Final Exam
Students will be given an in-class, open book exam.

10% Participation
Participation will be based on the student's attendance record and his or her participation in class discussion as well as his or her substantive participation in the weekly online discussion.

At the end of the term, every student will have a numerical course grade between 0 and 100. We will decide upon the numerical cutoffs between various letter grades based on my professional judgment. We will consider students' performance relative to the class. We will also consider absolute standards of professional competence. Highly competent students will get A's. Barely competent students will get B's. Incompetent students will get B-'s or worse. The cutoffs that I use will respect the ordinal ranking of numerical course grades. No student with a given numerical course grade will receive a lower letter grade than someone else with a lower numerical course grade.

Required Technology
Students are expected to have access to a word processing package (e.g. Microsoft Word), a spreadsheet package (e.g., Microsoft Excel), and a statistical software package (Stata). Students should bring a calculator with them to class.

Purchasing Stata
The program's curriculum is designed to use Stata as the statistical software. Other leading statistical software packages include SAS and R. We have decided to focus on one package to enhance the continuity across courses in our program. A more superficial familiarity with multiple packages might be just as good as a deep understanding of a single package. But working with multiple packages would also result in less time to learn econometrics.

If you have not done so, students in the program should purchase Stata. Stata offers different "flavors" and different lengths of license. Price varies according to these two factors. A description of the flavors is given here: http://www.stata.com/products/which-stata-is-right-for-me/ Stata offers student discounts via the "Gradplan": http://www.stata.com/order/new/edu/gradplans/. A one-year license for Stata/IC is $125, and a perpetual license (which never expires) is $198. We do not recommend "Small Stata". Small Stata is too limited for the course work our program. Under the Gradplan, you may install Stata on up to three different computers. You may also eventually upgrade your version of Stata and your license, at a discount, if you wish.

Assignments
Assignments are due at the beginning of class. Assignments 1, 2, and 3 should be submitted via ELMS. You may also email both instructors (pdockins@umd.edu and cgriff16@umd.edu) as a backup.

Copyright Notice
Class lectures and other materials are copyrighted and may not be reproduced for anything other than personal use without written permission from the instructor.

Other Standard Policies for the Program and the University of Maryland

Policies related to all graduate courses at the University of Maryland are posted on this page of the Graduate School's website:

https://gradschool.umd.edu/faculty-and-staff/course-related-policies

Please familiarize yourself with these policies related academic integrity, non-discrimination policy, accessibility, absences and accommodations, grading, academic standing, grievance procedures, and other important policies.

Email: The University has adopted email as the primary means of communication outside the classroom, and we will use it to inform you of important announcements. The University creates an "@umd.edu" email address for every graduate student. All official UMD communications will be sent to students at their "@umd.edu" email address. You are responsible for reading your @umd.edu email address, including ELMS/Canvas Announcements we send to the class. You should make sure ELMS/Canvas Announcements and messages are forwarded to an email address that you check regularly. Failure to check email, errors in forwarding email, and returned email due to "mailbox full" or "user unknown" will not excuse a student from missing announcements or deadlines. We will do my best to respond to email within 36 hours.

Course Website: Copies of the course syllabus, student's grades, and other relevant links and documents will be posted on the course's ELMS/Canvas website. Students can access the site via www.elms.umd.edu. They will need to use their University of Maryland "directory ID" and password.

Contact Hours: Three credit master's-level courses at the University of Maryland require a minimum amount of contact between instructors and students. Our courses' 12 weekly meetings only satisfy 80% of the university's contact requirement. The other 20% is satisfied by weekly mandatory and graded online contact. In principle, the contact hours requirement could be satisfied by scheduling 3 additional 150-minute meetings per term, or 6 additional 75-minute meetings, or 10 additional 45-minute meetings. But in practice the contact hours requirement is satisfied by the weekly online discussions. The weekly online discussions are a more flexible way to ensure that our program's courses in DC provide the same level of student-instructor contact as the traditional 15-week face-to-face version of the same course when it is taught on campus in College Park.

Work Load: Mastering the material covered in this course requires a significant amount of work outside of class. Students should expect to spend more time outside of class than in class – typically at least twice as much time. The courses in our DC program are 12-week courses that cover all the same material as a traditional semester-long 3-credit course (15 weeks). The compressed schedule makes it possible to complete our degree in just 15 months if you take 2 courses each term. But the compressed

schedule also implies an accelerated pace with an average of 25% more work per week in a given course (15/12 = 1.25). The normal full-time load in a master's program is 3 courses per semester, or 6 courses per year. The weekly workload when taking 2 of our DC courses per term is equivalent to the load from 2.5 "normal" 15-week courses - so 2.5/3.0=83% of a full-time load. However, the DC program takes just 1 week off between terms. Students who take 2 courses per quarter in our program complete 8 courses per year. So over the course of a year, taking 2 courses per quarter in our DC program is equivalent to 133% of a "normal" full-time load in the traditional semester-based program (8/6 = 1.33).

Academic Progress: The graduate school requires that students maintain a GPA of at least 3.0. Students whose cumulative GPA falls below 3.0 will be placed on academic probation by the graduate school. Students on academic probation must ask the program's director to petition the graduate school if they want to remain in the program. The petition must include a plan for getting the student's GPA up to at least 3.0. Students who do not live up to their plan can be forced to leave the program without having earned the degree. Note: a grade of "B" corresponds to a GPA of 3.0. A grade of "B-" corresponds to a GPA of 2.7.

Excused Absences: If you miss any class meetings for any reason, it is your responsibility to work with the instructor to make sure you catch up on the missed material. Instructors routinely facilitate things by posting lecture notes, etc.
If you need to miss an exam or other graded course requirement because of illness, injury, or some other emergency: Follow doctor's orders and get documentation. Get in touch with the instructor as soon as you're able – preferably prior to missing the exam or deadline. Communicate with the instructor to make up the course requirement as soon as possible. You are entitled to recover before you make up the course requirement, but you are not entitled to extra days to study beyond the time the doctor's note says you're incapacitated. If you are incapacitated for more than a week or so beyond the end of the term, your grade in the course will be an "Incomplete". In such cases you must negotiate a plan with your instructor for completing the course requirements. Once you make up the course requirement the instructor will change your "I" to the appropriate letter grade.

School Closings and Delays: Information regarding official University closing and delays can be found on the campus website and the snow phone line: (301) 405-SNOW (405-7669). The program director will also announce cancellation information to the program as an announcement on the program's ELMS/Canvas site. This will generally be done by 1:00 p.m. on days when weather or other factors are an issue. When classes need to be canceled during the semester, we make every effort to schedule makeup classes.

UMD Counseling Center: Sometimes students experience academic, personal and/or emotional distress. The UMD Counseling Center in Shoemaker Hall provides free, comprehensive, and confidential counseling / mental health services that promote personal, social, and academic success. All Counseling Center services are completely free for enrolled students. Proactively explore the range of services available at the Counseling Center, including the Counseling Service and Accessibility and Disability Service described at http://www.counseling.umd.edu/

Graduate Academic Counselor: The UMD Graduate School also has an academic counselor available to support students who are having difficulty navigating mental health resources on campus, are considering a leave of absence and/or need assistance finding mental health care off campus. The Graduate Academic Counselor also facilitates bi-weekly Graduate Student Circle Sessions which provide

an opportunity to learn about resources and connect with other graduate students. Students can learn more about the Graduate Academic Counselor by going to: https://gradschool.umd.edu/gradcounselor

Course Evaluations: Near the end of the term, you will receive an email inviting you to submit a voluntary and anonymous course evaluation. Your feedback on courses will be very helpful in improving the quality of instruction in our program.

Building Access: You will need to go to our classroom suite in DC to take your midterm and final exams. There is a smartphone app that can be used to enter our building after normal business hours. The program coordinator will provide information about this. We will also provide information about the code for entering the front door of our suite. Please make sure you are receiving the ELMS-Announcements that we send out to the program about these and other important matters.

COVID Policies: Up-to date information about UMD COVID-19 policies and guidance are posted at

https://umd.edu/4Maryland

Given the evolving nature of the pandemic, the guidance and polices are subject to change. The plans are always coordinated with state and county health officials, with additional guidance provided by the University System of Maryland. The focus will always be on the health and well-being of our entire campus community.

We strongly urge all students, staff and faculty to read announcements they receive about COVID related guidance and policy, and to stay familiar with the information. We thank you all for your individual efforts to help protect the collective health of our entire community.

Class Schedule:

Week & Date	Topics	Readings *(Required in **bold**, others optional)*
Wk 1 11/29	Course overview Introduction to Environmental Economics	***EPA 2020 Draft Guidelines.*** **Chapter 1: Introduction** Fullerton, D. and Stavins, R., 1998. How economists see the environment. *Nature*, *395*(6701), pp.433-434. McCarthy, G., 2019. The role of environmental economics in US environmental policy. *Review of Environmental Economics and Policy*. **Sandmo, A., 2015. The early history of environmental economics. *Review of Environmental Economics and Policy*.**
Wk 2 12/6	Efficient Markets and Market Failure	***EPA 2020 Draft Guidelines.*** **Chapter 3: Need for Regulatory Action and Evaluation of Policy Options** **Lockwood, B., 2008. Pareto Efficiency, in *The New Palgrave Dictionary of Economics*, 2nd ed., Palgram Macmillan.** Frischmann, B.M., Marciano, A. and Ramello, G.B., 2019. Retrospectives: Tragedy of the commons after 50 years. *Journal of Economic Perspectives*, *33*(4), pp.211-28. Sandmo, A., 2013. public goods. In *The New Palgrave Dictionary of Economics*, 2ed, Eds. Durlauf, S. and Blume, L. Palgrave Macmillan
Wk 3 12/13	Regulatory Mechanisms, Part 1	***EPA 2020 Draft Guidelines.*** **Chapter 4: Regulatory and Non-Regulatory Approaches to Pollution Control** **Goulder, L.H. and Parry, I.W., 2008. Instrument choice in environmental policy. *Review of environmental economics and policy*.** Bennear, L.S. and Coglianese, C., 2012. Flexible environmental regulation. Cohen, M.A. and Tubb, A., 2018. The impact of environmental regulation on firm and country competitiveness: A meta-analysis of the porter hypothesis. *Journal of the Association of Environmental and Resource Economists*, *5*(2), pp.371-399. Medema, S.G., 2020. The Coase theorem at sixty. *Journal of Economic Literature*, *58*(4), pp.1045-1128. Starrett, D.A., 2003. Property rights, public goods and the environment. In *Handbook of environmental economics* (Vol. 1, pp. 97-125). Elsevier. Walls, M., 2011. Deposit-refund systems in practice and theory. *Resources for the future discussion paper*, (11-47).
	Assignment 1 – Topic TBD Due Date – Jan. 3 (Week 5)	
Wk 4 12/20	Regulatory Mechanisms, Part 2	***EPA 2020 Draft Guidelines.*** **Chapter 4: Regulatory and Non-Regulatory Approaches to Pollution Control (continued)** Goulder, L.H., 2013. Markets for pollution allowances: what are the (new) lessons?. *Journal of economic perspectives*, *27*(1), pp.87-102.

		Hahn, R.W. and Stavins, R.N., 2011. The effect of allowance allocations on cap-and-trade system performance. *The Journal of Law and Economics*, *54*(S4), pp.S267-S294. Sandel, M. 1997. Its Immoral to Buy the Right to Pollute. *New York Times*. **Schmalensee, R. and Stavins, R.N., 2017. Lessons learned from three decades of experience with cap and trade. *Review of environmental economics and policy*.** Schmalensee, R. and Stavins, R.N., 2013. The SO 2 allowance trading system: the ironic history of a grand policy experiment. *Journal of Economic Perspectives*, *27*(1), pp.103-22. Stavins, R.N., 1998. What can we learn from the grand policy experiment? Lessons from SO2 allowance trading. *Journal of Economic perspectives*, *12*(3), pp.69-88. Prices vs Quantity Burtraw, D., Holt, C., Palmer, K., Paul, A. and Shobe, W., 2018. Quantities with prices. *Resources for the Future Working Paper*, *18-08*. **Pizer, W.A., 1997. *Prices vs. quantities revisited: the case of climate change*. *Resources for the Future Working Paper*, 98-02**. Weitzman, M.L., 1974. Prices vs. quantities. *The review of economic studies*, *41*(4), pp.477-491.
Dec 27	• ***NO CLASS***	***Winter Break***
Wk 5 1/3	Benefit-Cost Analysis and Welfare Measures *Assignment 1 Due*	***EPA 2020 Draft Guidelines*:** **1. Chapter 5: Setting the Foundation: Scope, Baseline, and Other Analytic Design Considerations** **2. Appendix A: Economic Theory** Kelman, S., 2000. Cost-Benefit Analysis: An Ethical Critique (with replies). *AEI Journal on Government and Society Regulation*. pp.33-40. Krutilla, K., 2005. Using the Kaldor‐Hicks tableau format for cost‐benefit analysis and policy evaluation. *Journal of Policy Analysis and Management: The Journal of the Association for Public Policy Analysis and Management*, *24*(4), pp.864-875. Tuncel and Hammitt. 2014. A new meta-analysis on the WTP/WTA disparity. *Journal of Environmental Economics and Management.* **Weimer, D., 2008. Cost-Benefit Analysis, in *The New Palgrave Dictionary of Economics*, 2nd ed., Palgram Macmillan.**
Wk 6 1/10	Non-market valuation, human health and ecosystem services	***EPA 2020 Draft Guidelines*. Chapter 7. Benefits Analysis. (Sections 7.1 & 7.2)** Cameron, Trudy Ann, Valuing Morbidity in Environmental Benefit-Cost Analysis (November 2014). Annual Review of Resource Economics, Vol. 6, Issue 1, pp. 249-272, 2014, Available at SSRN: https://ssrn.com/abstract=2507225 or http://dx.doi.org/10.1146/annurev-resource-091912-151943

		Holzman DC. 2012. Accounting for nature's benefits: the dollar value of ecosystem services. *Environmental Health Perspectives*. 2012 Apr;120(4):A152-7. Jewhurst, S.L., Mulvaney, K.K. and Mazzotta, M.J., 2017. The application and usefulness of economic analyses for water quality management in coastal areas. *Journal of ocean and coastal economics*, *4*(1). **Loomis, J., 2005. Economic values without prices: the importance of nonmarket values and valuation for informing public policy debates. *Choices*, *20*(3), pp.179-182.** Olander, L., Tallis, H., Polasky, S. and Johnston, R.J., 2015. *Best practices for integrating ecosystem services into federal decision making*. Durham, NC, USA: Duke University, National Ecosystem Services Partnership. Robinson, L.A., 2007. Policy Monitor. How US Government Agencies Value Mortality Risk Reductions. *Review of Environmental Economics and Policy*
	Assignment 2 – Topic TBD Due Date – Jan 31 (Week 9)	
Wk 7 1/17	Revealed Preference Methods	**EPA 2020 Draft Guidelines. Chapter 7. Section 7.3.1** **Bateman, I.J. and Kling, C.L., 2020. Revealed preference methods for nonmarket valuation: An introduction to best practices. *Review of Environmental Economics and Policy*.** Hedonic Property Models Bishop, K.C., Kuminoff, N.V., Banzhaf, H.S., Boyle, K.J., von Gravenitz, K., Pope, J.C., Smith, V.K. and Timmins, C.D., 2020. Best practices for using hedonic property value models to measure willingness to pay for environmental quality. *Review of Environmental Economics and Policy*. Leggett, C.G. and Bockstael, N.E., 2000. Evidence of the effects of water quality on residential land prices. *Journal of Environmental Economics and Management*, *39*(2), pp.121-144. Hedonic Wage Models Evans, M.F. and Taylor, L.O., 2020. Using revealed preference methods to estimate the value of reduced mortality risk: Best practice recommendations for the hedonic wage model. *Review of Environmental Economics and Policy*. Recreation Demand Models Lupi, F., Phaneuf, D.J. and von Haefen, R.H., 2020. Best practices for implementing recreation demand models. *Review of Environmental Economics and Policy*.
Wk 8 1/20	Stated Preference Methods	**EPA 2020 Draft Guidelines. Chapter 7. Sections 7.3.2** **Carson, R.T., 2012. Contingent valuation: A practical alternative when prices aren't available. *Journal of economic perspectives*, *26*(4), pp.27-42.**

Fri.	***Please note that this class is on Friday January 20th via Zoom***	Carson, R.T. and Hanemann, W.M, 2005. Contingent Valuation. In Maler, K.G. and Vincent, J.R. eds., *Handbook of Environmental Economics, Volume II*. Elsevier. Hausman, J., 2012. Contingent valuation: from dubious to hopeless. *Journal of economic perspectives*, *26*(4), pp.43-56. Johnston, R.J., Boyle, K.J., Adamowicz, W., Bennett, J., Brouwer, R., Cameron, T.A., Hanemann, W.M., Hanley, N., Ryan, M., Scarpa, R. and Tourangeau, R., 2017. Contemporary guidance for stated preference studies. *Journal of the Association of Environmental and Resource Economists*, *4*(2), pp.319-405. **Kling, C.L., Phaneuf, D.J. and Zhao, J., 2012. From Exxon to BP: Has some number become better than no number?. *Journal of Economic Perspectives*, *26*(4), pp.3-26.** Moore, C., Guignet, D., Maguire, K., Dockins, C. and Simon, N., 2015. *A stated preference study of the Chesapeake Bay and watershed lakes* (No. 2168-2018-8163).
Wk 9 1/24	Guest Lecture & Discussion *Assignment 2 Due*	**TBD**
	Assignment 3 – Policy Memo Due Date – Feb. 14 (Week 11)	
Wk 10 1/31	Economics of Climate change and Discounting	**EPA 2020 Draft Guidelines. Chapter 6: Discounting** **Auffhammer, M., 2018. Quantifying economic damages from climate change. *Journal of Economic Perspectives*, *32*(4), pp.33-52**. Gayer, T. and Viscusi, W.K., 2014. Determining the proper scope of climate change benefits. *Washington, DC: GWU Center for Regulatory Studies*. Gillingham, K. and Stock, J.H., 2018. The cost of reducing greenhouse gas emissions. *Journal of Economic Perspectives*, *32*(4), pp.53-72. Hsiang, S. and Kopp, R.E., 2018. An economist's guide to climate change science. *Journal of Economic Perspectives*, *32*(4), pp.3-32. **Hsiang, S., Kopp, R., Jina, A., Rising, J., Delgado, M., Mohan, S., Rasmussen, D.J., Muir-Wood, R., Wilson, P., Oppenheimer, M. and Larsen, K., 2017. Estimating economic damage from climate change in the United States. *Science*, *356*(6345), pp.1362-1369.** McKibbin, W.J. and Wilcoxen, P.J., 2002. The role of economics in climate change policy. *Journal of economic perspectives*, *16*(2), pp.107-129. Newell, R.G., Pizer, W.A. and Raimi, D., 2013. Carbon markets 15 years after Kyoto: Lessons learned, new challenges. *Journal of Economic Perspectives*, *27*(1), pp.123-46. Pizer, W., Adler, M., Aldy, J., Anthoff, D., Cropper, M., Gillingham, K., Greenstone, M., Murray, B., Newell, R., Richels, R. and Rowell, A., 2014. Using and improving the social cost of carbon. *Science*, *346*(6214), pp.1189-1190.

		Goulder, L.H. and Stavins, R.N., 2002. Discounting: an eye on the future. *Nature*, *419*(6908), pp.673-674.
Wk 11 2/7	Environmental Economics and Federal Regulation *Assignment 3 Due*	**EPA 2020 *Draft Guidelines*. Chapter 11.** **Aldy, J., Kotchen, M.J., Evans, M., Fowlie, M., Levinson, A. and Palmer, K., 2021. Cobenefits and regulatory impact analysis: Theory and evidence from federal air quality regulations. *Environmental and Energy Policy and the Economy*, *2*(1), pp.117-156.** Currie, J. and Walker, R., 2019. What do economists have to say about the Clean Air Act 50 years after the establishment of the Environmental Protection Agency? *Journal of Economic Perspectives*, *33*(4), pp.3-26. Griffiths, C., Klemick, H., Massey, M., Moore, C., Newbold, S., Simpson, D., Walsh, P. and Wheeler, W., 2012. US Environmental Protection Agency valuation of surface water quality improvements. *Review of Environmental Economics and Policy*. Keiser, D.A. and Shapiro, J.S., 2019. US water pollution regulation over the past half century: burning waters to crystal springs?. *Journal of Economic Perspectives*, *33*(4), pp.51-75. Schmalensee, R. and Stavins, R.N., 2019. Policy evolution under the clean air act. *Journal of Economic Perspectives*, *33*(4), pp.27-50. Office of Management and Budget (OMB). 2011. *Regulatory impact analysis: A primer*. White House, Washington, DC. Heinzerling, L., 2014. *EPA's Formaldehyde Rule: The Mystery of the Shrinking Benefits*. Center for Progressive Reform.
Wk 12 2/14	Final exam	The final exam will be held in class on February 14.

Books and General Resources (these are not provided, but for your reference)

Environmental economics – theory and practice:

- Baumol, W.J., Baumol, W.J., Oates, W.E., Bawa, V.S., Bawa, W.S. and Bradford, D.F., 1988. *The theory of environmental policy*. Cambridge university press.
- Dasgupta, P., Pattanayak, S.K., and Smith, V.K. eds., 2018. *Handbook of Environmental Economics, Volume 4*. Elsevier.
- Keohane, N.O. and Olmstead, S.M., 2016. *Markets and the Environment*. Island Press.

Benefit-cost analysis:

- Boardman, A.E., Greenberg, D.H., Vining, A.R. and Weimer, D.L., 2017. *Cost-benefit analysis: concepts and practice*. Cambridge University Press.

Valuing environment and health:

- Freeman III, A.M., Herriges, J.A. and Kling, C.L., 2014. *The measurement of environmental and resource values: theory and methods*. Routledge.

Welfare economics – theory:

- Just, R.E., Hueth, D.L. and Schmitz, A., 2005. The welfare economics of public policy: a practical approach to project and policy evaluation. Edward Elgar Publishing.

Other readings on specific topics may be added