

THE GEORGE WASHINGTON UNIVERSITY
Department of Economics
Economics of the Environment and Natural Resources, ECON 6237
1957 E St., Room B 17
Fall 2016, Thursday, 7:10-9:00 pm

PROFESSOR: Benjamin Simon
Office Hours: by appointment.
Phone: 208-4916.
Email address: bsimon@gwu.edu

COURSE DESCRIPTION. The course will apply the tools of microeconomic theory to analyze a variety of environmental and natural resource problems. Knowledge of microeconomic theory at the intermediate, undergraduate level (e.g., PPPA 6017) is essential for the course. Problems will be analyzed using a combination of graphical and mathematical techniques as well as classroom exercises. Although calculus is not required, some concepts from calculus will be employed; these will be explained in class and in handouts as appropriate.

REQUIREMENTS AND GRADING.

Memo Assignments. Approximately three assignments will be posted over the term and you must complete TWO of the three. If you complete more than two, your top two grades will be counted. For these assignments, the deliverable is a 1-2 page memo (typed, single spaced, 12 point font, 1 inch margins) to your policy-maker boss and a short appendix (no more than 3 pages) with additional details, if appropriate. Upload a pdf of your entire assignment to Blackboard. ***Please make sure your name is in the filename of the file you upload.*** These projects are an important part of the course (as reflected in their contribution to your final grade). ***I expect to see high quality, polished, professional work.*** ***Writing quality counts!*** Be sure to format the memo up with appropriate "To," "From," "Date," and "Subject" headings. Any bibliographic references must use a standard format (*however, keep in mind that most policy memos are not academic, in the sense that they do not typically include extensive footnotes and references*). Wikipedia, popular magazines, and newspapers ***are not*** appropriate sources of information for the memos. If you choose, you may work in a team of two on your assignments but you cannot keep the same partner for more than one assignment from the instructor prior to the deadline will be limited to answering pointed questions. Do not expect to be led through the process of doing the project.

Math/Excel Assignments. One math review and 5 assignments using Excel (or statistical software of your choosing) are required. The math assignment is designed to review relevant math concepts. The excel assignments and datasets will be posted on Blackboard in the "projects" area. These assignments may be done in groups of 3 or less.

Article summaries. You must select at least one article *from each topic on the syllabus (this does not include the textbook readings)* and prepare a short (1 page) summary of the key points; *no article summaries will be required for topics I and II.* ***Note that some of these assignments require a one page summary of two articles (i.e., one page per article).*** There are 10 topics on the syllabus. To ensure coverage of the articles I may assign some of the articles. The articles will be discussed during one (or more) class meetings for each major topic covered. The summary you prepare must be posted to

Blackboard prior to the articles being discussed in class. Article summaries will be graded on a check-plus (A), check (A-), and check-minus (B+) system.

Homework. Five optional homework sets will be assigned over the course of the semester. Homework assignments will not be collected or graded. These assignments are designed primarily to illustrate relevant concepts covered in lecture and in the text. Answer sheets will be posted on Blackboard about a week after the assignment is made available.

Turning in assignments. Assignments should be uploaded to Bb or turned in at the beginning of class on the due date.

Submission of Written Work Products Outside of the Classroom. It is your responsibility to ensure that I receive your assignment on time. It is not permissible to submit assignments on the digital dropbox of Blackboard unless I tell you so.

Collaboration on Assignments. You are welcome to work in groups; however, you are expected to write up your answers individually.

Late work will not be graded (unless an exception has been granted prior to the due date).

Tests. There is a midterm and a final exam. The midterm exam will be a take home. The time and place of the final exam will be announced later in the semester.

Class participation. Classroom participation is strongly encouraged.

Grading. The course grade will be calculated using the following weights: midterm exam -- 20%; final exam -- 25%; memo assignments -- 15%; math and Excel assignments -- 30%; article summaries -- 5%; and class participation -- 5% (I expect that you will come to class having read the assigned readings and prepared to engage with me and other students in discussing the material we are covering; class participation is more than just attendance).

Graphing. I highly recommend Desmos (<https://www.desmos.com/calculator>) for graphing equations. While not a substitute for your ability to draw graphs by yourself or for using Excel, it is a highly useful tool for checking your work and understanding how changes in an equation change the graph.

Late or Missed Class. If you are late or absent from class, it is your responsibility to obtain all announcements, assignments, and handouts from Blackboard or from your classmates.

Exam Dates. Please notify me in the first two weeks of class if you are aware of a pre-existing conflict, such as a religious holiday you observe, that will preclude you from taking either the midterm or final at the assigned time. To the extent possible, we will work together to reschedule the exam as close to the original date as possible.

Incompletes. You must consult with me to obtain an incomplete no later than the last day of classes in the semester. At that time, we will both sign the CCAS contract for incompletes and submit a copy to the School Director.

Changing Grades After Completion of Course. No changes can be made in grades after the conclusion of the semester, other than in cases of clerical error.

Accommodation for Students with Disabilities. If you need extra time on exams or assignments due to a disability, let me know in the first week of class. In order to receive accommodations on the basis of disability, you'll need to provide proper documentation to the Office of Disability Support Services, Marvin Center 436, 202-994-8250. Accommodations will be made based upon the recommendations of the DSS Office.

University Counseling Center. The University Counseling Center (UCC), 202-994-5300, offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include: crisis and emergency mental health consultations; confidential assessment, counseling services (individual and small group), and referrals

Religious Holidays. If you need to miss a class to observe a religious holiday, please notify me the first week of classes about any conflict; we will arrange an absence without penalty.

Academic Integrity. The George Washington University is guided by the standards of academic integrity. Students are reminded to honor the Code of Academic Integrity, which can be viewed at:
<http://www.gwu.edu/~ntegrity/code.html>
If you are not familiar with the Code, you should read through it carefully.

Summary of Topics and Assignment Due Dates

Due Date	Topic	Article Summary	Math/Excel (you must do all)	Memo (choose 2)	Tests
9/1	Topic I- welfare econ				
9/8	Topic II – on your own; Topic III – property rights/mkt failure	√ - one article from Topic III	Math review		
9/8	Topic III – property rights/mkt failure		Excel 1 – supply and demand		
9/15	Topic IV – govt failure	√ - one article			
9/22	Topic V – instruments for pollution control		Excel 2 – Negative externalities		
9/29	Topic V – instruments for pollution control	√ - two articles		Memo 1	
10/6	Topic VI – benefit cost analysis		Excel 3 –M&I water demand		
10/13	Topic VI – benefit cost analysis	√ - two articles			Mid-term
10/20	Topic VI – benefit cost analysis				
10/27	Topic VII – ecosystem services	√ one article		Memo 2 Flint Michigan Water pollution	
11/3	Topic VIII – exhaustible resources	√ - one article			
11/17	Topic VIII – exhaustible resources		Excel 4 – Benefit transfer		
12/1	Topic IX – renewable resources	√ - one article		Memo 3 Petroglyphs	
12/8	Topic X – climate change	√ - two articles	Excel 5 – Exhaustible resources		
12/13	Make up/extra class/review				
12/?					Final Exam

TEXTBOOKS and READINGS.

Readings are divided into two categories: required and optional. All required readings will be on available via Blackboard's electronic reserves, but only some optional readings will be on Blackboard. Students will be expected to have completed the readings before the class for the relevant topic related to the reading.

- Ward, Frank, *Environmental and Natural Resource Economics*, Prentice Hall, 2006.
- Readings from Alan Randall, *Resource Economics*, 2nd ed., John Wiley, 1987 are denoted with **AR**. These readings are on Bb.
- Optional readings are marked with a single asterisk (*).

TOPICS

I. Review of Welfare Economics (1 class)

1. AR, Chapter 5.
2. Ward, Chapter 2.
3. Fullerton, Don, and Stavins, R. 1998. "How Economists See the Environment," *Nature*, Vol. 395, October.
4. Bockstael, Nancy, et. al. 2000. On Measuring Economic Values for Nature. *Environ Sci Technology*. 34, 1384-1389.

II. Integrating the Environment and Natural Resources in Models of the Economy (*cover this topic on your own*)

1. Pearce and Turner, Chapters 1 and 2 (on Bb).

III. Property Rights and Market Failures (2-3 classes)

1. Ward, pp. 79-86.
2. Daniel H. Cole, *Pollution and Property: The Conceptual Framework*, Chapter 1 in *Pollution and Property*, Cambridge University Press 2002.
3. Farrell, Joseph. Information and the Coase Theorem. *Journal of Economic Perspectives*. Vol 1, No. 2, Fall 1987, pp. 113-129.
4. C. Ford Runge, *Common Property and Collective Action in Economic Development*, in *Making the Commons Work*, ed. by Daniel W. Bromely, Institute for Contemporary Studies Press, 1992.
5. Thomas Dietz, et al. 2003. The Struggle to Govern the Commons, *Science*, Vol. 302, December 12. *Journal of Economic Perspectives*, 14(3), pp. 137-158.
6. E. Ostrom, 2003. "Collective Action and the Evolution of Social Norms," *Journal of Economic Perspectives*, 14(3), pp. 137-158, 2000.
7. Seabright, Paul. 1993. Managing Local Commons: Theoretical Issues in Incentive Design. *Journal of Economic Perspectives*. Volume 7, Number 4, Pp 113-134.
8. *Marc Ribaud, Fred Kuchler, Lisa Mancino, 2008. Market Failures: When the Invisible Hand Gets Shaky. *Amber Waves*, November.

IV. Government Failures (1 class)

1. Ward, pp. 86-88.
2. Theodore Panayotou, "The Economics of Environmental Degradation: Problems, Causes and Responses," in *Environmental Economics: A Reader*, ed. by Anil Markandya and Julie Anderson, St. Martin's Press, 1992.
3. Gareth Porter, Natural Resource Subsidies, Trade and Environment: The Cases of Forests and Fisheries, *Journal of Environment and Development*, vol. 6, no. 3, September. Available online at: <http://nautilus.org/papers/enviro/tepp/porterTEPP.html>.
4. A.P.G. de Moor, Perverse Incentives Subsidies and Sustainable Development, Institute for Research on Public Expenditure, 1997. Available online at: <http://www.worldpolicy.org/globalrights/environment/subsidies.html>
5. Davis, Lucas, 2013. The Economic Cost of Global Fuel Subsidies. *Energy Institute at Haas (EI @ Haas) Working Paper 247*. December. Available online at: <https://ei.haas.berkeley.edu/research/working-papers.html>.
6. *de Gorter, Harry, and David R. Just. 2010. The Social Costs and Benefits of Biofuels: The Intersection of Environmental, Energy and Agricultural, *Applied Economic Perspectives and Policy*, Volume 32, number 1, pp. 4–32.

V. Choice of Policy Instruments for Controlling Pollution (2-3 classes)

1. Ward, Chapter 16.
2. Goulder, Lawrence, and Parry, Ian W.H., 2008. "Instrument Choice in Environmental Policy, *Review of Environmental Economics and Policy*, pp. 1-24, July.
3. Robert S. Pindyck, 2007. Uncertainty in Environmental Economics. *Review of Environmental Economics and Policy*, Vol. 1, issue 1, winter, pp 45-65.
4. Richard Schmalensee and Robert N. Stavins. 2013. The SO2 Allowance Trading System: The Ironic History of a Grand Policy Experiment. *Journal of Economic Perspectives*. Volume 27, Number 1, Winter 2013. Pages 103–122.
5. Lawrence H. Goulder. 2013. Markets for Pollution Allowances: What Are the (New) Lessons? *Journal of Economic Perspectives*. Volume 27, Number 1, Winter, Pages 87–102.
6. Karen Fisher-Vanden and Sheila Olmstead. 2013. "Moving Pollution Trading from Air to Water: Potential, Problems, and Prognosis." *Journal of Economic Perspectives*. Volume 27, Number 1. Pages 147–172.
7. Hahn, Robert W., 1989. "Economic Prescriptions for Environmental Problems: How the Patient Followed the Doctor's Orders," *Journal of Economic Perspectives*, Vol. 3, No. 2, Spring, pp. 95-114.
8. *Stavins, Robert N., 1998. What Can We Learn from the Grand Policy Experiment? Lessons from SO2 Allowance Trading, *Journal of Economic Perspectives*, Vol. 12, No. 3, pp. 69-88.
9. Kotchen, Matthew J. 2013. Voluntary- and Information-Based Approaches to Environmental Management: A Public Economics Perspective. *Review of Environmental Economics and Policy Advance Access* published June 10, 2013.

VI. Benefit-Cost Analysis (2 classes)

1. Ward, Chapters 5, 6, 7.
2. Steven Kelman, "Cost-Benefit Analysis: An Ethical Critique," *Regulation*, Vol. 10, Jan/Feb 1981, pp. 33-40, along with the replies to this article that appeared in the March/April, 1981 issue of *Regulation*.
3. Arrow et al., "Is There a Role for Benefit-Cost Analysis in Environmental, Health and Safety Regulations?," *Science*, 272:221-2 (12 April 1996).
4. Herman Leonard and Richard Zeckhauser, Cost-Benefit Analysis Defended, *Report from the Center for Philosophy and Public Policy*, University of Maryland at College Park, Vol. 3, No. 3 (Summer 1983), pp. 6-9. Reprinted in *The Environmental Ethics and Policy Book*, 3rd ed. (D. VanDeVeer and C. Pierce, eds.), Wadsworth, 2003.
5. Goulder, L. and Stavins, R. 2002. "An eye on the future," *Nature*, Vol. 419, Oct 17.
6. Loomis, John B., and Rosenberger, Randall S. 2006. "Reducing barriers in future benefit transfers: Needed improvements in primary study design and reporting." *Ecological Economics*, Vol. 60, pp. 343-350.
7. Stated Preference readings:
 - a) Hausman, Jerry. 2012. "Contingent Valuation: From Dubious to Hopeless." *Journal of Economic Perspectives*, Volume 26, Number 4, Fall, pp. 43–56.
 - b) Carson, Richard T. 2012. Contingent Valuation: A Practical Alternative when Prices Aren't Available. *Journal of Economic Perspectives*, Volume 26, Number 4, Fall, Pages 27–42.
 - c) Haab, T. et al. 2016. "Interesting Questions Worthy of Further Study: Our Reply to Desvousges, Mathews, and Train's (2015) Comment on Our Thoughts (2013) on Hausman's (2012) Update of Diamond and Hausman's (1994) Critique of Contingent Valuation," *Applied Economic Perspectives and Policy*, Vol 38, No. 1, pp. 183-189.
 - d) Carson, Richard, Mitchell, Robert T., Hanemann, Michael, Rudd, Paul. 2003. "Contingent Valuation and Lost Passive Use: Damages from the Exxon Valdez Oil Spill." *Environmental and Resource Economics*, 5: 257-286.
8. Bartik, T., 2015. "The Social Value of Job Loss and Its Effect on the Costs of U.S. Environmental Regulations," *Review of Environmental Economics and Policy*, Vol. 9, Issue 2, Summer.

VII. Ecosystem Services, Biodiversity (1 class)

1. Brown, T.C., Bergstrom, John C., and Loomis, John B. 2007. Defining, Valuing, and Providing Ecosystem Services, *Natural Resources Journal*, Volume 47, pp. 329-376.
2. Metrick, A. And Martin Weitzman, Conflicts and Choices in Biodiversity Preservation, *Journal of Economic Perspectives*, Volume 12, No. 3, 1998.
3. Bateman, I., et al. 2011, Economic Analysis for Ecosystem Service Assessments, *Environmental and Resource Economics*, 48:177–218.

4. Leslie Richardson, John Loomis, Timm Kroeger, Frank Casey, 2105. *The role of benefit transfer in ecosystem service valuation*, Ecological Economics, Vol 115, pp. 51-58.
5. Shogren, Jason, et al., Why Economics Matters for Endangered Species Protection, *Conservation Biology*, pp 1257-1261, Volume 13, No. 6, December 1999.
6. Pindilli, E. 2015. *Biodiversity and Habitat Markets: Policy, Economic, and Ecological Implications of Market-Based Conservation*, USGS Circular 1414, available at: <https://pubs.er.usgs.gov/publication/cir1414>.
7. Boyd, J. 2011. Valuation of Ecosystem Services. Available at: <https://www.moore.org/materials/white-papers/Ecosystem-Services-Seminar-3-Valuation.pdf>.
8. Boyd, J. et al. 2015. Conservation Planning: A Review of Return on Investment Analysis, *Review of Environmental Economics and Policy*, volume 9, issue 1, winter 2015, pp. 23–42.

VIII. Exhaustible Resources and Scarcity (1 class)

1. Ward, Chapter 13.
2. Oli Tahvonen, A. Economic Sustainability and Scarcity of Natural Resources: A Brief Historical Review, *Resources for the Future*, June 2000. Only available online at: <http://www.rff.org/Documents/RFF-IB-00-tahvonen.pdf>.
3. Krautkraemer, Jeffery A. 2005. Economics of Natural Resource Scarcity: The State of the Debate. April 2005 *Resources for the Future Discussion Paper 05–14*. Available online at: <http://www.rff.org/rff/documents/rff-dp-05-14.pdf>.
4. Livernois, John. The Empirical Significance of the Hotelling Rule. *Rev Environ Econ Policy*. November 6, 2008.
5. *Brown, Stephen P. and Daniel Wolk, 2000. “Natural Resource Scarcity and Technological Change.” *Economic and Financial Review*, Federal Reserve Bank of Dallas.

IX. Renewable Resources: Water and Forests (2 classes)

1. Ward, Chapters 8, 10.
2. Carl Bauer, *Marketing Water, Marketing Reform*, *Resources for the Future*, Summer 2003. Available online at: www.rff.org/rff/Publications/Resource_Articles.cfm
3. Howitt, Richard and Hansen, Kristiana. 2005 The Evolving Western Water Markets. *Choices*. Vol 20, no. 1.
4. Olmstead, Sheila M. and Stavins, Robert N. 2009. Comparing price and nonprice approaches to urban water conservation. *Water Resources Research*, Vol 45 W04301.
5. Bonnie Colby, Estimating the Value of Water in Alternative Uses, *Natural Resources Journal*, Volume 29, Spring 1989, pp. 511-527.
6. Olmstead, Shelia M. 2010. The Economics of Managing Scarce Water Resources. *Review of Environmental Economics and Policy* Advance Access published June 24, 2010.
7. Grafton, Quentin R., et. al. 2011. An Integrated Assessment of Water Markets: A Cross-Country Comparison, *Review of Environmental Economics and Policy*
8. *Marca Weinberg, et al., Water Markets and Water Quality, *American Journal of Agricultural Economics*. Volume 78, May, 1993: 278-291. Available via JSTOR.

X. Climate Change (1-2 classes)

1. Ward, Chapter 15.
2. Stavins, Robert N. 2001. "Economic Analysis of Global Climate Change Policy: A Primer." *Climate Change: Science, Strategies, and Solutions*, eds. E. Claussen, V.A. Cochran, and D.P. Davis. Boston: Brill Publishing.
3. Social cost of carbon readings:
 - *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866. <https://www.whitehouse.gov/sites/default/files/omb/inforeg/scc-tsd-final-july-2015.pdf>.
 - EPA Fact Sheet on Social Cost of Carbon: <https://www3.epa.gov/climatechange/Downloads/EPAactivities/social-cost-carbon.pdf>
4. Newell, Richard G., Pizer, William A., Raimi, Daniel. 2014. Carbon Market Lessons and Global Policy Outlook. *Science*, 21 March, Vol 343, p. 1316.
5. Tietenberg, Tom H. 2013. Reflections—Carbon Pricing in Practice. *Review of Environmental Economics and Policy Advance Access* published June 10, 2013.
6. Stavins, Robert N. 2008. "Addressing Climate Change with a Comprehensive U.S. Cap-and-Trade System." *The Oxford Review of Economic Policy*, Volume 24, Number 2, pp. 298-321.
7. Chameides, William, et al. 2007. Climate Change: Carbon Trading Over Taxes, *Science* 315, 1670.
8. Arrow, Kenneth J. 2007. "Global Climate Change: A Challenge to Policy," *Economists' Voice* www.bepress.com/ev, June.
6. Convery, Frank, J. and Wagner G. 2015. "Managing Uncertain Climates: Some Guidance for Policy Makers and Researchers," *Review of Environmental Economics and Policy*, Vol. 9, Issue 2, Summer.
9. Thomas C. Schelling, 2007. "Climate Change: The Uncertainties, the Certainties, and What They Imply About Action." *Economists Voice*. July 2007.
10. *Nicholas Stern, Stern Review on the Economics of Climate Change, Executive Summary, Her Majesty's Treasury, October 2006. Only available online at: http://www.hm-treasury.gov.uk/media/4/3/Executive_Summary.pdf.
11. *Thomas Lyon, Voluntary versus Mandatory Approaches to Climate Change Mitigation, Resources for the Future Issue Brief 03-01, February 2003. Available online at: www.rff.org/rff/Documents/RFF-IB-03-01.pdf.