University of Waterloo
Department of Economics
Econ 657: Environmental Economics
Winter 2020
Class Hours: Mondays and Wednesdays, 2:30 - 3:50 pm
Classroom: HH 123

Instructor Information

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Course Description

This course aims at providing students with the appropriate skills to diagnose the economic causes of environmental problems, and to propose adequate solutions to such problems. The first part of the course, which will last slightly more than half of the term, will cover the basics of environmental economics and policy. It will introduce students to the relationship between economic activities and the environment, and review the application of economic tools and theory to solve current environmental problems. The normative foundations of economic analysis will be discussed, including efficiency, intergenerational equity, and sustainability. The design and implementation of environmental policy will then be analyzed, including the use of command and control regulation, and market-based instruments. The second part of the course will focus on some specific and more complex issues in environmental economics. These include global warming and other international environmental problems, corporate environmental behavior, environmental outsourcing, environmental innovation, etc.

Textbook

The students' main support for this course will be the following textbook:

> Perman, R., Ma, Y., Common, M., D. Maddison, and J. McGilvray (2011), Natural Resource and Environmental Economics, Fourth Edition, Pearson / Addison Wesley.

This textbook will be available for purchase at the UW BookStore. It is required that students complement lecture materials with the reading of relevant chapters from the textbook. Students who opt to use earlier versions of the textbook are responsible to make sure that they read the appropriate chapters.

In addition, we will draw some materials from academic journals - such as the Journal of Environmental Economics and Management, Environmental and Resource Economics, and Resource and Energy Economics – as well as from the following references:

- Baumol, W. J. and W. E. Oates (1988), The Theory of Environmental Policy, Second Edition, Cambridge University Press.

- Copeland, B.R. and M.S. Taylor (2003), Trade and the Environment: Theory and Evidence, Princeton University Press.
- Croci, E. (2005), The Handbook of Environmental Voluntary Agreements: Design, Implementation and Evaluation Issues, Springer.
- Kolstad, C.D. (2000), Environmental Economics, Oxford University Press.
- Thomson, W. (2001), A Guide for the Young Economist: Writing and Speaking Effectively about Economics, The MIT Press.
- Tietenberg, T.H. (2006), Emissions Trading: Principles and Practice, Resources for the Future Press.

These additional textbooks, as well as journal articles that are not available online, will be put on reserve at the Dana Porter Library.

Topics and Suggested Readings

Important notes:

- Readings marked with a star (*) must be done in advance of the class.
- Some topics may require more or less emphasis than planned previously. To reflect that need, this outline may be updated as we move through the term.

1. Introduction: the Environment and Economics

*Perman et al. (Chapter 1)

Baumol and Oates (Chapter 1)

Kolstad (Chapters 1 & 2)

Copeland, B. and M.S. Taylor (2015), "Environmental and Resource Economics: A Canadian Retrospective", *Canadian Journal of Economics*, 50(5): 1382-1413.

Deacon, R. et al (1998), "Research Trends and Opportunities in Environmental and Natural Resource Economics", *Environmental and Resource Economics*, 11: 383-97.

Portney, P. (2000), "Environmental Problems and Policy", *Journal of Economic Perspectives*, 14: 199-206.

Pommeret, A. and K. Schubert (2018), "Intertemporal Emission Permits Trading Under Uncertainty and Irreversibility", *Environmental and Resource Economics*, 71:73–97.

Smith, G., Day, B., and A. Binner (2019), "Multiple-Purchaser Payments for Ecosystem Services: An Exploration Using Spatial Simulation Modelling", *Environmental and Resource Economics*, 74: 421–447.

2. Intergenerational Equity and Sustainability

*Perman et al. (Chapters 2, & 3)

Brander, J.A. (2007), "Viewpoint: Sustainability: Malthus Revisited?" *Canadian Journal of Economics*, 40(1): 1-38.

Kneese, A.V. and W.D. Schulze (1985), "Ethics and Environmental Economics", Chapter 5 in A.V. Kneese and J. L. Sweeney (eds), Handbook of Natural Resource and Energy Economics, vol I, North-Holland, Amsterdam.

3. Efficiency, Optimality, and Market Failure

*Perman et al. (Chapter 4)

Baumol and Oates (Chapters 1, 2 & 3)

Kolstad (4, 5, 6)

Coase, R.H. (1960), "The problem of Social Cost", *Journal of Law and Economics*, 3: 1-44.

Dasgupta, P. (1990), "The Environment as a Commodity", *Oxford Review of Economic Policy*, 6(1): 51-67.

4. Design and Implementation of Environmental Policy

4.1. Goals, principles, and constraints

*Perman et al. (Chapter 5)

Baumol and Oates (Chapters 11 & 17)

Kolstad, C.D. (1987), "Uniformity vs. Differentiation in Regulating Externalities", *Journal of Environmental Economics and Management*, 14(4): 386-99.

Rose-Ackerman, S. (1973), "Effluent Charges: a Critique", *Canadian Journal of Economics*, 6(4): 512-28.

Segerson, K. and J. Wu (2006). "Nonpoint Pollution Control: Inducing First-Best Outcomes Through the Use of Threats", *Journal of Environmental Economics and Management*, 51, 165–184.

Segerson, K. (1988). "Uncertainty and Incentives for Nonpoint Pollution Control", *Journal of Environmental Economics and Management*, 15, 87-98.

4.2. Instrument Choice and Policy Implementation

*Perman et al. (Chapters 6 and 7)

Baumol and Oates (Chapters 5, 12 & 14)

Kolstad (Chapters 4, 5, 7, 8, 9, & 10)

Blackman, A., Li, Z., and A.A. Liu (2018), "Efficacy of Command-and-Control and Market-Based Environmental Regulation in Developing Countries", *Annual Review of Resource Economics*, 10: 381-404.

Crépin, A-S. (2005), "Incentives for Wetland Creation", *Journal of Environmental Economics and Management*, 50: 598–616.

Duggan, J. and J. Roberts (2002), "Implementing the Efficient Allocation of Pollution", *American Economic Review*, 92(4): 1070-8.

Fischer, C., Parry, I. and W. Pizer (2003), "Instrument Choice for Environmental Protection when Technological Innovation is Endogenous", *Journal of Environmental Economics and Management*, 45: 523-45.

MacKenzie, I.A. and M. Ohndorf (2012), "Cap-and-Trade, Taxes, and Distributional Conflict", *Journal of Environmental Economics and Management*, 63(1): 51-65.

Miyamoto, T. (2014), "Taxes versus Quotas in Lobbying by a Polluting Industry with Private Information on Abatement Costs", *Resource and Energy Economics*, 38:141–167.

Stocking, A. (2012), "Unintended Consequences of Price Controls: An Application to Allowance Markets", *Journal of Environmental Economics and Management*, 63(1): 120-36.

Weitzman, M.L. (1974), "Prices versus Quantities", *Review of Economic Studies*, 41(4): 477-91.

Wirl, F. (2012), "Global Warming: Prices versus Quantities from a Strategic Point of View, *Journal of Environmental Economics and Management*, 64(2): 217-29.

5. Economic Valuation of the Environment

*Perman et al. (Chapter 12)

Kolstad (Chapters 15, 16, 17)

Adamowicz et al. (1994), "Combining Revealed and Stated Preference Methods for Valuing Environmental Amenities," *Journal of Environmental Economics and Management*, 26(3): 271-92.

Bajari, P., Fruehwirth, J. C., Kim, K. and C. Timmins (2012), "A Rational Expectations Approach to Hedonic Price Regressions with Time-Varying Unobserved Product Attributes: The Price of Pollution", *American Economic Review*, 102(5): 1898–1926.

Dickie, M. and S. Gerking (1991), "Willingness to Pay for Ozone Control: Inferences from the Demand for Medical Care", *Journal of Environmental Economics and Management*, 21(1): 1-16.

Hanneman, M. (1991), "Willingness to Pay versus Willingness to Accept: How Much Can They Differ?", *American Economic Review*, 81(3): 635-47.

Kolstad, C.D. and R.M. Guzman (1999), "Information and the Divergence Between Willingness to Accept and Willingness to Pay", *Journal of Environmental Economics and Management*, 38(1): 66-80.

6. Selected Topics

6.1. Environmental Policy and the Porter Hypothesis

Mohr, R.D. and S. Saha (2008), "Distribution of Environmental Costs and Benefits, Additional Distortions, and the Porter Hypothesis", *Land Economics*, 84(4): 689–700.

Palmer, K., Wallace, E.O., and P.R. Portney (1995), "Tightening Environmental Standards: The Benefit-Cost or the No-Cost Paradigm?", *Journal of Economic Perspectives*, 9(4): 119-32.

Popp, D. (2005), "Uncertain R&D and the Porter Hypothesis", *Contributions to Economic Analysis & Policy*, 4(1): 1–16.

Porter, M. C., and C. van der Linde (1995), "Toward a New Conception of Environment-Competitiveness Relationship", *Journal of Economic Perspectives*, 9(4): 97–118.

6.2. Environmental Policy, Imperfect Market Competition, and the Eco-industry

Canton, J., Soubeyran, A. and H. Stahn (2008), "Optimal Environmental Policy, Vertical Structure and Imperfect Competition", *Environmental and Resource Economics*, 40(3): 369-82

David, M. and B. Sinclair-Desgagné (2005), "Environmental Regulation and the Eco-Industry", *Journal of Regulatory Economics*, 28(2): 141-55.

Nimubona, A-D. and B. Sinclair-Desgagné (2011), "Polluters and Abaters", *Annals of Economics and Statistics*, 103-104: 9-24.

Perino, G. (2010), "Technology Diffusion with Market Power in the Upstream Industry", *Environmental and Resource Economics*, 46(4) : 403-28.

6.3. Pollution Policy and Environmental Technological Change

Acemoglu, D., Aghion, P., Bursztyn, L. and D. Hemous (2012), "The Environment and Directed Technical Change", *American Economic Review*, 102(1): 131-166.

Chiou, J.R. and J.L. Hu (2001), "Environmental Research Joint Ventures under Emission Taxes", *Environmental and Resource Economics*, 21: 129-146.

Heyes, A. and S. Kapur (2011), "Regulatory Attitudes and Environmental Innovation in a Model Combining Internal and External R&D", *Journal of Environmental Economics and Management*, 61: 327-40.

Laffont, J.J. and J. Tirole (1996), "Pollution permits and environmental innovation", *Journal of Public Economics*, 62 (1—2): 127- 40.

Poyago-Theotoky, J.A. (2007), "The Organization of R&D and Environmental Policy", *Journal of Economic Behavior and Organization*, 62(1): 63-75.

6.4. Emissions Trading Schemes

Tietenberg (Chapters 1, 2 & 3)

Böhringer, C. and A. Lange (2005), "Economic Implications of Alternative Allocation Schemes for Emission Allowances", *Scandinavian Journal of Economics*, 107(3): 563-81.

Cason, T. N. (1995), "An Experimental Investigation of Seller Incentives in the EPA's Emissions Trading Auction", *American Economic Review*, 85(4): 905-22.

_____ and C.R. Plott (1996), "EPA's New Emissions Trading Mechanism: A Laboratory Evaluation", *Journal of Environmental Economics and Management*, 30(2): 133-60.

6.5. Voluntary Environmental Control

Croci (Chapters 1, 5 & 6)

Alberini, A. and K. Segerson (2002), "Assessing Voluntary Programs to Improve Environmental Quality", *Environmental and Resource Economics*, 22: 157- 84.

Arora, S. and T.N. Cason (1995), "An Experiment in Voluntary Environmental Regulation: Participation in EPA's 33/50 Program", *Journal of Environmental Economics and Management*, 28(3): 271- 86.

Kim, E-H. and T.P. Lyon (2011), "Strategic Environmental Disclosure: Evidence from the DOE's Voluntary Greenhouse Gas Registry, *Journal of Environmental Economics and Management*, 61(3): 311-26

Lyon, T.P. and J.W. Maxwell (2003), "Self-Regulation, Taxation and Public Voluntary Environmental Agreements", *Journal of Public Economics*, 87: 1453- 86.

Segerson, K. and T.J. Miceli (1998), "Voluntary Environmental Agreements: Good or Bad News for Environmental Protection?", *Journal of Environmental Economics and Management*, 36(2): 109- 30.

6.6. Uncertainty, Irreversibility, and the Precautionary Principle

Barrieu, P. and B. Sinclair-Desgagné (2006), "On Precautionary Policies", *Management Science*, 52(8): 1145-54.

Fisher, A.C. (2000), "Investment under Uncertainty and Option Value in Environmental Economics", *Resource and Energy Economics*, 22:197-204.

Insley, M. (2003), "On the Option to Invest in Pollution Control under a Regime of Tradable Emissions Allowances", *Canadian Journal of Economics*, 35(4): 860-883.

Viscusi, K. (1988), “Irreversible Environmental Investments with Uncertain Benefit Levels,” *Journal of Environmental Economics and Management*, 15(2): 147- 57.

6.7. Transboundary Pollution

Barrett, S. (1994), “Self-Enforcing International Environmental Agreements," *Oxford Economic Papers*, 46: 878-94.

_____ (2006), “Kyoto and Beyond: Alternative Approaches to Global Warming”, *American Economic Review*, 96(2): 22-5.

Candel-Sanchez, F. (2006), “The Externalities Problem of Transboundary and Persistent Pollution”, *Journal of Environmental Economics and Management*, 52(1): 517–26.

Nordhaus, W. (2006), “After Kyoto: Alternative Mechanisms to Control Global Warming”, *American Economic Review*, Papers and Proceedings, 96(2): 31-4.

6.8. Trade, Growth, and the Environment

Copeland and Taylor (Chapters 1, 2, 3, 4, 5 & 7)

Antweiler, W., Copeland, B., and S. Taylor (2001) “Is Free Trade Good for the Environment”, *American Economic Review*, 91, 877–907.

Chichilnisky, G. (1994), “North-South Trade and the Global Environment”, *American Economic Review*, 84(4): 851-74.

Copeland, B. (2000), “Trade and Environment: Policy Linkages”, *Environment and Development Economics*, 5: 405-32.

_____ and M.S. Taylor (1999), “Trade, Spatial Separation, and the Environment”, *Journal of International Economics*, 47: 137-168.

Lopez, R. and S. Mitra (2000), “Corruption, Pollution and the Kuznets Environment Curve”, *Journal of Environmental Economics and Management*, 40(2): 137-50.

6.9. Tied Foreign Aid and Pollution Abatement

Chao, C-C. and E. S.H. Yu (1999), “Foreign Aid, the Environment, and Welfare”, *Journal of Development Economics*, 59: 553–64.

Hatzipanayotou, P., Lahiri, S. and M. S. Michael (2002), “Can Cross-Border Pollution Reduce Pollution?”, *Canadian Journal of Economics*, 4: 805-18.

Nimubona, A-D. and H. Rus (2011), “Green Technology Transfers and Border Tax Adjustments”, *Environmental and Resource Economics*, 62(1): 189-206.

Schweinberger, A.G. and A.D. Woodland (2008), “The Short and Long Run Effects of Tied Foreign Aid on Pollution Abatement, Pollution and Employment: A Pilot Model”, *Journal of Environmental Economics and Management*, 55(3): 310-25.

6.10. Economic Growth and the Environment

Grepperud, S. and I. Rasmussen (2004), “A General Equilibrium Assessment of Rebound Effects”, *Energy Economics*, 26: 261-82.

Jorgenson, D.W. and P.J. Wilcoxen (1990), “Environmental Regulation and the U.S. Economic Growth”, *Rand Journal of Economics*, 21: 314-40.

Müller-Fürstenberger, G. and M. Wagner (2007), "Exploring the Environmental Kuznets Hypothesis: Theoretical and Econometric Problems", *Ecological Economics*, 62:648-60.

Stern, D. and M. Common (2001), "Is There an Environmental Kuznets Curve for Sulfur?", *Journal of Environmental Economics and Management*, 41: 162-78.

Paudel, K.P. and M.J. Schafer (2009), "The Environmental Kuznets Curve Under a New Framework: The Role of Social Capital in Water Pollution", *Environmental and Resource Economics*, 42: 265-78.

6.11. Climate Change and its Effects on Violence and Conflict

Almer, C., Laurent-Lucchetti, J., and M. Oechslin (2017), "Water Scarcity and Rioting: Disaggregated Evidence from Sub-Saharan Africa", *Journal of Environmental Economics and Management*, 86: 193–209.

Couttenier, M. and R. Soubeyran (2014), "Drought and Civil War in Sub-Saharan Africa", *Economic Journal*, 124: 201–244.

Harari, M.F. and E. La Ferrara (2018), "Conflict, Climate and Cells: A Disaggregated Analysis", *Review of Economics and Statistics*, 100(4): 594-608.

Course Requirements and Assessment

Your final grade will be calculated based on the following:

- A midterm exam (35%): in-class evaluation to be held on Wednesday, March 4th.
- A research paper (35%): You may choose to do a case study, develop an economic model, or conduct an econometric analysis of any environmental related issue of your choice. Note that the instructor must approve in advance the topic of the research paper. Due dates concerning this research paper are as follows:
    - A two-page description of the specific question(s) you intend to explore as well as a bibliography of at least 10 academic papers: due on Wednesday, January 29th.
    - A literature review and a detailed outline of the paper: due on Wednesday, February 26th.
    - A final draft of the paper: due on Wednesday, April 8th.

Please note that no late submissions will be accepted. More details about the research paper will be provided in class.

- A paper presentation (20%): in-class presentation of an academic paper to be held during the second half of the term.
- In-class participation (10%): your participation grade will be based on two activities. First, over the first half of the term, every student will be required to discuss (in about 5 minutes) one academic paper assigned to students individually by the instructor from the list of papers to be read in preparation for the class. Your paper discussion should be accompanied by a one-page written report summarizing the paper, and stating your comments in terms of the appropriateness of the methodology and the significance of the results. Second, these paper discussions as well as the above long paper presentations will be followed by an open discussion period in which I expect everyone to be an active participant. Indeed, even when you are not

scheduled for a discussion or presentation, you will still be required to read the paper to be discussed or presented.

Policy on Missed Evaluation Items

A student who misses the midterm and does not have a relevant medical certificate will get a grade of zero. Late assignment submissions will not be accepted and will earn a grade of zero. Failure to submit or to present a paper on the date the presentation was scheduled will also earn a grade of zero.

Academic Integrity

In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. See the UWaterloo Academic Integrity webpage and the Arts Academic Integrity webpage for more information.

Discipline

A student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline. For typical penalties check Guidelines for the Assessment of Penalties.

Grievance

A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 - Student Petitions and Grievances, Section 4. When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

Appeals

A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals.

Note for Students with Disabilities

The AccessAbility Services office, located on the first floor of the Needles Hall extension (NH 1401), collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AS office at the beginning of each academic term.

Mental Health Support

All of us need a support system. The faculty and staff in Arts encourage students to seek out mental health supports if they are needed.

On Campus

- Counselling Services: counselling.services@uwaterloo.ca / 519-888-4567 ext 32655
- MATES: one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services
- Health Services Emergency service: located across the creek form Student Life Centre

Off campus, 24/7

- Good2Talk: Free confidential help line for post-secondary students. Phone: 1-866-925-5454
- Grand River Hospital: Emergency care for mental health crisis. Phone: 519-749-433 ext. 6880
- Here 24/7: Mental Health and Crisis Service Team. Phone: 1-844-437-3247
- OK2BME: set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213

Full details can be found online at the Faculty of ARTS website
Download UWaterloo and regional mental health resources (PDF)
Download the WatSafe app to your phone to quickly access mental health support information