

## Master of Science in Sustainability Management

### **Economics of Sustainability Management - PS4190** **3 Credits**

**Instructor:** Alexander Heil, PhD

#### **Course Overview**

We begin by introducing the linkages between the environment and the economy. We discuss methods by which aggregate resource allocation decisions occur in capitalist economies, with implications for social welfare and economic efficiency. We discuss briefly the policy and welfare implications of perfectly competitive markets that represent an idealized analytical benchmark. We then analyze markets where the benchmark assumptions do not hold. We see how a laissez-faire approach leads to inefficient outcomes in the presence of "market failures" such as monopoly power, externalities, and public goods.

We discuss the appropriateness of various public policy options (taxes, subsidies, regulations, public provision of goods and services) to correct these failures. We examine practical steps in the implementation of these tools by studying environmental valuation techniques and cost-benefit analysis. We examine "government failure" to consider the limits of regulatory intervention arising from asymmetric information and the limitations of political economy.

We then analyze more sophisticated regulatory approaches that take into account information problems. We also study the possibilities for sustainability that arise from corporate social responsibility. We examine basic techniques of renewable and non-renewable resource management. We analyze the implications of risk management methods for resource allocation.

#### **Course Objectives**

Economics of Sustainability Management teaches students to use an economic framework to analyze environmental decision-making. Students will be expected to understand, intelligently apply and critique basic microeconomic tools that inform environmental problems. By the end of the semester, students will be expected to use economic concepts fluently to recommend or critique actual environmental decisions. Throughout the semester, concepts and metrics from microeconomic theory, capital budgeting, game theory, information economics and risk management will be utilized.

#### **Readings**

##### **Required Textbook:**

Charles D. Kolstad (2010), Environmental Economics, 2nd Edition (abbreviated CDK).

The Kolstad textbook is required for the course. In addition, the course material will draw on other textbooks, articles and other readings listed/provided in Canvas.

Other potentially useful textbooks [I can provide some more guidance if needed]:

##### **Microeconomics Background**

If you need a mathematically sophisticated refresher on intermediate microeconomics with calculus, then please see R. Preston McAfee (2006), Introduction to Economic Analysis, available for download without charge at <http://introecon.com>, (abbreviated RPM). This is an "open access" publication. RPM provides a comprehensive and rigorous primer to most of the tools used in economic problem solving. Reading RPM is not a good way to learn economics from scratch unless you are mathematically fluent. If you have no background in economics and would like a gentler introduction to a shorter list of economics topics geared towards management problems, please read Barry P. Keating & Maryann O. Keating Microeconomics for Public Managers or Anne C. Steinemann, William C. Apgar & H. James Brown, Microeconomics for Public Decisions.

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If your learning process requires collateral reinforcement through worked examples, boxed case studies, color charts and pictures, then please see Jeffrey M. Perloff *Microeconomics: Theory & Applications with Calculus* or David Besanko & Ronald R. Braeutigam, *Microeconomics*.

### **Environmental Economics & Sustainability**

There are numerous useful resources that might be helpful especially if you have not been exposed to some of the topics previously. Here is a selection:

Nick Hanley, Jason F. Shogren & Ben White, *Environmental Economics in Theory & Practice* 2nd Edition. Nick Hanley, Jason F. Shogren & Ben White, *Introduction to Environmental Economics*.

Tom Tietenberg & Lynne Lewis *Environmental & Natural Resource Economics*. Barry C. Field & Martha K. Field *Environmental Economics: An Introduction*.

In addition, the course will draw on texts, articles and other readings on reserve or on Canvas.

## **Course Requirements (Assignments) - Evaluation/Grading**

### **Prerequisites**

Students are expected to have had some exposure to economics. Students who have had an undergraduate course in intermediate microeconomics with calculus will be adequately prepared to excel in the course. Those who have not had such preparation will need to work hard to absorb the theoretical concepts along with the applications. However, it is not uncommon for students with little economics preparation to excel in this course. In the absence of any economics preparation, it is useful to have some mathematical fluency.

If you are concerned about your level of mathematics preparation, you are strongly encouraged to attend the Math Camp provided periodically.

Please reach out to me directly if you have any concerns about your level of preparedness for this course. You can call and/or email me prior to the beginning of the spring semester.

### **Method of Instruction**

Pre-class reading, regular attendance at lectures, intelligent class participation and diligent efforts to do the problem sets are each necessary to master the course. The course will use basic calculus when convenient. However, the emphasis will be on building strong economic intuition and critical interpretation of economic research rather than technical research skills.

Regular attendance and active participation in class are required. Students are expected to have done the readings for each lecture before class. Participation will account for 10% of the final grade. Students will be required to contribute to class discussions. Contributing to class discussions means enhancing the quality of the class experience for yourself and others. It involves making relevant, useful and non-obvious comments, or posing pertinent questions, in clear and succinct language. In addition, every student is required to report on an economic highlight of the week [a 5-minute presentation on an economic news item].

You can utilize the discussion forum feature in Canvas to communicate with your team members about the problem sets and the final paper/presentation. In addition, you can utilize a discussion thread to exchange information, post comments, and ask questions involving everyone else. However, there is no graded component to Canvas discussion.

Problem sets/homework (5) account for 25% of the final grade. Students are required to form teams of 3-4 to work together and turn in the assignments. Except under extenuating circumstances, students are expected to remain in the same problem set team

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for the entire semester. Homework will be distributed at least one week before they are due. Please submit your answers electronically in Canvas.

There is one midterm exam (30% of the final grade).

There is a team presentation on the economics of a current environmental policy problem. The presentation and written report constitute 35% of the final grade. Details regarding topics for team presentations will be provided later in the semester. Team composition for the presentation will be based on topic preferences and will differ from the problem set teams.

Late assignment penalty: 10% grade deduction

NOTE: Academic dishonesty will not be tolerated. This includes failure to properly cite ideas in your work that are not originally yours.

ASSIGNMENT	% Weight
Participation [In-class & 5-minute presentation]	10%
Group Problem Sets/Homework	25%
Midterm	30%
Group Presentation	10%
Group Paper	25%
<b>TOTAL</b>	<b>100%</b>

## Course Policies

### *Policy on Laptop/Cellphone Use*

Laptops may be used to take notes during class time. However, if I notice the use of any device for purposes of travelling through various social media accounts [Facebook etc] or just general web browsing, I reserve the right to not allow the use of any technology during class time.

## School Policies

### *Copyright Policy*

Please note—Due to copyright restrictions, online access to this material is limited to instructors and students currently registered for this course. Please be advised that by clicking the link to the electronic materials in this course, you have read and accept the following:

The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted materials. Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specified conditions is that the photocopy or reproduction is not to be "used for any purpose other than private study, scholarship, or research." If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that user may be liable for copyright infringement.

### *Academic Integrity*

Columbia University expects its students to act with honesty and propriety at all times and to respect the rights of others. It is fundamental University policy that academic dishonesty in any guise or personal conduct of any sort that disrupts the life of the University or denigrates or endangers members of the University community is unacceptable and will be dealt with severely. It is essential to the academic integrity and vitality of this community that individuals do their own work and properly acknowledge

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the circumstances, ideas, sources, and assistance upon which that work is based. Academic honesty in class assignments and exams is expected of all students at all times.

SPS holds each member of its community responsible for understanding and abiding by the SPS Academic Integrity and Community Standards posted at <http://sps.columbia.edu/student-life-and-alumni-relations/academic-integrity-and-community-standards>. You are required to read these standards within the first few days of class. Ignorance of the School's policy concerning academic dishonesty shall not be a defense in any disciplinary proceedings.

### *Accessibility*

Columbia is committed to providing equal access to qualified students with documented disabilities. A student's disability status and reasonable accommodations are individually determined based upon disability documentation and related information gathered through the intake process. For more information regarding this service, please visit the University's Health Services website: <http://health.columbia.edu/services/ods/support>.

## Course Schedule/Course Calendar

Most readings will be posted as pdf files in the weekly folders. Some changes to these anticipated readings or the course schedule in general might be made based on student interest and course progress.

### Session 1

Topic:

- Introduction
- Economy-environment interactions
- What is economics? What is environmental economics?
- What is sustainable development vs. sustainability management?

### Anticipated Readings:

- CDK Chapters 1 + 2
- Fullerton, Don and Robert Stavins. 1998. "How Economists See the Environment?" *Nature* 395(6701): 433-434.
- Masood, Ehsan and Laura Garwin. 1998. "Costing the Earth: when Ecology Meets Economics." *Nature* 395(6701): 426-427.
- Daly, Herman E. "Introduction: The Shape of Current Thought on Sustainable Development." In *Beyond Growth*, 1-23. Boston: Beacon.

### Session 2

Topic:

- Review of Microeconomics
- Law of Demand & Supply
- Elasticity
- Market Structures
- Profit maximization
- Financial concepts: NPV, Time value of money
- Regression analysis

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### Anticipated Readings:

- Any introductory microeconomics text, lecture notes from previous courses, etc [I can provide some guidance on what might be good to review prior to this class.]

**Comment:** The intent of this lecture is to revisit microeconomic and financial principles that will be applied throughout the semester. If you have any questions about basic issues, please make sure to ask them here.

### Session 3

Topic:

- Social choice, efficiency and markets
- Efficiency and market equilibrium
- The power of markets and the First Welfare Theorem
- Market failure

### Required Readings:

- CDK Chapters 3 + 4 + 5
- Hayek, Friedrich A. 1945. "The Use of Knowledge in Society." *American Economic Review* 35(4):519-530.
- Ostling, Robert. 2009. "Economic Influences on Moral Values," *B.E. Journal of Economic Analysis & Policy* 9(1), Article 2.

### Assignments Due:

- **Assignment 1**

### Session 4

Topic:

- Environmental Valuation
- Demand theory
- Revealed preference vs. Stated preference

### Required Readings:

- CDK Chapters 7, 8 & 10
- Smith, V. Kerry. 1990. "Can we measure the economic value of environmental amenities?" *Southern Economic Journal* 56:865-78.
- McFadden, Daniel. 1996. "Why is Natural Resource Damage Assessment So Hard?" Paper presented as the Agricultural and Resource Economics Hibbard Lecture, University of Wisconsin, Madison, April 12.
- Navrud, Stale and Gerald J. Pruckner. 1997. "Environmental Valuation - To Use or Not to Use? A Comparative Study of the United States and Europe." *Environmental & Resource Economics* 10:1-26.
- Schlapfer, Felix. 2009. "Contingent valuation: confusions, problems, and solutions." *Ecological Economics* 68:1569-1571.

### Assignments Due:

- **Assignment 2**

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### Session 5

Topic:

- Cost-Benefit Analysis
- Discounting & inter-temporal decision-making

#### Required Readings:

- CDK Chapter 6
- Arrow, Kenneth J., Maureen L. Cropper, George C. Eads, Robert W. Hahn, Lester B. Lave, Roger G. Noll, Paul R. Portney, Milton Russell, Richard Schmalensee, V. Kerry Smith, Robert N. Stavins. 1996. "Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation." *Science* 272: 221-222.
- Goulder, Lawrence H. and Robert Stavins. 2002. "An Eye on the Future." *Nature* 419:673-674.
- Arild Vatn. 2009. "An Institutional Analysis of Methods for Environmental Appraisal" *Ecological Economics* 68:2207-2215.
- Kelman, Steven. 2000. "Cost-Benefit Analysis: An Ethical Critique (with Replies)." In *Economics of the Environment: Selected Readings* edited by Robert N. Stavins, Chapter 15.
- Hoen Ben, Ryan Wisler, Peter Cappers and Mark Thayer. 2011. "An Analysis of the Effects of Residential Photovoltaic Energy Systems on Home Sales Prices in California." Prepared for the Office of Energy Efficiency and Renewable Energy Solar Energy Technologies Program, U.S. Department of Energy and the National Renewable Energy Laboratory and the Clean Energy States Alliance. LBNL-4476E.
- Tomalty, Ray, Bartek Komorowski and Dany Doiron. 2010. "The Monetary Value of the Soft Benefits of Green Roofs." Report prepared for Canada Mortgage and Housing Corporation.

### Session 6

#### In-class Midterm Exam

### Session 7

Topic:

- Risk and Uncertainty

#### Required Readings:

- CDK Chapter 18
- McAfee, R. Preston and Tracy Lewis. "Applied Consumer Theory - Risk Aversion" in *Introduction to Economic Analysis*, Chapter 13.4.
- Friedman, Lee S. 2002. "Uncertainty and Public Policy." In *Microeconomics of Public Policy Analysis*, Chapter 7.
- Yap, Roberto C. 2004. "Option Valuation of Philippine Forest Plantation Leases" *Environment and Development Economics* 9(3):315-333.

#### Assignments Due:

- Assignment 3

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### Session 8

Topic:

- Property Rights and Resource Management
- The Coase theorem
- The Tragedy of the commons
- Investment decision-making
- Pigouvian Taxes & Marketable Permits

### Required Readings:

- CDK Chapter 12+13
- Hardin, Garrett. 1968. "The Tragedy of the Commons." *Science* 162(3859):1243-1248.
- Ostrom, Elinor. 2009. "Beyond Markets and States: Polycentric Governance of Complex Economic Systems." Nobel Prize Acceptance Lecture, December 8.
- McAfee, R. Preston and Tracy Lewis. "Investment" in *Introduction to Economic Analysis*, Chapter 11.
- Coase, Ronald H. 1960. "The Problem of Social Cost." *Journal of Law and Economics* 3:1-44.
- Kenneth J. Arrow et al. 2004. "Are We Consuming Too Much?" *Journal of Economic Perspectives* 18(3):147-172.

### Break

### Session 9

Topic:

- Information Problems
- Regulations over space and time
- Asymmetric information: moral hazard & adverse selection
- Regulating with unknown abatement costs
- Audits & enforcement

### Required Readings:

- CDK Chapter 14 + 15 + 16

### Session 10

Topic:

- Regulation & Government Failure
- Information aggregation
- Regulatory capture
- Distortionary subsidies, monopoly & rent-seeking

### Required Readings:

- CDK Chapter 11

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- Weimer, David L. and Aidan R. Vining. 2005. "Limits to Public Intervention: Government Failures." In *Policy Analysis: Concepts and Practice*, Chapter 8. Pearson Prentice Hall.
- Friedman Lee S. 2002. "Industry Regulation." In *The Microeconomics of Public Policy Analysis*, Chapter 18.
- BÓ, Ernesto Dal. 2006. "Regulatory Capture: A Review." *Oxford Review Of Economic Policy*, 22(2).

### Assignments Due:

- **Assignment 4**

### Session 11

Topic:

- Porter Hypothesis, CSR & SRI

### Required Readings:

- CDK Chapter 17
- Palmer, Karen, Wallace E. Oates and Paul R. Portney. 1995. "Tightening Environmental Standards: The Benefit-Cost or the No-Cost Paradigm." *Journal of Economic Perspectives* 9(4):119-132.
- Porter, Michael E. and Claas van der Linde. 1995. "Toward a New Conception of the Environment-Competitiveness Relationship." *Journal of Economic Perspectives* 9(4):97-118.
- Benabou, Roland and Jean Tirole. 2010. "Individual and Corporate Social Responsibility." *Economica* 77(305)1-19.
- Chatterji Aaron K., David I. Levine and Michael W. Toffel. 2009. "How Well Do Social Ratings Actually Measure Corporate Social Responsibility?" *Journal of Economics & Management Strategy* 18(1):125-169.
- Statman, Meir. 2006. "Socially Responsible Indexes: Composition, Performance, and Tracking Error." *Journal of Portfolio Management* 32(3):100-109.
- Adler, Timothy and Mark Kritzman. 2008. "The Cost of Socially Responsible Investing." *Journal of Portfolio Management* 35(1):52-56.

### Assignments Due:

- **Assignment 5**

### Session 12

Topic:

- Macroeconomic Sustainability
- Limits to Growth?

### Required Readings:

- Daly, Herman E. "Part I: Economic Theory and Sustainable Development" In *Beyond Growth*, 27-70. Boston: Beacon.

### Session 13

Topic:



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- Course Summary [We may also discuss other topics based on student interest]
- Group Project Presentations

### Session 14

Topic:

- Course Summary [We may also discuss other topics based on student interest]
- Group Project Presentations

### Assignments Due:

- **Group Papers Due**