

The Economics of Sustainability
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Professors Amit Batabyal and Jeffrey Wagner
Rochester Institute of Technology
Department of Economics

Prof. Batabyal
Bldg. 01 - Room 1345
Email: aabgsh@rit.edu
Phone: 475-2805

Office Hours: Tuesday & Thursday, 4-5
and by appointment

Prof. Wagner
Bldg. 01 – Room 1341
Email: jeffrey.wagner@rit.edu
Phone: 475-5289

Office Hours: Tuesday & Thursday, 2-4
and by appointment

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Course Requirements:

Four problem sets @ 12.5% each:	50%
Phase 1 term paper	20%
Phase 2 term paper	20%
Class participation	5%
Paper presentation during finals	5%

Term Paper

The term paper will be constructed in two phases. Phase 1 is the preparation of a three-page double-spaced document that is due in class on Thursday, January 15 (end of the fifth week of class). Phase 2 is the preparation of a ten to fifteen page (double-spaced) final paper that is due in class on Tuesday, February 17.

The Phase 1 document must include discussion of each of the following: (a) the topic and specific research question under study (b) two economics peer reviewed journal articles on the topic (c) two non-economics peer-reviewed journal articles on the topic and (d) the

approach one plans to take in developing this Phase 1 document into the Phase 2 final document.

The steps involved are the following:

1. Identify a provisional sustainability dissertation topic
 - i. Emphasis on *provisional*; here we are practicing how to execute economics research methodology as it applies to any sustainability topic. Therefore, the lessons learned can be transferred to any eventual sustainability dissertation topic.
 - ii. A sample general topic is “Incentivizing Sustainable Waste Management” and a specific focus could be on the strategic production input selection of waste disposal facility operators. How can facility location, on-site waste quality monitoring, and leachate control engineering decisions be chosen/managed to achieve maximum waste disposal facility sustainability, and how can incentives be designed to motivate that outcome?
2. Identify economic tensions in one’s topic
 - i. Where there is scarcity, there is an economic tension.
3. Locating economics and non-economics peer-reviewed research on the topic/tension.
 - i. One can search by journal title at <http://wally.rit.edu> or one can search key words within a database of journals, such as the ScienceDirect database at <http://wally.rit.edu/electronic/scidirect/scidirect.html> or the EconLit database at <http://wally.rit.edu/electronic/econlit/econlit.html> and/or see the list of economics journals at <http://www.oswego.edu/~economic/journals.htm>.
4. Preparing annotated bibliographies and research journals.
 - i. What is the purpose of each paper?
 - ii. Why is the article interesting?
 - iii. What are the key assumptions and are they “mainstream”?
 - iv. What are your first ideas for extending this work?
 - v. Note any questions that arise regarding methodology?
 - vi. What additional topics/subjects will need to be studied in order to extend the literature (i.e., to answer your research question)?
5. Sections of standard economics research papers
 - i. Introduction
 - ii. The Model
 - iii. The Data (if appropriate)
 - iv. Results and Interpretations
 - v. Conclusions and Directions for Future Research.

The outline of subjects and materials for our studies is as follows:

Lecture 1

The Problem of Sustainability and the Economics Paradigm

Professor Wagner

A. Readings

- a. Norton, B.; Toman, M. A. (1997). Sustainability: ecological and economic perspectives. *Land Economics* 73(4): 553-569.
- b. Heal, G. (1998). Valuing the Future: Economic Theory and Sustainability, Columbia University Press, Chapter 1.
- c. Perrings, C. (2006). Resilience and sustainable development. *Environment and Development Economics* 11: 417-427.
- d. Howarth, R. B. (2007). Towards an operational sustainability criterion. *Ecological Economics* 63(4): 656-663.

B. Today's topics

- a. Introductions
- b. Discuss course syllabus/logistics—intermediate microeconomics prerequisite, nature of class meetings, problem sets, term paper development and assignment/course grades.
- c. Overview of course material and teaching approach. First five weeks regard “The Microeconomics of Green Consumption/Design and Sustainability” and will be taught by Prof. Wagner. The second five weeks regard “Dynamic Economic Growth Models and Sustainability” and will be taught by Prof. Batabyal.
- d. Today's topic: The problem of sustainability and the economics paradigm. Please consider the above readings as soon as possible.
- e. Four key economic tensions regarding sustainability: the **substitutability** between natural and engineered capital; the **reversibility** of our choices in each time period; the **resiliency** of the ecological-economic system; and the **asymmetry** between the wishes of present generation versus the wishes of future generations who are not present to vote (with ballots or money) as to how things should be.
- f. Two time perspectives: static and dynamic models. Static models enable us to study economic tensions that arise when time is not a factor, thereby helping us understand what changes, and what does not change, when we add time as a factor.
- g. Two economic scopes for study: microeconomic and macroeconomic. We shall begin our studies with consideration of static microeconomic considerations (under the rubric “green consumption and green design”) and work toward dynamic macroeconomic considerations (under the rubric “economic growth with sustainability”).

Lecture 2

Consumer Theory and Sustainability: Essential Microeconomic Theory

Professor Wagner

A. Readings

- a. Nicholson, W.; Snyder, C. (2008). Microeconomic Theory: Basic Principles and Extensions, 10th ed., Thomson South-western, ISBN 978-0-324-58507-0 (book only), chapters 3-6, which we will draw upon for Lectures 2-5.
- b. Hayek, L. (1945). The use of knowledge in society. *American Economic Review* 35(4): 519-530.
- c. Stigler, G. J.; Becker, G. S. (1977). De gustibus non est disputandum. *American Economic Review* 67(2): 76-90.

B. Today's topics

- a. Optimal consumer choice revisited.
- b. Uncompensated (Marshallian) demand functions.
- c. Indirect utility functions and expenditure functions.
- d. Compensated (Hicksian) demand functions.
- e. Slutsky equation.
- f. Importance of price as information transmitter (Hayek).
- g. Importance of stable preferences assumption (Stigler and Becker).

Lecture 3

Consumer Theory and Sustainability: Conceptualizing Green Preferences

Professor Wagner

A. Readings

- a. Norton, B.; Costanza, R.; Bishop, R. (1998). The evolution of preferences: why 'sovereign' preferences may not lead to sustainable policies and what to do about it. *Ecological Economics* 24: 193-211.
- b. Wagner, J. (2006). On the economics of sustainability. *Ecological Economics* 57: 659-664.
- c. Brekke, K. A. (1997). The numeraire matters in cost-benefit analysis. *Journal of Public Economics* 64: 117-123.

B. Today's topics

- a. Alternative perspectives on preferences, optimal choice and sustainability.
- b. Compensating variation, equivalent variation and consumer surplus.
- c. A compensating variation application (Wagner 2006).
- d. An equivalent variation application (Brekke 1997).

Lecture 4

Consumer Theory and Sustainability: Modeling and Testing Responses to Green Incentives and Green Information

Professor Wagner

A. Readings

- a. Kotchen, M. J. (2005). Impure public goods and the comparative statics of environmentally friendly consumption. *Journal of Environmental Economics and Management* 49(2): 281-300.
- b. Teisl, M. F; Roe, B.; Hicks, R. L. (2002). Can eco-labels tune a market? Evidence from dolphin-safe labeling. *Journal of Environmental Economics and Management* 43: 339-359.

B. Today's topics

- a. Green products as impure public goods.
- b. Comparative statics: generating testable hypotheses.
- c. Selection of functional forms: quasi-linear utility (Kotchen p. 291, NS p. 109), separability (Teisl *et al.* p. 345, NS pp. 197, 200-201), and almost ideal demand systems (Teisl *et al.* pp. 345-350, NS p. 139).

C. Distribute Problem Set #1, due at next class

Lecture 5

Consumer Theory and Sustainability: Moral Motivation and Green Consumption

Professor Wagner

A. Readings

- a. Brekke, K.; Kverndokk, S.; Nyborg, K. (2003). An economic model of moral motivation. *Journal of Public Economics* 87: 1967-1983.
- b. Nyborg, K.; Howarth, R. B.; Brekke, K. A. (2006). Green consumers and public policy: on socially contingent moral motivation. *Resource and Energy Economics* 28: 351-366.

B. Today's topics

- a. Modeling "effort".
- b. Modeling moral motivation.
- c. Coordination failures.

C. Collect Problem Set #1 in class

Lecture 6

Theory of the Firm and Sustainability: Essential Microeconomic Theory

Professor Wagner

A. Readings

- a. Nicholson and Snyder text, chapters 9-12, which we will draw upon for Lectures 6-10.

B. Today's topics

- a. Initial survey of these chapters, building bridges from intermediate micro to microeconomic theory.
- b. Modeling technology and technological change.
- c. Modeling costs and profits.
- d. Optimization strategies: profit maximization and cost minimization.

Lecture 7

Theory of the Firm and Sustainability: "Green Design"

Professor Wagner

A. Readings

- a. Fullerton, D.; Wu, W. (1998). Policies for green design. *Journal of Environmental Economics and Management* 36: 131-148.
- b. Choe, C.; Fraser, I. (1999). An economic analysis of household waste management. *Journal of Environmental Economics and Management* 38(2): 234-246.
- c. Choe, C.; Fraser, I. (2001). On the flexibility of optimal policies for green design. *Environmental and Resource Economics* 18: 367-371.

B. Today's topics

- a. The economic concept of green design.
- b. Measuring and evaluating improvements in green design.
- c. Motivating green design.
- d. Taking household waste management effort into account.
- e. First-best versus second-best.

Lecture 8

Theory of the Firm and Sustainability: Managing Life-Cycle Externalities and Recycling Challenges of Green Design

Professor Wagner

A. Readings

- a. Walls, M.; Palmer, K. (2001). Upstream pollution, downstream waste disposal and the design of comprehensive environmental policies. *Journal of Environmental Economics and Management* 41(1): 94-108.

- b. Calcott, P.; Walls, M. (2005). Waste, recycling and ‘design for environment’: roles for markets and policy instruments. *Resource and Energy Economics* 27: 287-305.

B. Today’s topics

- a. Accounting for “upstream” and “downstream” externalities—number of policy instruments must equal number of policy objectives.
- b. Advance disposal fees (ADF’s).
- c. Economics of Life-Cycle Assessments.
- d. Green design with multiple recycling options.

C. Distribute Problem Set #2, due at next class.

Lecture 9

Theory of the Firm and Sustainability: Managing Uncertainty, Potential Liability and Nonlinear Budget Constraints

Professor Wagner

A. Readings

- a. Dyar, J. A.; Wagner, J. (2003). Uncertainty and species recovery program design. *Journal of Environmental Economics and Management* 45(2S): 505-522.

B. Today’s topics

- a. Likelihood of program success as economic objective.
- b. Uncertainty.
- c. Managing potential liability.
- d. Nonlinear budget constraints

C. Collect Problem Set #2 in class today.

Lecture 10

Theory of the Firm and Sustainability: Incentivizing Sustainable Waste Management, or catch up on and conclude materials from first nine lectures

Professor Wagner

A. Readings

B. Today’s topics

- a. Green design of landfills.

C. Collect Phase #1 Term Paper in class today.

Lectures 11 and 12
The Basic Solow Growth Model
Professor Batabyal

Lecture 11 Topic: Stylized Facts about Economic Growth and Introduction to the Solow Growth Model.

- Readings:
- Jones, C.I. 2002. *Introduction to Economic Growth*, 2nd edition. Norton, New York, New York, Chapters 1 and 2.
 - Solow, R.M. 1956. A contribution to the theory of economic growth, *Quarterly Journal of Economics*, 70, 65-94.
 - Solow, R.M. 1970. *Growth Theory*. Oxford University Press, Oxford, UK, Chapter 1.

Lecture 12 Topic: Solow Growth Model in Detail; Technology, Analytical Solutions, Introductory Growth Accounting.

- Readings:
- Jones, C.I. 2002. *Introduction to Economic Growth*, 2nd edition. Norton, New York, New York, Chapter 2.
 - Solow, R.M. 1957. Technical change and the aggregate production function, *Review of Economics and Statistics*, 39, 312-320.
 - Miller, M.H., and Upton, C.W. 1986. *Macroeconomics*. University of Chicago Press, Chicago, Illinois, Chapter 2.

Lectures 13 and 14
The Solow Growth Model With Natural Resources
Professor Batabyal

Lecture 13 Topic: Exhaustible and Renewable Resources in the Solow Model.

- Readings:
- Jones, C.I. 2002. *Introduction to Economic Growth*, 2nd edition. Norton, New York, New York, Chapter 9.
 - Nordhaus, W.D. 1992. Lethal model 2: The limits to growth revisited, *Brookings Papers on Economic Activity*, 2, 1-59.
 - Solow, R.M. 2000. Sustainability: An economist's perspective, in R.N. Stavins, (Ed.), *Economics of the Environment*, 4th edition. Norton, New York, New York.

Lecture 14 Topic: Quantifying Importance of Natural Resources and Prices as Indicators of Scarcity.

- Readings:
- Jones, C.I. 2002. *Introduction to Economic Growth*, 2nd edition. Norton, New York, New York, Chapter 9.
 - Hartwick, J.M. 1977. Intergenerational equity and the investing of rents from exhaustible resources, *American Economic Review*, 67, 972-974.

- Sorensen, P.B., and Whitta-Jacobsen, H.J. 2004. *Introducing Advanced Macroeconomics*. McGraw Hill, Maidenhead, Berkshire, UK, Chapter 7.

Lectures 15 and 16

Natural Resource Use and Sustainability in a Classical Framework

Professor Batabyal

Lecture 15 Topic: Exhaustible Resources.

- Readings:
- Heal, G.M. 1998. *Valuing the Future*. Columbia University Press, New York, New York, Chapter 3.
 - Krautkraemer, J.A. 1985. Optimal growth, resource amenities, and the preservation of natural environments, *Review of Economic Studies*, 52, 153-170.
 - Conrad, J.M., and Clark, C.W. 1987. *Natural Resource Economics*. Cambridge University Press, Cambridge, UK, Chapters 1 and 3.

Lecture 16 Topic: Renewable Resources.

- Readings:
- Heal, G.M. 1998. *Valuing the Future*. Columbia University Press, New York, New York, Chapter 4.
 - Roughgarden, J., and Smith, F. 1996. Why fisheries collapse and what to do about it, *Proceedings of the National Academy of Sciences*, 93, 5078-5083.
 - Conrad, J.M., and Clark, C.W. 1987. *Natural Resource Economics*. Cambridge University Press, Cambridge, UK, Chapter 2.

Lectures 17 and 18

Ecological Economics

Professor Batabyal

Lecture 17 Topic: Ecosystems, Biodiversity, Stability, and Resilience.

- Readings:
- Holling, C.S., Schindler, D.W., Walker, B.W., and Roughgarden, J. 1995. Biodiversity in the functioning of ecosystems: An ecological synthesis, in C. Perrings, K. Maler, C. Folke, C.S. Holling, and B. Jansson, (Eds.), *Biodiversity Loss*. Cambridge University Press, Cambridge, UK.
 - Perrings, C. 1995. Biodiversity conservation as insurance, in T.M. Swanson, (Ed.), *The Economics and Ecology of Biodiversity Decline*. Cambridge University Press, Cambridge, UK.
 - Holling, C.S. 1996. Engineering resilience versus ecological resilience, in P.C. Schulze, (Ed.), *Engineering Within Ecological Constraints*. National Academy Press, Washington, DC.

Lecture 18 Topic: Ecosystem Services.

- Readings:
- Costanza, R., Cumberland, J., Daly, H., Goodland, and Norgaard, R. 1997. *An Introduction to Ecological Economics*. St. Lucie Press, Boca Raton, Florida, Chapter 3.
 - Batabyal, A.A., Kahn, J.R., and O'Neill, R.V. 2003. On the scarcity value of ecosystem services, *Journal of Environmental Economics and Management*, 46, 334-352.
 - Daily, G.C., Soderqvist, T., Aniyar, S., Arrow, K.J., Dasgupta, P.S., Ehrlich, P.R., Folke, C., Jansson, A., Jansson, B., Kautsky, N., Levin, S., Lubchenco, J., Maler, K., Simpson, D., Starrett, D., Tilman, D., and Walker, B. 2000. The value of nature and the nature of value, *Science*, 289, 395-396.

Lectures 19 and 20
Ecological Economics and Climate Change
Professor Batabyal

Lecture 19 Topic: Swidden Agriculture.

- Readings:
- Dufour, D.L. 1990. Use of Tropical Rainforests by Native Amazonians, *BioScience*, 40, 652-659.
 - Southgate, D. 1990. The causes of land degradation along spontaneously expanding agricultural frontiers in the third world, *Land Economics*, 66, 93-101.
 - Batabyal, A.A., and Beladi, H. 2004. Swidden agriculture in developing countries, *Review of Development Economics*, 8, 255-265.

Lecture 20 Topic: Global Warming.

- Readings:
- Kahn, J.R. 1998. *The Economic Approach to Environmental and Natural Resources*, 2nd edition. Dryden Press, Fort Worth, Texas, Chapter 6.
 - Nordhaus, W.D. 2007. To tax or not to tax: Alternative approaches to slowing global warming, *Review of Environmental Economics and Policy*, 1, 26-44.
 - Dasgupta, P.S. 2007. Commentary: The Stern Review's economics of climate change, *National Institute Economic Review*, 199, 4-7.