

University of Waterloo
Department of Economics
Course Outline
Economics 355: Economics of Energy and Natural Resources
Fall 2011, Lecture 001

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Office Hours:
Mon/Wed 2:00-3:00 pm, or by
appointment
Time of lecture: 1-2:20, T,Th
Location of lecture: RCH 204

Course description: Humanity depends on natural resources for survival; yet increasing population and economic growth have put pressure on key natural resources such as forests, fisheries, and water. In addition, the economies of the world's wealthier countries are highly dependent on depletable natural resources - oil and natural gas, in particular. In this course we will use the theory and tools of economics to explore key issues of natural resource use and management. We will seek to understand the meaning and implications of natural resource scarcity and how the insights of economics might be used to promote a more sustainable path for our future. We begin with basic economic concepts such as static and dynamic efficiency, property rights and market failure. We then apply these concepts to the management of key resources such as energy resources, fisheries, forestry, and water.

Prerequisite: Econ 201

Textbook: Jonathan M. Harris, *Environmental and Natural Resource Economics, A Contemporary Approach*, Houghton Mifflin Company, 2006. This text is available on-line at:

http://ase.tufts.edu/gdae/publications/textbooks/env_nat_res_economics.html

Other Resources (on reserve in the Dana Porter Library)

- Tom Tietenberg and Lynne Lewis, *Environmental and Natural Resource Economics*, Pearson, eighth edition, 2009.
- Barry Field, *Natural Resource Economics, An Introduction*, Waveland Press, 2001.
- Frank A. Ward, *Environmental and Natural Resource Economics*, Pearson Education Ltd, 2006.

Evaluation	Percent of final grade	Date
Essay - outline	5%	Tues Oct 11 during class time.
Midterm	25%	Tues Oct 18 during class time, location TBA
Essay – final draft	20%	Thurs Nov 24
Final Exam	50%	Scheduled by the registrar

Essay

The essay is worth 25% of your grade of which 5% is for the outline and 20% is for the final draft. You are to write an essay on one topic chosen from a list that will be distributed early in the term. The essay is to be 7 – 8 pages double spaced, excluding the bibliography, figures and tables. The essay outline, including annotated bibliography, is due on October 11. The final draft (worth 20%) and is due on November 24. A late deduction of 5% per day will be applied to the outline and final draft if turned in late. More details about the essay will be provided in a separate document.

Important Notes:

1. Course notes, announcements etc can be found on UW-ACE.
2. If you miss the midterm, I will shift its weight to the final exam.
3. The final exam is cumulative. If it is to a student's benefit I will drop the midterm mark and shift its weighting to the final exam.
4. This course assumes students are competent with skills in basic algebra, such as solving two linear equations in two unknowns, and working with exponents and logarithms.
5. Students with a concern about the marking of the midterm must consult with me within three weeks of the date that it is returned in class. After three weeks I will not make any changes to a midterm mark.
6. Students are responsible for material covered in lectures and assigned readings.

Outline of topics to be covered:

1. Introduction
 - 1.1. Natural resources and the economy
 - 1.2. Scarcity and limits to growth
2. Normative criteria for decision-making
 - 2.1. Review of basic concepts: willingness-to-pay, marginal and total cost, consumer and producer surplus
 - 2.2. Static efficiency
 - 2.3. Dynamic efficiency
 - 2.4. Choice of discount rate
3. Markets and efficiency
 - 3.1. Efficient institutions
 - 3.2. Market failure, externalities, public goods, common property

- 3.3. Public policy options for natural resource management (property rights, taxes, subsidies, direct control, etc.)
4. Non-renewable resources: the theory of optimal extraction and depletion
5. Energy economics: non-renewable and renewable energy sources
 - 5.1. Assessing the resource stock: how soon will we run out of oil?
 - 5.2. Explaining oil prices
 - 5.3. Meeting future energy demand – outlook for renewables
6. Forest economics: a renewable, but depletable, resource
7. Fisheries: a common pool resource
8. Water economics: a renewable, but depletable, resource
9. Sustainability: Can we achieve a sustainable path in natural resource use?

Tentative Course Schedule

Note: I will not follow this schedule rigidly, but will adapt the timing of topics as needed to best make use of class time. Readings with a * represent required readings. Other readings are recommended to supplement lectures. Additional readings will be assigned throughout the term. Check ACE regularly for an up-to-date reading list.

Lecture 1: Tues Sept 13

1. Introduction – Course overview

1.1 Natural resources and the economy

- *Harris, Ch 1,2, and Ch 13, pages 280-281 (1st and 2nd laws of thermodynamics)

Lecture 2: Thurs Sept 15

1.2 Scarcity and limits to growth

- *Joel Darmstadter (2011) 'Meeting the World's Natural Resource Needs: Confrontation (or Worse) Ahead?' Resources for the Future, Issue Brief 11-07, June 2011. <http://www.rff.org/rff/documents/rff-ib-11-07.pdf>
- *Simpson, Toman and Ayres (2004) 'Scarcity and Growth in the New Millennium: Summary', Discussion Paper 04-01, Resources for the Future, January 2004. <http://www.rff.org/rff/documents/rff-dp-04-01.pdf>

Lecture 3: Tues Sept 20

2. Normative criteria for decision making

2.1 Review of basic concepts

2.2 Static efficiency

- *Harris, Ch 3, pages 63-72
- Tietenberg, Ch 2
- Field, Ch 3, Ch 4, Ch 5

Lecture 4: Thurs Sept 22

2.3 Dynamic efficiency

- *Harris, Ch 6, pages 114-119
- Field, Ch 5

Lecture 5: Tues Sept 27

2.3 (continued) Dynamic efficiency

2.4 Choice of discount rate

- *Cameron Hepburn (2009) 'Ethics and Discounting Global Warming Damages,' Weekly Policy Commentary, Resources for the Future, Oct 20.
<http://www.rff.org/publications/wpc/pages/ethics-and-discounting-global-warming-damages.aspx>
- *Pearce, D., B. Groom, C. Hepburn, and P. Koundouri (2003) 'Valuing the future: recent advances in social discounting,' *World Economics* 4(2): 121-41.
<http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.121.130>

Lecture 6: Thurs Sept 29

2.5 Treatment of risk and uncertainty

- *Harris, Ch 6, pages 119-130

3. Markets and Efficiency

3.1 Efficient institutions

3.2 Market Failures

- *Harris, Ch 3 and Ch 4
- *Hardin, Garrett (1968), 'The tragedy of the commons,' *Science* (162): 1243-1248. Available at: <http://dieoff.org/page95.htm>
- Tietenberg, Ch4
- Field, Ch 6

Lecture 7: Tues Oct 4

3.2(continued) Market failures

Lecture 8: Thurs Oct 6

3.2(continued) Market failures

3.3 Public policy options

- Field, Ch 7

Lecture 9: Tues Oct 11

4. Non-renewable resources: the theory of optimal extraction and depletion

- *Harris, Ch 5 and Ch 12, page 257-271
- Tietenberg, Ch 5 and Ch 7

Essay outline due

Lecture 10: Thurs Oct 13

4. (continued) Optimal depletion

Lecture 11: Tues Oct 18

Midterm

Lecture 12: Thurs Oct 20

4. (continued) Optimal depletion

<p>Lecture 13: Tues Oct 25</p> <p>5. Energy economics: non-renewable and renewable energy sources</p> <ol style="list-style-type: none"> a. Assessing the resource stock: how soon will we run out of oil? b. Explaining oil prices <ul style="list-style-type: none"> • *James Smith, 'World Oil: Market or Mayhem?' <i>Journal of Economic Perspectives</i>, 23(3): 145-164. • *Lutz Killian (2010) 'A primer on oil price shocks past and present,' Resources for the Future, Weekly Policy Commentary, May 21, 2010. http://www.rff.org/Publications/WPC/Pages/A-Primer-on-Oil-Price-Shocks-Past-and-Present.aspx
<p>Lecture 14: Thurs Oct 27</p> <p>5.2(continued) Explaining oil prices</p> <p>5.3 How will future energy demand be met?</p> <ul style="list-style-type: none"> • *Harris, Ch 13
<p>Lecture 15: Tues Nov 1</p> <p>6. Forest Economics</p> <ul style="list-style-type: none"> • *Harris, Ch 15, pages 337-339 • Tietenberg Ch 13 • Ward, Ch 8
<p>Lecture 16: Thurs Nov 3</p> <p>6.(continued) Forest economics</p>
<p>Lecture 17: Tuesday Nov 8</p> <p>6.(continued) Forest Economics</p>
<p>Lecture 18: Thurs Nov 10</p> <p>7. Fisheries</p> <ul style="list-style-type: none"> • *Harris, Ch 14 • Costello, Christopher, S. Gaines, and J. Lynham (2008) 'Can Catch Shares Prevent Fisheries Collapse,' <i>Science</i>, 321: 1678-1681.
<p>Lecture 19: Tues Nov 15</p> <p>7(continued) Fisheries</p>
<p>Lecture 20: Thurs Nov 17</p> <p>7 (continued) Fisheries</p>
<p>Lecture 21: Tues Nov 22</p> <p>8. Water</p> <ul style="list-style-type: none"> • *Harris, Ch 15, pages 340-349.
<p>Lecture 22: Thurs Nov 24</p> <p>8. Sustainability</p>

<ul style="list-style-type: none"> • *Harris, Ch 7 • *Harris, Ch 8
Essay due
Lecture 23: Tues Nov 29 8. (continued) Sustainability <ul style="list-style-type: none"> • *Harris, Ch 20
Lecture 24: Thurs Dec 1 Course evaluation and summary

Academic Integrity

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility.

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, <http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm>

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, <http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm>

Appeals: A student may appeal the finding and/or penalty in a decision made under Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read Policy 72 - Student Appeals, <http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm>

Academic Integrity website (Arts): http://arts.uwaterloo.ca/arts/ugrad/academic_responsibility.html

Academic Integrity Office (UW): <http://uwaterloo.ca/academicintegrity/>

Accommodation for Students with Disabilities:

Note for students with disabilities: The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, 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 OPD at the beginning of each academic term.