

University of Waterloo
Department of Economics
Economics 255
Introduction to the Economics of Natural Resources, Fall 2021
1:00 – 2:20 pm, MW, Room: STC 1012

Instructor Information

Instructor: Margaret Insley
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Office hours and communication with the instructor

When sending email, please use your official UWaterloo account and have ECON 255 in the subject line. Please also include a signature line with your full name.

I am available for virtual office hours on Monday and Wednesdays from 3:30 pm to 4:30 pm. Please send me an email to book an appointment. I will send you an MS Teams link for the appointment time. If these times do not work for you, then please contact me and we can arrange an alternate time.

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, some of which are major sources of carbon emissions. 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 natural resources such as energy resources and fisheries.

Course objectives and learning outcomes

The objective of the course is to apply the normative economic concepts of static and dynamic efficiency to questions concerning society's exploitation of natural resources.

Upon completion of the course students should be able to:

- Explain the determination of the efficient rate of extraction over time for renewable and non-renewable resources and distinguish between efficiency and equity
- Explain the importance of property rights in the management of natural resource use

- Explain the significance of discounting in economic decisions about natural resources and the associated ethical dilemmas
- Analyze market failures in specific examples and the need for government intervention to support a more efficient allocation of natural resources
- Evaluate government natural resource policies for efficiency, equity and societal welfare.

Textbooks

- Tom Tietenberg and Lynne Lewis (**T&L**), Environmental and Natural Resource Economics, Pearson, eleventh edition, 2018. The 11th edition is available in the bookstore and on-line through the library. (Three copies may be used concurrently through the library.)
- A basic first year microeconomics textbook to provide a review of first year concepts. Some examples that are freely available include:
 - Douglas Curtis and Ian Irvine. Principles of Microeconomics (Lyryx) (<https://openlibrary.ecampusontario.ca/catalogue/item/?id=2c524756-e7fd-47e1-9dc8-e9398a935150>)
 - Timothy Taylor, Steven A. Greenlaw and David Shapiro. Principles of Microeconomics - 2e: OpenStax (<https://openlibrary.ecampusontario.ca/catalogue/item/?id=92a5668c-a33b-4521-9853-6c06dbb38699>)

Course Assessment

Evaluation	Percent of final grade	Date
Assignment 1	15%	Friday, October 8
Midterm	25%	Monday, Nov 1
Assignment 2	15 %	Monday, Nov 29
Final Exam	45 %	Scheduled by the registrar

Other course information

Contingency in the event of short term or longer term in-class cancellation

- In the event that in-person classes must be cancelled, classes will be held on-line and/or video lectures will be posted to cover the relevant material.

Contingency in the event of cancelled exams

- In the event that the final exam or midterm cannot be held in person, an on-line version of the exam will be held using the LEARN platform.

Attendance Policy

- Consistent class attendance is highly recommended for a student to do well in this course. Course notes available on LEARN are intended as an aid to understanding, not a substitute for classes.
- In the event of absence due to influenza-like illness or required self-isolation, students shall submit an Illness Self-declaration. Students can find the [Illness Self-declaration form in the Personal Information section of Quest](#). A doctor's note for accommodation is not required. In such cases, students will be provided with on-line resources covering the relevant materials for missed classes.

Required Background

- The prerequisite is Econ101.
- Students are expected to be competent with skills in basic algebra, such as solving two linear equations in two unknowns, and working with exponents and logarithms.

Readings and notes on LEARN

- Course notes, announcements etc. can be found on LEARN.
- The course notes provide an outline of important points, but leave out many details. It is recommended that you bring the relevant notes to class each week so that you can fill in missing sections.

Midterm

- A student who misses the midterm due to influenza-like illness shall submit an Illness Self-declaration. Students can find the [Illness Self-declaration form in the Personal Information section of Quest](#). A doctor's note for accommodation is not required. Students should email me to inform me they have submitted their Illness Self-declaration. A make-up midterm will be scheduled at an alternate time.
- A student who misses the midterm due to other extenuating circumstances (such as an illness other than influenza) should seek approval from me to write a make-up midterm. To obtain approval, a student must provide appropriate documentation such as the University's Verification of Illness Form completed by their physician. If a student does not receive my approval, then a mark of zero will be assigned for the missed midterm. **Students must submit their documentation within one week of the missed midterm.**
- Students with a concern about the marking of a midterm must consult with me **within two weeks** of the date that it is returned to the class. After two weeks, I will not make any adjustments to a midterm mark.

Assignments

- It is permitted to consult with other students regarding the assignment questions, however the final work submitted must be your own. Students who submit identical (or nearly identical) assignments will receive a grade of zero.
- Assignments are to be submitted to the designated Dropbox on LEARN. Assignments may be handwritten or typewritten.
- Students with a concern about the marking of an assignment must consult with me **within two weeks** of the date that it is returned to the class. After two weeks I will not make any adjustments to a assignment mark.

Policy on late assignments

- A deduction of 5% per day will be applied to an assignment handed in late.

Final Exam

- The final exam is cumulative.
- Students are responsible for material covered in lectures and assigned readings.

Electronic Device Policy

- Students are welcome to bring laptop computers or other electronic devices to class for note taking. Browsing the internet during class is not permitted. Please turn off cell phones during class time.

Economics Department Deferred Final Exam Policy

- The Deferred Final Exam Policy is found at <https://uwaterloo.ca/economics/undergraduate/resources-and-policies/deferred-final-exam-policy>

Schedule and outline of topics to be covered:

Note: The readings listed below may be adjusted during the term depending on time available and interest.

1. Introduction

Weeks 1 and 2 (Sept 8 and 13)

Notes:

- 1.1. What is natural resource economics?
- 1.2. Natural resource scarcity

1.3. Natural resources and the economy

Readings:

- Trevor Tombe, Better off dead: “Value Added” in Economic Policy Debates. SPP Research Papers, Vol 8, Issue 9, The School of Public Policy, University of Calgary, March 2015.

Optional Readings:

- T&L, Ch 1
- Gee, Marcus (2018) ‘Even without rose-tinted glasses, life’s till a lot rosier,’ *Globe and Mail*, August 25, 2018. Available on Learn.
- Kopecky, Arno (2018) ‘Things have never been so good for humanity, nor so dire for the planet’, *Globe and Mail*, August 25, 2018. Available on Learn.
- Lomborg, Bjorn (2020) ‘The alarm about climate change is blinding us to sensible solutions,’ *Globe and Mail*, July 17, 2020.

2. Normative criteria for decision making in a static setting: Efficiency and cost effectiveness

Week 2 (Sept 13 and 15)

Notes:

- 2.1. Choices and tradeoffs
- 2.2. Measuring benefits
- 2.3. Measuring costs

Week 3 (Sept 20 and 22)

Notes:

- 2.4. Static efficiency criterion
- 2.5. Cost effectiveness criterion

Readings:

- T & L, Ch 3 , Sections :
- Optional: A first year microeconomics text for review of concepts such as willingness to pay, cost curves in the short and long run, efficiency and market failure. Relevant chapters in the suggested online textbooks include:
 - Curtis and Irvine, Chapters 3, 5 and 8
 - Timothy Taylor, Steven A. Greenlaw and David Shapiro, Chapters 3, 7

3. Property rights and market failures

Week 3 (Sept 22) and Week 4 (Sept 27 and 29)

Notes:

- 3.1. Property rights and efficient market allocations
- 3.2. Externalities as a source of market failure

- 3.3. Public goods
- 3.4. Other sources of market failure
- 3.5. Addressing market failures through private resolution and negotiation

Readings:

- T & L, Ch 2
- *The Economist*, “Schools Brief: Externalities, Pigouvian taxes”, August 19, 2017.
- Bergstrom, Theodore (2010) ‘The Uncommon Insight of Elinor Ostrom,’ *Scandinavian Journal of Economics*, 112(2), 245-261.

4. Discounting and dynamic efficiency

Week 5 (Oct 4 and 6)

Notes:

- 4.1. What is dynamic efficiency?
- 4.2. How should the discount rate be chosen for public policy decisions?
- 4.3. Discounting over long time periods

Readings:

- *Cropper, M (2013) ‘[How should benefits and costs be discounted in an intergenerational context?](#)’ *Resources Magazine*: 183, Resources for the Future.
- *Pearce, D.; B. Groom; C. Hepburn; and P. Koundouri (2003) [Valuing the future: recent advances in social discounting](#), *World Economics* 4(2): 121–41.

5. Dynamic efficiency and sustainability

Week 6 (Oct 18 and 20) and Week 7 (Oct 25 and 27)

Notes:

- 5.1. Characterizing the resource stock
- 5.2. Optimal extraction in a two period model
- 5.3. Intertemporal fairness and the sustainability criterion

Readings:

- T & L, Ch. 5
- Geoffrey Heal (2012) “Defining and measuring sustainability.” *Review of Environmental Economics and Policy*, 6(1), pp. 147-163.

6. Non-renewable resource allocation: efficient extraction over a long time horizon

Week 8 (Nov 3) and Week 9 (Nov 8 and 10) (Note that Nov 1 is the midterm date.)

- 6.1. Case I: Constant cost, no backstop
- 6.2. Case II: A change in the discount rate

- 6.3. Case III: Presence of a backstop technology
- 6.4. Case IV: Increasing marginal extraction costs
- 6.5. Exploration and new discoveries
- 6.6. Market allocations of non-renewable resources

Readings:

- T&L, Ch 6 (including appendix)

7. Transitioning from fossil fuels to renewable energy sources

Week 10 (Nov 15 and 17)

Notes:

- 7.1. Are fossil fuels becoming more scarce?
- 7.2. Transitioning power generation away from fossil fuels

Readings:

- T&L, Ch 7, Sections on: Electricity, the role of depletables; Electricity: transitioning to renewables, pp 158-163
- Colin J. Campbell and Jean H. Laherrère, The end of cheap oil, *Scientific American*, 1998.
- Bassi, Samuela; Maria Carvalho, Baran Doda and Sam Fankhauser (2017) 'Credible, effective and publicly acceptable policies to decarbonise the European Union, Final Report', Grantham Research Institute on Climate Change and the Environment, Chapter 2 "The effectiveness of decarbonisation policies".
- National Energy Board (NEB) (2017) 'Canada's Adoption of Renewable Power Sources Energy Market Analysis,' May 2017. <https://www.neb-one.gc.ca/nrg/sttstc/lctrct/rprt/2017cnddptnrnwblpwr/2017cnddptnrnwblpwr-eng.pdf>
- Covert, T.; M. Greenstone; C. Knittel (2016) 'Will we ever stop using fossil fuels?' *Journal of Economic Perspectives*, 30, p. 117-138.

8. Fisheries

Week 11 (Nov 22 and 24); Week 12 (Nov 29 and Dec 1); Dec 6

Notes:

- 8.1. Introduction
- 8.2. A model of the fishery
- 8.3. Dynamics of open access
- 8.4. Determining the socially optimal harvest level
- 8.5. Extinction in a steady state model
- 8.6. Regulation of the fishery

8.7. Case study: Pacific halibut

Readings:

- T&L, Chapter 12
- *The Economist*, (2016) 'Unbalancing the Scales,' Print edition, July 16, 2016.
- Kroetz, Kailin; and James N. Sanchirico (2015) '[The Costs of Competing Goals in Fishery Management](#),' *Resources Magazine*: 190, Resources for the Future, September 2015.
- Sumaila, U. Rashid (2010) 'A cautionary note on individual transferable quotas,' *Ecology and Society*, Volume 15, Issue 3, Article number 36.

Statements and links included on all course outlines

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. [Check [the Office of Academic Integrity](#) for more information.]

Grievance: A student who believes that a decision affecting some aspect of their 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.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for their actions. [Check [the Office of Academic Integrity](#) for more information.] 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 instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](#). For typical penalties, check [Guidelines for the Assessment of Penalties](#).

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 they have a ground for an appeal should refer to [Policy 72, Student Appeals](#).

Note for students with disabilities: [AccessAbility Services](#), located in Needles Hall, Room 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 AccessAbility Services at the beginning of each academic term.

Other Information from the Faculty of Arts

Intellectual Property

Students should be aware that this course contains the intellectual property of their instructor, TA, and/or the University of Waterloo.

Intellectual property includes items such as:

- Lecture content, spoken and written (and any audio/video recording thereof);
- Lecture handouts, presentations, and other materials prepared for the course (e.g., PowerPoint slides);
- Questions or solution sets from various types of assessments (e.g., assignments, quizzes, tests, final exams); and
- Work protected by copyright (e.g., any work authored by the instructor or TA or used by the instructor or TA with permission of the copyright owner).

Course materials and the intellectual property contained therein, are used to enhance a student's educational experience. However, sharing this intellectual property without the intellectual property owner's permission is a violation of intellectual property rights. For this reason, it is necessary to ask the instructor, TA and/or the University of Waterloo for permission before uploading and sharing the intellectual property of others online (e.g., to an online repository).

Permission from an instructor, TA or the University is also necessary before sharing the intellectual property of others from completed courses with students taking the same/similar courses in subsequent terms/years. In many cases, instructors might be happy to allow distribution of certain materials. However, doing so without expressed permission is considered a violation of intellectual property rights.

Please alert the instructor if you become aware of intellectual property belonging to others (past or present) circulating, either through the student body or online. The intellectual property rights owner deserves to know (and may have already given their consent).

Chosen/Preferred First Name

Do you want professors and interviewers to call you by a different first name? Take a minute now to verify or tell us your chosen/preferred first name by logging into [WatIAM](#).

Why? Starting in winter 2020, your chosen/preferred first name listed in WatIAM will be used broadly across campus (e.g., LEARN, Quest, WaterlooWorks, WatCard, etc). Note: Your legal first name will always be used on certain official documents. For more details, visit [Updating Personal Information](#).

Important notes

- If you included a preferred name on your OUAC application, it will be used as your chosen/preferred name unless you make a change now.
- If you don't provide a chosen/preferred name, your legal first name will continue to be used.

Mental Health Support

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

On Campus

Due to COVID-19 and campus closures, services are available only online or by phone.

- Counselling Services: counselling.services@uwaterloo.ca / 519-888-4567 ext. 32655
- [MATES](#): one-to-one peer support program offered by the Waterloo Undergraduate Student Association (WUSA) and Counselling Services

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: 519-749-4300 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 on 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.

Territorial Acknowledgement

We acknowledge that we are living and working on the traditional territory of the Attawandaron (also known as Neutral), Anishinaabe and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes ten kilometres on each side of the Grand River.

For more information about the purpose of territorial acknowledgements, please see the [CAUT Guide to Acknowledging Traditional Territory](#).

Academic freedom at the University of Waterloo

[Policy 33, Ethical Behaviour](#) states, as one of its general principles (Section 1), “The University supports academic freedom for all members of the University community. Academic freedom carries with it the duty to use that freedom in a manner consistent with the scholarly obligation to base teaching and research on an honest and ethical quest for knowledge. In the context of this policy, 'academic freedom' refers to academic activities, including teaching and scholarship, as is articulated in the principles set out in the Memorandum of Agreement between the FAUW and the University of Waterloo, 1998 (Article 6). The academic environment which fosters free debate may from time to time include the presentation or discussion of unpopular opinions or controversial material. Such material shall be dealt with as openly, respectfully and sensitively as possible.” This definition is repeated in Policies 70 and 71, and in the Memorandum of Agreement, Section 6