



Introduction to Environmental Economics

Course Outline August 2018

1. Names and contact details

Course Presenter: Dr. Ross Cullen
Telephone (021) 294 6819
Email: ross.cullen@lincoln.ac.nz

Course Administrator: Zaneta Waitai
Email: zaneta.waitai@mbie.govt.nz

2. Course Learning Objectives

This course aims to provide an introduction to the theories, toolkits, research, and policy options needed to analyse and respond to environmental and natural resource issues and problems. Human activity is now the dominant factor impacting the environment globally and economics can play a key role analysing and interpreting how we use and misuse natural resources. During the last sixty years a large amount of new economic theory and toolkit development has occurred enabling research and analysis of a very wide range of environmental and resource use issues.

The course will:

- * Increase students' awareness and appreciation of the importance of economic analyses in resource use, allocation and management to public and private decision-makers.
- * Develop participants' understanding of basic theoretical concepts and analytical tools necessary to evaluate natural resource use, allocation and management issues.
- * Develop students' knowledge of analytical environmental economic models and valuation techniques such as benefit-cost analysis and non-market valuation.

3. Learning outcomes

On completion of the course participants will have the following:

- Ability to apply appropriate economic theory and analysis to real world environmental and natural resource issues.
- Greater understanding of a range of environmental and natural resource issues in both New Zealand and internationally.
- Increased ability to develop and appraise policy options to address environmental and natural resource issues in both New Zealand and internationally.
- Awareness of the key principles and practices underpinning sustainable activities and development.

4. Target Audience

This course will be most helpful to policy advisors with some economics training who have not completed courses such as environmental or resource economics and who wish to increase their skill in using economics for policy analysis of environmental and resource issues.

5. Knowledge of economics required

Some familiarity with economic thinking will be helpful. Previous study of economics at 100 level or the GEN course **Introductory Microeconomics for Policy Analysis** should be completed before this course.

6. Overview of Session Topics

Session 1: Goods types, property rights, externalities, missing markets, co-operation

This module provides a classification of the various types of natural resources, explains the role of property rights in resource and environmental issues, studies externalities and the impact of missing markets.

Key Learning Objectives:

1. Explain how 'goods' and 'bads' can be classified on a 2 x 2 system
2. Explore the importance of various types of externalities
3. Explain how environmental problems occur when the market fails
4. Check if there are co-operative solutions to environmental issues

<http://www.pearsoned.co.nz/9781292055688>

Readings:

1. Chapter 4 Tom Tietenberg and Lynne Lewis, 2013. ***Environmental Economics and Policy***, Sixth Edition
2. Ostrom, E, 2009. A general framework for analyzing sustainability of social-ecological systems. *Science*, 325, 24 July, 419-422.
3. Pannell D, 2008. Public benefits, private choices, and policy mechanism choices for land-use changes for environmental policy. *Land Economics*, 84(2), 225-240.

Session 2: Evaluating tradeoffs: Benefit-Cost Analysis and other Decision-making metrics

This module examines how societies make choices about use of resources. These decisions are guided by analytical tools designed to evaluate environmental risks and assess the costs and benefits of minimising them. The focus of this module is on benefit-cost analysis, an economic tool used to guide environmental policy decisions. It looks at discounting, Net Present Value, Cost effectiveness and other decision-making metrics.

Key Learning Objectives:

1. Explain how benefit-cost analysis can be used to evaluate specific projects and policies.
2. Provide an overview and critique of Non Valuation methods

Readings:

1. Chapter 2, 3 Tom Tietenberg and Lynne Lewis, 2013. ***Environmental Economics and Policy***, Sixth Edition
2. The Treasury, 2015. Guide to Social Cost Benefit Analysis.
<http://www.treasury.govt.nz/publications/guidance/planning/costbenefitanalysis/guide/cba-guide-jul15.pdf>
<https://treasury.govt.nz/publications/guide/cbax-spreadsheet-model>

Session 3: Dynamic efficiency and sustainable development

The focus of this module is on economic efficiency and the difference between static efficiency and dynamic efficiency. We study how scarcity requires the balancing of present and future uses of resources.

Key Learning Objectives:

1. Distinguish between static efficiency and dynamic efficiency.
2. Using a two-period model, derive the maximisation of net benefits over time both mathematically and graphically.
3. Compare Hotelling and Bradley theories of extraction

Readings:

1. Chapter 5, 7 Tom Tietenberg and Lynne Lewis, 2013. ***Environmental Economics and Policy***, Sixth Edition
2. Garnaut, R. 2012. The contemporary China resources boom. *Australian Journal of Agricultural and Resource Economics*, 56(2), 222-241

Session 4: Mineral and Energy Resources

This module investigates the application of economics of the problems of allocating and extracting mineral and energy resources. The allocation of rights to minerals and energy is accompanied by royalty or taxation regimes. Some countries divert royalties collected into special funds as a means to smooth income between generations.

Key Learning Objectives:

1. Understand the basis for efficient allocation of rights to mineral and energy resources.
2. Examine market-orientated mechanisms for allocating minerals and energy.
3. Examine the range of royalties on mineral and energy extracted.
4. Examine the case for Sovereign Wealth Funds.

Readings:

1. Chapter 8 Tom Tietenberg and Lynne Lewis, 2013. ***Environmental Economics and Policy***, Sixth Edition
2. AUPEC 2009. Evaluation of the Petroleum Tax and Licensing Regime of New Zealand. Final report to the Ministry of Economic Development.
3. Minz, J. and Chen, D. 2012. Capturing economic rents from resources through

royalties and taxes. School of Public Policy Research Papers, University of Calgary, 5(30), October.

Sessions 5, 6: Fisheries

This module investigates the application of economics of the problems of harvesting fish and other marine species. The race to fish is a chronic problem in fisheries and most countries attempt to halt that by a range of regulatory and other policies. Tradable rights are the predominant tool used in New Zealand to halt the race to fish.

Key Learning Objectives:

1. Understand the race to fish and its consequences.
2. Examine regulatory and market-orientated mechanisms for managing fishing activity.

Readings:

1. Chapter 13 Tom Tietenberg and Lynne Lewis, 2013. *Environmental Economics and Policy*, Sixth Edition
2. Kerr, S., Newell, R. Sanchirico, J. Evaluating the New Zealand Individual Transferable Quota Market for Fisheries Management. <http://motu.nz/our-work/environment-and-resources/fisheries-management/evaluating-the-new-zealand-individual-transferable-quota-market-for-fisheries-management-2>

Session 7, 8: Water Resources

This module investigates the application of economics to the problems of allocating and managing water resources.

Key Learning Objectives:

1. Understand the basis for the efficient allocation of water, both urban and rural.
2. Examine market-orientated mechanisms for allocating and pricing of water.

Readings:

1. Chapter 9 Tom Tietenberg and Lynne Lewis, 2013. *Environmental Economics and Policy*, Sixth Edition
2. Freebairn, J. Utilising Water: Some Economic Issues. Fourth AARES Symposium. http://www.agrifood.info/Agrifood/Connections/AARES_Symp_01/Freebairn.pdf
3. Chapter 4, OECD, Environmental Performance Reviews: New Zealand 2017. http://www.oecd-ilibrary.org/environment/oecd-environmental-performance-reviews-new-zealand-2017_9789264268203-en
4. Harris, SR, Kerr, GN and Doole, GJ 2016. Economics of fresh waters. Ch.33 in, P. G. Jellyman, T.J.A. Davie, C.P. Pearson, J.S. Harding (eds). **Advances in New Zealand Freshwater Science**. New Zealand Freshwater Sciences Society and New Zealand Hydrological Society

Session 9: Pollution

Approaches to managing pollution and environmental degradation. Allocative efficiency and cost-effectiveness are used to analyse regulations, and instruments such as technology-based standards, pollution charges, and tradeable pollution permits.

Key Learning Objectives:

1. Recognise a range of policy alternatives by exploring both conventional and economic solutions to environmental degradation.
2. Investigate the traditional use of standards to define environmental objectives.
3. Examine the command-and-control approach to implementing the standards.
4. Explore the market approach as a secondary form of environmental control policy.

Readings:

1. Chapter 15 Tom Tietenberg and Lynne Lewis, 2013. ***Environmental Economics and Policy***, Sixth Edition.
2. Kerr, S., McDonald, H., and Rutherford, K.. Nutrient Trading in Lake Rotorua: A Policy Prototype. <http://motu.nz/our-work/environment-and-resources/nutrient-trading-and-water-quality/nutrient-trading-in-lake-rotorua/>
3. Greenhalgh, S and Selman, M. 2008, Water quality trading programs - a comparison between the northern and southern hemispheres. 2008 AARES annual conference. <http://ageconsearch.umn.edu/bitstream/6028/2/cp08qr03.pdf>

Session 10: Climate Change

An overview of climate change and of policies to reduce or mitigate carbon emissions.

Key Learning objectives:

1. Understand the key elements forcing climate change.
2. Examine options for reducing CO₂ emissions and the cost effectiveness of selected emissions reduction policies.

Readings:

1. Chapter 16 Tom Tietenberg and Lynne Lewis, 2013. ***Environmental Economics and Policy***, Sixth Edition
2. McKibben, W.J., and Wilcoxon, P.J. 2002. The role of economics in climate change policy. *Journal of Economic Perspectives*, 16(2), 107-130
3. OECD (2013b). Climate and carbon: Aligning prices and policies, *OECD Environment Policy Papers No. 1*. OECD, Paris, <http://dx.doi.org/10.1787/5k3z11hjq6r7-en>.
4. Jaffe, Adam B., and Suzi Kerr. 2015. "The Science, Economics, and Politics of Global Climate Change: A Review of The Climate Casino by William Nordhaus." *Journal of Economic Literature*, 53(1): 79-91.

Sessions 11, 12: Biodiversity and Conservation

This session examines the economics of managing forests and biodiversity. It focuses on issues of deforestation from a microeconomic perspective. The module examines the

anthropogenic reasons for biodiversity loss and evaluates policy options for the management of conservation resources to preserve endangered species and biodiversity.

Key Learning Objectives:

1. Identify reasons for deforestation from private and public sectors.
2. Identify reasons for biodiversity loss.
3. Examine the total economic value of conservation resources and biodiversity.
4. Evaluate options for management of conservation resources using cost-benefit analysis, non-market valuation and alternative analytical tools.

Readings:

1. Chapter 12 Tom Tietenberg and Lynne Lewis, 2013. **Environmental Economics and Policy**, Sixth Edition
2. Cullen, R., Fairburn, G. & Hughey, K.F.D. (2001) Measuring the productivity of threatened species programs. *Ecological Economics*, 39, 53-66.
3. Joseph, L., Maloney, R., Possingham, H. 2009. Optimal allocation of resources among threatened species: A Project Prioritization protocol. *Conservation Biology*. 23(2), 328-338.
4. Scofield, P., Cullen, R., and Wang, M. (2011). Are predator-proof fences the answer to New Zealand’s terrestrial faunal biodiversity crisis? *New Zealand Journal of Ecology*. 35(3). <http://newzealandecology.org/nzje/2997>
5. Pannell, D. (2018). Prioritising environmental investments, *DecisionPoint* # 103, 12-15.

7. Teaching and Learning Methods

The material covered by the course is fairly broad. In standard university undergraduate curricula this material requires a one semester-length subject in environmental economics. The breadth of the material to be covered means that the teaching is intensive and lecture-style. Participants are expected to come to class having read the relevant chapters of the textbook so they can keep up with the pace and content of the course. They are also strongly encouraged to read beyond the textbook and to discuss the content of the lectures with classmates and economist colleagues.

The lectures are interactive and include class discussion of numerous “real life” examples of the application of core economic concepts to policy problems from a wide range of areas. Active participant engagement and interaction in classes is expected, meaning that all participants will be expected to speak and work in groups during the classes.

8. Class Details

Session	Date	Times	Venue
1	Monday 20 August	10:00am - 3:00pm	G.01, 15 Stout Street, Wellington
2	Monday 27 August	10:00am - 3:00pm	G.01, 15 Stout Street, Wellington
3	Monday 3 September	10:00am - 3:00pm	G.03, 15 Stout Street, Wellington

Report to Reception, MBIE, 15 Stout Street, Wellington.

There will be a 1 hour lunch break in each session (lunch will not be provided).

9. Course Costs

This course is provided by the Government Economics Network (GEN) at a cost of \$500 plus GST per person.

10. Course Materials

10.1 Recommended Text

No single textbook meets all the needs for the coverage, approach and application required for this subject. It is important to have access to a good introductory microeconomics textbook that should cover most of the material, as no specific readings are provided for each topic.

The following introductory textbook is recommended, although other introductory textbooks can also be used:

Tom Tietenberg and Lynne Lewis, Environmental Economics and Policy, 6th edition.

<http://www.pearsoned.co.nz/9781292055688>

The chapters from Tietenberg and Lewis listed in section 6 above, are assigned as readings for each session.

Some alternative texts are:

J Harris, B Roach, 2017. Environmental and Natural Resource Economics: A Contemporary Approach. 4th ed. http://www.ase.tufts.edu/gdae/publications/textbooks/env_nat_res_economics.html

JR Kahn, 2011. The Economic approach to Environmental and Natural Resources, 3rd ed.

R.Q. Grafton, W. Adamowicz, D. Dupont, H. Nelson, R.J. Hill, S. Renzetti, 2004. The economics of the environment and natural resources.

10.2 Additional Reading

Participants are encouraged to read newspapers, articles and blogs to see how economic thinking is applied to a wide range of environmental and resource issues.

International and New Zealand environmental economics websites include:

<http://ageconsearch.umn.edu/>

<http://www.env-econ.net>

<http://www.fe2wnetwork.org/>

<http://www.panneldiscussions.net/about/>

<http://www.ecosystemmarketplace.com/>

<http://www.energyandpolicy.org/>

<http://www.perc.org/>

<http://www.footprintnetwork.org/en/index.php/GFN/>

<http://recvaluation.forestry.oregonstate.edu/>

<http://selfservice.lincoln.ac.nz/nonmarketvaluation/default.asp>

<https://www.evri.ca/Global/Splash.aspx>
<http://waterways.ac.nz/Useful%20resources.shtml>
<http://www.globalwaterforum.org/>
<http://www.ren21.net/>
<https://scienceofdoom.com/>
<http://centerbear.org/>
<http://thebreakthrough.org/publications>
<http://www.intracen.org/itc/projects/trade-and-environment/>
<http://www.nzpam.govt.nz/cms>
<http://www.mfe.govt.nz/>
<http://pce.parliament.nz>
<http://www.landandwater.org.nz/>
<https://www.lawa.org.nz/>
<http://morganfoundation.org.nz/public-policy-education/>
<http://motu.nz/our-work/environment-and-resources/>
<http://www.eds.org.nz/>

11. Assessment

The course will be assessed and participants who pass the course will receive a certificate of achievement. The weighting for the assessment is as follows:

Assessment Task	
Essay	100
Total	100

Group Essay

Participants are required to write a group essay using economic theory and thinking to analyse an environment or natural resource issue of their choice. Participants will be assigned to groups.

The purpose of the essay is to (1) deepen understanding of how apply economic reasoning to environment and natural resource issues, and (2) stimulate reflection on both the strengths and shortcomings of the economic approach.

A wide range of policy issues could be suitable topics for the essay, but the selected topic should be amenable to economic analysis. It could include a current policy issue being considered in an agency.

Proposals should start by raising a clearly stated policy question. Thus, to give an example, the essay should not just consist of writing about “carbon taxes”, but of using economics to tackle a clear policy question such as “Are carbon taxes an effective, low cost way to reduce

CO₂ emissions?” Clearly identifying the key issue for policy analysis is crucial in this exercise.

Proposals for the essay topic must be submitted to the Course Presenter for approval by 3:00 pm on **3 September 2018**. Participants may wish consider in advance proposals for topics.

The essay should:

- Define the problem and the underlying economic issue and rationale for government intervention
- Apply economic theory and reasoning to analyse the issue
- Draw on (and cite) both New Zealand and international literature and case studies
- Draw on studies that provide empirical evidence where relevant
- Identify and evaluate at least two policy options for dealing with the issue
- Discuss public policy options based on economic analysis and criteria
- Identify the strengths and limitations of an economic approach to the topic

All members of the group who contribute to the essay will be given the same mark. Group management is a matter for the group itself, including issues of free-rider behaviour. Participants may wish to note the email addresses of each member of the group as they will need to do further preparation and communicate as the essay is developed.

The word limit is 3,000 words (not including any footnotes and appendices). Words in excess of the stipulated word length will be ignored by the marker. Grading criteria are indicated in the assessment matrix below.

Criterion	Mark
Identification of the issue	20
Application of economics	20
Relevant use of literature an evidence	20
Critical evaluation of options	20
Strengths and weaknesses of the economic approach	10
Quality of writing and presentation	10
Total	100

The essay should be word processed, neatly presented and submitted in hard copy and by email to the Course Administrator by close of business on the **due date 28 September 2018**. Participants should keep a copy of all submitted work.

Referencing

A well prepared essay should contain at least 15-20 pertinent references. It is critical to read widely for the essay and cite correctly the material drawn on. Full acknowledgement of sources used is required – both for general referencing and for quotation. This includes acknowledgment of any internal document or web sources used. Where extracts are used directly these must be quoted and cited; where ideas are relied upon more broadly referencing is still needed.

Include a full reference list at the end of the essay, listing in alphabetical order all references cited in the assignment, and in a standard format such as the Harvard citation style. **Do not** use *ibid.* or *op cit*, do not place references in footnotes and do not cite the lecture notes. <http://www.citethisforme.com/harvard-referencing>

Plagiarism

Plagiarism is unacceptable in any format. Participants should be aware that software (e.g. "Turn-it-in") may be used at the discretion of GEN to review material submitted. Serious penalties may be applied in cases of plagiarism.

12. Attendance Requirements

Full attendance by participants is expected and a record of attendance will be maintained in this subject. Where absence is unavoidable, notification to the Course Administrator as soon as possible is required. If a participant is absent for two sessions or more, additional work in lieu of attendance will be required to be eligible to pass this course.

13. Withdrawal from Course

If a participant is unable to attend, the registration may be transferred to another person by advising the Course Administrator in writing at least two days before the start of the course.

14. Course Lecturer



Ross Cullen is an emeritus professor of resource economics at Lincoln University. He taught and researched environmental and resource economics for thirty years at first Otago, and then Lincoln University. His research ranges widely and includes economic analysis of biodiversity management; analysis of urban and rural water issues; perceptions of the state of the environment; impacts of land use change on ecosystem services; energy policy evaluation. His publications are found at: https://www.researchgate.net/profile/Ross_Cullen After completing full-time work in 2012 Ross lived for three years in Norway; he continues part-time-research on environment and resource topics.

15. About the Government Economics Network

The Government Economics Network was established in 2011 to promote the better use of economics in the public sector in New Zealand. The network has three aims:

- 1) support economics training and professional development;

- 2) develop linkages between economists; and
- 3) strengthen economic advice to government.

For further information please visit our website: www.gen.org.nz