

REM 321/ENV 321 - Ecological Economics

Fall Semester (2013)

FINAL UPDATE: November 29, 2013

Instructor:

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Lecture:

Tues: 12:30-2:20pm (SECB1010)
Exam: 8:30-11:30am, Dec. 13 (Friday)

Tutorials:

Tues: 3:30-4:20pm (WMC 2501)
Wed: 12:30-1:20pm (AQ 4125)
Wed: 1:30-2:20pm (AQ 4125)

Course Website: <https://sites.google.com/site/remenv321fall2013/home>

Assignments will be submitted and graded using [Canvas](#).

“One studies economics to avoid being fooled by economists.” – *Joan Robinson*

Broad Learning Outcomes:

Once you complete this course, you will be able to:

1. Define and explain the major modern environmental problems.
2. Critically evaluate the strengths and drawbacks of economic concepts of the environment.
3. Apply course concepts and tools to real-world environmental problems (e.g. media coverage).
4. Challenge your own assumptions regarding environmental and economic issues, and understand/develop your personal values.
5. Develop collaborative, interdisciplinary learning and thinking skills.
6. Demonstrate the level of respect and organization expected in the workforce.

Course Themes:

We will draw from many real-world examples of environmental problems, including climate change, fisheries management and biodiversity loss. We will learn and use several tools from ecological economics, including ecological footprint, cost-benefit analysis, valuation of ecosystem services, measures of economic growth versus development, and definitions of “sustainability.”

Course Evaluation

The course grade will be determined as follows:

- 1. Participation (16%)**
 - Tutorial/lecture discussions/activities (10%)
 - iClicker participation (3%)
 - Two journal entries (3%)
- 2. Assignments (34%)**
 - A1: Defining sustainability (10%, 2 pages)
 - A2: Trade-off analysis (12%)
 - A3: Policy evaluation (12%, 3 pages)
- 3. Midterm exam (20%)**
 - T/F (explain answer), short answer, essay answer (know and apply)
- 4. Final exam--comprehensive (30%)**
 - T/F (explain answer), short answer, essay answer (know and apply)

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Required Text Readings and Materials

1. **Environmental Economics, 3rd Canadian Edition** (2011), Barry Field and Nancy Olewiler, McGraw-Hill Ryerson. Available at SFU bookstore (a few copies will be on reserve at SFU.)
2. A number of additional online (electronic) readings will be uploaded to the course website, including reports, journal articles and several newspaper/magazine articles.
3. Lecture will make use of **iClickers**. Students will need to buy a personal iClicker from the SFU bookstore, and bring it to every lecture.

Class Format

The course blends a variety of formats and interactions:

- **Lectures:** will be 1:50 in length with one 5-10 minutes break. I will combine lectures (slides, overheads, white-board) with clicker quizzes, group work, discussion and dialogue.
- **Tutorials:** will be 50 minutes, and will supplement, reinforce and critique material presented in lecture. Several short “modules” will be delivered to train students on particular skills relating to assignments. Several “simulation” exercises will engage students in interactive games to learn ecological economics concepts through experience.
- **Group work:** after the first class, you will be placed into an interdisciplinary work team. You will work with this team for all remaining lectures and tutorials—including small group discussions, simulation exercises and other activities.
- **Journal exercise (JE):** at three points during the semester, you will submit a short piece of writing (< 1 page). Each week will address a different topic. Your submission will receive a Pass or Fail, and a few comments. A Fail is assigned if you did not address the assignment, and/or your grammar/writing is too unclear for the TA. You will have one chance to correct a Fail.
- **iClicker exercises:** lectures will regularly use iClicker exercises to reinforce class material, and help with your learning. Most clicker exercises will only require participation—though some will be graded.
- **Attendance:** given the participatory nature of this class and topic, you are expected to attend all lectures and tutorials, and to participate. All students will be called on to share at some point. Failure to attend will affect your participation mark (see website for description of participation mark).

Rules and Grading

- As a condition of being in this class, we all agree to create a learning environment that is respectful, comfortable and safe. We will listen to one another, and practice the learning of other people’s perspectives. We will be willing take risks in order to learn about ourselves, each other, society and the environment.
- The times and dates of the midterm and final exams are already set. As a condition of your participation in this class, you must be aware of these times, and agree to attend without complaint.
- Turn off and put away all electronic devices during lectures and tutorials. Laptops (or other computers) are okay for note taking. However, checking email, social media or other non-class-related websites is distracting for you and other students—and will impact your participation grade You will work in teams, and sit with your team, in every lecture and tutorial.
- You will need to attend lecture and tutorials, participate and take notes. Powerpoints and notes will not always be posted online, and when posted they will not be complete.
- Late assignments are penalized 1 grade step per day (e.g. A+ becomes A). Deferred grades are only given under exceptional circumstances and a doctor's note is required.

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- Letter grades will follow SFU standards. The only situation in which I would mark on a “curve” would be to *increase* your grade in the event that an exam/assignment proves to be unfair (though this has never happened...).
- Plagiarism will not be tolerated and is surprisingly easy to detect. For further information, see the university's plagiarism policy at: <http://www.sfu.ca/policies/Students/index.html>. Ignorance of what constitutes plagiarism will not be permitted as an excuse (e.g. unintentional plagiarism).

Course Outline (will change)

Week (Class Day)	Topic	Text	Other Readings (**Optional)	Comment/ Assignments (A)	Tutorial
1 Sept 3	Intro to ecological econ	Ch.1	**Jackson (2009), Summary		“About you” Media analysis Writing module
2 Sept 10	Environmental problems Perspectives sustainability	Ch.2	Solow (1991) Daly (2005)	JE1 Due (Sept 10, 12:30pm)	Debate Daly/Solow
3 Sept 17	Intro to human values Supply/demand/efficiency	Ch. 3 Ch. 4	Rolston (2003) **McAfee Chap.2	A1 Due (Sept 20, 5pm)	Supply/demand simulation
4 Sept 24	Supply/demand (con't) Market failures	Ch. 4 Ch.10	Fullerton (1998) Green (2009)		Coase simulation Discuss Green
5 Oct 1	Market failure (con't) Trade-off analysis (CBA, and alternatives)	Ch.6	Arrow (1996)		Tradeoff exercise CBA Critiques
6 Oct 8	Trade-off (con't) Ecosystem services (ES)		Costanza (1997) Patterson (2009) McCauley (2006)		Valuation survey Debate ES ideas
7 Oct 15	Midterm				Course review
8 Oct 22	Climate change (Jaccard) Valuation methods	Ch. 7	Jaccard, Peak Oil **Levi (2012)	Guest: Dr. Jaccard A2 Due (Oct 25, 5pm)	Discuss Jaccard Feedback
9 Oct 29	Optimal pollution and alternatives	Ch. 5 Ch. 8			Discuss WTP Build MAC
10 Nov 5	Optimal pollution (con't) Policy evaluation	Ch. 9 Ch.11 **Ch.12	Olewiler (2012) **C.D. Howe (2004)	JE2 Due (Nov 8. 5pm)	Tradable permit simulation
11 Nov 12	Fisheries and renewable resources		Harris (Chap.14) Schwindt (2003)		Policy module Discuss Schwindt
12 Nov 19	Fossil fuels and non- renewable resources (Guest: Katya Rhodes and Jeff Rambharack)	Ch.20	Harris (Chap.5) Harris (Chap.12)	A3 due (Nov 22, 5pm) Dr. Axsen AWAY Guest: TBD	Non-renewables discussion
13 Nov 26	Trade and environment		Harris (Chap.19) Jaccard handout **Fischer (2010)		Trade example Review for final

Final exam: Friday, December 13, 8:30-11:30am.

Course “Concept Map”

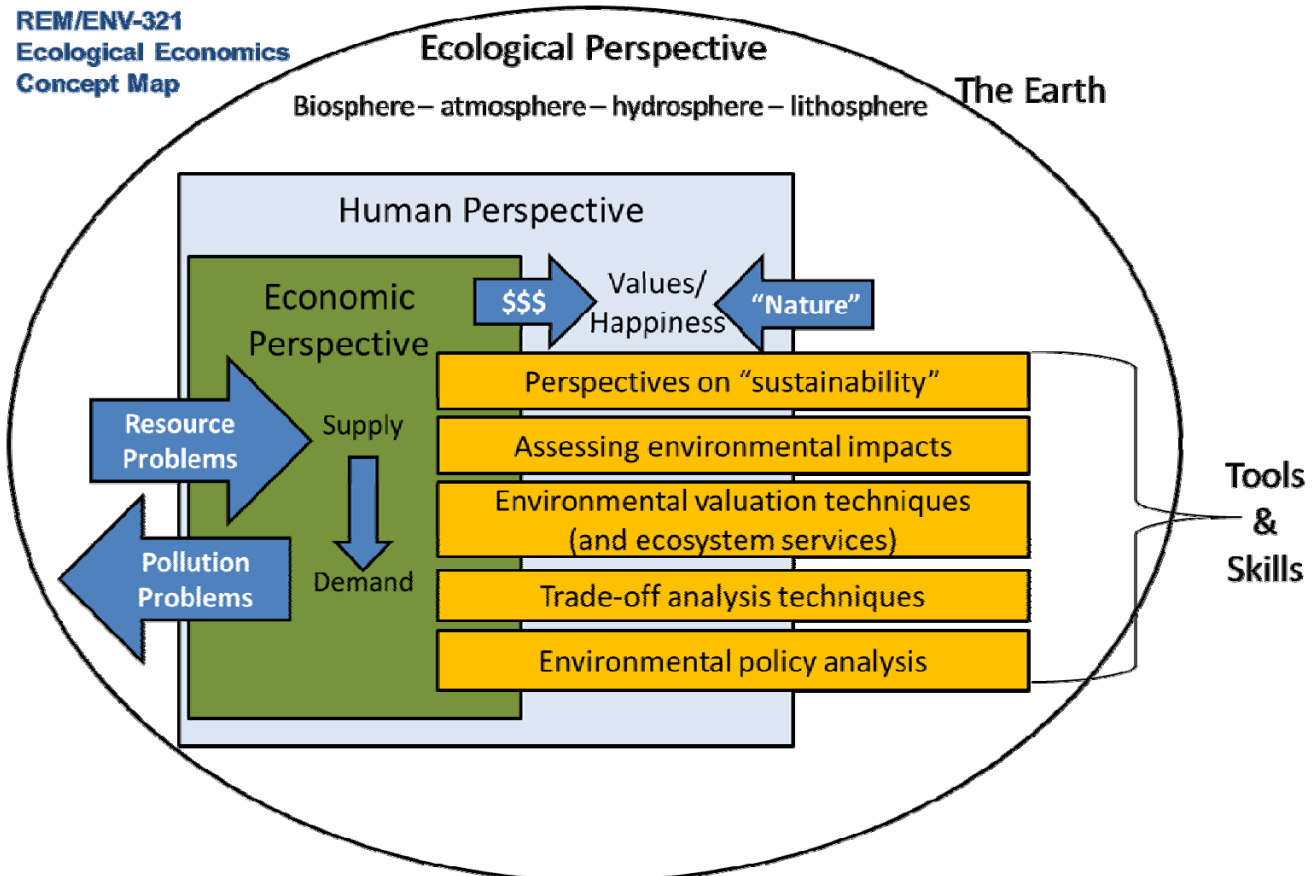
The figure below provides one view on the course. The outer circle represents the earth system, including biosphere, atmosphere, hydrosphere and lithosphere. We will consider three perspectives on the earth and environment:

1. The green box represents the (neoclassical) “**economic**” perspective, which seeks to maximize profit and utility while viewing the environment as a source of resources, and a waste bin (sink) for pollution. (Egoistic values.)
2. The broader “**human**” perspective includes economic concerns, as well as other values (e.g. culture, altruism) and happiness more generally. Happiness can be drawn from the economy, as well as the environment. (Humanistic-altruistic values.)
3. The “**ecological**” perspective views humans as just one of many species on the planet, existing within the global ecosystem (rather than separate from it). The earth is finite in terms of energy and materials, and there are limits to growth for all species, including humans. (Biospheric values.)

Within this course, we will learn and apply several tools and skills that can be tailored to each of these perspectives. We consider alternative definitions of **sustainability** and methods of measuring environmental **impacts**. We apply methods to assign **value** to environmental services to help us make **trade-offs** regarding different societal and environmental objectives. And we consider ways to evaluate government **policies** seeking to meet environmental objectives. Some more specific learning outcomes are detailed on the next page.

Figure 1: REM/ENV-321 “Concept” Map

REM/ENV-321
Ecological Economics
Concept Map



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More specific learning outcomes (not exhaustive)

After completing the course, you will be able to:

Knowledge and comprehension:

1. Identify and compare economic and ecological perspectives on sustainability, including weak versus strong sustainability.
2. Explain and depict the economic concepts of market demand, supply, equilibrium and efficiency.
3. Define, explain and depict the concepts of market failures, including externalities, common pool resources and public goods.
4. Define the concept of ecosystem services and identify examples.
5. Identify and compare the different ways that humans may value the environment.
6. Explain and compare different methods of non-market valuation, including revealed and stated preference methods.
7. Identify and explain the major categories of environmental policies (voluntarism, subsidies, taxes, market-oriented regulation, standards and hybrid approaches).
8. Explain and depict the key economic and ecological challenges of managing renewable resources (e.g. open-access, maximum sustainable yield vs. economically efficient yield).

Application, analysis and evaluation:

9. Identify and explain the major critiques of the neoclassical economic perspective on the environment.
10. Critique the economic concept of “optimal pollution” and explain alternative approaches to setting environmental goals.
11. Explain, apply and critique the “Coase theorem.”
12. Apply and critique trade-off techniques to environmental problems, including cost-benefit analysis and multi-attribute trade-off analysis.
13. Demonstrate methods of accounting for risk and uncertainty in ecological economics.
14. Evaluate environmental policy according to criteria of effectiveness, efficiency, equity, simplicity and political acceptability.
15. Explain and critique economic and ecological perspectives regarding economic growth, including GDP and Environmental Kuznet’s Curve.
16. Explain and critique different perspectives on economic trade and the environment, including notions of “gains from trade.”

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IMPORTANT: Flow of course by Section

Note: “F&O” refers to: Environmental Economics, 3rd Canadian Edition (2011), Barry Field and Nancy Olewiler, McGraw-Hill Ryerson.

Section 1: Introduction (Week 1)

Learning outcomes:

- 1.1 Understand the flow and expectations of REM/ENV-321.
- 1.2 Identify your own preconceptions of what “economics” means and what are its uses.
- 1.3 Depict and explain the circular flow of the economy.
- 1.4 Explain the key differences between neoclassical economics, welfare economics, and ecological economics.
- 1.5 Define environmental economics, resource economics and ecological economics, and depict the differences.

Concepts to know:

- Perspective of neoclassical, environmental and resource economics
- Perspective of ecological economics
- Production and consumption
- Circular flow of economics
- Energy and materials
- Wastes, materials recycling

Readings (and questions to guide your reading):

1. F&O, Chapter 1: What is Environmental Economics?

- F&O use lots of (potentially) new terms, especially in the first paragraph. We will cover these terms in detail as the course progresses. For now, use the textbook to write definitions of each term in your own words.
- Summarize how F&O define explain economics and the “economic approach” to pollution.
- Contrast the goals of “efficiency” and “equity.”
- Think of your own example of an environmental “externality.”
- Look at equation on p.8. Which of the three levers (right-hand side) do politicians normally target, if any?
- Do you agree with F&O’s definition of sustainability?
- The PPF concept (p16-17) is complex. Do your best to understand for now—can you figure out why Fig. 1-4b is more optimistic?

Optional:

2. Jackson, T. (2009). Prosperity without growth?, Summary (pages 6-13)

- Compare the tone of Jackson (an ecological economist) with F&O (neoclassical)
- How does Jackson define “prosperity”? Do you agree?
- Summarize Jackson’s arguments regarding “growth.”
- What is Jacksons’ critique of consumerism?
- Do you agree that a “less materialistic society will enhance life satisfaction” (p11)?
- Are you satisfied with Jackson’s 12 steps to sustainability in Box 1? Why or why not?

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Section 2: Sustainability (Week 2)

Learning outcomes:

- 2.1 Classify environmental problems by scale, effect, source and timing
- 2.2 Explain the different forms of human-based capital, and how this differs from natural capital.
- 2.3 Define and depict weak versus strong sustainability.
- 2.4 Relate the first and second laws of thermodynamics to economic and ecological concepts of sustainability.
- 2.5 Compare and contrast the “growth paradigm” with “steady-state” principles, and identify measures consistent with each.

Concepts to know:

- Threats to sustainability
- Pollutants: stock/flow, local/global, continuous/episodic, point/nonpoint source
- Types of capital (Natural vs. human)
- Weak and strong sustainability
- Systems (open, closed, isolated)
- First and second laws thermodynamics (entropy)
- Intergenerational equity
- The growth paradigm
- GDP, Green-adjusted GDP, Genuine Progress Indicator (GPI), happiness
- Environmental Kuznets curve (EKC)

Readings (and questions to guide your reading):

1. **F&O, Chapter 2: Natural Capital, Linkages between the Economy and the Environment, and Pollution**
 - Summarize F&O’s explanation of why the word “capital” is used in “natural capital.”
 - Fig.2-1 is different from the economy-environment diagram in class (avoid confusion!)
 - What controversy to F&O point out regarding the term “pollution”?
 - What are the challenges of dealing with “accumulative” pollutants? Or nonpoint source pollutants?
2. **Solow, R. (1991). Sustainability: An Economists Perspective, Presentation at Woods Hole, June 14, 1991.**
 - What is Solow’s idea for a “different kind” of definition of sustainability?
 - What is Solow’s position on the “substitutability” of resources?
 - What are his assumptions about human desires and values? (See his Iroquois statement)
 - How does the example of Norway illustrate Solow’s perspective on sustainability?
 - Do you buy into Solow’s argument about present vs. future poverty?
3. **Daly, H. (2005). Economics in a Full World, *Scientific American*, September 2005.**
 - What does Daly mean by “uneconomic growth”?
 - How does Daly define and differentiate “full world” and “empty world” economics?
 - How does Daly feel about the “substitutability” of natural and human capital?
 - What does he say about “well-being” and “happiness” in relation to economic growth?

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Section 3: Human Values (Week 3)

Learning outcomes:

- 3.1 Understand your own values regarding the environment.
- 3.2 Explain the differences between egoistic, altruistic and biospheric values.
- 3.3 Define the economic concept of “homo economicus” and provide a critique.

Concepts to know:

- Rational choice model (or “homo economicus”)
- Egoistic, altruistic and biospheric values
- Anthropocentric vs. biocentric
- Intrinsic versus instrumental value

Readings (and questions to guide your reading):

1. **Rolston, H. (2003). Environmental ethics, in *The Blackwell Companion to Philosophy*, 2nd edition, Ed. Nicholas Bunnin and E. P. Tsui-James. [Only read pp.517-524]**
 - How does Rolston portray differences between the “humanistic ethics” and “animal welfare ethics” and “biocentrism”?
 - What do you think—are values and ethics necessarily human-based?

Section 4: Supply and Demand (Weeks 3-4)

Learning outcomes:

Demand

4a.1 Define the primary assumptions of neoclassical economics.

4a.2 Explain and depict the law of demand according to utility, marginal willingness to pay.

4a.3 Define own-price elasticity and explain the importance of the concept.

4a.4 Differentiate between complements and substitutes in demand.

Supply

4b.1 Explain the primary difference between short-run and long-run supply.

4b.2 Differentiate between total, average and marginal costs.

4b.3 Explain and depict the law of supply (and upward sloping marginal costs).

Concepts to know:

- Marginal analysis
- Assumptions of neo-classical economics
- Utility
- Opportunity cost
- Willingness-to-pay (WTP)
- Demand curve (individual and market)
- Law of demand (and diminishing marginal utility)
- Elasticity (own-price)
- Complements and substitutes in demand
- Short-run and long-run
- Average and marginal cost
- Law of supply

Readings (and questions to guide your reading):

1. F&O. Chapter 3: Benefits and Costs, Supply and Demand

- Pay attention to the orientation of the graphs. You will need to get comfortable with these graphs. What is on the y-axis? What is on the x-axis? Get practice drawing the supply and demand curves for yourself.
- Understand the demand curve. Why does it normally slope downwards?
- Understand the concept of opportunity cost.
- Understand the supply curve. Why does it normally slope upwards?

Optional:

- McAfee, Chapter 2: Supply and Demand

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Section 5: Market Efficiency (Week 4)

Learning outcomes:

- 5.1 Explain and depict market equilibrium, consumer surplus, producer surplus and social welfare.
- 5.2 Identify deadweight loss in cases of market inefficiencies, and explain the importance of this concept.
- 5.3 Contrast and critique different economic notions of efficiency, e.g. Pareto efficiency and Hicks-Kaldor efficiency.

Concepts to know:

- The invisible hand and market equilibrium
- Consumer surplus and producer surplus
- Social welfare
- Surplus and shortage
- Dead-weight loss (DWL)
- Pareto efficiency
- Hicks-Kaldor efficiency (potential Pareto optimal)

Readings (and questions to guide your reading):

1. F&O. Chapter 4: Economic Efficiency and Markets [pp52-60]

- Note that F&O use the term “social surplus,” “net benefits,” and “net social value” interchangeably, which has the same economic definition as the term “total welfare” that we use in lecture.
- How is economic efficiency defined, calculated and depicted?
- How does social efficiency compare with economic efficiency?
- How can goals of efficiency clash with goals of equity?
- Complete the calculation exercise at the bottom of page 54.
- Start to get familiar with the section on “external costs”—we will get into more detail on this topic in this course.

2. Green, T (2009). The efficient drowning of a nation: Is economics education warping gifted minds and eroding human prospects? In *Morality, Ethics and Gifted Minds*, Eds. D. Ambrose and T. Cross.

- What are Green’s critiques of economists notions of efficiency?
- What does Green mean when he describes economic efficiency as a “normative” concept?
- Do you think that training in neoclassical economics actually makes students become more self-interested?
- How does Greene describe a sort of “lock-in” to reinforce neoclassical thinking among economic scholars?

Section 6: Market Failures (Weeks 4-5)

Learning outcomes:

- 6.1 Define, explain and depict the concepts of market failures.
- 6.2 Depict the concept of an environmental externality and explain two potential solutions, including the Coase theorem.
- 6.3 Explain the concept of common pool resource and how this relates to property rights.
- 6.4 Explain and depict the notion of public good.
- 6.5 Identify market failures in real-world environmental problems.

Concepts to know:

- Externality (positive and negative)
- Pigouvian tax
- Coase theorem
- Rivalrous and excludable goods
- Public good
- Free-riding
- Common property resource (tragedy of the commons)
- Property rights

Readings (and questions to guide your reading):

1. F&O, Chapter 4 (pp 57-67)

- Look closely at Figure 4-3 and understand what is being represented. What could a policymaker do to align marginal private costs with marginal social costs?
- How does an open-access resource relate to property rights?
- How does the concept of “positive externalities” relate to “public goods”?
- Think of a real-world example of how a person or group can “free ride” with respect to an environmental public good? Is this “fair”?

2. Fullerton and Stavins, 1998, How economists see the environment, *Nature*, 395, 433-434

- What are the four “myths” that the authors describe regarding perceptions of economists?
- What do the authors give as examples of environmental problems that are not well suited for “market solutions”?
- What do the authors say about the use of money (or monetization) to make environmental decisions? Do you agree with this approach?
- Would you say that the authors speak more from a “neoclassical economics” perspective or from an “ecological economics” perspective?

3. F&O, Chapter 10: Liability Laws, Property Rights Moral Suasion, Green Good (pp 168-175)

- Understand the Coase theorem and read the examples closely. Do you think this idea is useful? Is it realistic? Is it more relevant for a particular type (or types) of environmental problem.
- How does the Coase theorem address equity?

Section 7: Tradeoff Analyses (Weeks 5-6)

Learning outcomes:

- 7.1 Explain and critique the use of cost-benefit analysis (CBA) for environmental problems.
- 7.2 Apply trade-off techniques to environmental problems, including CBA and multi-attribute trade-off analysis (MATA).
- 7.3 Identify the controversies surrounding the use of discount rates and net present value (NPV).
- 7.4 Explain decision-making under uncertainty including the use of sensitivity analysis, expected value and decision trees.

Concepts to know:

- Cost-benefit analysis (CBA)
- Discounting
- Private vs. social discount rate
- Opportunity cost of capital
- Net Present Value (NPV)
- Benefit-cost ratio (BCR)
- Sensitivity analysis
- Drawbacks of CBA
- Expected value
- Maximax and Maximin decision rules
- Multi-attribute tradeoff analysis (MATA)

Readings (and questions to guide your reading):

1. F&O, Chapter 6: Framework of Analysis

- What criticism to F&O provide of real-life use of CBA?
- We will cover Figure 6-1 later in the course.
- Why are monetary units typically used to put a value on benefits and costs?
- What is the difference between calculating net-benefit and benefit-cost ratio?
- Is the “best” (most stringent) treatment of pollution always socially efficient?
- Why must discounting be used for multi-year analyses? How is it controversial?
- What are some key sources of uncertainty in CBA? How can uncertainty be addressed? What about higher risk, low probability events?
- Read the case study on fuel sulphur (p105). What scenario maximized NPV? Why did the authors recommend the 30 ppm scenario? Do you agree with this approach?

2. Arrow.et al. (1996). Is there a role for benefit-cost analysis in environmental health and safety regulation? *Science*, 272, 221-222

- What is estimated cost per statistical life saved? How might this be estimated?
- Do you agree with the authors recommendations regarding CBA use?

Section 8: Ecosystem Services (Week 6)

Learning outcomes:

- 8.1 Summarize general trends of human impacts on ecosystems to date.
- 8.2 Explain the concept of ecosystem services (ES), including ecological and economic origins.
- 8.3 Identify ES examples from the four main categories, and apply the concept to a region.
- 8.4 Articulate your own critique on the ES concept and how it may or may not be useful for achieving environmental objectives.

Concepts to know:

- Ecosystem services (ES)
- Provisioning, regulating, cultural and supporting services
- Consumptive and non-consumptive services
- Payment for ES

Readings (and questions to guide your reading):

1. **Patterson, T. (2009). Ecosystem services: Foundations, opportunities, and challenges for the forest products sector, *Forest Ecology and Management*, 257, 1637-1646.**
 - Look at the ES categories in Figure 1. Is this breakdown exhaustive? Useful? Potentially misleading? Explain.
 - Think about the different types of ES definitions shown in Figure 2. What is the difference between definitions meant for “awareness” versus “valuation”? Why is this difference important?
 - Understand the idea of payment for ES (and Figures 4 and 5).
 - What is the difference between replacement value and street value? How does this matter for ES valuation?
2. **McCauley, D. (2006). Selling out on nature, *Nature*, 443(7), 27-28.**
 - According to the author, what are the four major limitations of the ES concept?
 - How might technological change affect motives to conserve ecosystems?
 - Should all natural capital be assigned an “infinite value”? Is this useful?
3. **Costanza et al. (1997). The value of the world’s ecosystem services and natural capital, *Nature*, 387.**
 - Read through the article, and figure out how the authors estimated the \$33 trillion/year value for the biosphere.
 - Does this value make sense? Is it useful to monetize the entire biosphere in this way?

Optional

Fisher, B. et al. (2009). Defining and classifying ecosystem services for decision making, *Ecological Economics*, 68, 643-653.

de Groot et al. (2002). A typology for the classification, description and valuation of ecosystem functions, goods and services, *Ecological Economics*, 41, 393-408.

Millennium Ecosystem Assessment (2005). *Ecosystems and Human Well-Being*. Island Press, Washington D.C

Section 9: Valuation Methods (Week 8)

Learning outcomes:

- 9.1 Explain why valuation is an important concept in all types of economics.
- 9.2 Differentiate between direct, indirect and non-use value concepts.
- 9.3 Explain and compare different methods of non-market valuation, including revealed and stated preference methods.
- 9.4 Differentiate between willingness-to-pay and willingness-to-accept.
- 9.5 Identify the potential sources of bias in stated preference methods.

Concepts to know:

- Non-market valuation
- Direct use value
- Indirect use values (option, bequest)
- Non-use value (existence value)
- Stated vs. revealed preference techniques
- Hedonic price method
- Travel cost method
- Contingent valuation
- Willingness-to-pay, willingness-to-accept
- Bias (hypothetical, strategic, interviewer)

Readings (and questions to guide your reading):

1. F&O, Chapter 7: Benefit-Cost Analysis: Benefits

- Does it make sense to put a dollar value on human health and life?
- Understand the estimate of produce surplus change in Figure 7-1.
- Why can't we just rely on market prices to quantify environmental goods?
- Understand the consumer surplus calculation for environmental quality in Figure 7-3.
- Understand the differences between preventative expenditures, hedonic estimation, surrogate markets and contingent valuation.
- How does CVM work? What are the critiques of this method?
- What do you think is a "better" concept: WTP or WTA? Why?
- (NOTE: p134, bullet point 2, says "stated preference approach" but should instead say "revealed preference approach.")

Optional

Knetsch (2007). Biased valuations, damage assessments and policy choices: The choice of measure matters, *Ecological Economics*, 63, 684-689.

Section 10: Environmental Targets (Week 9)

Learning outcomes:

- 10.1 Depict the marginal damage cost (MDC) curve and explain its shape.
- 10.2 Depict the marginal abatement cost (MAC) curve and explain its shape.
- 10.3 Explain and depict the equi-marginal principle and why it is important when companies face different MAC curves.
- 10.4 Explain and critique the economic concept of “optimal pollution”
- 10.5 Explain alternative approaches to setting environmental goals (e.g. uncertainty and safe minimum standard)

Concepts to know:

- Absorptive capacity
- Emissions vs. ambient concentrations
- Marginal damage cost (MDC) curve
- Marginal abatement cost curve (MAC) curve
- Optimal pollution
- Equimarginal principle
- Drawbacks of “optimal pollution”
- Safe minimum standard

Readings (and questions to guide your reading):

1. F&O, Chapter 5: The Economics of Environmental Quality

- Understand the concept of pollution damages. Why might marginal damage functions take different shapes? What is the importance of the threshold concept?
- How does the concept of MACs relate to pollution-control technologies?
- Why might MACs be different across different companies? How does this relate to the equi-marginal principle?
- Look closely at the concept of “socially-efficient pollution” (which I am calling “optimal pollution.” Does this concept make sense? Is it making any assumptions that you do not agree with?
- Don’t worry about reading the Addendum (unless you are interested).

2. F&O, Chapter 8: Benefit-Cost Analysis: Costs [p137-140 only]

- The first part of this chapters relates to the MAC concept described above. Get familiar with the different aspects of cost, such as opportunity costs and enforcement costs.
- Why might there be environmental costs associated with an environmental protection program?

Section 11: Policy Evaluation (Week 10)

Learning outcomes:

- 11.1 Explain how policies can differ by “compulsoriness.”
- 11.2 Identify and explain the major categories of environmental policies (voluntarism, subsidies, taxes, market-oriented regulation, standards and hybrid approaches).
- 11.3 Apply the concept of economic efficiency to policy design, and explain why other criteria may be important.
- 11.4 Evaluate environmental policy according to criteria of effectiveness, efficiency, equity, simplicity and political acceptability.

Concepts to know:

- Compulsoriness
- Voluntarism
- Command-and-control
- Property rights
- Cap-and trade
- Fiscal incentives (taxes, subsidies)
- Artificial niche-market regulation
- Effectiveness
- Efficiency (and equi-marginal principle)
- Equity or fairness
- Simplicity
- Political acceptability
- Leakage

Readings (and questions to guide your reading):

1. F&O, Chapter 9: Criteria for Evaluating Environmental Policies

- This is a very short chapter on policy evaluation criteria. Use this as a complement to the framework presented in lecture. How is different? How is similar?
- What do the authors mean by “efficient” and “cost-effective” environmental policy?
- What do the authors mean by “moral” considerations? Is this a useful criterion?

2. F&O, Chapter 11: Standards [p180-191]

- What are the “compliance” costs associated with a given environmental policy?
- Understand the different types of standards. What is an example of a technology-based standard?
- Why is it that some standards violate the equi-marginal principle? Why is that considered to be economically inefficient?

3. Olewiler, N. (2012) Smart Environmental Policy with Full-Cost Pricing, The School of Public Policy Research Papers, The University of Calgary, Volume 5(6), March 2012.

- Summarize Olewiler’s main recommendations for the Canadian government.
- How does Olewiler measure damages from air pollution in Canada?
- What is the summary of Canada’s “environmental performance” from 2000-2008?
- Which existing/past policies are considered to be more cost-effective?
- Do you agree with Olewiler’s recommendations? Why or why not?

Optional: [You will likely want to consult these chapters in writing A4]

- **F&O, Chapter 12: Emissions Taxes and Subsidies, Chapter 13: Transferable Emissions Permits, Chapter 14: Compliance Costs, Uncertainty and Information, Chapter 15: Environmental Policy in Canada**

Section 12: Application: Fisheries and Renewable Resources (Week 11)

Learning outcomes:

- 12.1 Explain and depict the ecological concept of maximum sustainable yield (MSY) for fisheries (as an example of a renewable resource).
- 12.2 Depict the economic model of “efficient” fishing effort and explain why it differs from the MSY.
- 12.3 Explain why the open-access equilibrium is economically inefficient.
- 12.4 Describe and analyze the main policies available to manage renewable resources like fisheries.

Concepts to know:

- Population, growth rate and carrying capacity
- Maximum sustainable yield (MSY)
- Bio-economic model for fishing (Gordon-Schaeffer model)
- Efficient fishing effort
- Open access fishing effort
- Bycatch and highgrading
- Open access regulations
- Limited access regulation
- Individual tradeable quotas (ITQs)

Readings (and questions to guide your reading):

1. **Harris, Chapter 14: Renewable Resource Use: Fisheries [p304-319]**
 - Understand the concept of maximum sustainable yield (MSY).
 - What is the importance of ecological complexity? Think of an example relating to fisheries, say BC Salmon. Be sure to understand such concepts as resilience and carrying capacity.
 - Pay attention to Figure 14-2 (though I would ignore the arrows below the horizontal axis – I find them to be confusing).
 - Compare MSY to the economic optimum in Figure 14-3. Why are these different?
 - Why is the “open-access” equilibrium different? Why is it considered to be economically inefficient? Would you describe this as a market failure?
 - What types of policies can be used to shift fishing effort to be more economically efficient?
2. **Schwindt, R. et al. (2003). A policy analysis of the BC Salmon Fishery, *Canadian Public Policy*, 29(1), 73-94.**
 - Understand the history of the BC salmon fishery. What do the authors mean by the “capital-stuffing” behaviour of fishers?
 - Work through the policy examples, and the policy analysis in Table 5. What do you the authors recommend? Do you agree? Why or why not?

Section 13: Application: Fossil Fuels and non-renewable resources (Week 12)

Learning outcomes:

- 13.1 Understand the concepts of reserves and resources, and why these estimates will change
- 13.2 Explain and depict the economic concept of non-renewable resource consumption over time.
- 13.3 Explain different methods of pricing non-renewables (differential, scarcity, monopoly rents)
- 13.4 Explain how Hartwick's rule relates to sustainability

Concepts to know:

- Climate change
- Economic difficulties of climate change
- Allocation of burden
- Reserve vs. resource
- Scarcity rent
- Differential rent
- Government rent capture
- Peak oil (Hubert's curve)

Readings (and questions to guide your reading):

1. Harris, Chapter 5: Resource Allocation over Time

- Understand the importance of timing for non-renewable resources.
- Focus on the representation of two time periods in Figure 5-2.
- Become familiar with user costs and Hotelling's rule.

2. Harris, Chapter 12: Nonrenewable Resources [p357-271]

- Understand the different types of resources and reserves.
- What is a backstop resource and why does this concept matter?
- Apply the concepts of user costs and Hotelling's rule to non-renewable resources.

Section 14: Trade and Environmental growth (Week 13)

Learning outcomes:

- 14.1 Calculate and compare the absolute and comparative economic advantage that one country may have relative to another.
- 14.2 Explain and critique the economic notion of “gains from trade.”
- 14.3 Explain the three effects that increased trade may have on the environment (scale, composition and technology).
- 14.4 Articulate arguments that are for and against “free-trade.”

Concepts to know:

- Globalization
- Absolute advantage
- Comparative advantage
- Gains from trade
- Free trade arguments (pro- and anti-trade)
- “Race to the bottom”
- Scale effect
- Composition effect
- Technological (or technique) effect

Readings (and questions to guide your reading):

1. Harris, Chapter 19: World Trade and the Environment

- Understand Figure 19-2 and how international trade can improve total social welfare. How does this change when environmental externalities are considered?
- Give examples of how trade can result in a larger or smaller environmental impact, depending on context.
- What is the idea of “race to the bottom”? Give an example of where this might be happening now.
- Differentiate between scale, composition and technique effects from trade.
- How might a World Environmental Organization (WEO) help to reduce the potential environmental impacts of trade?

Optional

Fischer, C. (2010). Does trade help or hinder the conservation of natural resources? Review of Environmental Economics and Policy, 4(1), 103-121