Environmental Economics – Lecture 1

Economics and the Environment

Florian K. Diekert January 22, 2015

Perman et al (2011) ch 1-4

UiO : Department of Economics
University of Oslo

ECON 4925, spring 2015

- 13 Lectures (Thursdays, 10:15-12:00, in Auditorium 5.)
- Seminars are on Fridays; 10:15-12:00 in HH 301 and 12:15-14:00, in room HH 101
- Exam is on May 26, at 14:30
- Teaching-team:
  Florian Diekert (f.k.diekert@ibv.uio.no),
  Michael Hoel (m.o.hoel@econ.uio.no),
  Eivind Olsen (e.h.olsen@econ.uio.no)
- Course webpage: `http://www.uio.no/studier/emner/sv/oekonomi/ECON4910/v15/`

UiO : Department of Economics
University of Oslo

Why study environmental economics?

Environment:
"The surroundings of, and influences on, a particular item of interest" [wiktionary.org]

- Natural and social environment are two sides of the same coin
- Environmental conditions constrain economic activity
- Economic activity has environmental impact

Why study environmental economics?

Environment:
"The surroundings of, and influences on, a particular item of interest" [wiktionary.org]

- Natural and social environment are two sides of the same coin
- Environmental conditions constrain economic activity
- Economic activity has environmental impact
- Economic activity $\rightarrow$ environmental problems
- Environmental problems $\rightarrow$ economic loss

Two examples

Figure: Santiago de Chile and the Red-cockaded woodpecker`wikepdia.en`

This course

Applying economic theory for systematic analysis of environmental problems and policy

Emphasis is on:

- Markets, incentives and policy (rather than ecology)
- Intuition and analytical tools (rather than factual knowledge)

This course

- Students should have good prior skills in basic microeconomic theory and non-cooperative game theory.
- Familiarity with dynamic optimization methods, for example through ECON4140 - Mathematics 3: Differential equations, static and dynamic optimization/ECON4145 is an advantage.
- Students not familiar with dynamic optimization methods must be prepared to put in extra effort. As a minimum, students must be able to set up and solve simple optimal control problems (lecture note on this topic will be provided).
- Exam may have any of these: essay, modeling exercise, multiple choice (most likely all)
- At least 1 exam question will be close to 1 seminar problem
- Contact student will help evaluate the course

This course

Overview lectures

Jan 22	L1	Economics and the Environment (FKD)
Jan 29	L2	Emission control: Targets (FKD)
Feb 5	L3	Emission control: Instruments (FKD)
Feb 12	L4	Regulation under imperfect information (FKD)
Feb 19	-/-	No lecture
Feb 26	L5	Valuation and Cost-Benefit Analysis (FKD)
Mar 5	L6	CBA and Uncertainty (FKD)
Mar 12	L7	Voluntary contributions (FKD)
Mar 19	L8	Environmental R&D (MH)
Mar 26	L9	Stock pollution problems (MH)
Apr 2	-/-	No lecture
Apr 9	L10	Climate policy: taxes and quotas (MH)
Apr 16	L11	Climate policy: Subsidies and renewable portfolio standards (MH)
Apr 23	L12	International Environmental Agreements (MH)
Apr 30	L13	Supply-side climate policy (MH)

Preview this lecture

1. Efficient and optimal allocation of goods
2. Public goods and the Free-rider problem
3. Externalities and the Coase theorem

Efficient and optimal allocation of goods

Notation:

- Two persons A and B,
- two produced goods X and Y,
- and two inputs K and L.

Utility from consumption: $U^A(X^A, Y^A)$ and $U^B(X^B, Y^B)$

Production: $X = f(K, L)$ and $Y = g(K, L)$

Efficiency requires:

$$MRUS^A = MRUS^B$$

Efficient and optimal allocation of goods

Notation:

- Two persons A and B,
- two produced goods X and Y,
- and two inputs K and L.

Utility from consumption: $U^A(X^A, Y^A)$ and $U^B(X^B, Y^B)$

Production: $X = f(K, L)$ and $Y = g(K, L)$

Efficiency requires:

$$MRUS^A = MRUS^B \qquad MRTS^X = MRTS^Y$$

Efficient and optimal allocation of goods

Notation:

- Two persons A and B,
- two produced goods X and Y,
- and two inputs K and L.

Utility from consumption: $U^A(X^A, Y^A)$ and $U^B(X^B, Y^B)$

Production: $X = f(K, L)$ and $Y = g(K, L)$

Efficiency requires:

$$MRUS^A = MRUS^B = MRT \tag{1}$$

Efficient and optimal allocation of goods

- An efficient allocation of resources is not unique

Efficient and optimal allocation of goods

- An efficient allocation of resources is not unique
- Given a social welfare function, find the optimal allocation
- Do we agree on the social welfare function?

Efficient and optimal allocation of goods

- An efficient allocation of resources is not unique
- Given a social welfare function, find the optimal allocation
- Do we agree on the social welfare function?
- Note: Welfare maximization implies allocative efficiency, but moving towards allocative efficiency does not necessarily imply welfare improvement
- Compensation tests are void of welfare comparisons

Efficient and optimal allocation of goods

Given ideal conditions, markets allocate goods efficiently.

These ideal conditions are:

1. All goods and services are private goods.
2. Markets exist for all goods & services produced and consumed
3. All markets are perfectly competitive.
4. All agents are rational maximizers with perfect information.
5. All utility and production functions are 'well behaved'.

Public goods and the Free-rider problem

	Excludable	Non-excludable
Rivalrous	**Pure Private Good** Ice cream	**Open Access Resource** Ocean fishery (outside territorial waters)
Non- rivalrous	**Congestible Resource** Wilderness area	**Pure Public Good** Defence

Figure: Characteristics of private and public goods (Table 4.4 in Perman)

UiO : Department of Economics
University of Oslo

Public goods and the Free-rider problem

If X is a public good, efficiency condition corresponding to (1) is:

$$MRUS^A + MRUS^B = MRT \tag{2}$$

The private provision of a public good will not be efficient.

Public goods and the Free-rider problem

Figure: http://theinfluentials.wordpress.com/2010/03/30/free-riding/

Externalities and the Coase theorem

Externality:
"An economic side-effect. Externalities are costs or benefits arising from an economic activity that affect somebody other than the people engaged in the economic activity and are not reflected fully in prices." [http://www.economist.com/economics-a-to-z/]

Externalities are classified as:

- Consumption to consumption
- Production to consumption
- Consumption to production
- Production to production

Externalities and the Coase Theorem

Coase did not write a theorem, but an article.

Main point for environmental economics course is that:

a.) The inefficiency caused by an externality can be corrected by private bargaining if:
   - property rights are well defined
   - there are no transaction costs

b.) The initial allocation of property rights does not matter for efficiency if there are no income effects

The "Coase theorem" is silent on distributional fairness

Key concepts this lecture

- Markets allocate goods efficiently under ideal conditions but need not be optimal from a social point of view
- Efficiency for private goods: $MRUS^A = MRUS^B = MRT$
- Public goods are goods that are both non-excludable and non-rivalrous
- Efficiency for public goods: $MRUS^A + MRUS^B = MRT$
- Public good implies presence of externality
- Externality does **not** imply existence of public good
- Uncorrected externalities lead to inefficiencies

Preview next lecture

Emission control: Targets Perman et al (2011) ch 5

1. Benefits and damages from emissions
2. The efficient level of emissions
3. Different types of pollution problems

UiO : Department of Economics
University of Oslo