SOS 512 Sustainable resource allocation

Course title: Sustainable Resource Allocation

Number: SOS 512

Semester hours: 3

Course instructors: Charles Perrings (Coordinator), Joshua Abbott

Assessment: Term paper 25%
Presentation: 25%
Mid term exam: 50%

Meeting times: Tuesdays, 1.40-2.55, ECG G305
Thursdays, 1.40-2.55, ECG G305

Pre-requisites: No pre-requisites, however students will be expected to have demonstrated competence in basic microeconomics, ecology and mathematics at the undergraduate level.

Co-requisites: None

Aims To enable students to apply economic principles to the sustainable use of environmental goods and services.

Learning Outcomes Students are expected to develop the following skills:
- to understand the essential concepts and methods of environmental economics;
- to be able to apply these concepts and methods to the sustainable use of environmental services;
- to be able to identify the regulatory and policy options required to deal with sustainability problems involving externality and the provision of environmental public goods at different spatial and temporal scales;
- to use the skills acquired to formulate, analyse and solve specific problems.

Outline: The course comprises both lectures and problem solving seminars. It is built around a core set of lectures on the application of
economic principles to the sustainable use of environmental goods and services. These provide the tool kit needed to specify and solve sustainability problems. Topics include the nature of environmental externality and environmental public goods, the valuation of non-market environmental resources, environmental regulation and policy including the use of market-based instruments, decision-making under uncertainty, adaptation to and mitigation of environmental change. Beyond these lectures the course will take a number of sustainability issues, and require students to specify and solve the resource allocation problems involved, using available literature and data. Results will be presented in course seminars.
Detailed outline

Section I: Core lectures Charles Perrings (CP) Joshua Abbott (JA)

1 Introduction to decision-theory CP (January 15, 17, 22, 29)
   a. Concepts of sustainability
   b. Sustainability objectives in resource allocation decisions
   c. Mathematical methods in decision-making
   d. Benefit cost analysis
   e. Decision-making under uncertainty

The introduction to the course will explore concepts of sustainability to be used in the course, and will relate these to the nature of the private and social decision-problems facing individuals, households, firms and the wider community. Since sustainability concerns the capacity of systems to function effectively over time, the concepts concern the stability (resilience, robustness and persistence) of dynamical systems. The decision problems to be explored concern the allocation of environmental resources given both preferences for sustainability, and the dynamics of the system concerned. Since these decisions involve uncertain futures, the introduction will also introduce approaches to decision-making under uncertainty.

2 The optimal use of environmental goods and services JA (February 5, 7) CP (February 12)
   a. Mining the environment: extraction of exhaustible resources
   b. Managing ecosystem services: renewable resources
   c. Common pool, open and regulated access resources

This covers the theory of the sustainable use of renewable and non-renewable environmental resources. It is shown that the mining of natural resources may be sustainable if the rents are reinvested in renewable assets. It also covers optimal renewable resource extraction, treating the assimilative capacity of the biosphere as a renewable resource.

3 The valuation of environmental goods and services CP (February 14, 19)
   a. The welfare basis of value
   b. Applications to environmental goods and bads
   c. Non-market valuation methods: stated and revealed preference methods
d. Discounting

These lectures introduce the principles of non-market valuation of environmental resources, covering the welfare basis of value, along with the methods developed to identify values either through direct elicitation or observed behavior. Special attention will be paid to the role of science in deriving the values of environmental resources that are intermediate inputs in the production of the provisioning or regulating ecosystem services that enter final demand.

4  **Sustainability policy: managing environmental externalities and public goods, CP** (February 21, 26)

a. Externalities in production and consumption
b. Environmental public goods and public bads.
c. Property rights and the Coase theorem
d. Price-based policy instruments including Pigovian taxes/subsidies, charges and user fees
e. Standards and other quantitative restrictions including safe minimum standards, quota and emission ceilings
f. Political economy of environmental regulation: lobbying and corruption models

The theory of externalities and public goods is central to understanding why individual incentives to use and manage environmental goods and services may differ from what that of the society. The Coase theorem provides some useful insights on how liabilities must be assigned when one party’s actions inflict damage on another. Several applications of this theorem to pollution problems will be discussed along with cases where some form of government intervention is needed. The relative merits and demerits of alternative policy instruments such as quotas, taxes, permits will be discussed from the perspective of economic efficiency as well as political feasibility. These lectures will also cover some political economy models of how environmental policy is designed and implemented, including models of lobbying and corruption.

5. **Spatial and temporal dimensions: Globalization, growth and the environment CP** (March 4, 6)

a. Sustainable resource allocation at multiple spatial and temporal scales
b. Globalization and the environmental consequences of closer integration of the economic system
c. Sustainability at the local scale
c. Sustainability at the global scale: Multilateral environmental agreements
Many of the key challenges to the environmental sustainability of economic behaviour involve the use of common pool resources beyond national jurisdiction (the open oceans, the atmosphere and space), or involve transboundary effects (effects that impact more than one country). These lectures discuss both the effect of globalisation on the environment, and the way that decisions about the use of environmental resources are made at the international level through, for example, multilateral environmental agreements.

**Mid-term exam**, March 18.

6. **Conclusions and general discussion CP** (April 22, 24)

These two sessions will be used first to provide an overall review of the course, and second to have a general discussion about the implications for sustainability science, research and policy.

**Section 2: Student seminars CP** (March 20, April 1, 3, 15, 17) **JA** (March 25, 27, April 8, 10)

Students will be expected to prepare a 3000 word paper on a particular sustainability problem working closely with one or other of the course lecturers. A draft of the paper will be presented to the group, and the finished paper will be submitted as coursework at the end of the semester.

**Reading**

Texts relevant to the lecture material include the following:


The application of the theory of sustainable resource allocation to specific problems in section 2 of the course will be based on journal articles from the literature. Most will derive from six journals:

- Ecological Economics,
- Environment and Development Economics,
- Environmental and Resource Economics,
- Journal of Environmental Economics and Environmental Management,
- Land Economics,
- Resource and Energy Economics.

Texts that will be useful for the mathematical methods section include:

