# Unit One: Environmental Economics as a Discipline

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UNIT INFORMATION

Unit Overview
This unit introduces the meaning and scope of environmental economics. The unit explains why the discipline is important, the linkages between the economy and the environment; the origins and development of environmental economics; and the scope of the discipline. The unit then provides an overview of why markets fail. The unit concludes with a brief examination of the relationship between economics and politics and the impact on environmental policy design in practice.

Unit Aims
- To explain how the economy and the environment are linked and the uses made of the environment by the economy.
- To set the discipline of environmental economics in context and to outline the scope of the discipline.
- To explain why markets and government fail and the impact on the environment.
- To explain the relationship between economics and politics and the influence this has on practical policy design and implementation.

Unit Learning Outcomes
By the end of this unit, students should understand:
- the main interactions between the environment and the economy; the physical constraints that place limits on the interaction
- the history of the discipline of environmental economics and what is included in the discipline
- the impact on the environment of market and government failure
- the divergence between the principles of policy design and the practical reality
Unit Interdependencies

Unit 2
The link to the material in this unit relates to the reasons for market failure. In particular, in Unit 2 we examine the role of property rights in the functioning of a market.

Unit 3
The framework we introduce and develop to facilitate the design and evaluation of environmental policies takes account both explicitly and implicitly of political realities.

Unit 4
The policy instruments introduced in this unit are shaped by both the physical and political environments we examine here.

Unit 5
The policy instruments introduced in this unit are shaped by both the physical and political environments we examine here.

Unit 6
The physical environment in which policy operates is subject to many sources of uncertainty. In Unit 6 we consider some of these sources of uncertainty and examine how they impact the design, implementation and evaluation of policy.

Unit 7
The balance that needs to be struck between policy objectives and the necessary level of enforcement is frequently a political decision. In Unit 7 we examine this trade-off.

Unit 8
In this unit we consider issues relating to the use of liability laws. For these laws to be meaningful a clear link between cause and effect is necessary. This means that the damage process causing the harm needs to be understood.

Unit 9
In Unit 9 we explicitly examine how environmental policy needs to take account of differences that can exist between physical as well as political boundaries.

Unit 10
The development of policy instruments to deal with climate change is a function of both economic principles and political economy.
KEY READINGS


This paper provides an excellent review of the environmental Kuznets curve (EKC) literature. This literature examines the relationship between the generation of pollution and the associated relationship with economic growth. The EKC has emerged out of the debates in the late 1960s and early 1970s relating to the relationship between economic growth and environmental quality. The basic premise of the EKC is that at lower levels of economic growth there is a negative relationship with environmental quality. However, as an economy grows and income increases the relationship turns to become positive. Thus, it provides support for continued economic growth as a means to eventually prevent and reverse environmental damage.

The EKC has spawned a very large empirical literature that goes to the heart of the relationship between economic growth and environmental quality. The paper by Carson does an excellent job at summarising the literature and the myriad of claims and counter-claims about the relationship that exist in the literature. Importantly, it explains that the EKC is probably too simplistic an explanation for the complex relationship that exists between economic activity and environmental quality.


Reading the first four chapters of the textbook by Kolstad provides a good introduction to environmental economics with a strong neoclassical perspective. Chapters 1, 2, 3 and 4 examine important conceptual and theoretical aspects of environmental economics that relate to the design and implementation of environmental policy. Read these four chapters fairly quickly in one go. If you have studied economics before many of the concepts will be familiar. If this is new material for you, or if your economics is ‘rusty’, go back and read again any sections which are not at first clear to you.
**FURTHER READING**


This paper presents an interesting empirical case of the impact that environmental pressure groups have on environmental policy. The study employs standard econometric methods to examine the relationship between air pollution and a set of explanatory variables including a measure of the number of environmental non-government organisations within a country. The conclusion the authors draw is that for various air pollutants the number of organisations does lead to a reduction in air pollution.
REFERENCES


**MULTIMEDIA**


This video is available on your e-study guide.


This talk, by Pavan Sukhdev was presented by the Centre for Policy Development at the Sydney Opera House. Afterwards, Pavan Sukhdev joined a panel consisting of leading business people, climate change advocates and scientists.


Pavan Sukhdev is special advisor to the UNEP’s Green Economy Initiative, and study leader of The Economics of Ecosystems and Biodiversity (TEEB).


Available from: [http://www.youtube.com/watch?v=REhUZDnpm_8](http://www.youtube.com/watch?v=REhUZDnpm_8)

Bill Scher is the executive editor of LiberalOasis.com, and the online campaign manager at Campaign for America’s Future. Filmmaker: David Pakman.

*Scottish Natural Heritage (undated)* *Valuing our Environment.* Scottish Natural Heritage. Video and Report.


This is a short film that demonstrates how Scotland’s nature and landscapes are fundamental to the prosperity of its people. There is also a report that can be downloaded from the website.
1.0 INTRODUCTION

Section Overview

In this section we begin by outlining the field of economics, environmental economics and the role of this module within environmental economics. Specifically we develop a conceptual model of the relationship between the economy and the environment that places in context many of the activities undertaken by environmental economists, in particular, environmental policy design and implementation. The model we develop draws attention to some of the key relationships between the economy and the environment and the varying importance attached to these relationships by the environmental economics profession.

Section Learning Outcomes

By the end of this section, students should have an understanding of:

• the complexity of the interaction of economy and environment
• the extent to which economic activity can use the environment before resource sustainability becomes an issue

1.1 Defining economics and the environment

Our starting point is to place this module within the field of environmental economics. To do this, we need first to have an idea of what we mean by economics and the environment.

A dictionary definition of economics would be something like

... the science of the management of the material resources of an individual, community or country.

Thus, economics is about the allocation of scarce resources amongst competing uses.

What about ‘environment’? A broad definition of the environment might be the surroundings: the conditions influencing development or growth. Thus, you might include any number of things that are around you as being part of your environment. For example, the environment can be defined to include all flora and fauna, aquatic ecosystems, energy and material resources, and the atmosphere (Hanley et al 2007).

There are many examples of the way in which the economy and the environment interact and are interdependent, for example, agriculture and the environment. Society has become very aware of the environmental impact of agriculture over the last few decades because of the increased understanding of the negative consequences of certain agricultural practices.

At the same time it has become apparent that many of these practices have resulted from the policies introduced to encourage farmers to produce agricultural output. Examples of the negative consequences of agriculture include water pollution (both surface and groundwater), soil erosion and soil compaction, the loss of wetlands
because of drainage, air pollution such as acidification of soil as a result of livestock activity, and the loss of biodiversity because of land clearance for more agriculture as well as the adoption of new technologies. These outcomes have resulted because many commodity specific price and income support programs, such as those in the EU, North American and Australia, did not require farmers to take account of the environmental consequences of their actions (Glebe 2007).

1.2 Links between the economy and the environment

Let us begin by considering in general the ways in which the economy and the environment are interlinked. Then we will look at how environmental economics has developed and the scope of the subject. We employ the typical characterisation found in many textbooks and assume the economy can be divided into two sectors: production and consumption. These sectors use the environment in three main ways:

- as a supplier of natural resource inputs
- as a supplier of environmental or amenity goods
- in its capacity as waste sink

Using the environment in one of these ways may affect the other uses, as will become clear in the following discussion.

Supplier of resource inputs

Land, water, and stocks of raw materials are important inputs to production. These resources frequently vary between countries and so will affect the country’s economy. Some countries will have large stocks of minerals, while others have good arable land.

Natural resources are either renewable (eg trees) or non-renewable (eg crude oil). This distinction is important as it influences the way the resources have to be managed in production.

These resources are used by the production sector to create goods and services for use by consumers, or as inputs for another part of the production sector, but in the process waste products are also produced.

Can you think of an example from your country where a natural resource is used in a production process, resulting in both a product for use by consumers and a waste product?

Answer.

An example could be coal used to generate electricity: as the coal is burned, it produces electricity, but at the same time, carbon dioxide and sulphur dioxide are also produced and these may have detrimental effects on the environment.
Supplier of environmental or amenity goods

Economic benefits (ie increased utility) may be directly derived from the consumption of the flow of services that are forthcoming from a stock of environmental goods. There are many examples of where the environment provides amenity benefits for society. For example, some countries enjoy beautiful landscapes and the public benefit from these via their associated recreational services and tourism.

Environmental stocks of trees can offer global services such as climatic regulation because the trees absorb carbon dioxide, which might otherwise contribute to climate change.

Many people get enjoyment from the biodiversity that exists in the world, and this can also be considered as a form of public consumption of environmental good.

Waste sink capacity

This is the capacity of the environment to assimilate the waste products of production and consumption and convert them into harmless or ecologically useful products. This use of the environment is the one we are most concerned with in this module, as we look at the introduction of policies which affect how and at what level the environment is used as a waste sink.

The environment is not only affected by waste products, but also by intentional releases of chemicals, such as pesticides, wood preservatives, paints and lubricants. Let us put some figures onto these wastes and intentional releases.

The impact of human activity on the composition of chemicals in the atmosphere is clear. Since 1750, ie the pre-industrial period, carbon dioxide concentrations have changed from 280 parts per million in 1750 to 380 parts per million in 2000. There have also been significant increases in other gases such as methane and nitrous oxide. There are serious concerns being expressed about these increasing concentrations in the atmosphere and climate change (Stern 2007).

We are thinking here about the physical assimilative capacity of the environment. This is the physical capacity of the land, water and the atmosphere to absorb wastes and is determined by physical factors such as the climate, rainfall, wind patterns and geographical location.

When thinking about waste we need to distinguish between degradable and cumulative pollutants. With cumulative pollutants we need to understand if there are any important thresholds that need to be avoided. The figure in 1.2.1, below, illustrates the importance of assimilative capacity for threshold and non-threshold cumulative pollutants.
1.2.1 Pollution damage functions

In 1.2.1 we have drawn three damage functions. Function A shows a simple linear damage function, Function B an exponential damage function, and Function C a damage function with a threshold. The important issue captured by Function C is that there is a point beyond which a pollutant has a significantly increased impact on the environment. An example is pollution that reduces the level of oxygen in water, which if it falls below a particular level becomes extremely dangerous for fish.

It is common practice to describe the waste assimilation capacity of the environment mathematically.

Stock of degradable pollutant \( S^a_t \) at time \( t \) is given by

\[
S^a_t = F_t - A_t
\]

Stock of cumulative pollutant \( S^c_t \) at time \( t^* \) is given by

\[
(S^c_t) = \sum_{t_i}^{t=t^*} F_t
\]

where

- \( F_t \) is the positive flow in a year
- \( A_t \) is the amount assimilated in a year
- \( t_i \) is the starting date for emissions

Environmental management can require that we take actions to prevent further pollution because we think that any important threshold might be breached. The term used to describe this type of environmental management is the precautionary principle.

The precautionary principle states that action to prevent or restrict environmental damage should not be delayed just because there are uncertainties about how the damage is caused or the level of damage (Hanley et al 2007).
1.3 The first two laws of thermodynamics

The natural laws which govern the environment and which are, therefore, of interest to us are the first two laws of thermodynamics. These relate to closed systems. Strictly speaking, the earth is not a closed system as it receives energy from the sun, but it is almost a closed system.

**First law of thermodynamics**

The First Law states that whenever energy is converted in form, its total quantity remains unchanged. In other words, energy (or matter) can be neither created nor destroyed.

Common and Stagl (2005) use the example of coal-fired electricity generating plant. The coal is heated which produces electricity. A by-product of this process is waste heat that is transported away as cooling water or gases. In addition, various waste gases are emitted into the atmosphere, which cause pollution, such as acid rain.

**Second law of thermodynamics**

This law states that in a closed system, entropy does not decrease.

*Entropy* could be described as a measure of the ‘disorderedness’ of energy. For instance, ordered energy is useful and an example of this is the energy stored in a battery. However, disordered energy is not useful, and an example is the energy dispersed into the environment by a fire.

Entropy is a thermodynamic property of matter and is related to the amount of energy that can be transferred from one system to another in the form of work. For a given system with a fixed amount of energy, the value of the entropy ranges from zero to a maximum. If the entropy is at its maximum, then the amount of work that can be transferred is equal to zero; if the entropy is at zero, then the amount of work that can be transferred is equal to the energy of the system.

During an irreversible process the entropy of a system always increases.

The key points to remember from the above are that, because of these natural laws:

- increased extraction of minerals by the production process leads to an increase in wastes
- there is a limit on the substitutability of inputs
- since production and consumption lead to the dissipation of matter, scarce energy is needed for recycling

The importance of these two laws relates to the use, re-use and recycling of the environment after interactions with the economy.

Let us look more closely at the subject of recycling, as this would seem to offer a chance for the economy to retain the use of scarce resources.

**Recycling**

There is a hierarchy of resource use that includes recycling. This is referred to as the 3R’s – reduce, re-use and recycle. The final and least appealing option after resource use is to dispose of any remaining waste.
There are now many materials which are routinely recycled and re-used. For example, glass bottles have been collected and re-used by a number of drinks companies for many years. In various countries this practice is encouraged by the use of deposit-refund schemes. (Choe and Fraser 1998) Other examples include paper, metal, glass, plastic, textiles, and garden waste.

For instance, in the Netherlands, household waste that can be composted is collected separately from other household waste and is composted by the local authorities. To encourage citizens to participate in this scheme, householders received some free compost soon after the scheme was set up. However, there are clearly costs involved in such a scheme:

- separate waste bins were provided for the compostable waste
- information was provided to householders
- householders use time to separate their waste
- costs of separate collection and of dealing with the compost

In the Netherlands, chemical household waste is also collected separately, with similar costs involved. There are numerous examples of different economic instruments used to deal with waste at both the household and industry levels. (Choe and Fraser 1998, and Pearce 2005).

There are clearly limits to what resources can be re-used and recycled. These limits are not only dictated by the laws of thermodynamics but also by the costs associated with re-using and recycling many items.
Section 1 Self Assessment Questions

Question 1
List the main components of the environment.

Question 2
What are the three ways in which society uses the environment?

Question 3
True or false?
(a) According to the 1st law of thermodynamics energy can be destroyed.
(b) The 3R’s of resource use are reduce, re-use and recycle.
2.0 ORIGINS AND SCOPE OF ENVIRONMENTAL ECONOMICS

Section Overview
In this section we provide an overview of the discipline of environmental economics and the philosophical schools of thought that currently exist. This in turn provides a useful means with which to understand the scope of the discipline, as it currently exists.

Section Learning Outcomes
By the end of this section, students should have an understanding of:

- the relationship of environmental economics to economics in general
- the differing importance that environmental economists attach to the physical constraints imposed by the environment on economic activity

2.1 Origins of environmental economics
Environmental economics developed in its present form in the 1960s as a result of the intensification of pollution and the heightened awareness amongst the general public in Western countries about the environment and its importance to our existence.

Economists became aware that, for economic growth to be indefinitely sustainable, the economic system needs to take into account the uses of the environment that we have already mentioned, so that natural resources are not depleted and so that the environment is not overused as a waste sink. Environmental economists view the environment as a form of natural capital which performs life support, amenity and other functions that cannot be supplied by man-made capital. This stock of natural capital includes natural resources plus ecological systems, land, biodiversity and other attributes.

The growth of environmental economics in the 1970s was initially within the neoclassical paradigm. In general this approach to the environment is concerned with issues of market failure, inappropriate resource allocation and how to manage public goods. There was little concern for the underlying relationships between the economy and the environment. Concerns about the limits of this approach to environmental economics led some environmental economists to develop what is now referred to as ecological economics. An important aspect of this field of research is co-evolutionary economics which has become a foundational concept of ecological economics (see Kallis and Norgaard (2010) for details).

Ecological economics views the relationship of the economy and the environment as central. Thus, any analysis places economic activity within the environment. This distinction is neatly illustrated with reference to debates concerning sustainable development and the difference between weak and strong sustainability. Ecological economics supports the notion of strong sustainability. This view of sustainability assumes that not all forms of capital (ie human and natural) are perfectly substitutable.
At times the distinction between neoclassical environmental economists and ecological economists is of no practical relevance. However, the underlying philosophical differences do matter in certain contexts and the main environmental economics journals illustrate this. In particular, the journal *Ecological Economics* publishes many papers that support this view of the world.

In the context of this course the material presented is generally accepted by both neoclassical environmental economists and ecological economists. The differences between the approaches become more obvious and important when we examine issues of resource management and sustainable development.

Finally, it is worth noting that there are other forms of economic analysis that examine environmental issues. For example, Vlachou (2005) employs value-theoretic and class-based analysis to provide an understanding of environmental regulation. This type of analysis is firmly rooted in an understanding the process by which capitalists extract surplus value as a result of owning the means to production.

### 2.2 Scope of the discipline

We have now outlined the place of environmental economics as an academic discipline and how it has developed. We are now in a position to examine the role of environmental economists in policy design and implementation.

Essentially, environmental economics revolves around three broad questions.

- What are the economic and institutional causes of environmental problems? That is, how do economic and social systems shape incentives in ways that lead to environmental degradation as well as to improvements?
- How can we assess the economic importance (ie monetary value) of environmental degradation/improvements?
- How can we design economic incentives to slow or halt environmental degradation and bring about improvements in the quality of the natural environment?

The first question leads to an analysis of market failure and government failure.

For example, one of the principal reasons for market failure is that there are incomplete markets in environmental assets. There are plenty of examples of where markets are incomplete including:

- clean air
- beautiful views
- unpolluted beaches
- tropical rainforests, with their biodiversity and their carbon-fixing properties
- a quiet environment

To ensure that we employ scarce resources efficiently the environment needs to be included in economic calculations, and environmental economics aims to do this.
The second question requires that we are able to place economic values on environmental degradation/improvements. As we have already noted, many environmental resources and goods are not priced in markets. Thus, to do this environmental economics has developed a set of methods to place values on these types of goods.

The third question is the main focus of this module. We will use economic tools critically to evaluate environmental policies, and whether they are likely to achieve the aim of decreasing or halting environmental degradation.
Section 2 Self Assessment Question

Question 4

True or false?

(a) Environmental economics is a development of the neoclassical paradigm.

(b) Ecological economics proposes that economic growth is limited by the availability of natural capital.

(c) A key objective of environmental economics is to ensure that the design and implementation of environmental policy reduces environmental degradation to efficient levels.
3.0 MARKET FAILURE AND GOVERNMENT FAILURE

Section Overview
This section provides a brief revision explaining why market failure occurs. We also examine reasons why government policy can affect the environment in a negative way.

Section Learning Outcomes
By the end of this section, students should be able to:
- define what is meant by market failure
- differentiate between the different forms of market failure
- differentiate between the different forms of Government failure

3.1 Market failure
Neoclassical economics is concerned with markets for goods allocating scarce resources to alternative uses, and prices being established which reflect the scarcity and levels of demand for goods.

Think for a moment about our daily life and what affects it. We live in a particular environment, breathing the air. However, we do not pay a price for the air, as there is no market in air. As a result, we cannot reflect our preference for breathing clean rather than dirty air through the market. This is an example of market failure.

Market failure occurs when the conditions for perfect competition are not met. If the market fails, then government intervention designed to correct the market failure may bring benefits to society. However, government intervention may fail to secure these benefits, it can make matters worse and it can be the reason why there is market failure. This is known as government failure.

We know that the market mechanism will lead to the socially optimal outcome only when:
- the state of perfect competition prevails
- when all Pareto-relevant effects are reflected in the prices of the market

However, it is highly unlikely that these conditions will be fully satisfied. The existence of perfect competition in reality as it is defined in textbooks is highly unlikely. The likelihood that prices will result from the realisation of all Pareto-relevant effects can only occur when a complete and effective system of property rights exist, including property rights to environmental goods such as clean air.

When either condition is not satisfied, markets fail, and this can, deliberately or unintentionally, bring about undesirable consequences.

Let us work through the argument for a negative externality. In this case, the marginal private cost (MPC) is less than the marginal social cost (MSC). The marginal private cost represents the short-run market supply curve. Hence, with a negative externality, the short-run market supply curve is lower than would be society’s short-
run supply curve. The difference between MSC and MPC are the marginal damages (MD). MDs are the amount of the negative externality which as the quantity of output increases, increase as well. These are damages being inflicted on society as a result of the private producer not taking account of the costs that result from production, such as air or water pollution. This situation is illustrated in 3.1.1.

3.1.1 Effect of a negative externality

![Graph showing the effect of a negative externality]

A shows the equilibrium position with a negative externality. Price is $P$ and quantity supplied is $Q$.

B shows the Pareto optimum, where price is $P^*$ and quantity supplied is $Q^*$.

Hence, with a negative externality, too much of the externality-producing good is supplied at too low a price (relative to the Pareto optimum).

This is an example of market failure. It results from the absence of property rights and a market for the marginal damages produced by this activity.

Source: unit author

3.2 Government failure

Having taken note of possible reasons for market failure, what can governments do to improve the situation? Do you think that government intervention is always successful, or can you think of examples where the government intervention has actually made the position worse?

There are plenty of reasons why government failure can occur. For example, the government may come under pressure from certain groups in society and act in the interests of these groups rather than in the interests of society as a whole; there may be a lack of information resulting in the best policy decisions not being taken; and politicians and bureaucrats may not have the goal of maximising society’s welfare.
A classic example of government failure that has resulted in environmental harm is the Common Agricultural Policy (CAP) of the European Union. Historically, the CAP has supported farmers’ incomes through the use of high product prices. This has lead to over-production and intensive farming. Some of the results of this have been a reduction in hedgerows, leading to a loss of habitat; surface and ground water pollution; overgrazing and pollution from ammonia emissions from livestock farming. More recently, in an effort to correct these government failures, policy has been introduced that offers farmers financial incentives to provide the level of environmental quality desired by society.

There are plenty of other examples of how government policy has resulted in environmental degradation. For example, energy policies in developing countries have increased environmental problems. This is because energy use in developing countries has frequently been subsidised, leading to a wasteful use of energy. This has increased air pollution and problems of waste disposal.
Section 3 Self Assessment Questions

Question 5
List the two characteristics of a pure public good.

Question 6
What is meant by 'market failure'?

Question 7
What happens to the level of output produced when there is a discrepancy between private and social costs?

Question 8
What other social goals are there, which may not be achieved by the market?
4.0 POLITICAL ECONOMY OF ENVIRONMENTAL POLICY

Section Overview

In this module we focus in general on policy design and implementation in an ideal world. In reality many policies that are introduced take account of the political reality in which decision-makers operate. In this section we provide a brief overview of the political economy of environmental instrument choice.

Section Learning Outcomes

By the end of this section, students should:

- have an appreciation of the link between environmental policy in principle and practice
- recognise that policies in practice will frequently be significantly different from those deemed efficient in principle

4.1 The political decision-making process

The traditional view of the role of government in a market economy is that the government is attempting to maximise social welfare. It is an exogenous agent acting to correct market failures and its role is to provide a legal, regulatory and institutional framework. To do this, it defines: the political rules needed for decision-making; the economic rules, such as those concerning property rights and the rules for contracts, enabling exchanges to take place. However, there are now many theories which have been put forward to explain how political and economic decisions are actually taken and you may come across these in the literature, so we will mention some of them briefly.

In these new theories, government is not taken to be a single, exogenous entity, but is viewed as a collective form of a number of legislative and institutional groups, such as bureaucrats and political parties, each of which has its own set of objectives.

These theories may help us understand why certain policies are in place, and why others, which are more desirable from an economic point of view, are not attractive to policy-makers.

One of the main models is the rational choice model, which is based on the idea that the individual actors in the decision-making process act rationally and are trying to achieve their own aims in competition with one another. We will concentrate on this model later in this section.

At the other end of the spectrum is the systems model, which treats the whole social system as the basic unit for analysis and is concerned with how the component parts of the system respond to the constraints of the system.

One example of this is the neo-Marxist approach where the state and the economy are viewed as a system of relationships. The state is in a contradictory position as it needs both to spend to achieve its aims and to control its spending. In this model there may be close links between the state bureaucracy and the industries needing regulating, which may be reflected in the choice of policy instruments. State
subsidies may well be chosen as the appropriate instrument, as these will not cause conflicts between the bureaucracy and the regulated industry.

In between the rational choice and the systems models is the institutions model. Here the emphasis is placed on the institutions in place in the society and their influence on the groups pursuing environmental aims. The institutions in society affect which policies are likely to be implemented. One example of an institution is the capitalist corporation, and in the institutions approach, the modern corporation may have different long-term aims from the neoclassical profit-maximising firm of the rational choice model. It may prefer certainty of future operations to profit maximisation and therefore prefer command-and-control instruments which are more likely to stabilise the market. In other words, the institutional factors affect the objectives of polluters. These factors vary between countries and may help to explain why different instruments are favoured by different countries.

We now concentrate on the rational choice model and see how it can be applied to environmental policy. To do this we can begin by making a list of groups of people who are affected by, or have an interest in, the choice of an environmental policy and its associated policy instrument:

- political parties
- polluters and polluters’ organisations
- regulators and other bureaucrats
- environmentalists and their interest groups
- voters

All of these groups are acting in a political market which is similar to and linked to the economic market. The political market can redistribute wealth and wealth leads to economic power. The economic market can create wealth, which can then enhance political power.

Each of these groups will have different objectives and will try to influence the decision-making process so that the decision finally taken enables them to achieve their objectives.

The rational choice model has led to other rational actor models which attempt to explain how decisions are made. Two of these which you may find in the literature are the clearing house model and the politician voter model, both of which try to explain agricultural policy decisions.

**Clearing house model** – this concentrates on the interaction between pressure groups, who are well informed, and voters, who are assumed to be ill-informed. The pressure groups seek to achieve their own objectives, but face costs of organisation and communication, which may lead to free-rider problems if the group becomes too large and dispersed. The government’s role is as a clearing house for the various pressure groups, and it is assumed to act in such a way as to maximise the probability of its re-election.

**Politician voter model** (Downs 1957) – this model assumes that the influence of pressure groups is not great, and concentrates on the link between politicians and voters. Active politicians supply intervention as demanded by voters, who supply political support to the politicians. The model assumes that voters have perfect information.
We will now take each of the groups in the rational choice model in turn and try to see what their objectives are and how they affect decisions.

**Political parties**

The aim of politicians is to win office, so they may support issues not for the sake of the issue itself, but in order to win votes. That is, political parties will tend to pursue policies that guarantee the maximum number of votes. Parties will be responsive to changes in public opinion, and may be reluctant to commit themselves too strongly to a particular policy, in case public opinion changes.

There have recently been examples of political parties founded specifically to support environmental issues, for instance, the Green Party in the United Kingdom, but these have not won wide support from the voters. To win support, a party usually needs policies on a wide range of issues as voters have a wide range of concerns.

Political parties may try to compensate those sectors of the economy whose relative incomes fall, and they will try to avoid decreases in real incomes for sectors whose representatives have strong political power. Thus, there may be political resistance to drastic changes in policy, once a policy has been put in place.

**Polluters and polluters’ organisations**

We assume that the aim of polluters and their organisations is to maximise their profits etc. They, like any other interest group, expend large amounts of money on rent seeking, that is, on efforts to influence the outcomes of the legislative process in a way that yields the highest possible benefits for them. Arguments have been put forward that they will thus prefer subsidies to standards, and standards to emission taxes, as these result in lower profit losses.

Most polluters’ interest groups acknowledge the polluter pays principle, but reject its application in their own country until it is also applied in other countries. Polluters are likely to be relatively few in number, so will be more capable of taking effective collective action than will the larger, more dispersed groups of actors – voters, for instance. They may therefore have a significant influence on the choice of policy instrument. This could be one reason for the widespread use of standards as an instrument of environmental policy.

**Regulators and other bureaucrats**

The preferences of polluters may influence bureaucrats and politicians in their choice of instrument, depending on the power that the groups of polluters can exert. There may be collusion between the regulator and the regulated as these groups have to work together and this will be easier with harmonious working relationships. This is described in the literature as ‘regulatory capture’.

But bureaucrats may also have their own objectives when deciding on policy instruments and will be trying to achieve these objectives. These may include the maximisation of their own power, prestige, influence, involvement and room for manoeuvre. These variables depend mainly upon the amount of the appropriated budget and the scope of their responsibilities. Bureaucrats control much of the relevant information on policies and also on their own activities, and may be able to use this in a way to achieve their own objectives. The bureaucracy is supposed to be
scrutinised by the political decision-makers (the parliament), but this monitoring is usually imperfect, given the informational deficiencies and asymmetries involved.

On this basis, the bureaucrats may also prefer standards to the other policy instruments as standards involve the highest degree of administrative involvement and give them more direct control over polluters than do subsidies, taxes or permits. Bureaucrats would probably prefer subsidies to taxes because the former involve less potential for conflict and possibly higher administrative involvement. They would probably rate permit systems last because this would imply handing over the responsibility for the instrument to the market mechanism.

**Environmentalists**

Environmentalists focus on the impact of environmental policy on the environment. Environmental interest groups, like other interest groups, are rent seeking and are trying to maximise benefits by influencing the outcome of legislation. There are many influential interest groups in the environmental field, including Greenpeace and Friends of the Earth. In the past, they have often disapproved of incentive-based instruments such as subsidies and marketable permits, as these infer that the polluter has some right to pollute. Permit systems, in particular, have often been regarded as a ‘sell-out’ of the environment.

Although there is now a growing feeling that incentive-based instruments are acceptable, the preferred policy instrument is still standards. This is because standards offer the highest certainty that the environmental policy goal will actually be achieved.

**Voters**

Voters, in the rational choice model, are considered to be rationally-acting individuals who aim to maximise their utility. They have concerns about many issues and decide to vote for the party whose ‘package’ gives them maximum utility. Environmental concerns may not feature highly in these packages, and voters may be more likely to concentrate on economic, health or education issues when choosing the package.

Although the individual voters may not see themselves as having much influence over national environmental policies they are more likely to get involved in local issues, where the local benefits and costs are more apparent.

They may want environmental improvements in theory, but be reluctant to pay the associated costs. In this respect, it is important to note that voters are usually also taxpayers. However, as a country’s income rises, its voters are more likely to demand higher environmental quality. It has been suggested in the literature that voters will tend to prefer standards to other instruments for the same reason as environmentalists, that is, the higher certainty of achieving the environmental policy goals.
4.2 Choice of policy instruments in practice

Several theoretical models have been put forward to account for the use of particular policy instruments in practice as opposed to others. Typically, most environmental economists frequently advocate the use of taxes (i.e., incentive-based instruments) as opposed to standards. However, in practice the adoption of these instruments has been somewhat limited. There are a number of models that have been used to rationalise this outcome.

For example, Buchanan and Tullock (1975) addressed the question of why command-and-control instruments, such as standards are more frequently observed in practice than taxes. They argued that under a standard, a firm is not in short-term equilibrium. By assuming emissions are proportional to output, the firm is being forced by the standard to limit its production to a certain amount. It is therefore not in short-term equilibrium as it is not producing at the point where its marginal cost is equal to marginal revenue. It faces internal pressures to increase output, and hence emissions.

It also follows that under a standard, is there an incentive for new firms to enter the industry because market demand is not being fully met by existing firms as each is restricting output. Price will thus rise. In this case firms can gain short-term profits under a standard. If the standard restricts the total industry output, then the price will rise and individual firms may be able to increase net profits in the short term.

These theoretical models are frequently used as a means to argue against government intervention. Whether models of this kind are always valid it is always worth bearing in mind that models of this type can be useful in explaining actual policy outcomes.

Pearce (2005) provides a very useful explanation of the processes that underpin the choice of policy instruments. As he explains economics is based on the notion of maximising net benefits. This equates to the calculus of trading off gains and losses so as to maximise the difference. In general economists employ a social welfare function when making these sorts of calculations. However, as Pearce states in reality the social welfare of the economist himself will not be used in practice and the various interest groups already discussed will influence the calculus. In reality policymakers face a political welfare function which combines both economic and political elements. Once we enter a world in which political preferences are to be satisfied then we should not be surprised that many of the solutions supported by environmental economists are not reflected in the mix of environmental policies in practice.
4.2.1 A case study: the UK transport carbon tax

In 1990 the UK government announced the likelihood of transport tax to reduce fuel use and reduce carbon emissions. A tax was introduced in 1993 that delivered a 10% increase in transport fuel duty. The tax was then to increase by 3% per annum (real terms). This became known as the Fuel Duty Escalator (FDE). Initially, it was expected that the FDE would last until 2002. It had been estimated that had the FDE been kept in place by the UK government the transport sector would have experienced between a 5% and 12% reduction in carbon emissions by 2010.

However, the politics of the tax meant that the FDE did not last the course. By 1999 the anti-FDE lobby had managed to have the automatic aspect of the FDE dropped. Although the automatic increase was dropped in 2000 it continued to be increased in line with the rate of inflation. The various interest groups opposed to the tax rallied. The transport sector and farmers launched direct action in September 2000 and blockaded oil depots as well as ‘go slow’ driving on various major motorways. At the same time crude oil prices jumped significantly. This all resulted in November 2000 in a reduction in the real rate of the fuel tax, not an increase. As Pearce notes, the FDE which was the only true carbon tax in the UK failed because of political pressure.

So why was the anti-FDE lobby so successful?

As Pearce explains the transport sector, in particular the road haulage sector has already extracted a number of beneficial changes out of the UK government in the late 1990’s. For example, the likelihood of congestion charging, high up the political agenda in the mid 1990’s fell out of favour. (It should be noted that since 2000 and the experience gained with the London Congestion Charge that road pricing has once again risen to the topic of the environmental policy agenda.) It was also the case that once the transport sector made a case against the FDE the government changed its position very quickly, ie it gave in.

This case study provides an interesting insight into the difficulties of introducing a tax when the various interest groups who will pay the tax are well organised and have the ability to carry out effective and disruptive protests. It is also the case that trying to make a complex argument for an environmental tax suffers when those who do not want to pay the tax simply claim it is another attempt by government to raise revenue and place the industries in question at an economic disadvantage.

Source: adapted from Pearce (2005)
Question 9

True or false?

(a) Maximising social welfare will always result in a policy choice that will keep all interest groups satisfied.

(b) As a tax to reduce carbon emissions the introduction of the FDE in the UK made no economic sense.
UNIT SUMMARY

In this unit, we have looked at the linkages between the environment and the economy.

We defined the environment as including the atmosphere, all flora and fauna, and energy and material resources, and stated its main uses for the economy as:

- a supplier of resource inputs
- a supplier of public consumption environmental or amenity goods
- a waste sink

We looked at the difference between degradable and cumulative pollution and noted that, in mathematical terms, stock of degradable pollutant at time $t$ is given by

$$ S_t^a = F_t - A_t $$

stock of cumulative pollutant at time $t^*$ is given by

$$ (S_t^c) = \sum_{t_1}^{t=t^*} F_t $$

where

- $F_t$ is the positive flow in a year
- $A_t$ is the amount assimilated in a year
- $t_i$ is the starting date for emissions

The natural laws (that is, the first two laws of thermodynamics) which the environment obeys mean that increased extraction of minerals leads to an increase in wastes; there is a limit on the substitutability of inputs; and, since production and consumption lead to the dissipation of matter, scarce energy is needed for recycling.

Recycling was examined in more depth, leading to the following conclusions:

- not everything can be recycled
- recycling uses scarce resources, so may not be either economically or environmentally desirable

The unit then considered the scope of environmental economics.

We then examined reasons for market failure.

We finished the unit with a brief overview of the political economy of policy design and implementation illustrating this issue with a case study from the UK on carbon taxation.
UNIT SELF ASSESSMENT QUESTIONS

Question 1

Using the Key Readings, draw a diagram that captures the three functions that the environment provides when interacting with the economy.

Question 2

Write a few short paragraphs giving examples of the ways in which a production activity such as agriculture might impact upon the environment.

Question 3

Write a short paragraph about the relationship between neoclassical environmental economics and Ecological economics.

Question 4

Draw a diagram to show the effect on prices and quantities, relative to the Pareto optimum, of a positive externality.

Question 5

Give an example of the way in which the three main uses of the environment overlap and can conflict.

Question 6

(a) List some of the reasons put forward to explain why command-and-control instruments, such as standards, are more often implemented than incentive-based instruments.

(b) Assuming individuals expect no gain from tax revenues, will they tend to prefer taxes or standards?

(c) Assuming individuals expect to gain from tax revenues, but not by the full amount of the tax, will they tend to prefer taxes or standards?
## Key Terms and Concepts

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>ecological economics</td>
<td>A branch of economics that places significant emphasis on the physical linkages between the economy and the environment</td>
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<tr>
<td>entropy</td>
<td>A measure of disorder in a thermodynamic system</td>
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<tr>
<td>environmental economics</td>
<td>The branch of economics dealing with the environment</td>
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<tr>
<td>externality</td>
<td>An unintended consequence, good or bad, from the actions of another economic agent</td>
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<tr>
<td>government failure</td>
<td>When government policy brings about undesirable outcomes</td>
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<tr>
<td>market failure</td>
<td>When a market does not functioning properly or does not exist</td>
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<tr>
<td>neoclassical economics</td>
<td>An economic paradigm that places markets at the heart of efficient resource allocation</td>
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<td>non-excludable</td>
<td>An individual cannot be prevented from receiving the benefits of a good or service even though she or he may refuse to pay</td>
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<tr>
<td>non-rivalrous</td>
<td>Consumption by one individual does not reduce the benefits available from a good or service to others, in other words a good being supplied to one individual can be supplied to others at no extra cost</td>
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<tr>
<td>political economy</td>
<td>The study of the interaction between the economy and politics</td>
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<tr>
<td>precautionary principle</td>
<td>Actions to prevent/stop environmental loss should not be delayed because of scientific uncertainty</td>
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<tr>
<td>public goods</td>
<td>A good which is non-rival and non-excludable</td>
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