

## 1

# An introduction to ecological economics

The purpose of this short chapter is to introduce the subject matter and to explain the organisation of the book.

## 1.1 WHAT IS ECOLOGICAL ECONOMICS?

The Greek word 'oikos' is the origin of the 'eco' in both ecology and economics. Oikos means household. Ecology is the study of nature's housekeeping, and economics is the study of housekeeping in human societies. **Ecology** can be defined as the study of the relations of animals and plants to their organic and inorganic environments and **economics** as the study of how humans make their living, how they satisfy their needs and desires.

**Ecological economics** is the study of the relationships between human housekeeping and nature's housekeeping. Put another way, it is about the interactions between economic systems and ecological systems. Humans are a species of animal so that in a sense, on these definitions, the field of study for economics is a subset of that for ecology. However, humans are a special kind of animal, mainly distinguished by their capacity for social interaction between individuals, and their economic activity is now distinctly different from that of other animals. Rather than one being a subset of the other, economics and ecology are disciplines whose subject matters overlap, and, as shown in Figure 1.1, ecological economics is where they overlap. Figure 1.2 is a summary of the essentials of the interactions between economic and ecological systems. Whereas Figure 1.1 is about fields of study, Figure 1.2 concerns the systems of interest. In it the 'Economy' is the world's economies treated as a single system, and the 'Environment' is the whole natural environment, planet earth. The economy is located within the environment, and exchanges energy and matter with it. In making their living, humans extract various kinds of useful things – oil, iron ore, timber, etc., for example – from the environment. Humans also put back into the environment the various kinds of wastes that necessarily arise in the making of their living – sulphur dioxide and carbon dioxide from burning oil, for example. The environment for humans, planet Earth, itself has an environment, which is the rest of the universe. Our environment exchanges energy, but not matter, with its environment. Human economic activity has always involved the material and energy exchanges with the environment shown in Figure 1.2. It would be impossible for humans to satisfy their needs without interacting with nature. For most of human history, mainly because there were few humans, the

2 INTERDEPENDENT SYSTEMS

Figure 1.1  
 Locating  
 ecological  
 economics.

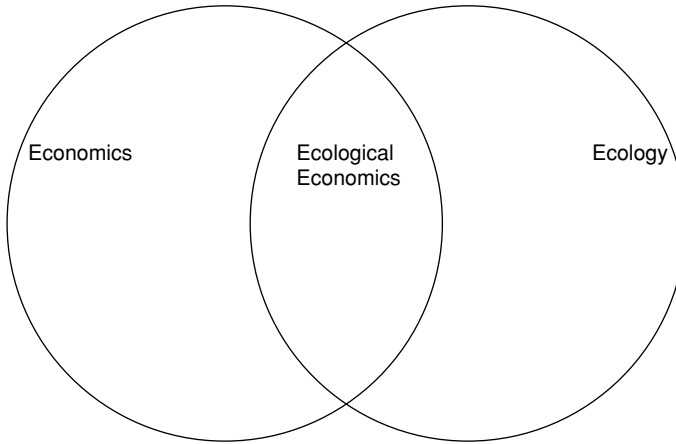
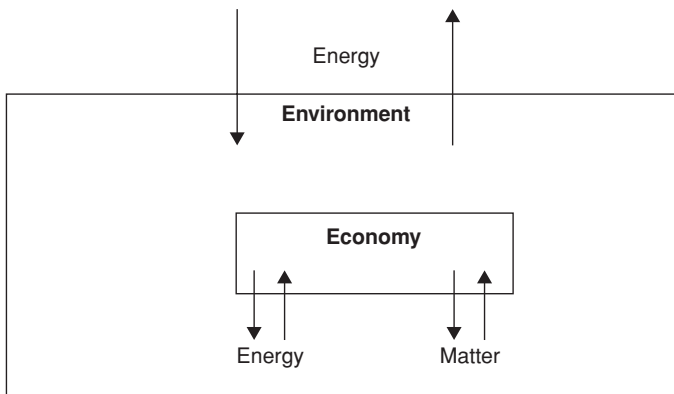


Figure 1.2  
 The  
 economy in  
 the  
 environment.



level of interaction did not much affect the functioning of the environment, except locally. However, in the last three centuries the magnitude of the interactions has been increasing rapidly. The global scale of human economic activity is now such that the levels of its extractions from and insertions into the environment do affect the way that it works. Changes in the way that the environment works affect its ability to provide services to human economic activity. The economy and the environment are interdependent – what happens in the economy affects the environment which affects the economy. Another way that we shall sometimes put this is to say that the economy and the environment are a joint system.

One example of this is the role of carbon dioxide in climate change. Fossil fuels are extracted from the environment and burned in the economy, resulting in the release into the atmosphere of carbon dioxide. Carbon dioxide is one of several ‘greenhouse gases’. The exchanges of energy between the environment and its environment shown in Figure 1.2 are affected by the amounts of these gases present in the atmosphere – higher concentrations of these gases mean that the environment, planet earth, gets warmer. As a result of the increasing use of fossil fuels in the last two hundred years, the amount of carbon dioxide in the atmosphere

has increased. The expert consensus is that this has warmed the planet, and will warm it further. The amount of warming to be expected, by say 2100, is not known with any precision. But, the expert consensus is that it will be enough to have serious impacts on human economic activity and the satisfaction of needs and desires. Beyond 2100, the impacts may be catastrophic.

## 1.2 A BRIEF HISTORY OF THE ENVIRONMENT IN ECONOMICS

One way to introduce ecological economics is to look at the way that the natural environment has figured in economics through that subject's history.

Economics as a distinct field of study began in 1776 when Adam Smith (1723–1790) published *The Wealth of Nations*. This wide-ranging enquiry into the nature and causes of economic progress is now famous mainly for Smith's doctrine of the 'invisible hand'. This is the idea that, in the right circumstances, the social good will be best served by leaving individuals free to pursue their own selfish interests. Smith was one of a group now known as 'the classical economists', whose ideas dominated economics until the last quarter of the nineteenth century. **Classical economics** was widely known as 'the dismal science'. This was because it took the view, particularly associated with Thomas Malthus (1766–1834), that the long-run prospects for improving living standards were poor. This view was based on the assumed fixity of the supply of agricultural land, together with the propensity of the human population to grow in size. The environment, for the classical economists, set limits to the expansion of economic activity, so that the long-run tendency would be for the wages of workers to be driven down to subsistence level.

As a prediction, this has not fared well. In fact, to date, it has been wrong. For the economies of western Europe and their offshoots, the main features of experience since the beginning of the nineteenth century have been population growth and rising living standards. The standard explanation as to why Malthus got it wrong is that he overlooked technological progress. He, and the other classical economists, did assume an unchanging technology, when in fact it was changing very rapidly in the wake of the industrial revolution. However, it should also be noted that the economies of western Europe were not operating with a fixed supply of agricultural land during this period – increasingly food was being imported into those economies from 'new' land in the Americas and Australasia, to which those economies exported population.

This predictive failure was one factor leading to the demise of classical economics. Starting around 1870 mainstream economics began to evolve from classical economics towards what is now called 'neoclassical economics'. By 1950, the ideas of the classical economists were taught to students of economics only as part of the history of the subject. While the natural environment, in the particular form of the availability of land, had been a major concern of the classical economists, **neoclassical economics**, circa 1950, largely ignored the relationships between human housekeeping and nature's housekeeping. In the 1950s and 1960s, economists developed theories of economic growth in which the natural environment simply did not figure. These theories implied that given proper economic

management, living standards could go on rising indefinitely. The pursuit of economic growth became a dominant objective of economic policy. One important reason for this was that economic growth seemed to offer the prospect of alleviating poverty in a relatively painless way. Neoclassical economics is not at all 'dismal'.

Starting in the early 1970s, neoclassical economics began to show renewed interest in the natural environment and it now includes the two important specialisations, or sub-disciplines, of **environmental economics** and **natural resource economics** (sometimes just resource economics). In terms of Figure 1.2, environmental economics (mainly) concerns itself with the economy's insertions into the environment, and with problems of environmental pollution. Natural resource economics concerns itself (mainly) with the economy's extractions from the environment, and with problems associated with the use of 'natural resources'. Many university economics programmes now offer higher-level optional courses in one or both of these specialisations. The compulsory courses in most economics programmes do not pay much attention to economy–environment interactions. It is possible to qualify as an economist and to know very little about environmental and resource economics. While neoclassical economists do not ignore the natural environment, they do not think that an understanding of the connections between the economy and the environment, as sketched in Figure 1.2, is an essential part of an economist's education.

Ecological economists do think that such an understanding is an essential part of an economist's education. Ecological economics is based on the idea that the proper study of 'how humans make their living' has to include the study of the relations of the human animal to its 'organic and inorganic environment'. Whereas neoclassical economics treats the study of economy–environment interdependence as an optional extra, for ecological economics it is foundational. It *starts* with the fact that economic activity takes place within the environment. Figure 1.2 – we shall look at a more detailed version of this in Chapter 4 – is the point of departure for ecological economics.

Ecological economics is a relatively new, transdisciplinary, field of study. In the last three decades of the twentieth century it became increasingly apparent to many scientists that human economic activity was having damaging impacts on the natural environment, and that this had economically harmful implications for future generations. The establishment, in 1989, of the International Society for Ecological Economics was motivated by the conviction, on the part of a number of scholars from several disciplines, that studying economy–environment interdependence and its implications requires a transdisciplinary approach, embracing parts of the traditional fields of study of the sciences of economics and ecology.

We need to explain our use of the term transdisciplinary here, and how it differs from terms such as interdisciplinary and multidisciplinary. For the prefixes here, the dictionary consulted gave the following meanings:

- multi – many; more than two
- inter – among; between; mutual, mutually
- trans – across, over; beyond, on the far side of; through.

In connection with academic disciplines and research, the prefixes get used in slightly different ways by different people. However, the following captures what most people mean:

Multidisciplinary research tries to bring together knowledge from different disciplines – the problem is studied in several disciplines. Understanding of the problem is improved by the multidisciplinary approach, and the insights gained feed back into the development of the contributing disciplines.

Interdisciplinary research implies additionally that the disciplinary representatives are all involved in defining the problem, work to become familiar with the concepts and tools from the other disciplines, take on board results from the other disciplines, and that all are involved in presenting the results.

Transdisciplinary research is issue-oriented and interdisciplinary, and ideally involves stakeholders as well as scientists from relevant disciplines.

When we say that ecological economics is transdisciplinary, we do not simply mean that it is concerned with economic and ecological phenomena and draws on the disciplines of economics and ecology. It is and it does, but more is involved. The point of the ‘trans’ in relation to ecological economics is that there are phenomena and problems that cross, or are beyond, the disciplinary boundaries. Studying such phenomena and problems requires not just that an economist and an ecologist work on them together each using their own perspectives and tools. It requires a common perspective that ‘transcends’ those that are standard in the two disciplines. When working on economy–environment interdependence, the traditional perspective of economics needs to be modified to take on board the material basis for economic activity and the fact that humans are, whatever else as well, a species of animal. The traditional perspective of ecology needs to recognise the role of humanity as a species in the functioning of all ecosystems. With these shifts of perspective go the recognition of the usefulness of tools and methods of analysis historically seen as going with the other discipline.

Two more points. First, the proper study of economy–environment interdependence involves more than ecological economics as we have described it – many disciplines are highly relevant. However, we do consider that ecological economics is a useful starting point. Second, there are many phenomena and problems to do with economies and ecosystems that can be handled within the traditional disciplinary boundaries. If you only want to study the way the stock market works, you do not really need to take much from ecology: if you are concerned with only the food chains in a remote lake, you do not need to think much about economics. However, if you want to understand the global economy as a system for satisfying human needs and desires, or the operation of the global ecosystem in terms of the distribution and abundance of species, then you do need to cross boundaries.

Throughout the history of economics, as well as studying how humans actually do make their living, economists have offered advice on how they should make their living. One of the reasons that many are attracted to the study of economics is its prescriptive role. In the beginning, Adam Smith urged more reliance on markets and less state intervention in economic affairs than was actually the case at the time that he wrote. Since his time, the views of economists on many issues of public policy have always been an important input to political debate. Notoriously, economists do not, and have never, spoken with a single voice on any given policy issue. There are differences within the ranks of neoclassical economists, as well as between neoclassical and ecological economists. In order to prepare the ground for an introduction to the relationship between ecological

and neoclassical economics, we need to look at the origins of differences on policy.

We will do that in section 1.5. First we need to explain the way we will use the terms ‘economist(s)’, ‘neoclassical economist(s)’ and ‘ecological economist(s)’ there, and throughout the rest of this text. There is much that the majority of neoclassical and the majority of ecological economists agree about. Where we are discussing something of this nature, we will refer to ‘economists’ or to ‘economics’ without any qualification. Where we are discussing something where there are significant differences we will refer to ‘neoclassical economists/economics’ or to ‘ecological economists/economics’ as appropriate.

### 1.3 SCIENCE AND ETHICS

---

In considering modes of study, a distinction is made between the ‘positive’ and the ‘normative’. A positive study is purely descriptive, whereas a normative study includes prescriptive elements. A report on a positive study would consist entirely of statements about what is, or might be – it would be about facts and explanations. A report on a normative study would likely include such positive statements, but would also include normative statements about what ought to be – it would involve recommendations. A positive statement takes the form ‘event *A* always follows action *B*’. A related normative statement would be ‘event *A* is bad, and therefore action *B* should be avoided’. The recommendation here requires two elements – the factual link from *B* to *A*, and the classification of the outcome *A* as something bad. All recommendations, all policy advice, involve both positive and normative elements.

In principle, it is possible to establish the truth or falsity of positive statements in a way that would satisfy all interested parties. Suppose that Jack and Jill are the interested parties. Jack believes that *A* always follows *B*, but Jill does not. The disagreement can be resolved. Jack and Jill could, for example, observe many repetitions of action *B* and record the subsequent occurrence, or non-occurrence, of event *A*. If ever *A* did not occur, Jack would have to agree that the statement ‘event *A* always follows action *B*’ is incorrect. The situation is different with normative statements – they cannot be classified as true or false on a factual basis. If Jack and Jill disagree about whether *A* is a bad outcome, there is no experiment that can resolve that difference.

One definition of science is that it is the business of sorting positive statements into the categories of true and false. Some people would argue that any field of study that involves making recommendations is not a science. However, many people working in fields generally regarded as branches of science do make recommendations. There need not be a contradiction here. Many recommendations are really conditional advice. Thus, if it were established knowledge in some field that *A* does always follow *B*, a recommendation from a scientist working in that field could take the form: ‘if you want *A* to happen, make *B* happen’. This is the sort of thing that medical scientists, for example, spend a lot of time doing – ‘if you want to feel less pain, then take this medication’. Where, as in this case, the objective that is the basis for the recommendation – pain reduction – would be generally regarded

as self-evidently desirable, this kind of statement by a scientist does not give rise to any problems. Often, the conditionality is so obvious and so uncontroversial, that it is not explicitly stated.

The recommendations that economists make can be regarded as conditional advice-type statements of this sort – ‘if you want a healthy economy, then repeal the minimum wage legislation’. Although, the economist’s and the doctor’s statements both have an ‘if . . . then . . .’ structure, there are important differences between them. Whereas pain is experienced directly via the senses of an individual, ‘economic health’ is an abstraction defined with reference to many individuals. Exactly what a ‘healthy economy’ might be is itself something to be enquired into, and any definition must involve normative elements.

There are two sorts of reason why different economists come up with different recommendations – some disagreements have positive origins, some normative origins. Not all positive statements in economics have been definitively classified as true or false. Economists disagree as to how the economy actually works – some consider that minimum wage legislation increases unemployment, others that it does not. However, even if all economists agreed on the true/false classification of all possible positive statements about the workings of the economy, different recommendations could still follow from different appreciations of what ‘economic health’ is – economist Jack could consider it to require an unemployment below 3 per cent, while Jill could consider any level of unemployment below 10 per cent to be consistent with a healthy economy.

In so far as economists agree about recommendations, it is because they agree about both positive descriptions of how things work and normative criteria for assessing performance. At the level of studying individuals choosing between alternatives, we refer to the normative criteria that they use as ‘preferences’ or ‘tastes’. Given that Jack could buy oranges or lemons, we say that what he actually buys is determined by his preferences as between oranges and lemons. In the context of analysing policy choices, we look at the normative criteria involved in terms of their basis in some ethical position. **Ethics**, or moral philosophy, is the study of the principles that ought to govern human conduct. One of its fundamental questions is: how do we decide whether or not an action is morally correct? There are two broad schools of thought.

According to deontological theories, moral correctness is a matter of fulfilling obligations, a matter of duty. According to consequentialist theories, moral correctness is to be judged in terms of the consequences that follow from an action. To illustrate the difference, consider the question: can it ever be right to tell a lie? The answer is ‘no’ on deontological criteria, ‘yes’ on consequential criteria. In the former case, it is argued that there is a universal duty to tell the truth. In the latter case, that there may be circumstances such that telling a lie produces a better outcome than telling the truth.

**Utilitarianism** is a particular variety of consequentialism. According to utilitarianism, the moral correctness of an action depends on the balance of pleasure and pain that it produces. Actions that increase the totality of pleasure or reduce the totality of pain are morally correct; actions that reduce the totality of pleasure or increase the totality of pain are morally incorrect. The term ‘utility’ refers to the situation of an individual in regard to the balance of pleasure and pain – pleasure

is that which increases an individual's utility; pain is that which reduces an individual's utility. The term 'welfare' is used for the totality of utility across individuals, and according to utilitarianism morally correct actions are those that increase welfare. Utilitarianism is the ethical basis for economics.

There are three main questions for utilitarianism. First, whose utility counts? Second, how is utility assessed? Third, how is utility across individuals added up to get welfare? There are different varieties of utilitarianism according to the answers to these three questions. We will look at differences, and commonalities, between neoclassical and ecological economics in terms of these questions later in this chapter.

#### 1.4 SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

The ideas of sustainability and sustainable development will figure very large in this book, as they are very important central ideas in ecological economics. **Sustainability** is:

maintaining the capacity of the joint economy–environment system to continue to satisfy the needs and desires of humans for a long time into the future

If the joint economy–environment system is operating as required for sustainability, it is in a sustainable mode of operation, otherwise it is unsustainable. As subsequent chapters will explain, the difference between sustainable and unsustainable configurations for the economy involves questions about both the scale and the composition, in terms of the sorts of extractions from and insertions into the environment, of economic activity. The scholars who set up the International Society for Ecological Economics in 1989 were largely motivated by the judgement that the way the world economy was operating was unsustainable. They were concerned by what they judged to be threats to sustainability, features of current economic activity that could undermine the capacity of the joint economy–environment system to continue to satisfy human needs and desires. Climate change is an example of a threat to sustainability.

The idea that it is important to 'maintain' a capacity implies that it is sufficient. In fact, in the second half of the twentieth century many scholars argued that the capacity of the joint economy–environment system to deliver human satisfactions needed to be increased rather than maintained. A major feature of the current human condition is the existence of mass poverty. The generally accepted remedy for poverty is economic growth, increasing the scale of economic activity. Here is a major problem. On the one hand, many judge that the current scale of global economic activity threatens sustainability: threatens to reduce the future capacity to satisfy human needs and desires. On the other hand, many argue that it is necessary to increase the scale of economic activity to alleviate poverty. Dealing with poverty now, it seems, is going to create future economic problems, via the environmental impacts arising from increasing the scale of current economic activity.

One of the most important and influential publications of the last part of the twentieth century was *Our common future*. This report by the World Commission

on Environment and Development, WCED, was published in 1987, two years before the formation of the International Society for Ecological Economics. It is sometimes referred to as the 'Brundtland Report', Ms Brundtland having been the commission's chair. *Our common future* described both the extent of poverty and the various threats to sustainability. It argued that the circle could be squared, that the economic growth required to deal with poverty need not, via its environmental impacts, create future economic problems. What was needed, the **Brundtland Report** argued, was a new kind of economic growth that had much less environmental impact and which, rather than threatening sustainability, actually increased the joint economy–environment system's capacity to deliver human satisfactions. It argued that what was needed could be done, and called it **sustainable development**. It is:

a form of economic growth that would meet the needs and desires of the present without compromising the economy–environment system's capacity to meet them in the future.

### 1.5 THE RELATIONSHIP BETWEEN ECOLOGICAL AND NEOCLASSICAL ECONOMICS

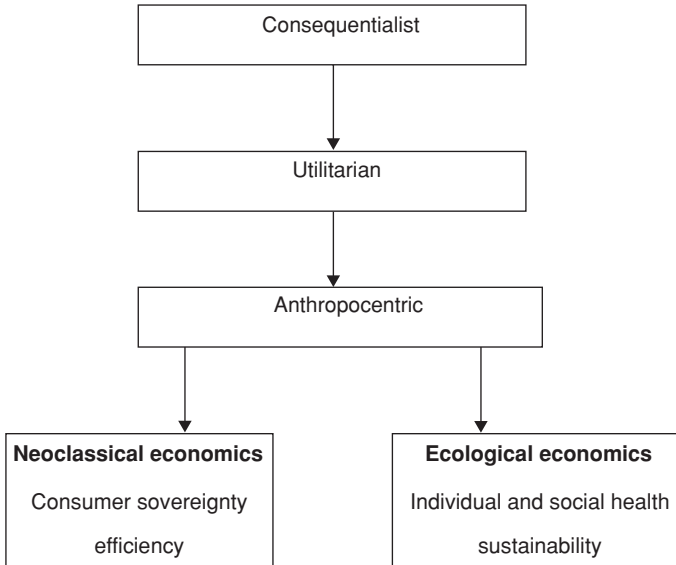
In this section we want to look at the broad relationship between ecological and neoclassical economics in terms of the normative and positive elements of both.

The first question about utilitarianism that we noted was: whose utility counts? In economics, ecological and neoclassical, the answer is: all of the humans who are affected by the action. There is no reason, in principle, why utilitarianism could not take account of the pleasure/pain of all affected animals. Some moral philosophers belonging to the utilitarian school argue that in working out the balance as between pleasure and pain, all affected beings capable of feeling pain and pleasure should be accounted for. If this argument were accepted, welfare would depend on the utilities of all 'sentient' beings, not just on the utilities of humans. The suggested candidates for consideration along with humans have mainly been the higher mammals. Normative economics does not take account of the utilities of non-human beings. It is **anthropocentric** in that the effects of an action on non-human beings are taken into account only in so far as they produce pain or pleasure for human beings. If no humans feel (mental) pain on account of animal suffering caused by an action, then that suffering does not figure in the calculation of the pleasure/pain balance to be used to judge the action. If any human does feel pain, that pain, not the animal suffering, does figure in the pleasure/pain balance. Also, if any human feels pain on account of the damage to a non-sentiment entity, such as a building for example, then that should be accounted for in evaluating the action responsible for the damage and the pain.

In terms of the answer to this first question, there is no difference at all between ecological economics and neoclassical economics. Both are anthropocentric, as well as utilitarian. In regard to the second question – how is human pleasure/pain to be measured? – there are some differences. In neoclassical economics, each affected human individual is the sole judge of whether her utility has increased or

10 INTERDEPENDENT SYSTEMS

Figure 1.3  
 Ethical  
 positions of  
 neoclassical  
 and ecological  
 economics.



decreased. The change in an individual's utility is measured solely in terms of the preferences of that individual. Individual preferences are taken as given, and are not subject to any moral evaluation. This is sometimes referred to as the doctrine of 'consumer sovereignty'. Ecological economics does not ignore individual preferences, but it treats them neither as sovereign, nor as the only source of normative criteria.

In neoclassical economics, provided it can be assumed that an individual is in possession of all relevant information, there can be no ethical basis for seeking to change his preferences. There can be no basis for saying that a taste for cycling should be encouraged, while a taste for driving motor cars should be discouraged. In ecological economics, there can be an ethical basis for comparing, evaluating and seeking to change tastes. Ecological economists would be sympathetic to the argument that tastes should be educated in the direction of cycling and away from motoring on the grounds that more cycling and less motoring promotes individual and social health. They consider sustainability to be a requirement of social health. In ecological economics, sustainability requirements are a source of normative criteria. Figure 1.3 summarises the discussion thus far of the ethical underpinnings of neoclassical and ecological economics.

We now look at the third question about utilitarianism – how to add up increases and decreases in utility across affected human individuals so as to get welfare. To make things simple, assume that there are just two individuals, identified as *A* and *B*, and use  $U^A$  and  $U^B$  to represent their utility levels, and  $W$  to represent welfare. Then simple addition for welfare would be

$$W = U^A + U^B$$

The problem that some see here is that this way of getting from utilities to welfare takes no account of the relative positions of *A* and *B*. Suppose that *A*'s utility is much