1. Economics and environmental change: an overview

1.1 INTRODUCTION

The increased ability of humankind to control, transform and use the Earth’s material resources to satisfy human wants is regarded by most people to be an important indicator of human progress. This ability has played a major role in the economic ascent of humanity, and has altered social structures and the nature of the organization of societies. Humankind has used this capacity to significantly transform natural environments. The means available to *Homo sapiens* to alter and manage natural environments are more powerful and pervasive than ever before and the environmental footprint of our species continues to escalate. Economic success has enabled massive rises in the level of global population to occur as well as an extraordinary increase in the level of aggregate consumption. As a result, the volume of natural resource use by humans continues to rise and natural environments (ecosystems) continue to undergo substantial and rapid change. Furthermore, *Homo sapiens* has well and truly out competed all other species for the use of natural resources.

The current situation poses several challenges for humanity. While not all the environmental changes occurring as a result of human economic activity are socially undesirable, several are. Some, such as human-induced climate change may lead to the future impoverishment of humanity on a global scale. This possibility is of particular concern because of the nature of social embedding in modern economies (see Chapter 5 of this book). Because of this embedding, the root causes of human-induced global warming may not be effectively addressed by politicians and the public or done so in a timely fashion.

In the foreseeable future, the major economic problem faced by humanity may not be shortages of raw materials but changes to natural and human-developed environments caused by economic activity. These changes include ecosystem deterioration (both of natural ecosystems and human-developed ecosystems, such as agro-ecosystems) and global environmental change caused by rising concentrations of atmospheric greenhouse gases (GHG). While this book gives most attention to these issues, it also addresses a
wider range of environmental and social challenges. In doing this, I combine economic, social and biophysical considerations wherever this is called for.

1.2 THE MAIN OBJECTIVES OF THIS BOOK

The main objectives of this book and the reasons for pursuing these can best be understood by considering the purposes of its individual chapters. A brief account of these therefore follows. However, it should be emphasized that the following account does not cover all the issues addressed in the individual chapters.

Human impacts on natural environments have existed for a very long period of time and have magnified in intensity and areal extent with the passage of time. The Agricultural Revolution and the Industrial Revolution escalated the magnitude of human effects on natural environments. However, the Agricultural Revolution was actually a relatively slow process and the Industrial Revolution had its roots in prior developments. The objective of Chapter 2 is to provide a very general historical overview of the ‘stages’ of economic development and how they have altered the relationship between humankind and natural environments.1 These historical developments are related to basic models of the magnitude of anthropocentric environmental impact, such as the model of Ehrlich (1989).

Significant concerns have been expressed in recent decades about whether economic growth (and even current levels of human well-being) can be maintained given the growing impacts of humanity on natural environments and the increasing rate at which it is depleting natural resources. Given this concern, strong support has been expressed in principle for the desirability of achieving sustainable (economic) development. The aim of Chapter 3 is to show that the concept of sustainable (economic) development is not straightforward. It has varied interpretations and it is unclear whether current generations are prepared to make sufficient sacrifices to obtain it, even if it can be achieved. Moreover, views differ significantly on what is needed to achieve sustainable development. Realizing the objective of sustainable development is likely also to be quite difficult in modern societies because of the presence of social embedding. This is explained in Chapters 5 and 9.

We rely heavily on our values (including the metrics of economic valuation) to assess economic and environmental changes, even though our perceptions of reality are also very important. Often, our values also influence our perceptions of reality. Chapter 4 explores the worth for assessing environmental and economic change of varied types of values and the suitability of a wide range of methods of economic valuation for doing this.
Social embedding has a variety of manifestations, causes and consequences. It constrains human behaviours. For example, it limits the ability of communities to respond to unwanted human-induced environmental changes, for example, to the causes of human-induced climate change. The purpose of Chapter 5 is to outline the nature of social embedding in contemporary societies and to show its importance in influencing our economic and environmental future.

Competitive market systems have been extolled as an efficient method of economic organization because they are parsimonious in the amount of information needed by market participants to ensure that these systems operate efficiently in allocating resources (Hayek, 1948). A further purported advantage of these systems is that they ensure consumers’ sovereignty. These views are, however, too simplistic. In modern economies, consumers do not have a sound knowledge of the safety, social and environmental consequences of their purchases or of their impacts on animal welfare, even though many consumers are concerned about these aspects. As a result, market failure occurs. The objective of Chapter 6 is to consider these failures and provide examples of these.

Today, human economic activity is the main cause of biodiversity loss (either directly or indirectly) and the scale and rapidity of this loss is such that it threatens economic sustainability and the level of human well-being. Consequently, Chapter 7 considers the significance of biological conservation for sustaining human well-being and investigates the shortcomings of markets, public bodies and non-government organizations (NGOs) as facilitators of biological conservation. In addition, commonly used economic techniques for valuing biological change are critically examined. This is done from a broad perspective rather than by focusing on minor details.

The consequences of rising concentrations of GHGs in the atmosphere leading to global warming, climate change and increased ocean acidification are a major contemporary concern. The main source of these gas emissions (principally, CO₂) is the use of fossil fuels as an energy source. While the ability of humankind to harness fossil fuels as sources of energy is and has been a major contributor to economic growth, it is now widely believed (on the basis of the available scientific evidence) to be leading to unsustainable global economic growth and could eventually have net negative impacts on human well-being. The purpose of Chapter 8 is to consider social impediments to reducing GHG emissions, to outline general biophysical relationships involved in the process of global warming and to give particular attention to the economic scope to increasingly meet energy demands by relying on sources such as solar and wind. The latter energy sources have significantly lower levels of CO₂ emissions than fossil fuel (such as coal) and also the use of biomass. The whole life-cycle of
different methods of energy supply (plus other considerations) is taken into account. In addition, it is argued that there is limited scope for sequestering CO₂ by increasing the biomass of vegetation.

The globe’s current level of human population is obligated to agriculture for survival and will become even more dependent on cultivars and domesticated organisms for its survival and welfare as the level of global population continues to increase. Today, it would only be possible to support a small fraction of the world’s population purely by hunting and gathering. Agricultural production is an important source of environmental change and is sensitive to it. Therefore, in Chapter 9, it is proposed to consider the major influences of agriculture on environmental changes and the consequences of climate change for agricultural production, as well as adjustment issues. Furthermore, the challenges which agriculture faces in this century in meeting demands for increased agricultural production without contributing significantly to socially unacceptable environmental change are to be assessed.

Marine ecosystem services (marketed, unmarketed and partially marketed commodities) are estimated to have a very high aggregate economic value (Costanza et al., 2014). The purpose of Chapter 10 is to discuss estimates of this value, consider its sources and assess how it might be affected by rising atmospheric CO₂ levels giving rise to global warming, climate change and ocean acidification. Drawing on the available literature, particular attention is given to the estimated effects of rising GHG emissions on the value of production by the Norwegian fisheries and on the changing economic value of coral reefs. These values are highly sensitive to biophysical predictions about changes in marine ecosystems, and these estimates have major consequences for economically optimal adjustment policies. However, there is a problem because scientific predictions about the dynamics of changes in marine ecosystems as a result of global warming, climate change and ocean acidification sometimes differ significantly. Consequently, determining the economics of adjustment policies is complicated by this uncertainty. This is explored and the importance is stressed of taking into account opportunity costs in assessing optimal economic adjustments to alterations in marine ecosystems.

1.3 FURTHER INSIGHTS INTO THE CONTENTS AND APPROACH ADOPTED IN THIS BOOK

The current challenges we face in responding to major environmental changes, especially human-induced environmental changes, are considered basically from four different angles. These are:
● from a broad historical perspective;
● the need to take account of the limitations of available economic measures and methods for valuing environmental change;
● the imperfections of many scientific predictions about the nature course, and consequences of biophysical attributes altered by environmental change (such as increasing levels of atmospheric CO₂); and
● the presence of social embedding (of different types) as an impediment to humankind responding effectively to actual or predicted environmental changes, especially human-induced environmental change, including human-generated climate change.

Knowledge of each of these components is essential for appreciating our current environmental problems and our prospects for solving these. We cannot assume that *Homo sapiens* is entirely rational² and we know that the rationality of our species is limited both in relation to individual decision-making and group decision-making (Tisdell, 1996). Therefore, the ability of humankind to respond to unwanted aspects of environmental change and to manage this change where it is human-induced is likely to be imperfect, particularly so in relation to managing the emissions of GHGs. Just how imperfect remains to be seen. This book identifies some of the most important challenges which we confront in dealing with these problems and why this is so.

**Social Embedding Could be our Most Challenging Constraint on Effectively Addressing Human-induced Climate Change**

As a rule, most economists do not give much attention to the fact that individuals are embedded in social systems. This embedding affects the values of individuals, their economic prospects and their ability to bring about potential changes to the socio-economic system, and it limits the responses of society to its environmental challenges. Two polar views seem to exist in the literature. At one extreme, it is argued that individuals are so locked into our current market-dominated socio-economic system that this system has assumed the nature of a superorganism. Consequently, no individual or small group of individuals can influence societal developments. Those who think they can influence the evolution of the system may just be responding to values generated by the system itself. ‘Solutions’ to problems may also be system-generated. Consequently, decision-makers may be little more than puppets when it comes to reacting to some of the challenges of environmental change, including climate change. Even methods and measures of economic valuation are liable to be influenced by social embedding influences.
At the other end of the spectrum is the view that individuals are entirely rational and societies do have the power to shape their future rationally. Put differently, given the extent of their knowledge about their economic and environmental possibilities, societies can be expected to make socially optimal decisions.

The truth probably lies somewhere in between these extremes. Just where is difficult to specify. However, the importance of social embedding ought not to be underestimated, even though, as is argued in Chapter 5 of this book, it is not as strong as in the case of some ultrasocial species of animals, such as some species of ants, bees and termites. Furthermore, the reasons for the social embedding of humans differ from those resulting in the ultrasociality of some animal species. In addition, changes in the nature of human embedding in human communities have occurred in a much shorter period of time than in the case of ultrasocial animal species. These changes accelerated in the Holocene era, the last 12,000 years or so.

Social embedding in human societies is not static. Its rate of change has been much faster than in the case of ultrasocial animal species. Furthermore, social embedding in human communities is significantly shaped by economic developments, as is apparent from the historical record. Today, as is demonstrated in Chapter 7, social embedding makes it difficult for humankind to address effectively the causes of global warming.

Social embedding does not imply stationarity in the structure of human societies but limits the ability of humans to manage change: it adds an extra constraint to the ability of humans to determine their future. As societies become larger in size, as has happened historically, the ability of individuals to influence the decisions of others is reduced. In the present era, this is occurring at a time when the welfare of all is becoming more interdependent due to increased economic globalization and to the growing global environmental consequences of economic activity.

1.4 CONCLUDING COMMENTS

We need to consider the environmental challenges we face from a holistic point of view. This means that our biophysical knowledge and our socio-economic knowledge must be combined in assessing environmental changes, and in determining the scope for humankind to respond to these challenges and to make desirable decisions. Even though the main focus of this book is on economic considerations, I have endeavoured, wherever possible and appropriate, to relate these to social and biophysical features. In addition, I have tried to concentrate on major issues rather than be
side-tracked by unnecessary details, which in my view would have clouded the presentation.3

The major conclusion (but not the only conclusion) which can be drawn from the work is that social embedding is the prime impediment to humanity responding effectively to many of its current environmental problems, especially climate change. The nature of contemporary social embedding is mainly a product of the dominance of the market system as a means of economic organization. This dominance is a ‘logical’ result of the historical process of economic evolution. The depth of this social embedding is reinforced because economic methods of valuation have co-evolved with the ascendency of the market system and reflect prevalent societal values and those of dominant social groups. While this may have short-run benefits, it also poses long-term dangers because of the failures to step outside the existing system and evaluate it.

NOTES

1. Actually the nature of economic development has not altered discretely by stages nor have societies developed in the same pattern (Svizzero and Tisdell, 2016). Nevertheless, we can identify significant economic events that have significantly changed the course of economic and social development. From this point of view, the posited economic stages of economic development assist our understanding of the historical processes that have shaped our current situation.

2. An interesting perspective on factors influencing human behaviour and their evaluation is provided by Karen Armstrong (2014, pp. 4–9). A problem with the rationality approach to human behaviour is that it seems to be impossible to establish the desirability of ultimate ends by means of rational argument. Also individuals differ significantly in their willingness or ability to exercise various forms of rationality. Emotional factors often swamp rational considerations. Homo sapiens is not an entirely rational animal. Furthermore, the extent to which an individual is rational is likely to vary depending on changing circumstances.

3. Some additional information about the motivation for writing this book is available in the Preface.

REFERENCES

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