CLIMATE CHANGE, JUSTICE AND FUTURE GENERATIONS

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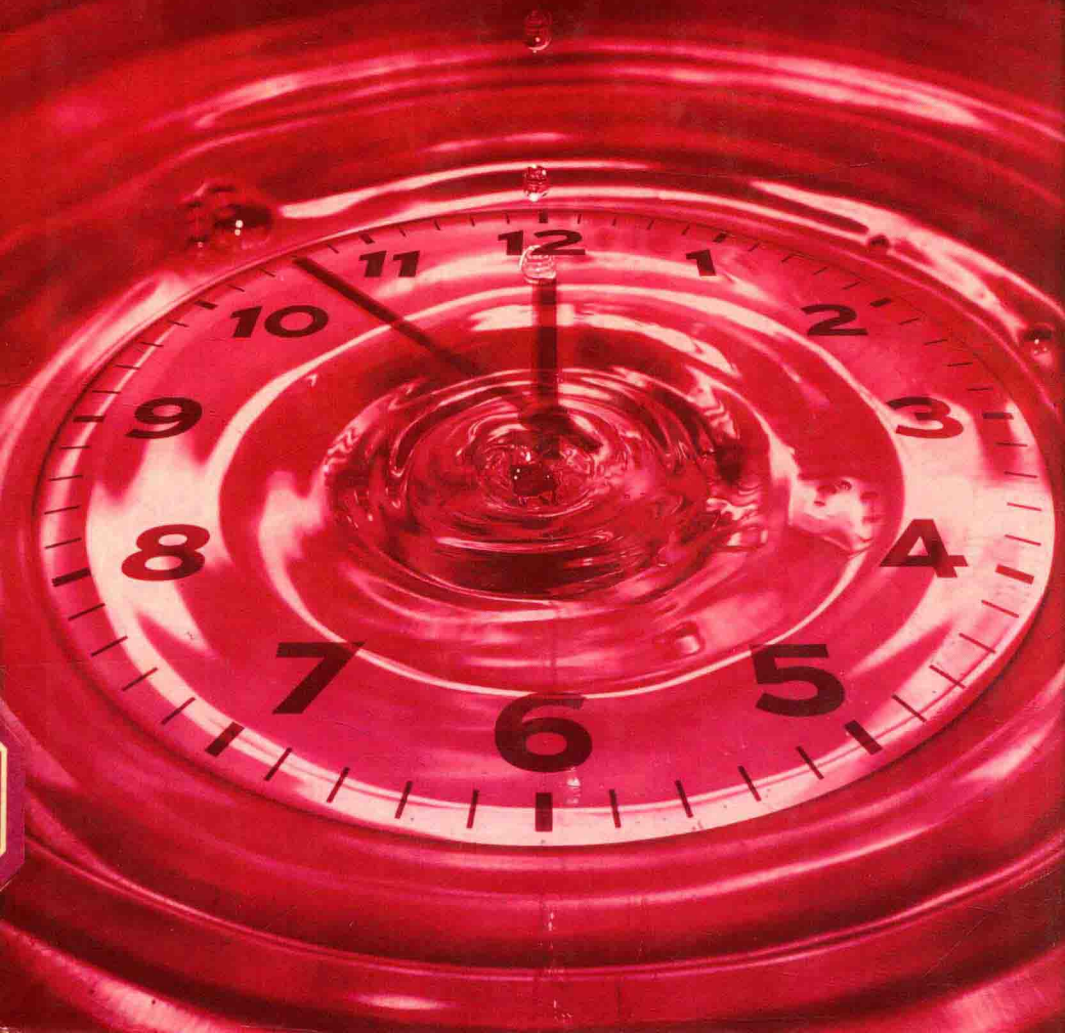

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Edward Elgar
Cheltenham, UK • Northampton, MA, USA

Published by
Edward Elgar Publishing Limited
Glensanda House
Montpellier Parade
Cheltenham
Glos GL50 1UA
UK

Edward Elgar Publishing, Inc.
William Pratt House
9 Dewey Court
Northampton
Massachusetts 01060
USA

Reprinted 2007
Paperback edition 2007

A catalogue record for this book
is available from the British Library

Library of Congress Cataloguing in Publication Data

Page, Edward, 1968–
Climate change, justice and future generations / by Edward A. Page
p. cm.
1. Climatic changes. 2. Climatic changes—Government policy—Economic aspects. 3. Global environment change. 4. Environmental management. I. Title.

QC981.8.C5P34 2006 2005052714

ISBN: 978 1 84376 184 6 (cased)
978 1 84720 496 7 (paperback)

Typeset by Cambrian Typesetters, Camberley, Surrey
Printed by Biddles Ltd, King's Lynn, Norfolk

Acknowledgements

During the period of writing this book, I have been fortunate enough to benefit from the comments and suggestions of a wide range of people. Earlier versions of the chapters contained in the book were presented at academic seminars and conferences at the universities of Lund, Gothenburg, Stockholm, Birmingham, Keele, Luleå, Umeå, Manchester, Leeds and Ulster. I am grateful to the audiences on all of these occasions for their comments. I am also grateful to John Barry, Stephen M. Gardiner and Oluf Langhelle for detailed comments on an earlier version of the book. I would especially like to thank colleagues at Lund, Gothenburg and Birmingham who have contributed in numerous ways to the project over the course of the last three years. In particular, I would like to thank Sverker Jagers, Johannes Stripple, Lars Göran Stenelo, Åsa Mattsson, Raimund Muscheler and Göran Duus-Otterström in Sweden; and Simon Caney, Derek Bell, Clare Heywood and Pia Halme in the UK. An equally great, and much longer-term, debt is owed to the supervisors of my doctoral research at Warwick University, Susan Hurley and Andrew Williams, whose ideas and comments improved my understanding of political philosophy on countless occasions. Finally, I would like to acknowledge the financial support of the European Commission, from whom I received a Marie Curie Research Fellowship to work at Lund University between 2002 and 2004, and the UK Arts and Humanities Research Council, which funds my present post at Birmingham University as part of the 'Global Justice and the Environment' research project.

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Climate is what we expect, weather is what we get.

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By spraying deodorant at your armpit in your New York apartment, you could, if you use an aerosol spray propelled by CFCs, be contributing to the skin cancer deaths, many years later, of people living in Punta Arenas, Chile. By driving your car, you could be releasing carbon dioxide that is part of a causal chain leading to lethal floods in Bangladesh. How can we adjust our ethics to take account of this new situation?[1]

Peter Singer

1.1 WEATHER, CLIMATE AND THE ETHICS OF CLIMATE CHANGE

On 29 August 2005, Hurricane Katrina made landfall on the Gulf coast of the United States, with winds of up to 135 miles per hour and catastrophic storm surges of up to seven metres. Katrina went on to have a huge socio-economic, human health and environmental impact in Louisiana, Mississippi and Alabama. At the time of writing, Katrina had been widely recognised as the greatest weather disaster in the history of the United States, with over 1300 confirmed dead, many in flood-ravaged New Orleans, and an estimated cost to insurers of over $30 billion according to the reinsurance giant Munich Re.[2]

Between 2 and 24 September 2004, Hurricane Ivan, the most powerful of an unusual series of wind storms, hit the coast of Florida after devastating several countries throughout the Caribbean. The hurricane caused over $10 billion in damage in total, and led to 2 million evacuations in four US states. Ivan, with winds of up to 280 kilometres per hour, was particularly catastrophic for Haiti and the Cayman Islands where high winds and waves of 6 metres wrecked up to 90 per cent of homes, killing hundreds and making hundreds of thousands homeless.[3]

One year earlier, on 10 August 2003, whilst Europe was in the middle of a heatwave, the record for the highest surface temperature in England was

broken. The Brogdale station in Kent reported a temperature of 38.5°C, a weather landmark. It was, in fact, the hottest day in the country that holds the longest unbroken temperature series, as scientists have collected data as part of the Central England Temperature record since 1659.[4] The year 2003 went on to be the third warmest recorded, surpassed only by 1998 and 2002. Not all were thrilled with the heat, however, and later studies confirmed that the heat-wave caused at least 20 000 excess deaths in Europe through dehydration and heat stroke.[5]

One year earlier still, between 31 July and 26 August 2002, two high-altitude, low-pressure systems combined to cause torrential rain and flooding across Northern Europe, hitting Germany, Austria and the Czech Republic severely. Several hundred thousand people were evacuated temporarily from their homes, and there were over 100 deaths. The exceptional scale of the event led to total economic damage of 15 billion euros, according to Swiss insurance company Swiss Re.[6]

In different ways, each of these weather events was unusual and all were talked about as early indications of global climate change (or 'global warming' – the most widely discussed, but far from the only, dimension of climate change).[7] Were these events, and other extremes of weather being reported around the world, reflective of a new trend in global climate towards extreme events? Were they early warnings of even greater events to come?

Because of the complexity of (and inherent variability in) weather and climate, such questions will probably never be answered. It will, for example, never be established beyond doubt that the events described above led to the *first* deaths and economic losses attributable to global climate change. But as we shall see, the vast majority of physicists and climatologists active today predict large increases in the frequency and/or intensity of all three types of event. That is, they hold that intense rainfall events will become more frequent in Europe and elsewhere; the frequency of very hot days will increase throughout the world; and the intensity of wind storms, such as Ivan, will increase.

This, of course, raises great practical questions – not least, what *can* be done by individuals, and the countries to which they belong, to prevent the adverse changes in climate that can still reasonably be avoided or to adapt to the dangerous climate changes that cannot reasonably be avoided. But it also raises ethical questions, such as what *should* be done to mitigate, or adapt to, climate change? Who should be held responsible for climate change? How should the costs of climate change be distributed? Which parties should take the lead in international attempts to manage the causes and effects of climate change? Should the needs (or rights) of present persons be viewed as prior to those of the not yet born in our decisions about climate change?

This book will address many of these, as well as a number of related, questions. In doing so, it will be guided by two fundamental ideas, as well as a host

of supplementary assumptions that will be explained later. The first idea is that a nuanced understanding of ethics is essential for the development of effective and legitimate policies to manage climate change. The second idea is that the part of ethics that is particularly useful in this regard is *distributive justice*, or the study of how benefits and burdens should be distributed across space and time. A theory of distributive justice is a central feature of any fully worked out ethical system, but, as will become clear, it is especially important in the debate about the impacts of climate change. Other aspects of ethics, which we might define broadly as the study of what we owe to each as a matter of duty, will also be relevant to our discussion, but will be secondary to the question of what division of benefits we should aim to bring about, as individuals and policymakers. We begin with a detailed look at some key concepts that will help us understand the causes and effects of climate change.

1.2 WEATHER AND CLIMATE: AN AWKWARD PARTNERSHIP

The *weather* – defined as the 'state or condition of the atmosphere at a particular place and time'[8] and comprised of 'weather elements' such as temperature, air pressure, wind, humidity, cloud and rain – has been a source of debate and discussion for millennia, possibly since the beginnings of human civilisation. Although by nature a transitory phenomenon, weather conditions play a key role in the lives of both individuals and states. Unusual weather conditions can profoundly affect a person's health, as well as their mental functioning. Extremes of heat are particularly dangerous, as has been shown by the numbers of heat related fatalities in unusually hot periods such as the heatwave of 2003; extremes of humidity are associated with a decrease in mental performance and general activity; and lack of sunshine has been associated with the deterioration of a range of functions, such as sleep and appetite. Weather is also a key contributor to a person's nutritional, clothing, shelter and recreational requirements on any given day. In fact, almost no feature of human life seems unaffected by weather.

Weather can also have unforeseen political consequences. Unexpected weather patterns have played an important role in a number of political events, in particular those concerning the timing, and outcome, of military conflicts.[9] It is well known, for example, that the D-Day landings were delayed repeatedly on the grounds of unfavourable weather conditions. In the event, the combined air and sea invasion of 6 June 1944 benefited not only by a forecasted opening of a window of relatively calm weather, but also by the relaxed readiness of the German defences as a result of the recent period of bad weather.[10] The brutal winter weather of 1941 that helped degrade the German

army's mobility, morale and logistics was a critical factor in the failure of Hitler's invasion of the Soviet Union.[11] A third example concerns the timing, and causes, of the French Revolution of 1789. The bad harvest of 1788, and harsh winter of 1788/89, served to exacerbate existing social and political cleavages (bread prices soared over this period and existing inequalities widened) partly contributing to the subsequent revolution.

Given the above, it might seem surprising that there have been few scholarly works on the political and ethical implications of weather. However, the reason for this gap in the literature is in many respects clear. This is that, as phenomena apparently beyond the influence of human action, the importance of weather events for human civilisation and well-being was viewed until recently as a matter of luck and contingency. As in the case of other natural events such as the Indian Ocean Tsunami disaster of December 2004 (300 000 plus casualties) or the 1976 Earthquake in north-east China (240 000 casualties), the popular view has been that the bad effects of weather are regrettable but not unethical, inequitable or unjust (I use these terms interchangeably) since they are no one's fault. This is not to say that features of societies that exacerbate the impact of weather disasters are beyond ethical criticism. Nor that the societies that people belong to have no obligations to mitigate the worst effects of weather disasters when they occur. Rather, it is to observe that people do not seem to have ethical claims, in particular claims of justice, against others that they be protected from natural variations in weather. We might say that the notion of 'weather ethics' on this view is incoherent.

Ironically perhaps, the study of weather, *meteorology*, which we can define as the systematic study of the earth's atmosphere and its weather phenomena,[12] was pioneered by one of the founders of modern political and ethical theory. In his *Meteorologica* (which was written around 340 BC), Aristotle (384–322 BC) synthesised existing knowledge of weather and proposed explanations of weather phenomena in terms of his doctrine of four elements (earth, air, fire and water) as well as general principles of their interaction.[13] Although almost all of Aristotle's meteorological views have now been refuted, Aristotle's theories went on to form the basis of the discipline, and in particular weather forecasting, for nearly 2000 years. In the late 16th and 17th centuries, scientists such as Tycho Brahe (1546–1601) and Johannes Kepler (1571–1630) developed Aristotle's theories by arguing that the relative positions of planets were associated with different atmospheric conditions, albeit within the context of a striking metaphysics that attributed to the Earth a soul that was susceptible to planetary and solar influence.[14]

Despite the influence and apparent success of Kepler's methods, the notion of a direct coupling between astrology, astronomy and weather fell out of favour in the 17th and 18th centuries (the connection between astronomical variables, such as changes in the pattern of the Earth's orbit around the sun,

were later shown to be a key factor in the timing of glacial and inter-glacial ages throughout earth's history by Milutin Milankovitch[15]). The new focus of meteorologists became the development of mathematical models that could explain observations of data made possible by a series of weather instrument inventions as well as conceptual improvements. Of particular importance were the introduction of the water thermometer (1593), mercury thermometer (1714), hygrometer (for measuring humidity, 1780), aneroid barometer (1843), and the development of cloud- (1803) and windspeed- (1806) classifications. The discipline also benefited indirectly from a number of other inventions, such as the telegraph (1830) which enabled the transmission and collection of weather data from large numbers of remote stations; supercomputers, such as the CRAY series of machines (1979–present), which could process increasingly complex forecast models within a reasonable time-period; and satellites, such as the US polar orbiting TIROS satellite (1960–66), that could make reliable observations of the Earth's cloud cover and other weather patterns from space.

Although these inventions have enabled great progress in weather forecasting, there has been a clear shift in outlook away from the ambitions of pioneer forecasters such as Aristotle and Kepler. Detailed forecasts that claim to model weather beyond ten days, for example, are highly controversial because of the many simplifying assumptions and uncertainties associated with weather models.[16] Nevertheless, an important assumption remained in place throughout this long period of meteorological innovation, namely, that although weather has a huge influence on human life and is to a certain extent predictable, it is not generally susceptible to direct human influence.

In contrast to weather, *climate* can be defined as 'a regional or global synthesis of weather extended through time'.[17] It is thus concerned with a range of data, such as the frequency and intensity of extremes of weather such as storms, floods and droughts mentioned earlier, as well as average measurements of weather elements such as temperature, over some extended period. Whereas meteorological forecasts typically refer to conditions in a region over a number of hours or days, climatologists analyse changes in atmospheric conditions over a much longer time-span, typically over several decades to millennia.

There have been numerous transformations of the Earth's atmosphere over its history, notably the successive glacial and inter-glacial periods that have characterised terrestrial climate for the last 2 billion years. The extremes of this period are staggering. Warmer periods (such as the period between 120 and 90 million years ago) were generally 5°C–15°C warmer than the colder periods that interspersed them (such as the numerous ice ages that have occurred in the last 15 million years) and sea levels were around 150 to 200

metres higher. In fact, mean temperatures have been much higher than they are today throughout most of the Earth's history.[18]

It appears from the evidence available that human life has been profoundly affected by each of the key climatic shifts that post-date modern man's evolution, notably the nine or more glacial ages of the last 750 000 years. Human societies have had to adapt continually to climatic events. Two prominent examples concern the human impacts of an unexpected cooling in the Northern Hemisphere. The first, the Younger Dryas Event, saw North America, Europe and Western Asia suffer a 1000 year temporary return to ice age conditions that started around 11 700 BC. Researchers believe that the event, which may have been caused by a disruption in the process that transports warm water to the northern latitudes, had a huge impact on animal and plant life in the Northern Hemisphere.[19]

A second example concerns the 'little ice age' that marked a pronounced cooling of Northern Europe between 1300 and 1850. The period witnessed a drop in temperature of between 1°C and 2°C relative to the average for the current, Holocene, climate period that began approximately 11 600 years ago, and appears to have been caused by a combination of reduced solar activity and raised volcanic activity. There were large advancements of glaciers in Scandinavia and Alpine Europe; crop failures throughout Europe; and massive cold and famine related mortality.[20] Moreover, like the Younger Dryas Event, some scholars claim that natural changes in climate during this period (and attempts to adapt to these changes) had large and unpredictable effects on human civilisation. There is increasing evidence, for example, that the cooling acted as a catalyst for the exploration and settlement of North America, as well as increased agricultural efficiency and the industrial revolution.[21] This raises the intriguing possibility that natural changes in climate themselves contributed to the development of institutions and practices that produced the anthropogenic greenhouse effect.

While a preoccupation with weather is arguably as central to the human condition as that of love, death and taxes – the Earth's climate has emerged as a much more recent feature of popular consciousness. If a non-specialist was asked 20 years ago what they thought about global warming or global climate change it is likely that they would have been baffled. As Mark Twain once quipped, everybody was talking about the weather but nobody could do anything about it for there was nothing one could do to affect it. The Earth's future climate was an even greater mystery. Tremendous advances in meteorology and climatology in the last 50 years, and in particular the greenhouse theory of climate change,[22] has changed this picture however. The vast majority of experts[23] now hold that we can affect, and are affecting, the global climate, and climate change is consistently reported as one of the greatest problems facing humanity in surveys of public opinion.[24]

1.3 THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

The international body charged with coordinating research into climate change is the Intergovernmental Panel on Climate Change (IPCC). The IPCC was founded by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988. Its aim is to assess – on the basis of peer-reviewed literature – the scientific, technical and socio-economic information relevant to understanding the scientific basis of human-induced climate change; and its potential impacts and options for mitigation (the prevention of avoidable climate change) and adaptation (the modifying of human practices to fit in better with climate changes when and where they occur).[25]

In its influential Second Assessment Report (SAR), the IPCC found that 'the balance of evidence suggests discernible human influence on climate'.[26] The SAR went on to claim that, because of the way in which it will disturb biological and physical systems, climate change will have a range of, generally adverse, impacts on the health[27] and socio-economic resources[28] of future human populations.

The SAR's findings were developed, and in many ways strengthened, by the IPCC's Third Assessment Report (TAR) published in 2001. This found that 'there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities' and that 'human influences will continue to change atmospheric composition throughout the 21st century'.[29] The TAR argued that the distributive implications of climate change raise 'an important issue of equity, namely the extent to which the impacts of climate change or mitigation policies create or exacerbate inequities both within and across nations and regions'.[30]

It is within this context that public and governmental concern has grown regarding the way in which climate change will influence the pattern of distribution of social and economic benefits across generations and nations. This concern is reflected in both the policy documents of individual countries and of the United Nations. Article 3.1 of the United Nations Framework Convention on Climate Change (UNFCCC[31]), for example, states that those countries party to it:

> should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities.[32]

Considerations of ethics and justice are integral to the IPCC's assessments of climate change. According to the SAR, climate change raises 'particular questions of equity among generations'[33] and the TAR observes that any

effective response to climate change must be consistent with ethical ideas of equity and fairness.[34] This claim, while not unchallenged, commands wide agreement amongst policymakers, ethicists, and scientists. In fact, the findings of the SAR and TAR commanded cross-party support in most industrialised countries.

The response of successive UK governments since 1992 is quite typical of the consensus. At the New York 'Rio Plus Five' Earth Summit held in June 1997, Tony Blair drew upon the SAR to urge all industrialised nations to set ambitious targets for the stabilisation, and eventual reduction, of greenhouse emissions. In his speech to the summit, Blair observed that:

> This Earth is the only planet in the solar system with an environment that can sustain life. Our solemn duty as leaders of the world is to treasure that precious heritage, and to hand on to our children and grandchildren an environment that will enable them to enjoy the same full life that we took for granted.[35]

Blair's speeches are mirrored by those of the then Secretary of State for the Environment, Margaret Beckett, who has claimed that:

> Climate change is the greatest and most urgent environmental challenge facing mankind today. For the sake of current and future generations and the future of the planet, let us rise to the challenge and take serious action to tackle it.[36]

Perhaps more surprisingly, achieving intergenerational equity was also a key aspect of the previous, Conservative, administration's approach to climate change. John Gummer (UK Environment Secretary 1993–7) was a firm supporter of the IPCC and played a key role in the UNFCCC negotiation process, and Margaret Thatcher (Prime Minister 1979–90) is credited as being one of the driving forces behind the establishment of the IPCC.[37]

It could, of course, be argued that the ideas contained in such speeches are motivated by political posturing, rather than by genuine concerns of environmental or intergenerational ethics. Blair's commitment to emissions reductions was criticised after it was confirmed in December 2004 that the UK would fail to meet the pledge contained in the Labour Party's 2001 manifesto to cut carbon dioxide emissions to 20 per cent below 1990 levels by 2010. Blair was also criticised when the UK Government increased the amount of greenhouse gases that businesses would be able to emit under the new European Emissions Trading Scheme (EU ETS) from 736 million tonnes to 756 million tonnes, mainly as a result of successful industry lobbying.[38] Nevertheless, such criticisms should not deflect attention from the growing emphasis on the ethical dimension of climate change, and in particular its impacts on the well-being of future generations.

There are a number of ethical arguments that might underwrite the expressions of concern about climate change surveyed above. The argument I wish

to focus on concerns the consequences of failing to address climate change for the quantity and quality of human well-being in the future, and is presented in humanist terms.[39] The argument has three steps:

P1. The changes in the climate system that are being brought about by human action threaten the well-being of members of future generations.
P2. Human action that threatens the well-being of members of future generations is unjust and unethical (I use these terms interchangeably).
C. The changes in the climate system that are being brought about by human action are unjust and unethical.[40]

We might call this the *Intergenerational Responsibility Argument*. This argument appears to be *valid*, as C clearly follows from P1 and P2. However, it is less clear if the argument is *true* as its premises are more controversial than they appear.

Much of the book will be devoted to a detailed investigation of this argument, which seems to underpin much common-sense thinking about the ethics of global climate change, as well as the ethical stance of the IPCC.[41] In particular, I will be investigating the debates that have emerged from both the popular and academic literature concerning P1 and P2 by applying the tools, techniques and methods of analytical philosophy. Consider premise P1. Some have claimed that this premise is false because the link between anthropogenic greenhouse gas emissions and climate change is unproven. The IPCC's assessments, it is argued, are little more than a 'scare story' and as such, there is insufficient evidence to claim that climate change exists, so the claim that climate change poses a clear and present threat to present or future well-being is false.[42]

The IPCC has also been criticised for being biased in the direction of mitigation as opposed to adaptation. This is because the IPCC, it is claimed, underplays the way in which climate change will be limited in the longer term by the logic of economic forces that will bring about the replacement of carbon intense activities (such as fossil fuel energy sources) with alternative, so-called 'clean', energy sources that involve little or no emissions of carbon (such as solar power) as and when they become more cost effective. In particular, the implicit support that the IPCC gives to the Kyoto Protocol, which is viewed as dangerous since it would damage economic development growth if implemented, is criticised.[43]

Still others have argued that climate change, while it certainly exists, will not have the range and depth of adverse effects on future generations that the IPCC suggest. They have also claimed that the *net* long-term impacts of climate change on humankind will either be negligible or mildly beneficial, as a result of localised reductions in cold-related deaths; improvements in agricultural yields; and benefits to tourism.[44]

While these 'sceptical' positions have been quite influential in some quarters, notably amongst administrations opposed to the Kyoto Protocol, it will be argued in Chapter 2 that they should not undermine our confidence in the IPCC's central findings or in the usefulness of the Kyoto Protocol.

Consider, next, the objections that might be directed towards premise P2, which will be the primary focus of the book. Whereas few deny that global environmental problems such as climate change pose a threat to the well-being of future generations, it might be claimed that such threats are simply not of genuine ethical concern. The requirements of ethics and justice, one might think, bind only contemporaries belonging to the same society, or only contemporaries whatever society they belong to. On the other hand, it might be conceded that the impacts of climate change are of ethical import, but only insofar as they threaten the well-being of those who will belong to the nearest of future generations. Such claims may appear to be unsound. However, it is an unsettling fact that there have been few systematic attempts to test the robustness of premise P2 (1) across different theories of distributive justice; (2) across the different accounts of human well-being that distributive theories adopt; or (3) in the light of some perplexing problems associated with extending the scope of distributive theories to cover persons belonging to different generations.

Regarding (1) and (2), I attempt to address this gap in the literature in Chapters 3 and 4, where I argue that climate change does indeed raise peculiarly important questions for a range of theories of the distribution of human well-being. The theories analysed are *impersonal* in the sense that they may view acts and social policies as wrong even if they harm no particular people. While such theories represent only a small range of the possible positions within ethics, they are important in that they provide the background to most discussions of what an ethical climate change policy would look like.[45]

Regarding issue (3), some preliminary comment is required. It appears to be the conviction of many that human activities that compound the climate change problem are inequitable, or unethical, because they *harm* the as yet unborn. Onora O'Neill, for example, writes that 'by burning fossil fuels prodigally we accelerate the green-house effect and may dramatically harm successors, who can do nothing to us'.[46] A similar view is held by Henry Shue.[47] Such views, because they urge us to benefit (or not to harm) particular persons, are often known as *person-affecting* views. The problem, as shown in Chapter 6, is that there are a number of difficulties in explaining exactly how our successors can be harmed either directly or indirectly by acts or policies which are also necessary conditions of their coming into existence.

Yet, even supposing that future persons can be harmed by actions or policies necessary for their coming into existence, some suggest that the lack of

mutual benefit (or reciprocity) that characterises dealings between members of different generations undermines the claims of future persons to resources currently at the disposal of existing persons. This is because, it is claimed, the scope of ethics and justice is determined by a principle of *reciprocity*. Nevertheless, the discussion in Chapter 5 shows that even theories of distribution that appeal to reciprocity give rise to norms of intergenerational justice.

It is worth noting that, because I spend most of my time clarifying, and responding to, various *objections* that might be raised to premises P1 and P2, the bulk of the defence provided for the existence of intergenerational duties, and their application to climate change, is indirect. I set out to show that none of the objections to the Intergenerational Responsibility Argument are sound, rather than to provide a completely new theory of intergenerational distribution as such. Nevertheless, the book does seek to examine more closely one neglected normative approach to these issues, grounded in the principle of *sufficiency*, which holds that resources should be distributed so as that many persons as possible lead a decent life. The principle of sufficiency, I will claim, is a central element in a theory of distribution that is pluralist in the sense that it recognises that there are multiple sources of obligation.

1.4 SCIENCE, ETHICS AND THE ENVIRONMENT

It might be argued at this point that, whereas the theoretical issues raised so far may be of interest to the student of philosophy, the systematic study of ethical arguments and beliefs has little bearing on the pressing issue of how to manage our dealings with the environment. The sceptic claims that only 'sound science' can explain how complex physical processes work, what their likely consequences will be for future human life, and come to the aid of policymakers faced with a bewildering range of alternative environmental policies. Ethical analyses of environmental problems, on the other hand, are viewed as too abstract to serve as a guide for environmental policymaking, or unnecessary since the appropriate aims of these policies are obvious and not in need of further discussion.

There are flaws in both of these sceptical lines of reasoning, however. The flaw in the latter is that the ethics of individual and state behaviour are more contested than they have ever been, both inside and outside the academic world. The flaw in the former line of argument is that, no matter how sophisticated one's natural scientific account of human–environmental interactions, empirical research can at best explain how things actually are and not how things ought to be. Since policymaking inevitably must aim for some desirable state of affairs – in democratic countries, this is usually developed in terms of the common good, subject to the constraints of personal freedom and

democratic rights – policymakers will always rely on normative information in their decision-making.

This is not to say that there is an absolute demarcation between natural science and ethics, between facts and values. As we shall see in the next chapter, scientists, such as those working under the auspices of the IPCC, regularly invoke normative ideas such as the precautionary principle, that do not fit well with a traditional, positivist conception of scientific method. But even taking a stronger view of the science–ethics boundary, ethical theorising has a clear role to play in environmental research, critically to help us understand why (and which) environmental changes are bad, and how we might choose between mitigating and/or adapting to outcomes when at least some of these are unavoidable.

It is important also not to underestimate the importance of empirical research and the role it plays in our ethical theorising, or to overstate the importance of the fact–value distinction. This comes out clearly when we reflect on different types of ethical principles, and the way their application is shaped by empirical facts. Science itself plays a vital background role in our normative theorising because it is often necessary to acquire a detailed understanding of the likely consequences of our actions, with the exact relevance of empirical knowledge depending on the nature of the duty in question. So whereas science cannot prescribe what is, and is not, ethical or just it can help us investigate whether certain ethical norms have been violated by an act or social policy.[48]

To take an example, ethical duties have traditionally been separated into two camps: those that prohibit the infliction of suffering on others (negative duties), and those that involve furthering the well-being of others (positive duties). The distinction has clear relevance to the climate change issue. Climate change, the IPCC informs us, will result in numerous adverse impacts on future persons, and thus prima facie negative duty violations, directly through heatwaves, floods or infectious diseases and indirectly through making the conditions of life far harder than they would have been. However, climate change will also alter the pattern of benefits across both nations and generations in a way that is not obviously tied to particular people being made worse off. For those that believe in positive duties, then, it also will almost certainly violate a range of these duties as well.

The exact relationship between negative and positive duties is complex, and although the distinction seems obvious in some cases, it is much less clear in others. What is clear is that to give a full account of our negative duties, and the harms done to others, it will at some stage be necessary to understand the impacts of our actions on the quality of life enjoyed by other persons, nations and generations even if uncertainty and complexity mean that this understanding will never be perfect. The IPCC's assessments provide valuable assistance