Controlling Climate Change

Controlling Climate Change is an unbiased and comprehensive overview that is free of jargon and solidly based on the findings of the Intergovernmental Panel on Climate Change (IPCC). It looks at what we can do to solve the problem of man-made climate change, working through the often confusing potential solutions. Readers will find answers to the vital questions:

- What will happen if climate change is not controlled?
- What is the magnitude of the challenge to avoid climate change?
- What is the role of prevention and adaptation?
- What measures can we take to control climate change and what do they cost?
- What policies are available to make it happen?

Bert Metz is a leading expert on climate change science and policy. As a former co-chair of the IPCC Working Group on Mitigation of Climate Change and an international climate change negotiator, his insider expertise provides a cutting edge, completely up-to-date assessment that gives the reader an insight to issues at the top of the political agenda. He leads the reader through the scenarios of ambitious actions to reduce greenhouse gas emissions and protect our forests, in the context of the challenges of countries to provide for economic growth and development and the need for societies to adapt to different climate conditions. Technical solutions, behavioural issues, costs, and policies and measures are discussed for each of the main economic sectors. The complexities of international climate negotiations are explained in a succinct manner. Damage to ecosystems, impact on food production, health and the very existence of a large proportion of the world's population are all tackled with an emphasis on the potential solutions.

Illustrations, tables of data, and extensive boxed examples motivate students to engage with this essential global debate. Questions for each chapter are available online for course instructors, so students can test their knowledge.

This textbook is ideal for any course on the consequences of climate change and its mitigation and adaptation. Written in accessible language with a minimum of technical jargon, it will also be valuable to anyone with an interest in what action should be taken to combat climate change, from the layman to scientists, professionals and policy makers.

Bert Metz has vast experience in the field of climate change policy. He served as the coordinator of climate policy at the Netherlands Ministry of Housing, Spatial Planning and Environment and chief negotiator for the Netherlands and the European Union in the international climate change negotiations from 1992 to 1998. He was elected co-chairman of the UN Intergovernmental Panel on Climate Change (IPCC) working group on climate change mitigation for the IPCC Third Assessment Report (1997–2002) and was re-elected for the Fourth Assessment report (2002–2008; in which period the IPCC received the 2007 Nobel Peace Prize). At the Netherlands Environmental Assessment Agency from 1998 to 2005, he led the group on climate change and global sustainability, publishing a large series of national and international policy analyses on climate change and sustainability. Since retiring, he is serving as advisor to the European Climate Foundation and other organizations. In 2009 he received the European Practitioner Achievement Award in applying environmental economics from the European Association for Environmental and Resource Economists.

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This book is dedicated to my grandchildren Mare, Nica, Phine, Thijmen, Lotte, and Kiek

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The colour plates will be found between pages 208 and 209.

Preface

This book is written to help people make sense of the discussion on climate change. In particular on the question of whether we can solve this problem. It is now generally accepted that our climate has changed and that it will further change due to our fossil fuel based economy, our transformation of the planet's surface, and the increasing number of people and their increasing wealth. But the confusion about the solutions is increasing.

Some people believe the only way is to change our way of life drastically. Give up our cars, give up our central heating, no more air travel. 'Back to the middle ages' so to speak. Some people believe that technology will give us abundant CO_2 free energy at low cost in the near future. Others think nuclear power is the only solution, because renewable energy and energy efficiency will never reduce CO_2 emissions strongly enough. For almost every possible solution to keep climate change under control there are problems to overcome. Biofuels can threaten food production and precious nature. Preserving forests may compete with land needed for food production. Wind turbines spoil the landscape. Nuclear reactors produce radioactive waste and increase the risk of proliferation of nuclear weapons. Capturing and storing CO_2 from coal fired power plants would make continued coal use compatible with stringent climate policy, but that would imply continuation of coal mining with its accidents and its air pollution. Energy efficient lamps seduce people to light up the garden. In a fuel efficient car you can drive further on the same amount of gasoline. If your refrigerator is energy efficient you can buy a bigger one. Furthermore, there are stories that these low carbon solutions will cost us a fortune and ruin our economy, that it will take a long time before they are commercially available and that for every reduction in CO_2 emissions that people in developed countries make there will be a much bigger increase in India and China. Many people have no clear picture of what it takes to solve the problem and even if it is possible to do so.

It is time to look at the facts. For that very reason this book leans heavily on the reports of the Intergovernmental Panel on Climate Change of the United Nations (IPCC). The IPCC was established in 1988 to assess and summarize our knowledge on climate change, its impacts, and ways to avoid it. Since then it has produced four big comprehensive reports and a number of smaller, more focused ones. It does its work by bringing together the best scientists, engineers, and economists of the world to critically look at all available publications. The reports of these authors are reviewed by hundreds of independent experts from around the world. At the end of the process the summary for policy makers is approved by the member governments of the IPCC by unanimity. The findings are formulated in a factual manner. No recommendations are given. The implications of certain policy decisions are outlined, but choices are always left to decision makers.

'Policy relevant, but not policy prescriptive' is the IPCC mantra. IPCC reports constitute therefore an authoritative and balanced picture of our knowledge.

Having been the co-chairman of the IPCC Working Group on Mitigation during the preparation of the Third (in 2001) and Fourth (in 2007) Assessment Report, I have seen the comprehensiveness, thoroughness and objectivity of the IPCC materials. I have therefore referred to IPCC findings extensively throughout this book. Where relevant new information was available that was not covered by the IPCC assessments, I used that. The book is my personal interpretation of the scientific facts and in no way constitutes or could be seen as being an IPCC product. In using the IPCC findings I relied on the painstaking work of the hundreds of authors that put the IPCC reports together. My task was to use their material and to tell the story of controlling climate change in a simple way. This means however that relevant details and considerations, carefully crafted statements about the uncertainty of IPCC findings, and precise references to the original literature sources are not found in this book. What I did was to point to specific sections of IPCC reports and other publications for further reading.

The book starts with a summary of our understanding of the climate system, the changes that are occurring, the prospects of further climate change, and the impact that will have on human and natural systems. It shows the huge risks of our current behaviour for the planet. It provides in a nutshell the rationale for the rest of the book that is devoted to the question of how to control climate change and limit it to manageable proportions. In chapter 2 I discuss the emissions of greenhouse gases, the main culprit of the man-made climate change we are facing. Chapter 3 looks at the question how much climate change the earth can handle and where we draw the line in terms of the amounts of greenhouse gases in the atmosphere. This chapter also shows the implications of keeping climate change under control: the need to drastically reduce our emissions of greenhouse gases, already in the short term. Before going into the major economic sectors and how they each can contribute to controlling climate change, Chapter 4 puts the problem firmly in a development context. It argues that climate change is in fact a development problem and that development in a more sustainable way also has to provide the solution. Chapters 5 to 9 then discuss specific contributions of energy supply, transportation, residential and commercial buildings, industry and waste management, and agriculture and forestry to the problem and to the solutions. Opportunities for emission reduction, the timeframe in which they are available, and the costs of achieving those reductions are discussed. Chapter 10 then puts all the bits together to present an overall economy-wide picture of strategies to keep climate change under control. It also deals with some of the cross cutting issues that are not covered by the sector based chapters. Finally, Chapters 11 and 12 address the critical question of how the opportunities to control climate change can be turned into reality, and it is made clear it will not happen automatically. Strong policy incentives are needed. Governments have a critical role to play domestically as well as internationally. The role of international agreements and the process of achieving them are therefore discussed extensively.

The book is written on the basis of the professional expertise that I gained in my capacity as IPCC Mitigation Working Group co-chair, my work for the Netherlands Environmental Assessment Agency, and before that as climate change negotiator for the

government of the Netherlands. But my motivation goes beyond the wish to share this experience. What our current knowledge tells us is that we can control climate change. We cannot completely avoid further change and further negative impacts, but we can avoid the most serious impacts of climate change, so that things remain manageable. I would like people to understand that and to see that this is possible only if strong and decisive action is taken now.

What has driven me is the strong wish to leave a liveable planet to future generations. Being blessed with having two daughters and six grandchildren, they are the personification of this liveable future. My grandchildren will likely experience the climate of the 2080s and 2090s. They will personally face the turmoil in the world when climate change gets out of control. I want to make my small contribution to save them and their generation from that.

I could not have written this book without the painstaking work of hundreds of IPCC authors who put such excellent reference material together. Nor would it have been possible without the strong support of the management and my colleagues at the Netherlands Environmental Assessment Agency where I worked for the last 10 years and where I was given the time to produce this book. I also thank the staff of the Woods Institute for the Environment at Stanford University, where I was able to make a good start with this book and of the European Climate Foundation for facilitating the competition. And last but not least I would like to thank my long-time friend and companion Mieke Woerdeman for her never-ending support and understanding while putting this book together.