The Science and Politics of Global Climate Change

A Guide to the Debate, Second Edition

The new edition of Dessler and Parson's acclaimed book provides an integrated treatment of the science, technology, economics, policy, and politics of climate change. Aimed at the educated non-specialist, and at courses in environmental policy or climate change, the book clearly lays out the scientific foundations of climate change, the issues in current policy debates, and the interactions between science and politics that make the climate change debate so contentious and confusing. This new edition is brought completely up-to-date to reflect the rapid movement of events related to climate change, including the recent findings of the Intergovernmental Panel on Climate Change (IPCC), the Stern Review on the economics of climate change, and recent policy initiatives up to the 2009 Copenhagen meeting. In addition, all sections of the book have been improved; in particular a more thorough primer on the basic science of climate change is included. The book also now integrates the discussion of contrarian claims with the discussion of current scientific knowledge, extends the discussion of cost and benefit estimates, and provides an improved glossary.

ANDREW DESSLER is a professor in the Department of Atmospheric Sciences at Texas A&M University. He received his Ph.D. in Chemistry from Harvard in 1994. He did postdoctoral work at NASA's Goddard Space Flight Center (1994–1996) and then spent nine years on the research faculty of the University of Maryland (1996–2005). In 2000, he worked as a Senior Policy Analyst in the White House Office of Science and Technology Policy, where he collaborated with Ted Parson. Dessler's academic publications include one other book: *The Chemistry and Physics of Stratospheric Ozone* (Academic Press, 2000). He has also published extensively in the scientific literature on stratospheric ozone depletion and the physics of climate.

EDWARD PARSON is Joseph L. Sax Collegiate Professor of Law and Professor of Natural Resources and Environment at the University of Michigan. His

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Praise for the First Edition

"This timely, informative and well-written book does an excellent job of explaining, in language accessible to everyone, the scientific basis for our current understanding of global warming and climate change, as well as societal implications and the political barriers to sound, rational policy. Its co-authors are well recognized experts in science and in public policy. I recommend it to anyone who wishes to gain a better understanding of this complex issue – what the debate is all about – and as a core textbook for introductory courses on the environment, climate change, or public policy"

Professor Neal Lane, Malcolm Gillis University Professor and Senior Fellow of the James A. Baker III Institute for Public Policy, Rice University. Former Science Advisor to President Clinton and former Director of the US National Science Foundation

"As the scientific evidence on human induced climate change becomes stronger and more widely accepted, voices that question it appear to get louder and seemingly more coordinated. In a complex area such as climate change, politics inevitably runs into conflict with the domain of science. This book is a timely analysis of the scientific evidence of climate change as well as the political forces that question its full acceptance. Dessler and Parson have produced a remarkable piece of work that is relevant for the scientific community in understanding the political implications of their work and for

politicians and the public at large to understand not only the overwhelming scientific evidence that has emerged in recent years, but also the remaining uncertainties that need to be addressed in future scientific endeavor. This feature alone and the simple and readable manner in which the book is written make it essential reading for scientists as well as the concerned public at large."

Dr. R.K. Pachauri, Chairman, Intergovernmental Panel on Climate Change (IPCC) and Director General, The Energy and Resources Institute (TERI), India

"… there is a real need for a comprehensive book on climate change … *The Science and Politics of Global Climate Change* is it. It does exactly what the title and subtitle promise, providing insights into the causes and effects of the contributing meteorological phenomena and into why it has been so hard to get consensus among governments … copies should be shipped to anyone who doubts the reality of climate change, starting with presidents in denial."

New Scientist

"… requires no specialised knowledge, but is accessible to any educated general reader who wants to make more sense of the climate change debate. It also sheds light on how science is used in policy debates."

The Chemical Engineer

"Each of the key aspects of global climate change is covered, with up-to-date and well-referenced information throughout. Its impressive breadth and the provision of succinct overviews of source material in the further reading sections of each chapter mean that teachers, lecturers and researchers will all find this book a useful starting point for in-depth study. There are now numerous taught masters courses on 'global change issues', and this book constitutes a must-have addition to their reading lists … read the book in its entirety – it is well worth it. …

"[This book] is an excellent attempt at deconstructing the confusion that surrounds the climate-change debate. This reviewer has been waiting some time for a book such as this to appear … The science and politics of climate change are brought together quite seamlessly … Dessler and Parson's book is a must for those who want to move beyond the rhetoric and understand the relationship between climate science and policy, and also for those seeking an interdisciplinary outlook on the management of global environmental issues. …

"This book will be most useful to undergraduates and post-graduates in the fields of environmental science, sustainability and international politics … as a primer that brings together global climate change science and politics it succeeds very well indeed."

Times Higher Education Supplement

"This is an excellent way into the subject for the beginner … one of the most lucid and readable introductory accounts of the topic that has been published in some while. As such it should be seen as a 'must-buy' and an essential addition to the library."

TENews

"This is a book which all scientists and the educated general public should read and reflect upon before it is too late to halt the apparently inevitable progress to Armageddon."

Chromatographia

"… a useful compendium of the current debates in the science and politics of climate change … succinct and consistent book … Ensure[s] fluent reading for non-expert, yet educated, citizens. The book is logically structured and it should become a key reading and teaching source in geography and environmental sciences. It can also be valuable to doctoral students and senior researchers interested in learning about climate change science and politics. Overall it is a book worth having on one's shelf."

Environmental Sciences

"As more and more extreme weather events around the globe are being associated with climate change, it is sometimes difficult to be able to see the wood for the trees, but this book takes the reader very clearly through the 'maze' of claims and counter-claims. … if only government leaders would read, digest and follow up some of the suggestions in the last chapter, there would be optimism that the problem can be overcome. As always with Cambridge University Press, the book, which is illustrated with diagrams, charts and boxes, is impeccably produced, and is an absolute 'must' for every reader of this journal."

International Journal of Meteorology

"Written by an atmospheric scientist and a law professor with extensive public policy experience, the book effectively tackles the rough-and-tumble intersection of science and policy that has led to confusion and inaction … The scholarly value of [the book] is indisputable. Dessler and Parson independently possess significant authority on both the science and the politics of climate change. Their treatment of the subject illustrates the complexity of the problem with remarkable ease and clarity … the carefully thought-through recommendations make this book critical reading for policymakers … considering action on the issue."

Maria Ivanova, The College of William and Mary

"… coverage and presentation of climate science and policy [is] commendable … a good candidate for a primer for multidisciplinary classes devoted to climate policy"

Randall M Wigle, Wilfrid Laurier University

"… both insightful and engaging … the book is also highly readable and well suited to reach a wide audience. That's good, because the gaps in understanding between scientists, policy makers, journalists, and the public remain a major barrier to the adoption of sensible responses to the problem. Dessler and Parson's book will help because it provides us with a sound and thoughtful guide to the climate change debate … It explains scientific and policy debates, discusses areas of knowledge and uncertainty regarding climate change, and offers possible policy options."

American Meteorological Society

"[Dessler and Parson] open with a powerful organizing principle for the climate and their book: to clearly distinguish between objective understanding (i.e. what we know) and subjective value judgment (i.e. what we believe should be). As a framework for thinking, this holds great promise: it curbs the potential to use ignorance to manipulate the debate, but also acknowledges the limits of scientific understanding."

Paul A. T. Higgins, Senior Fellow, American Meteorological Society Policy Program

"This important book will be as valuable to informed lay persons as to policy makers in government, industry and the wider community. While this is a political book, it is also a valid general primer about the science-policy interface. Furthermore, it serves as a model of how to clarify complex problems for lay persons through careful logic, wise choice of supporting literature, consistent definition of technical terms and clear writing."

Ecoscience

" … Dessler and Parson succeed in making both science and policy accessible to a wide readership. As someone working at the interface of science and policy, I could comfortably recommend this book to friends and colleagues. The book – which is well illustrated with easy-to-grasp figures, and which has summary tables provided at several key junctures – would also make an excellent resource for a high school or college-level survey course in either environmental studies or public policy."

Wendy S. Gordon, EOS

"Each of the key aspects of global climate change is covered, with up-to-date and well-referenced information throughout. Its impressive breadth and the provision of succinct overviews of source material in the further reading sections of each chapter mean that teachers, lecturers and researchers will all find this book a useful starting point for in-depth study."

David Reay, Edinburgh University

"Provides perhaps the most comprehensive and comprehensible analysis of the debates around climate change and is likely to become a foundational text for students, scholars, policymakers, and citizens seeking clarity on this topic. The scholarly value of *The Science and Politics of Global Climate Change* is indisputable. Dessler and Parson independently possess significant authority on both the science and the politics of climate change. Their treatment of the subject illustrates the complexity of the problem with remarkable ease and clarity. By juxtaposing the scientific and the political processes, they enrich the academic literature which has traditionally separated the two and open up new avenues for exploring policy solutions. Scientists will find value in the discussion of how their work is used by policymakers. Those knowledgeable about the politics of climate change will find value in the discussion of the science."

Global Environmental Politics

"Excellent overview of an increasingly critical issue."

Future Survey

"I found the book quite well written, with a good explanation of a suitable range of relevant scientific, 'political' and economic concepts … I believe it is a good candidate for a primer for multidisciplinary classes devoted to climate policy"

Canadian Public Policy, Randall M. Wigle, Wilfrid Laurier University

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A Guide to the Debate

SECOND EDITION

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Preface to the Second Edition

In the three years since the first edition of this book appeared, events related to climate change have moved rapidly. The fourth IPCC assessment report has documented the continued strengthening of scientific evidence for climate change, its predominant human causes, and the likely rate and risks of continuing changes. The Stern Review and subsequent debate have provoked a more serious discussion of the long-run character of climate-change risks and the appropriate way to evaluate them. The Kyoto Protocol first commitment period has arrived with many nations failing to meet their commitments, even as discussions starting in Bali in 2007 and continuing through Copenhagen in 2009 have sought to re-energize international actions. The United States has re-engaged with international efforts to build an effective response to climate change. And significant policy initiatives have been advanced by many nations, including comprehensive climate and energy legislation being considered in the US Congress. The accumulation of these events required this rewriting, even if continued rapid movement of climate-change policy and politics may mean that the summary of recent events in this edition will also have a short shelf-life.

But not everything about climate change moves fast. On the contrary, many key elements of the issue have changed little since we wrote the first edition. Although climate has many layers of variation on multiple time-scales, the basic dynamics of greenhouse-gas driven climate change operate on time-scales of decades and longer. Similarly in the energy system, the largest source of human-driven climate disruptions, the basic dynamics of capital turnover and technological change operate over decades. This is why – as we illustrate with the analogy of steering a supertanker that closes the book – most potential interventions to limit or respond to climate change only exert their full effect over decades of effort. Interventions to change course must be made well in advance of their effects, and in the face of considerable uncertainty. Scientific knowledge of

climate change also advances slowly, for the most part. Many fields of research relevant to climate change are now fairly mature, so the major uncertainties about climate change, associated risks, and potential responses are increasingly well characterized. Sudden breakthroughs that would substantially change current understanding could happen, but appear rather unlikely.

It is relative to this fast-slow tension that recent events must be understood. The core structure of the climate problem can remain essentially unchanged, even while changes in public concern, prevailing framings, and political declarations and actions have transformed its surface. So the central conclusion of the first edition remains essentially unchanged: serious action on climate change must start immediately to avoid grave risks, and the urgency for action increases and the opportunities to avoid risks at low cost decrease with each year of delay. The flood of activity now occurring in multiple nations and internationally *might* add up to that first serious step needed to begin re-orienting investment toward the required transformations – but this is not yet clear. As we discuss within, while we share the widespread hope that the climate challenge is at last truly engaged, we have little confidence in the success of the current international process. And in case current efforts continue failing to deliver the required rapid, concrete progress, we propose an alternative approach that emphasizes strong unilateral leadership, coupled with action by a small group of major nations.

In addition to updating the discussion to reflect recent developments in the science, technology, economics, policy, and politics of climate change, we have also used the opportunity to strengthen a few parts of the first edition that we found weak. The most important change is to provide a more thorough primer on the basic science of atmospheric radiation that underlies climate change. In addition, we have integrated the discussion of contrarian claims with the discussion of current scientific knowledge in Chapter 3; extended the discussion of cost and benefit estimates, including a new section elaborating on the basis of current controversies in inter-temporal valuation and discounting; and provided an improved glossary.

Beyond these changes, the aims of the book and its intended audience are unchanged. Its key contribution remains bringing together a basic presentation of issues in science, technology, economics, policy, and politics as they pertain to climate change and highlighting the interactions among these domains, to provide a well founded understanding of where we are, how we got here, and where we need to go. With this breadth, it is targeted at the educated non-specialist reader seeking an introduction to the climate-change issue. In addition, for readers who are involved in climate issues from one side or another – the science, the policy, or the politics – the book aims to help them see how their piece

fits into the bigger puzzle. In teaching, the book remains suitable for college courses at the upper-level undergraduate or introductory graduate/professional level, on climate change, environmental policy and politics, or science and public policy, with a prior course in physics, chemistry, or Earth science helpful but not necessary.

The few years since we worked on the first edition have deepened our own sense of the urgency and peril of addressing climate change. With this in mind, we dedicate our efforts in this new edition to our children: Matthew, Joshua, Alexander, and Michael. We do this in the hope that a prudent and competent global response to climate change – surely not too much to ask! – can preserve for them the opportunities for a secure, prosperous, and fulfilling life, and for connection with an undegraded natural world, that we have enjoyed.

College Station, Texas
Ann Arbor, Michigan

Preface to the First Edition

The Kyoto Protocol, the first international treaty to limit human contributions to global climate change, entered into force in February 2005. With this milestone, binding obligations to reduce the greenhouse-gas emissions that are contributing to global climate change came into effect for many of the world's industrial countries.

This event has also deepened pre-existing divisions among the world's nations that have been growing for nearly a decade. The most prominent division is between the majority of rich industrialized countries, led by the European Union and Japan, which have joined the Protocol, and the United States (joined only by Australia among the rich industrialized nations), which has rejected the Protocol as well as other proposals for near-term measures to limit greenhouse-gas emissions. Even among the nations that have joined Kyoto, there is great variation in the seriousness and timeliness of the emission-limiting measures they have adopted, and consequently in their likelihood of achieving the required reductions.

There is also a large division between the industrialized and the developing countries. The Kyoto Protocol only requires emission cuts by industrialized countries. Neither the Protocol nor the Framework Convention on Climate Change, an earlier treaty, provides any specific obligations for developing countries to limit their emissions. This has emerged as one of the sharpest points of controversy over the Protocol – a controversy that is particularly acute since the Protocol only controls industrialized-country emissions for the five-year period 2008–2012. In its present form, it includes no specific policies or obligations beyond 2012 for either industrialized or developing countries. While the Kyoto Protocol represents a modest first step toward a concrete response to climate change, there has been essentially no progress in negotiating the larger, longer-term changes that will be required to slow, stop, or reverse any human-induced climate changes that are occurring.

As these political divisions have grown sharper, public arguments concerning what we know about climate change have also grown more heated. Climate change may well be the most contentious environmental issue that we have yet seen. Follow the issue in the news or in policy debates and you will see arguments over whether or not the climate is changing, whether or not human activities are causing it to change, how much and how fast it is going to change in the future, how big and how serious the impacts will be, and what can be done – at what cost – to slow or stop it. These arguments are intense because the stakes are high. But what is puzzling, indeed troubling, about these arguments is that they include bitter public disagreements, between political figures and commentators and also between scientists, over points that would appear to be straightforward questions of scientific knowledge.

In this book, we try to clarify both the scientific and the policy arguments now being waged over climate change. We first consider the atmospheric-science issues that form the core of the climate-change science debate. We review present scientific knowledge and uncertainty about climate change and the way this knowledge is used in public and policy debate, and examine the interactions between political and scientific debate – in effect, to ask how can the climate-change debate be so contentious and so confusing, when so many of the participants say that they are basing their arguments on scientific knowledge.

We then broaden our focus, to consider the potential impacts of climate change, and the available responses – both in terms of technological options that might be developed or deployed, and in terms of policies that might be adopted. For these areas as for climate science, we review present knowledge and discuss its implications for action and how it is being used in public and policy debate. Finally, we pull these strands of scientific, technical, economic, and political argument together to present an outline of a path forward out of the present deadlock.

The book is aimed at an educated but non-specialist audience. A course or two in physics, chemistry, or Earth science might make you a little more comfortable with the exposition, but is not necessary. We assume no specific prior knowledge except the ability to read a graph. The book is suitable to support a detailed case-study of climate change in college courses on environmental policy or science and public policy. It should also be useful for scientists seeking to understand how science is used – and misused – in policy debates.

Many people have helped this project come to fruition. Helpful comments on the manuscript have been provided by David Ballon, Steve Porter, Mark Shahinian, and Scott Siff, as well as seminar participants at the University of British Columbia, the University of Michigan School of Public Health, and the University of Michigan Law School. A. E. D. received support for this project

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