

# Climate Change Reconsidered

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## 2011 Interim Report

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## From reviews of *Climate Change Reconsidered* 2009:

“With its emphasis on natural variability as a cause for the recent climate changes, it is a must-have for serious climate scientists who should not just rely on the IPCC Fourth Assessment Report alone to get the full picture of our current state of knowledge (and what is not known) about climate and climate change.”

**Anthony R. Lupo, Ph.D.**

University of Missouri-Columbia

“Their scholarly analysis brings some much-needed realism (and good old-fashioned common sense) to the climate change debate. Highly informative, *Climate Change Reconsidered* ought to be required reading for scientists, journalists, policymakers, teachers and students. It is an eye-opening read for everyone else (concerned citizens, taxpayers, etc.). In short ... this book is highly recommended!”

**William Mellberg**

Author, *Moon Missions*

“I’ve been waiting for this book for twenty years. It was a long wait, but I’m not disappointed. *Climate Change Reconsidered* is a tour de force. It takes on all the alleged evidences of catastrophic, manmade global warming and demonstrates, patiently and clearly, why they fail to support the conclusion.”

**E. Calvin Beisner, Ph.D.**

Cornwall Alliance for the Stewardship of Creation

“I strongly recommend this book to any individual who seriously wants to understand the science of climate, the effects of climate change on human health, or who needs to make decisions about policy related to greenhouse gas regulations. It should be in every library for education on these questions, as it is the best and most complete work on these subjects of its type.”

**Howard Maccabee, Ph.D., M.D.**

Alamo, California

“One of the most significant climate science documents ever produced. Coming to conclusions diametrically opposed to those of the Intergovernmental Panel on Climate Change (IPCC), the new Nongovernmental International Panel on Climate Change (NIPCC) report is essential reading for all politicians, or at least those who want to develop policies that actually benefit their countries and the environment.”

**Tom Harris**

International Climate Science Coalition

“The reports of the NIPCC and of the IPCC are very important reading for the public.... The former, an independent assessment of the claims of the latter, appears to be based on sound interpretations of solid scientific observations. One doctor is telling us that we have cancer and there is no hope (unless we kill ourselves to stop it). The other doctor has a second opinion which says maybe the symptoms are being misinterpreted; maybe we should pay more attention to actual observations and alternative explanations based on sound principles. *Climate Change Reconsidered* is must reading.”

**Ronald A. Wells, Ph.D.**

University of California, Berkeley (retired)

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## Foreword

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The Heartland Institute is pleased to partner once again with the Science and Environmental Policy Project and the Center for the Study of Carbon Dioxide and Global Change on a report that makes a serious contribution to the global debate over the causes and consequences of climate change.

Events since our last collaboration, the publication of *Climate Change Reconsidered* in 2009 (hereafter NIPCC-1), have made this new report necessary while also making the earlier report look prescient. This foreword briefly recaps how the global warming debate has changed in just the past two years.

### Recanting Alarmists, Climategate

Mike Hulme (2009), a professor of climate change in the School of Environmental Sciences at the University of East Anglia and a contributor to the Intergovernmental Panel on Climate Change (IPCC), published in 2009 a book that contained admissions of uncertainty rarely voiced by insiders of the climate change research community. Hulme wrote, “the three questions examined above—What is causing climate change? By how much is warming likely to accelerate? What level of warming is dangerous?—represent just three of a number of contested or uncertain areas of knowledge about climate change” (p. 75).

Hulme also admitted, “Uncertainty pervades scientific predictions about the future performance of global and regional climates. And uncertainties multiply when considering all the consequences that might follow from such changes in climate” (p. 83). On the subject of the IPCC’s credibility, he admitted it is “governed by a Bureau consisting of selected governmental representatives, thus ensuring that the

Panel’s work was clearly seen to be serving the needs of government and policy. The Panel was not to be a self-governing body of independent scientists” (p. 95).

These are all basic “talking points” of global warming realists, which invariably result in charges of “denial” and “industry shill” when expressed by someone not in the alarmist camp. To see them written by Hulme reveals how the debate has changed.

Just months after Hulme’s book was released, a large cache of emails was leaked by someone at the Climatic Research Unit at the University of East Anglia. “Climategate,” as it has come to be known, revealed deliberate efforts by leading scientific supporters of the IPCC, and of climate alarmism more generally, to hide flaws in their evidence and analysis, keep “skeptics” from appearing in peer-reviewed journals, and avoid sharing their data with colleagues seeking to replicate their results (Bell, 2011; Sussman, 2010; Montford, 2010). The emails reveal that important data underlying climate policy are missing or have been manipulated.

In February 2010, the BBC’s environment analyst Roger Harrabin posed a series of written questions to Philip D. Jones, director of the Climatic Research Unit (CRU) at the University of East Anglia and the person responsible for maintaining the IPCC’s all-important climate temperature records (BBC, 2010). Jones appeared to back away from many of the foundational positions of the IPCC, admitting for example:

- The rates of global warming from 1860–1880, 1910–1940 and 1975–1998, and 1975–2009 “are similar and not statistically significantly different from each other.”

- The temperature trend for the period 1995 to 2009 “is positive, but not significant at the 95% significance level.”
- When asked, “When scientists say “the debate on climate change is over”, what exactly do they mean – and what don’t they mean?” Jones replied, “It would be supposition on my behalf to know whether all scientists who say the debate is over are saying that for the same reason. I don’t believe the vast majority of climate scientists think this. This is not my view. There is still much that needs to be undertaken to reduce uncertainties, not just for the future, but for the instrumental (and especially the palaeoclimatic) past as well.”

Climategate was followed by a series of revelations that many of the key “findings” of the Fourth Assessment Report of the IPCC (IPCC-AR4) relied on non-peer-reviewed sources, sometimes little more than the newsletters of environmental advocacy groups. As a result, IPCC had to retract claims about Amazon rain forests, African crop harvests, Himalayan glaciers, trends in disaster losses, flooding in Bangladesh, and more. Evidence of these errors and more could be readily found in *Climate Change Reconsidered*, but the British media apparently preferred to “discover” and announce the errors in their own way. The media also ignored an excellent audit of all 18,531 references cited in the AR4 that found 5,587—nearly one-third—were not peer-reviewed (Laframboise et al., 2008).

### Global Warming Politics

The Climategate affair was followed by the messy global conference in Copenhagen in December 2009. It became evident that there was no political will to continue drastic restrictions on greenhouse gas emissions after the Kyoto Protocol expires in 2012. Developing nations, led by China and India, made it clear they did not intend to hamstring their economies by energy restrictions based on uncertain scientific justifications. Of course, smaller developing countries are quite happy to receive further financial subsidies from industrialized nations for the sake of “saving the climate.” This drive for subsidies will continue even if there is no successor to Kyoto.

Political leaders in European nations continue to mouth support for climate alarmism, but that support appears to be crumbling in the face of a financial crisis, the high price and small impact of renewable

energy sources, and the refusal by the United States, China, and India to participate in an emissions control regime. Japan, Canada, and Russia are abandoning negotiations for a future Kyoto Protocol, while there is still uncertainty in Australia. But one thing is certain: The Kyoto Protocol is dead.

At national and state levels in the United States, there have been major changes since 2009. The United States has never ratified the Kyoto Protocol, but there have been unilateral efforts to impose similar mandates. Those efforts peaked in 2009 when a Democrat-controlled House of Representatives passed a cap-and-trade bill. The November 2009 elections, however, put an end to Democratic control of the House, and more.

Republicans gained more seats in the House than in any election since 1938, leaving Democrats with the party’s fewest seats in the House since 1946. Even more important in terms of its impact on climate change policy were Republican gains at the state level. A record number of freshmen state legislators—1,765 out of 7,300—were elected. Republicans replaced Democrats in eight governors’ mansions and at least 675 seats in state legislatures. The number of Republican governors rose from 22 to 29, and the number of states with Republican majorities in both houses rose from 14 to 26.

The political realignment in the United States, combined with the slowest economic recovery among the world’s developed countries, means there is little chance of passing cap-and-trade legislation or a treaty for the coming two years, and probably longer. The White House and Environmental Protection Agency (EPA) seek to impose equivalent restrictions on the economy by the Clean Air Act, but EPA’s “endangerment finding,” necessary if the agency is to proceed in its regulatory efforts, is being challenged in the courts on the grounds that it is based on faulty IPCC science. Appeals are likely to continue into 2012. Meanwhile, the Republican majority in the House is doing what it can to restrict appropriations to EPA that would be used to implement greenhouse gas regulations.

### InterAcademy Council Audit of IPCC

In 2010, the Amsterdam-based InterAcademy Council (IAC), a scientific body composed of the heads of national science academies around the world, revealed crippling flaws in the IPCC’s peer-review process. The IAC reported (InterAcademy Council, 2010) that IPCC lead authors fail to give “due

consideration ... to properly documented alternative views” (p. 20), fail to “provide detailed written responses to the most significant review issues identified by the Review Editors” (p. 21), and are not “consider[ing] review comments carefully and document[ing] their responses” (p. 22).

The IAC found “the IPCC has no formal process or criteria for selecting authors” and “the selection criteria seemed arbitrary to many respondents” (p. 18). Government officials appoint scientists from their countries and “do not always nominate the best scientists from among those who volunteer, either because they do not know who these scientists are or because political considerations are given more weight than scientific qualifications” (p. 18).

The rewriting of the Summary for Policy Makers by politicians and environmental activists—a problem called out by global warming realists for many years, but with little apparent notice by the media or policymakers—is plainly admitted, perhaps for the first time by an organization in the “mainstream” of alarmist climate change thinking. “[M]any were concerned that reinterpretations of the assessment’s findings, suggested in the final Plenary, might be politically motivated,” the auditors wrote, and the scientists they interviewed commonly found the Synthesis Report “too political” (p. 25).

Note especially this description by the IAC of how the “consensus of scientists” is actually obtained by the IPCC:

Plenary sessions to approve a Summary for Policy Makers last for several days and commonly end with an all-night meeting. Thus, the individuals with the most endurance or the countries that have large delegations can end up having the most influence on the report (p. 25).

Another problem documented by the IAC that was noted in NIPCC-1 is the use of phony “confidence intervals” and estimates of “certainty” in the Summary for Policy Makers (pp. 27–34). We knew this was make-believe, almost to the point of a joke, when we first saw it in 2007. Work by J. Scott Armstrong (2006) on the science of forecasting makes it clear scientists cannot simply gather around a table and vote on how confident they are about some prediction, and then affix a number to it such as “80% confident.” Yet this is how the IPCC proceeds. The IAC authors say it is “not an appropriate way to characterize uncertainty” (p. 34), a huge

understatement. Unfortunately, the IAC authors recommend an equally fraudulent substitute, called “level of understanding scale,” which is mush-mouth for “consensus.”

The IAC authors warn, also on p. 34, that “conclusions will likely be stated so vaguely as to make them impossible to refute, and therefore statements of ‘very high confidence’ will have little substantive value.”

Finally, in a discussion of conflict of interest and disclosure, the IAC noted, “the lack of a conflict of interest and disclosure policy for IPCC leaders and Lead Authors was a concern raised by a number of individuals who were interviewed by the Committee or provided written input ... about the practice of scientists responsible for writing IPCC assessments reviewing their own work. The Committee did not investigate the basis of these claims, which is beyond the mandate of this review” (p. 46). Too bad, because these are both big issues and their presence in the report is an admission of more structural problems with the IPCC.

## **New Survey of Climate Scientists**

German scientists Dennis Bray and Hans von Storch (2010) released their latest international survey of climate scientists in 2010. The survey, which was actually conducted in 2007, consisted of 120 questions. Typical is question 11a, which asked scientists to rank “data availability for climate change analysis” on a scale from 1 (“very inadequate”) to 7 (“very adequate”). More respondents said “very inadequate” (1 or 2) than “very adequate” (6 or 7), with most responses ranging between 3 and 5. About 40 percent scored it a 3 or less. This single question and its answers imply that we need to know more about how climates actually work before we can predict future climate conditions.

The roughly bell-shaped distribution of answers is repeated for about a third of the 54 questions addressing scientific issues (as opposed to opinions about the IPCC, where journalists get their information, personal identification with environmental causes, etc.). Answers to the other questions about science were divided almost equally between distributions that lean toward skepticism and those that lean toward alarmism. What this means is that for approximately two-thirds of the questions asked, scientific opinion is deeply divided, and in half of those cases, most scientists disagree with positions

that are at the foundation of the alarmist case. This survey certainly shows no consensus on the science behind the global warming scare.

The questions for which most scientists give alarmist answers are those that ask for an opinion about the “big picture,” such as “How convinced are you that climate change poses a very serious and dangerous threat to humanity?” These questions ask about beliefs and convictions, not discrete scientific facts or knowledge. When asked questions about narrower scientific matters, scientists seem quick to admit their uncertainty.

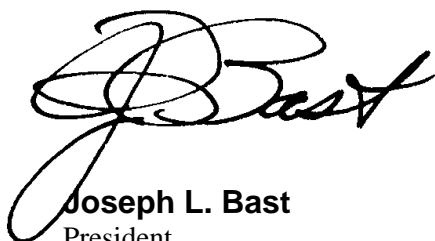
This survey, like previous ones done by Bray and von Storch, provided a fascinating look at cognitive dissonance in the scientific community. When asked, majorities of climate scientists say they do not believe the scientific claims that underlie the theory and predictions of catastrophic anthropogenic climate change, yet large majorities of those same scientists say they nevertheless believe in the theory and its

predictions. This cognitive dissonance gives rise to and sustains a popular mass delusion.

### Acknowledgements

Climate change is an interdisciplinary topic, and so it draws on the work of people in widely divergent fields of study. We have been honored to be able to work with many of the leading thinkers in the fields of physics, geology, climatology, biology, and economics. We extend our thanks and appreciation to the many scientists, economists, and other experts who helped write this report and its precursor, and to those who conducted the original research that is summarized and cited.

Funding for this effort comes from two family foundations, both requesting anonymity, and neither having any commercial interest in the topic. We thank them for their generosity. No government or corporate funds were solicited or received to support this project.



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## Preface

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This *2011 Interim Report* from the Nongovernmental International Panel on Climate Change (hereafter NIPCC-IR 2011) presents an overview of research on climate change that has appeared since publication of *Climate Change Reconsidered: The 2009 Report of the Nongovernmental International Panel on Climate Change* (Idso and Singer, 2009, hereafter NIPCC-1). Research published before 2009 is included if it did not appear in the 2009 report or provides context for the new research. Nearly all of the research summarized here appeared in peer-reviewed science journals.

The current report was coauthored by a team of scientists recruited and led by Craig D. Idso, Robert M. Carter, and S. Fred Singer. Significant contributions were provided by the lead authors and contributors identified on the title page. This team of scientists has been working since the release of NIPCC-1 on a new report currently scheduled for release in 2013. A second interim report, similar to the current report, is planned for 2012.

Being an interim compilation of research rather than a comprehensive assessment, this volume has not been formally peer reviewed. Peer review, as it has come to be exercised in the climate change debate, is controversial and difficult to define (Wegman et al., 2006). The InterAcademy Council (2010), for example, documented shortcomings in the process used by the Intergovernmental Panel on Climate Change (IPCC) for peer review of its Fourth Assessment Report (2007) (AR4), yet the IPCC continues to claim its reports were peer-reviewed. We will not make a similar mistake.

### About NIPCC

NIPCC is what its name suggests: an international panel of *nongovernment* scientists and scholars who have come together to understand the causes and consequences of climate change. Because we are not

predisposed to believe climate change is caused by human greenhouse gas emissions, we are able to look at evidence the IPCC ignores. Because we do not work for any governments, we are not biased toward the assumption that greater government activity is necessary.

Our motivation remains the same as we reported in the preface to NIPCC-1:

We donated much of our time and best efforts to produce this report out of concern that the IPCC was provoking an irrational fear of anthropogenic global warming based on incomplete and faulty science. ... While there is nothing wrong with initiatives to increase energy efficiency or diversify energy sources, they cannot be justified as a realistic means to control climate. Neither does science justify policies that try to hide the huge cost of greenhouse gas controls, such as cap and trade, a “clean development mechanism,” carbon offsets, and similar schemes that enrich a few at the expense of the rest of us.

Seeing science clearly misused to shape public policies that have the potential to inflict severe economic harm, particularly on low-income groups, we choose to speak up for science at a time when too few people outside the scientific community know what is happening, and too few scientists who know the truth have the will or the platforms to speak out against the IPCC.

NIPCC began as an informal “Team B” of persons who attended a meeting in Milan in 2003 organized by S. Fred Singer and the Science and Environmental Policy Project (SEPP). Their purpose was to produce an independent evaluation of the available scientific evidence in anticipation of the release of the IPCC’s

AR4. The organization was activated after the AR4 “Summary for Policy Makers” appeared in February 2007, and it organized an international climate workshop in Vienna in April 2007.

In 2008, SEPP partnered with The Heartland Institute to publish *Nature, Not Human Activity, Rules the Planet* (Singer 2008). In 2009, SEPP and The Heartland Institute partnered with the Center for the Study of Carbon Dioxide and Global Change to produce NIPCC-1, the first comprehensive rebuttal of the IPCC’s previous reports. That report, with contributions by 37 scientists and spanning the entire breadth of issues addressed by the IPCC, marked a decisive turning point in the global debate over climate change.

The three organizations that now constitute NIPCC decided so much new research was being produced, much of it critical of the alleged “consensus” in favor of belief in catastrophic anthropogenic global warming, that annual “interim reports” would be necessary prior to the release of NIPCC-2. Hence, the appearance of the current volume.

### New Science

The Executive Summary, which follows the Table of Contents, briefly summarizes the contents of the ten chapters of this report. On the most important issue, the IPCC’s claim that “most of the observed increase in global average temperatures since the mid-twentieth century is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations [emphasis in the original],” we once again reach the opposite conclusion, that natural causes are very likely to be dominant. Once again, we stress that we are not saying anthropogenic greenhouse gases (GHG) *cannot* produce some warming or have not in the past. Our conclusion is

that the evidence shows they are not playing a substantial role.

On the related question of the effects global warming might have on human health and the natural environment, we find the latest available research shows a warmer world would be a safer and healthier world for humans and wildlife alike. Climate change will continue to occur, regardless of whether human emissions contribute to the process, and some of those effects may be positive and some negative for human health and wildlife in different areas of the world. But the *net* effect of continued warming and rising carbon dioxide concentrations in the atmosphere is most likely to be beneficial to humans, plants, and wildlife.

### Looking Ahead

Since NIPCC-1 was published in 2009, scientific opinion, politics, and informed public opinion have shifted toward the realism presented in that volume. Other factors, including the lack of global warming and the economic recession in the United States, have contributed to growing skepticism about the scientific claims made by the IPCC.

One should not underestimate, however, the resources or momentum of the powerful interest groups that knowingly or unknowingly exaggerate the human role in climate. Some of these groups have financial stakes in maintaining climate alarmism—they include investors in “renewable energy” (solar and wind), producers of biofuels such as ethanol, financial houses and analysts, and of course environmental advocacy groups.

Our hope is that this report will help policymakers and politicians make rational decisions on climate policy and energy policy based on real science, not all-night plenary sessions. We are confident such decisions will advance economic development, expand job creation, and improve standards of living for all nations.



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Idso, C. and Singer, S.F. 2009. *Climate Change Reconsidered: The 2009 Report of the Nongovernmental International Panel on Climate Change (NIPCC)*. Chicago, IL: The Heartland Institute.

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# Executive Summary

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The current report was coauthored by a team of scientists recruited and led by Craig D. Idso, Robert Carter, and S. Fred Singer. Significant contributions were provided by the lead authors and contributors identified on the title page. This team of scientists has been working since the release of NIPCC-1 on a new comprehensive report currently scheduled for release in 2013. Being an interim compilation of research rather than a comprehensive assessment, this volume has not been formally peer-reviewed.

On the most important issue, the IPCC's claim that "most of the observed increase in global average temperatures since the mid-twentieth century is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations [emphasis in the original]," we once again reach the opposite conclusion, that natural causes are very likely to be dominant. Once again, we stress we are not saying anthropogenic greenhouse gases (GHG) *cannot* produce some warming or have not in the past. Our conclusion is that the evidence shows they are not playing a substantial role.

On the related question of the effects global warming might have on human health and the natural environment, we find the latest available research shows a warmer world would be a safer and healthier world for humans and wildlife alike. Climate change will continue to occur, regardless of whether human emissions contribute to the process, and some of those effects may be positive and some negative for human health and wildlife in different areas of the world. But

the *net* effect of continued warming and rising carbon dioxide concentrations in the atmosphere is most likely to be beneficial to humans, plants, and wildlife.

The report is divided into ten chapters that are briefly summarized here, and then more fully described in the remainder of this summary.

Chapter 1 describes problems that may be intrinsic to the global climate modeling exercise, followed by more detailed documentation of model shortcomings involving precipitation, temperature, El Niño/Southern Oscillation (ENSO), and soil moisture. We find evidence that the models over-estimate the amount of warming that occurred during the twentieth century, fail to incorporate chemical and biological processes that may be as important as the physical processes employed in the models. The models often diverge so greatly in their assumptions and findings that they cannot be said to validate each other, nor can such discordant projections be combined to produce meaningful averages.

Chapter 2 summarizes the latest research on what is known about forcings and feedbacks. While rising levels of atmospheric carbon dioxide (CO<sub>2</sub>) would increase global temperatures through its thermal radiative properties, all else being equal, all else is not equal. More CO<sub>2</sub> promotes more plant growth both on land and throughout the surface waters of the world's oceans, and this vast assemblage of plant life has the ability to affect Earth's climate in several ways, almost all of them tending to counteract the heating effects of CO<sub>2</sub>'s thermal radiative forcing.

Chapter 3 reviews the latest research on paleoclimatology and recent temperatures, finding new evidence that the Medieval Warm Period of approximately 1,000 years ago, when there was about 28 percent less CO<sub>2</sub> in the atmosphere than there is currently, was both global and warmer than today's world. Research also reveals a significant period of elevated air temperatures that immediately preceded the Little Ice Age, during a time that has come to be known as the Little Medieval Warm Period. Other

researchers have documented a decade-long cooling period following the record heat of 1998.

Chapter 4 reports the latest observations on changes in the cryosphere, oceans, precipitation, and rivers and streamflow, comparing those observations to projections made by the IPCC. The new research finds less melting of ice in the Arctic, Antarctic, and on mountaintops than previously feared, no sign of acceleration of sea-level rise in recent decades, no trend over the past 50 years in changes to the Atlantic meridional overturning circulation (MOC), and no changes in precipitation patterns or river flows that could be attributed to rising CO<sub>2</sub> levels.

Chapter 5 compares observations concerning extreme weather, such as floods, droughts, storms, and hurricanes, to projections made by the IPCC. Researchers have found extreme and destructive rainfall events were more common in many parts of the world during the Little Ice Age than they have been subsequently, contradicting the forecasts of the IPCC. Regional climate models of North America generate predictions that vary considerably among models and extend well beyond the realm of reality. Similarly, the frequency and severity of floods, droughts, and hurricanes all appear to be determined by natural processes other than anthropogenic climate change.

Chapter 6 compares observations regarding the fate of terrestrial animals to projections made by the IPCC. The IPCC assumes temperatures will rise so rapidly that many animal species will not be able to migrate poleward in latitude or upward in elevation rapidly enough to avoid extinction. New research and observational data contradict this assumption, finding instead that amphibians, birds, butterflies, other insects, lizards, mammals, and even worms benefit from global warming and its myriad ecological effects.

Chapter 7 reviews new research on the effects of rising temperatures and atmospheric CO<sub>2</sub> concentrations on plants and soils. It confirms NIPCC's earlier finding that plants benefit from both trends and increase the amount of carbon they sequester in woody tissue and root systems. Rising temperatures and atmospheric CO<sub>2</sub> concentrations, by increasing crop yields, will play a major role in averting hunger and ecological destruction in the future.

Chapter 8 examines research on the effects of rising temperature and atmospheric CO<sub>2</sub> concentrations on aquatic life. While some corals

exhibit a propensity to bleach and die when sea temperatures rise, others exhibit a positive relationship between calcification, or growth, and temperature. The latest research suggests corals and other forms of aquatic life have effective adaptive responses to climate change enabling them to flourish despite or even because of climate change.

Chapter 9 finds global warming is more likely to improve rather than harm human health because rising temperatures lead to a greater reduction in winter deaths than the increase they cause in summer deaths. The result is a large net decrease in human mortality. Climate plays a relatively small role in the spread of viral and vector-borne diseases, which suggests continued warming would not increase the incidence of diseases. Higher atmospheric CO<sub>2</sub> concentrations tend to increase the production of plant nutrients with direct medicinal value, such as antioxidants that protect cells from the damaging effects of oxidation.

Chapter 10 presents data on the economic effects of the global warming of the twentieth century, errors in how the IPCC conducts its impact analyses, and recent studies concerning biofuels and the relationship between climate and war and social unrest. It finds decades-long empirical trends of improving human well-being according to measures that are climate-sensitive, such as hunger, poverty rates, and deaths due to extreme weather events. The IPCC systematically underestimates society's adaptive capacity by failing to take into account the greater wealth and technological advances that will be present at the time for which impacts are to be estimated. Even in worst-case scenarios, mankind will be much better off in the year 2100 than it is today, and therefore able to adapt to whatever challenges climate change presents.

## **Key Findings By Chapter**

### **Chapter 1. Climate Models and Their Limitations**

- Climate models over-estimate the amount of warming that occurred during the twentieth century, fail to incorporate chemical and biological processes that may be as important as the physical processes employed in the models, and often diverge so greatly in their assumptions and findings that they cannot be said to validate each other.



## Executive Summary

- Climate models fail to correctly simulate future precipitation due to inadequate model resolution on both vertical and horizontal spatial scales, a limitation that forces climate modelers to parameterize the large-scale effects of processes that occur on smaller scales than their models are capable of simulating. This is particularly true of physical processes such as cloud formation and cloud-radiation interactions.
- The internal variability component of climate change is strong enough to overwhelm any anthropogenic temperature signal and generate global cooling periods (between 1946 and 1977) and global warming periods (between 1977 and 2008), yet models typically underestimate or leave out entirely this component, leading to unrealistic values of climate sensitivity.
- Climate models fail to predict changes in sea surface temperature and El Niño/Southern Oscillation (ENSO) events, two major drivers of the global climate. There has been little or no improvement to the models in this regard since the late-1990s.
- Climate models typically predict summer desiccation of soil with higher temperatures, but real-world data show positive soil moisture trends for regions that have warmed during the twentieth century. This is a serious problem since accurate simulation of land surface states is critical to the skill of weather and climate forecasts.
- While climate models produce a wide range of climate sensitivity estimates based on the assumptions of their builders, estimates based on real-world measurements find that a doubling of the atmosphere's CO<sub>2</sub> concentration would result in only a 0.4° or 0.5° C rise in temperature.
- tending to counteract the heating or cooling effects of CO<sub>2</sub>'s thermal radiative forcing.
- The natural environment is a major source of atmospheric aerosols, the output of which varies with temperature and CO<sub>2</sub> concentrations. Aerosols serve as condensation nuclei for clouds, and clouds affect Earth's energy budget through their ability to reflect and scatter light and their propensity to absorb and radiate thermal radiation. The cooling effect of increased emissions of aerosols from plants and algae is comparable to the warming effect projected to result from increases in greenhouse gases.
- Similarly, warming-induced increases in the emission of dimethyl sulfide (DMS) from the world's oceans would offset much or all of the effects of anthropogenic warming.
- New evidence points to a larger role for solar forcing than the IPCC has acknowledged. Likely mechanisms include perturbation of ocean currents, tropospheric zonal mean-winds, and the intensity of cosmic rays reaching the Earth.
- The IPCC underestimated the warming effect of chlorofluorocarbons (CFCs) prior to their gradual removal from the atmosphere following the implementation of the Montreal Protocol in 2000. This could mean CO<sub>2</sub> concentrations played a smaller role in the warming prior to that year, and could help explain the global cooling trend since 2000.
- Other forcings and feedbacks about which little is known (or acknowledged by the IPCC) include stratospheric water vapor, volcanic and seismic activity, and enhanced carbon sequestration.

## Chapter 2. Forcings and Feedbacks

- All else being equal, rising levels of atmospheric CO<sub>2</sub> would increase global temperatures through its thermal radiative properties. But CO<sub>2</sub> promotes plant growth both on land and throughout the surface waters of the world's oceans, and this vast assemblage of plant life has the ability to affect Earth's climate in several ways, almost all of them

## Chapter 3. Paleoclimate and Recent Temperature

- Evidence of a Medieval Warm Period (MWP) approximately 1,000 years ago, when there was about 28 percent less CO<sub>2</sub> in the atmosphere than there is currently, would show there is nothing unusual, unnatural, or unprecedented about recent temperatures. Such evidence is now overwhelming.

- New evidence not reported in NIPCC-1 finds the Medieval Warm Period occurred in North America, Europe, Asia, Africa, South America, Antarctica, and the Northern Hemisphere. Despite this evidence, Mann et al. (2009) continue to understate the true level of warming during the MWP by cherry-picking proxy and instrumental records.
- Research from locations around the world reveals a significant period of elevated air temperatures that immediately preceded the Little Ice Age, during a time that has come to be known as the Little Medieval Warm Period.
- Recent reconstructions of climate history find the human influence does not stand out relative to other, natural causes of climate change. While global warming theory and models predict polar areas would warm most rapidly, the warming of Greenland was 33 percent greater in magnitude in 1919–1932 than it was in 1994–2007, and Antarctica cooled during the second half of the twentieth century.
- Perlwitz et al. (2009) reported “a decade-long decline (1998–2007) in globally averaged temperatures from the record heat of 1998” and noted U.S. temperatures in 2008 “not only declined from near-record warmth of prior years, but were in fact colder than the official 30-year reference climatology ... and further were the coldest since at least 1996.”
- New research disputes IPCC’s claim that it has ferreted out all significant influences of the world’s many and diverse urban heat islands from the temperature databases they use to portray the supposedly unprecedented warming of the past few decades.
- After doubling during the early 2000s, annual ice discharge from the Greenland Ice Sheet slowed dramatically beginning in 2006, the result of negative feedback that mitigates against fast loss of ice in a warming climate. Scientists have concluded present-day melting rates “are not exceptional within the last 140 years” and “are not necessarily the result of anthropogenic-related warming” (Wake et al., 2009).
- Glaciers on mountaintops and in mountain valleys have been retreating since the end of the Little Ice Age and there is little evidence the rate of their retreat increased in the twentieth century. Scientists have ruled out any role for rising local air temperature in the loss of ice from the top of Mt. Kilimanjaro, identifying changes in atmospheric moisture due to logging and agriculture at the foot of the mountain as the cause.
- Mean sea level has risen at a constant rate over the past 114 years, even though the air’s CO<sub>2</sub> concentration rose about 3.8 times faster over the second half of that period as during the first half. The aerial fertilization effect of CO<sub>2</sub> stimulates biogenic contributions to marsh elevation, counterbalancing sea-level rise. Other studies find “no evidence of large-scale reductions in island area” and “reef islands are geomorphically resilient landforms that thus far have predominantly remained stable or grown in area over the last 20–60 years” (Webb and Kench, 2010).
- No trend has been found over the past 50 years in changes to the Atlantic meridional overturning circulation (MOC), despite predictions by the IPCC that warming would disrupt this important system of heat transportation through ocean basins.
- No changes in precipitation patterns, snow, monsoons, or river flows that might be considered harmful to human well-being or plants or wildlife have been observed that could be attributed to rising CO<sub>2</sub> levels. What changes have been observed tend to be beneficial.

#### **Chapter 4. Observations and Projections: Cryosphere, Ocean Dynamics, and Hydrology**

- The continent-wide snow and ice melting trend in Antarctica since 1979, when routine measurement of the phenomenon via space-borne passive microwave radiometers first began, has been negligible. New research also shows the West Antarctic Ice Sheet (WAIS) is more stable than previously thought.

## Chapter 5. Observations and Projections: Extreme Weather

- Researchers have found extreme and destructive rainfall events were more common in many parts of the world during the Little Ice Age than they have been subsequently, contradicting the forecasts of the IPCC. Regional climate models of North America generate predictions that vary considerably among models and extend well beyond the realm of reality.
- Flood frequency and severity in many areas of the world were higher historically during the Little Ice Age and other cool eras than during the twentieth century. Climate change ranks well below other contributors, such as dikes and levee construction, to increased flooding.
- Droughts are not becoming more frequent, more severe, or longer-lasting. For example, droughts in the central U.S. since 1895 have not been as severe or as long as earlier droughts, with three of the top ten most severe droughts occurring in the late sixteenth century.
- Hurricane frequency does not fluctuate linearly with global temperatures. Researchers find “no significant [tropical cyclone] trend remains using either an 1878 or a 1900 starting point” (Landsea et al., 2009). Hurricane frequency during the Medieval Warm Period was equivalent to or even greater than that of the recent past.
- Similarly, wildfire frequency and intensity does not increase linearly with global temperatures. The incidence of large forest fires has decreased during the past 150 years in Canada and Russia. Human adaptation during the industrial age appears to have overpowered any natural tendency toward increased wildfires.

## Chapter 6. Terrestrial Animals

- The basis of the IPCC’s forecasts of impending extinctions and range retractions is an assumption that temperatures will rise so rapidly that many animal species will not be able to migrate poleward in latitude or upward in elevation rapidly enough to

avoid extinction. New research and observational data contradict this assumption.

- The shortcomings associated with models predicting the impact of climate on distributions of species “are so numerous and fundamental that common ecological sense should caution us against putting much faith in relying on their findings for further extrapolations” (Dormann, 2007).
- Empirical data on amphibians, birds, butterflies, other insects, lizards, mammals, and even worms find global warming and its myriad ecological effects more often expand than contract animal habitats, ranges, and populations. Many species thrive with warmer temperatures, and while southern borders of ranges may remain stable, northern borders move poleward into previously uninhabitable regions.
- The net effect of climate change on the spread of parasitic and vector-borne diseases is complex and likely to be unpredictable. Rising temperatures increase the mortality rates as well as the development rates of many parasites of veterinary importance, and temperature is only one of many variables that influence the range of viruses and other sources of diseases.

## Chapter 7. Terrestrial Plants and Soils

- “The IPCC’s failure to report the beneficial effects of rising CO<sub>2</sub> concentrations is surprising when literally thousands of peer-reviewed journal articles exist on the subject. It is also a major defect of the IPCC report and one reason why it is not a reliable summary of the science of climate change” (NIPCC-1).
- Extensive research shows plants sequester greater amounts of carbon in woody biomass, including roots, as CO<sub>2</sub> concentrations rise. For most species studied and in most conditions, this sequestration does not slow or stop with the passage of time. Old-growth forests, for example, can sequester carbon for multiple centuries.
- Higher atmospheric CO<sub>2</sub> concentrations benefit plant growth-promoting microorganisms that help

land plants overcome drought conditions, a potentially negative aspect of future climate change. Continued atmospheric CO<sub>2</sub> enrichment should prove to be a huge benefit to plants by directly enhancing their growth rates and water use efficiencies.

- Increased plant growth leads to higher emissions of isoprene, a highly reactive non-methane hydrocarbon that is responsible for the production of tropospheric ozone, which in turn is harmful to plant and animal life. Between 1901 and 2002, climate change at the global scale was responsible for a 7 percent increase in isoprene emissions. However, rising atmospheric CO<sub>2</sub> caused a more-than-offsetting 21 percent *reduction* in those emissions. Combined with anthropogenic cropland expansion, global isoprene emissions fell 24 percent during the twentieth century (Lathiere et al., 2010).
- Rising temperatures and atmospheric CO<sub>2</sub> concentrations, by increasing crop yields, will play a major role in averting hunger without the taking of new land and water from nature. For a nominal doubling of the air's CO<sub>2</sub> concentration, for example, the productivity of Earth's herbaceous plants rises by 30 to 50 percent and the productivity of its woody plants rises by 50 to 80 percent or more. In addition, atmospheric CO<sub>2</sub> enrichment typically increases plant nutrient and water use efficiency.

## Chapter 8. Aquatic Life

- While some corals exhibit a propensity to bleach and die when sea temperatures rise, others exhibit a positive relationship between calcification, or growth, and temperature. "Such variable bleaching susceptibility implies that there is a considerable variation in the extent to which coral species are adapted to local environmental conditions" (Maynard et al., 2008).
- The latest research suggests corals have effective adaptive responses to climate change, such as symbiont shuffling, that allow reefs in some areas to flourish despite or even because of rising temperatures. Coral reefs have been able to recover

quickly from bleaching events as well as damage from cyclones.

- Bleaching and other signs of coral distress attributed to global warming are often due to other things, including rising levels of nutrients and toxins in coastal waters caused by runoff from agricultural activities on land and associated increases in sediment delivery.
- The IPCC expresses concern that rising atmospheric CO<sub>2</sub> concentrations are lowering the pH values of oceans and seas, a process called acidification, and that this could harm aquatic life. But the drop in pH values that could be attributed to CO<sub>2</sub> is tiny compared to natural variations occurring in some ocean basins as a result of seasonal variability, and even day-to-day variations in many areas. Recent estimates also cut in half the projected pH reduction of ocean waters by the year 2100 (Tans, 2009).
- Real-world data contradict predictions about the negative effects of rising temperatures, rising CO<sub>2</sub> concentrations, and falling pH on aquatic life. Studies of algae, jellyfish, echinoids, abalone, sea urchins, and coral all find no harmful effects attributable to CO<sub>2</sub> or acidification.

## Chapter 9. Human Health Effects

- Global warming is more likely to improve rather than harm human health because rising temperatures lead to a greater reduction in winter deaths than the increase they cause in summer deaths. The result is a large net decrease in human mortality.
- Climate plays a relatively small role in the spread of viral and vector-borne diseases, which suggests continued warming would not increase the incidence of diseases. Much bigger players include population growth (of both humans and domestic animals), armed conflicts, displaced populations, urbanization, and lack of reliable water systems.
- Higher atmospheric CO<sub>2</sub> concentrations tend to increase the production of plant nutrients with direct medicinal value, such as antioxidants that

protect cells from the damaging effects of oxidation. This effect has been found in wheat, Chinese broccoli, spinach, grapes, and thyme.

## Chapter 10. Economic and Other Policy Implications

- Decades-long empirical trends of climate-sensitive measures of human well-being, including the percent of developing world population suffering from chronic hunger, poverty rates, and deaths due to extreme weather events, reveal dramatic improvement during the twentieth century, notwithstanding the historic increase in atmospheric CO<sub>2</sub> concentrations.
- The magnitude of the impacts of climate change on human well-being depends on society's adaptability (adaptive capacity), which is determined by, among other things, the wealth and human resources society can access in order to obtain, install, operate, and maintain technologies necessary to cope with or take advantage of climate change impacts. The IPCC systematically underestimates adaptive capacity by failing to take into account the greater wealth and technological advances that will be present at the time for which impacts are to be estimated.
- Even accepting the IPCC's and Stern Review's worst-case scenarios, and assuming a compounded annual growth rate of per-capita GDP of only 0.7 percent, reveals that net GDP per capita in developing countries in 2100 would be double the 2006 level of the U.S. and triple that level in 2200. Thus, even developing countries' future ability to cope with climate change would be much better than that of the U.S. today.
- The IPCC's embrace of biofuels as a way to reduce greenhouse gas emissions was premature, as many researchers have found "even the best biofuels have the potential to damage the poor, the climate, and biodiversity" (Delucchi, 2010). Biofuel production consumes nearly as much energy as it generates, competes with food crops and wildlife for land, and is unlikely to ever meet more than a small fraction of the world's demand for fuels.
- The notion that global warming might cause war and social unrest is not only wrong, but even backwards – that is, global cooling has led to wars and social unrest in the past, whereas global warming has coincided with periods of peace, prosperity, and social stability.

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