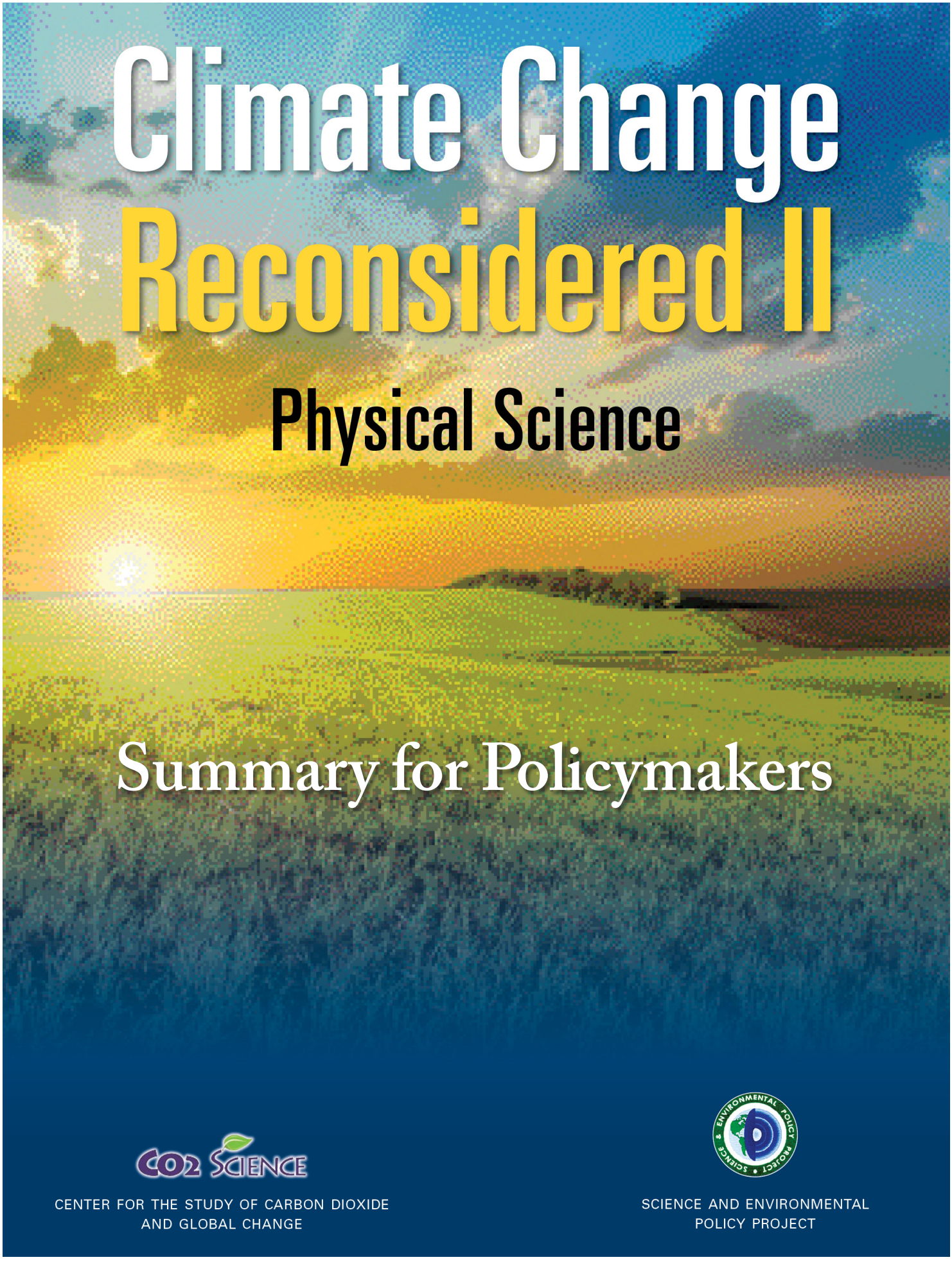

Climate Change Reconsidered II

Physical Science

Summary for Policymakers

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SCIENCE AND ENVIRONMENTAL POLICY PROJECT

About NIPCC and Its Previous Reports

The Nongovernmental International Panel on Climate Change, or NIPCC, as its name suggests, is an international panel of scientists and scholars who came together to understand the causes and consequences of climate change. NIPCC has no formal attachment to or sponsorship from any government or governmental agency. It is wholly independent of political pressures and influences and therefore is not predisposed to produce politically motivated conclusions or policy recommendations.

NIPCC seeks to objectively analyze and interpret data and facts without conforming to any specific agenda. This organizational structure and purpose stand in contrast to those of the United Nations' Intergovernmental Panel on Climate Change (IPCC), which *is* government-sponsored, politically motivated, and predisposed to believing that climate change is a problem in need of a U.N. solution.

NIPCC traces its beginnings to an informal meeting held in Milan, Italy in 2003 organized by Dr. S. Fred Singer and the Science & Environmental Policy Project (SEPP). The purpose was to produce an independent evaluation of the available scientific evidence on the subject of carbon dioxide-induced global warming in anticipation of the release of the IPCC's *Fourth Assessment Report* (AR4). NIPCC scientists concluded the IPCC was biased with respect to making future projections of climate change, discerning a significant human-induced influence on current and past climatic trends, and evaluating the impacts of potential carbon dioxide-induced environmental changes on Earth's biosphere.

To highlight such deficiencies in the IPCC's AR4, in 2008 SEPP partnered with The Heartland Institute to produce *Nature, Not Human Activity, Rules the Climate,* a summary of research for policymakers that has been widely distributed and translated into six languages. In 2009, the Center for the Study of Carbon Dioxide and Global Change joined the original two sponsors to help produce *Climate Change Reconsidered: The 2009 Report of the Nongovernmental International Panel on Climate Change (NIPCC)*, the first comprehensive alternative to the alarmist reports of the IPCC.

In 2010, a Web site (www.nipccreport.org) was created to highlight scientific studies NIPCC scientists believed would likely be downplayed or ignored by the IPCC during preparation of its next assessment report. In 2011, the three sponsoring organizations produced *Climate Change Reconsidered: The 2011 Interim Report of the Nongovernmental International Panel on Climate Change (NIPCC)*, a review and analysis of new research released since the 2009 report or overlooked by the authors of that report.

In 2013, the Information Center for Global Change Studies, a division of the Chinese Academy of Sciences, translated and published an abridged edition of the 2009 and 2011 NIPCC reports in a single volume. On June 15, the Chinese Academy of Sciences organized a NIPCC Workshop in Beijing to allow the NIPCC principal authors to present summaries of their conclusions.

In September 2013, NIPCC released *Climate Change Reconsidered II: Physical Science,* the first of two volumes bringing the original 2009 report up-to-date with research from the 2011 *Interim Report* plus research as current as the third quarter of 2013. A new Web site was created (www.ClimateChangeReconsidered.org) to feature the new report and news about its release. A second volume, *Climate Change Reconsidered II : Impacts, Adaptation, and Vulnerability*, is planned for release in 2014.

Climate Change Reconsidered II: Physical Science
2013 Report of the Nongovernmental International Panel on Climate Change (NIPCC)

Summary for Policymakers

Lead Authors/Editors:
Craig D. Idso (USA), Robert M. Carter (Australia), S. Fred Singer (USA)

Chapter Lead Authors:
Timothy Ball (Canada), Robert M. Carter (Australia), Don Easterbrook (USA), Craig D. Idso (USA), Sherwood Idso (USA), Madhav Khandekar (Canada), William Kininmonth (Australia), Willem de Lange (New Zealand), Sebastian Lüning (Germany), Anthony Lupo (USA), Cliff Ollier (Australia), Willie Soon (USA)

Contributing Authors:
J. Scott Armstrong (USA), Joseph D'Aleo (USA), Don Easterbrook (USA), Kesten Green (Australia), Ross McKitrick (Canada), Cliff Ollier (Australia), Tom Segalstad (Norway), S. Fred Singer (USA), Roy Spencer (USA)

Chapter Reviewers:
Habibullo Abdussamatov (Russia), Joe Bastardi (USA), Franco Battaglia (Italy), David Bowen (UK), Roy Clark (USA), Vincent Courtillot (France), Christopher Essex (Canada), David Evans (Australia), Sören Floderus (Denmark), Stewart Franks (Australia), Eigil Friis-Christensen (Denmark), Fred Goldberg (Sweden), Larry Gould (USA), William Gray (USA), Vincent Richard Gray (New Zealand), Howard Hayden (USA), Martin Hovland (Norway), Olavi Kärner (Estonia), James O'Brien (USA), Garth Paltridge (Australia), Donald Rapp (USA), Carl Ribbing (Sweden), Nicola Scafetta (USA), John Shade (UK), Gary Sharp (USA), Jan-Erik Solheim (Norway), Antón Uriarte Cantolla (Spain), Gerd Weber (Germany)

Editors:
S.T. Karnick (USA), Diane Carol Bast (USA)

Published for the Nongovernmental International Panel on Climate Change (NIPCC)

The Heartland INSTITUTE

Introduction

Many scientists, policymakers, and engaged citizens have become concerned over the possibility that man-made greenhouse gas emissions, in particular carbon dioxide (CO_2), may be causing dangerous climate change. A primary reason for this public alarm is a series of reports issued by the United Nations' Intergovernmental Panel on Climate Change (IPCC). The IPCC claims to know, apparently with rising certainty over time, that "most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations" (IPCC AR4 SPM, p. 10). This Summary for Policymakers summarizes and interprets a major scientific report that refutes this claim.

The Red Team Reports

A technique frequently used in industry, government, and law when dealing with complex or controversial matters is to deploy competing Green and Red Teams to pursue alternative approaches (e.g., Sandoz, 2001; Nemeth *et al.,* 2001). A Red Team provides a kind of "defense counsel" to verify and counter arguments mounted by the initial Green Team (the "prosecution") as well as discover and present alternatives the Green Team may have overlooked.

For many years, one team has dominated the global debate over climate change, the Green Team of the United Nations' Intergovernmental Panel on Climate Change (IPCC). In 2003, however, at a meeting in Milan, a Red Team started to emerge composed of independent scientists drawn from universities and private institutions around the world. Since 2008 that team, the Nongovernmental International Panel on Climate Change (NIPCC), has been independently evaluating the impacts of rising atmospheric concentrations of CO_2 on Earth's biosphere and evaluating forecasts of future climate effects (Singer, 2008; Idso and Singer, 2009; Idso, Carter, and Singer, 2011).

CCR-II: Physical Science

Climate Change Reconsidered II: Physical Science is NIPCC's latest official report. Lead authors Craig D. Idso, Robert M. Carter, and S. Fred Singer have worked with a team of some 50 scientists to produce a 1,200-page report that is comprehensive, objective, and faithful to the scientific method. It is the first of two volumes that together mirror and rebut the IPCC's Working Group 1 and Working Group 2 reports, the latter last published in 2007 (*Fourth Assessment Report*, or AR4) and expected to be updated and released in 2013 and 2014 (*Fifth Assessment Report*, or AR5). The second volume of *CCR-II* will address impacts, adaptation, and vulnerabilities.

Like the IPCC's reports, NIPCC's reports cite thousands of articles appearing in peer-reviewed science journals relevant to the subject of human-induced climate change. For *CCR-II: Physical Science,* NIPCC presents its findings in seven chapters:

Global Climate Models
Forcings and Feedbacks
Solar Forcing of Climate
Observations: Temperature Records
Observations: The Cryosphere
Observations: The Hydrosphere and Oceans
Observations: Extreme Weather

In keeping with its Red Team mission, NIPCC authors paid special attention to contributions that were either overlooked by the IPCC or that contain data,

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discussion, or implications arguing against the IPCC's claim that dangerous global warming is resulting, or will result, from human-related greenhouse gas emissions. Figure 1 on the following page summarizes NIPCC's principal findings. Most notably, its authors say the IPCC has exaggerated the amount of warming likely to occur if the concentration of atmospheric CO_2 were to double, and such warming as occurs is likely to be modest and cause no net harm to the global environment or to human well-being.

This Summary for Policymakers was written in collaboration with the lead authors and approved by them. It reproduces in a series of figures the executive summary of *Climate Change Reconsidered II: Physical Science,* which appears at the beginning of that book. Because it is aimed at a larger and more popular audience than the book itself, this summary adds a discussion of the scientific method and the precautionary principle, a brief summary and critical analysis of each of the IPCC's main lines of argument, and a brief set of recommendations for policymakers.

1. Methodology

The IPCC relies on three lines of reasoning: computer models that it asserts show CO_2 to be responsible for most of the global warming in the twentieth century, a series of postulates that make a plausible case for its hypothesis, and circumstantial evidence that would be consistent with its hypothesis were it true. These IPCC arguments are summarized in Figure 2.

The Scientific Method

Although the IPCC's reports are voluminous and their arguments impressively persistent, it is legitimate to ask whether that makes them good science. In order to conduct an investigation, scientists must first formulate a falsifiable hypothesis to test. The hypothesis implicit in all IPCC writings, though rarely explicitly stated, is that *dangerous global warming is resulting, or will result, from human-related greenhouse gas emissions.*

In considering any such hypothesis, an alternative and *null* hypothesis must be entertained, which is the simplest hypothesis consistent with the known facts. Regarding global warming, the null hypothesis is that *currently observed changes in global climate indices and the physical environment, as well as current changes in animal and plant characteristics, are the result of natural variability.* To invalidate this null hypothesis requires, at a minimum, direct evidence of human causation of specified changes that lie outside usual, natural variability. Unless and until such evidence is adduced, the null hypothesis is assumed to be correct.

In contradiction of the scientific method, the IPCC assumes its implicit hypothesis is correct and that its only duty is to collect evidence and make plausible arguments in the hypothesis's favor. One probable reason for this behavior is that the United Nations protocol under which the IPCC operates defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (United Nations, 1994, Article 1.2). Not surprisingly, directing attention to only the effects of human greenhouse gas emissions has resulted in the IPCC failing to provide a thorough analysis of climate change in the round.

All three of the IPCC's lines of reasoning, summarized in Figure 2, depart from proper scientific methodology. Global climate models produce meaningful results only if we assume we already know perfectly how the global climate works, and most climate scientists say we do not (Bray and von Storch, 2010). Moreover, it is widely recognized that climate models are not designed to produce *predictions* of future climate but rather what-if *projections* of many alternative possible futures (Trenberth, 2009). Postulates, commonly defined as "something suggested or assumed as true as the basis for reasoning, discussion, or belief," can stimulate relevant observations or experiments but more often are merely assertions that are difficult or impossible to test (Kahneman, 2011). Observations in science are useful primarily to falsify hypotheses and cannot prove one is correct (Popper, 1965, p. vii).

The Precautionary Principle

Facing such criticism of its methodology and a lack of compelling evidence of dangerous warming, the IPCC's defenders often invoke the precautionary principle. The principle states: "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation" (United Nations, 1992, Principle 15). This is a sociological precept rather than a scientific one and lacks the intellectual rigor necessary for use in policy formulation (Goklany, 2001).

FIGURE 1
Summary of NIPCC's Findings

- Atmospheric carbon dioxide (CO_2) is a mild greenhouse gas that exerts a diminishing warming effect as its concentration increases.
- Doubling the concentration of atmospheric CO_2 from its pre-industrial level, in the absence of other forcings and feedbacks, would likely cause a warming of ~0.3 to 1.1°C, almost 50% of which must already have occurred.
- A few tenths of a degree of additional warming, should it occur, would not represent a climate crisis.
- Model outputs published in successive IPCC reports since 1990 project a doubling of CO_2 could cause warming of up to 6°C by 2100. Instead, global warming ceased around the end of the twentieth century and was followed (since 1997) by 16 years of stable temperature.
- Over recent geological time, Earth's temperature has fluctuated naturally between about +4°C and -6°C with respect to twentieth century temperature. A warming of 2°C above today, should it occur, falls within the bounds of natural variability.
- Though a future warming of 2°C would cause geographically varied ecological responses, no evidence exists that those changes would be net harmful to the global environment or to human well-being.
- At the current level of ~400 ppm we still live in a CO_2-starved world. Atmospheric levels 15 times greater existed during the Cambrian Period (about 550 million years ago) without known adverse effects.
- The overall warming since about 1860 corresponds to a recovery from the Little Ice Age modulated by natural multidecadal cycles driven by ocean-atmosphere oscillations, or by solar variations at the de Vries (~208 year) and Gleissberg (~80 year) and shorter periodicities.
- Earth has not warmed significantly for the past 16 years despite an 8% increase in atmospheric CO_2, which represents 34% of all extra CO_2 added to the atmosphere since the start of the industrial revolution.
- CO_2 is a vital nutrient used by plants in photosynthesis. Increasing CO_2 in the atmosphere "greens" the planet and helps feed the growing human population.
- No close correlation exists between temperature variation over the past 150 years and human-related CO_2 emissions. The parallelism of temperature and CO_2 increase between about 1980 and 2000 AD could be due to chance and does not necessarily indicate causation.
- The causes of historic global warming remain uncertain, but significant correlations exist between climate patterning and multidecadal variation and solar activity over the past few hundred years.
- Forward projections of solar cyclicity imply the next few decades may be marked by global cooling rather than warming, despite continuing CO_2 emissions.

Source: "Executive Summary," *Climate Change Reconsidered II: Physical Science* (Chicago, IL: The Heartland Institute, 2013).

FIGURE 2

IPCC's Three Lines of Argument

GLOBAL CLIMATE MODEL PROJECTIONS

IPCC modelers assume Global Climate Models (GCMs) are based on a perfect knowledge of all climate forcings and feedbacks. They then assert:

- A doubling of atmospheric CO_2 would cause warming of up to 6°C.
- Human-related CO_2 emissions caused an atmospheric warming of at least 0.3°C over the past 15 years.
- Enhanced warming (a "hot spot") should exist in the upper troposphere in tropical regions.
- Both poles should have warmed faster than the rest of Earth during the late twentieth century.

POSTULATES

Postulates are statements that assume the truth of an underlying fact that has not been independently confirmed or proven. The IPCC postulates:

- The warming of the twentieth century cannot be explained by natural variability.
- The late twentieth century warm peak was of greater magnitude than previous natural peaks.
- Increases in atmospheric CO_2 precede, and then force, parallel increases in temperature.
- Solar forcings are too small to explain twentieth century warming.
- A future warming of 2°C or more would be net harmful to the biosphere and human well-being.

CIRCUMSTANTIAL EVIDENCE

Circumstantial evidence does not bear directly on the matter in dispute but refers to circumstances from which the occurrence of the fact might be inferred. The IPCC cites the following circumstantial evidence it says is consistent with its hypothesis:

- Unusual melting is occurring in mountain glaciers, Arctic sea ice, and polar icecaps.
- Global sea level is rising at an enhanced rate and swamping tropical coral atolls.
- Droughts, floods, and monsoon variability and intensity are increasing.
- Global warming is leading to more, or more intense, wildfires, rainfall, storms, hurricanes, and other extreme weather events.
- Unusual melting of Boreal permafrost or sub-seabed gas hydrates is causing warming due to methane release.

The hypothesis of human-caused global warming comes up short not merely of "full scientific certainty" but of reasonable certainty or even plausibility. The weight of evidence now leans heavily against the theory. Invoking the precautionary principle does not lower the required threshold for evidence to be regarded as valid nor does it answer the most important questions about the causes and consequences of climate change. Scientific principles acknowledge the supremacy of experiment and observation and do not bow to instinctive feelings of alarm nor claims of a supposed scientific "consensus" (Legates *et al.*, 2013). The formulation of effective public environmental policy must be rooted in evidence-based science, not an over-abundance of precaution (More and Vita-More, 2013; U.K. House of Commons Science and Technology Committee, 2006).

Contradictions about methodology and the verity of claimed facts make it difficult for unprejudiced lay persons to judge for themselves where the truth actually lies in the global warming debate. This is one of the primary reasons why politicians and commentators rely so heavily on supposedly authoritative statements issued by one side or another in the public discussion. Arguing from authority, however, is the antithesis of the scientific method. Attempting to stifle debate by appealing to authority hinders rather than helps scientific progress and understanding.

2. Global Climate Models

In contrast to the scientific method briefly described in Section 1, computer models (called Global Climate Models or GCMs) represent speculative thought experiments by modellers who often lack a detailed understanding of underlying processes. The results of GCMs are only as reliable as the data and theories "fed" into them, which scientists widely recognize as being seriously deficient. If natural climate forcings and feedback are not perfectly understood, then GCMs become little more than an exercise in curve-fitting, or changing parameters until the outcomes match the modeller's expectations. As John von Neumann is reported to have once said, "with four parameters I can fit an elephant, and with five I can make him wiggle his trunk" (Dyson, 2004).

The science literature is replete with admissions by leading climate modellers that forcings and feedback are not sufficiently well understood, that data are insufficient or too unreliable, and that computer power is insufficient to resolve important climate processes. Many important elements of the climate system cannot be properly simulated by the current generation of models, including atmospheric pressure, wind, clouds, temperature, precipitation, ocean currents, sea ice, and permafrost.

The major known deficiencies include model calibration, non-linear model behavior, and the omission of important natural climate-related variability. Model calibration is faulty as it assumes all temperature rise since the start of the industrial revolution has resulted from human CO_2 emissions. In reality, major human-related emissions commenced only in the mid-twentieth century. Non-linear climate models exhibit chaotic behavior. As a result, individual simulations ("runs") may show differing trend values (Singer, 2013b). Internal climate oscillations (AMO, PDO, etc.) are major features of the historic temperature record, yet GCM models do not even attempt to simulate them. Similarly, the models fail to incorporate the effects of variations in solar magnetic field or in the flux of cosmic rays, both phenomena known to significantly affect climate.

In general, GCMs perform poorly when their projections are assessed against empirical data. Specifically, the following forecasts made by GCMs have been falsified by real-world data:

- *IPCC Claim #1: A doubling of atmospheric CO_2 would cause warming between 3°C and 6°C.* The increase in radiative forcing produced by a doubling of atmospheric CO_2 is generally agreed to be 3.7 Wm^{-2}. Equating this forcing to temperature requires taking account of both positive and negative feedbacks. IPCC models incorporate a strong positive feedback from increasing water vapor but exclude negative feedbacks such as a concomitant increase in low-level clouds – hence they project a warming effect of 3°C or more.

The IPCC ignores mounting evidence that climate sensitivity to CO_2 is much lower than its models assume. Empirical tests of climate sensitivity to increasing atmospheric CO_2 indicate negative feedbacks predominate and associated warming is likely an order of magnitude less than the IPCC projects (Spencer and Braswell, 2008; Lindzen and Choi, 2011). Atmospheric methane (CH_4) levels are rising more slowly than predicted and nitrous oxide (N_2O) emissions are expected to fall as CO_2 concentrations and temperatures rise, a negative climate feedback not taken into account by the IPCC.

Other forcings and feedbacks the IPCC has failed to take into account include increases in low-level clouds in response to enhanced atmospheric water vapor, ocean emissions of dimethyl sulfide (DMS), and the presence and total cooling effect of both natural and industrial aerosols. These natural processes are likely to offset most

or even all of any warming caused by rising CO_2 concentrations. Figure 3 summarizes these and other findings about forcings and feedbacks appearing in Chapter 2 of *CCR-II: Physical Science*.

- *IPCC Claim #2: CO_2 caused an atmospheric warming of at least 0.3°C over the past 15 years.* The IPCC's authors compare the output of unforced (and incomplete) models with a dataset that represents twentieth century global temperature (HadCRUT, British Meteorological Office). Finding a greater warming trend in the dataset than in model projections, the false conclusion is then drawn that this "excess" warming must be caused by human-related greenhouse forcing. In reality, no excess warming has been demonstrated, first because this line of argument assumes models have perfect knowledge, information, and power, which they do not. And second, because a wide variety of datasets other than the HadCRUT global air temperature curve favored by the IPCC do not exhibit a warming trend during the second half of the twentieth century. See Figure 4.

- *IPCC Claim #3: A thermal hot spot should exist in the upper troposphere in tropical regions.* Observations from both weather balloon radiosondes and satellite MSU sensors show the opposite, with either flat or decreasing warming trends with increasing height in the troposphere (Douglass *et al.*, 2007; Singer, 2011; Singer, 2013a).

- *IPCC Claim #4: Both polar regions should have warmed faster than the rest of Earth during the late twentieth century.* Late-twentieth century warming occurred in many Arctic locations and also over a limited area of the West Antarctic Peninsula, but the large polar East Antarctic Ice Sheet has been cooling since at least the 1950s (O'Donnell *et al.*, 2010).

More facts about climate models and their limitations reported in Chapter 1 of *CCR-II: Physical Science* are reported in Figure 5.

We conclude the current generation of GCMs are unable to make accurate projections of climate even 10 years ahead, let alone the 100-year period that has been adopted by policy planners. The output of such models should therefore not be used to guide public policy formulation until they have been validated and shown to have predictive value.

FIGURE 3
Key Facts about Temperature Forcings and Feedbacks

- A doubling of CO_2 from pre-industrial levels (from 280 to 560 ppm) would likely produce a temperature forcing of 3.7 Wm^{-2} in the lower atmosphere, for about ~1°C of *prima facie* warming.
- IPCC models stress the importance of positive feedback from increasing water vapor and thereby project warming of ~3-6°C, whereas empirical data indicate an order of magnitude less warming of ~0.3-1.0°C.
- In ice core samples, changes in temperature precede parallel changes in atmospheric CO_2 by several hundred years; also, temperature and CO_2 are uncoupled through lengthy portions of the historical and geological records; therefore CO_2 cannot be the primary forcing agent for most temperature changes.
- Atmospheric methane (CH_4) levels for the past two decades fall well below the values projected by the IPCC in its *Assessment Reports*. The IPCC's temperature projections incorporate these inflated CH_4 estimates and need downward revision accordingly.
- The melting of permafrost or submarine gas hydrates is not likely to emit dangerous amounts of methane at current rates of warming.
- Nitrous oxide (N_2O) emissions are expected to fall as CO_2 concentrations and temperatures rise, indicating it acts as a negative climate feedback.
- Other negative feedbacks on climate sensitivity that are either discounted or underestimated by the IPCC include increases in low-level clouds in response to enhanced atmospheric water vapor, increases in ocean emissions of dimethyl sulfide (DMS), and the presence and total cooling effect of both natural and industrial aerosols.

*Source: "*Chapter 2. Forcings and Feedbacks," *Climate Change Reconsidered II: Physical Science* (Chicago, IL: The Heartland Institute, 2013).

FIGURE 4
Lack of Evidence for Rising Temperatures

The difference in surface temperatures between 1942–1995 and 1979–97, as registered by datasets that represent land, oceanic, and atmospheric locations.

LAND SURFACE	Global (IPCC, HadCRUT)	+0.5° C
	United States (GISS)	~zero
OCEAN	Sea surface temperature (SST)[1]	~zero
	SST Hadley NMAT	~zero
ATMOSPHERE	Satellite MSU (1979–1997)	~zero
	Hadley radiosondes (1979–97)	~zero
PROXIES	Mostly land surface temperature[2]	~zero

Unless otherwise indicated, data is drawn from the nominated government agencies.
[1]Gouretski *et al., GRL,* 2012; [2]Anderson *et al., GRL,* 2013.

3. Postulates

Figure 2 identifies five postulates at the base of the IPCC's claim that global warming is resulting, or will result, from anthropogenic greenhouse gas emissions. All five are readily refuted by real-world observations.

- *IPCC Postulate #1: The warming of the twentieth century cannot be explained by natural variability.* Temperature records contain natural climate rhythms that are not well summarized or defined by fitting straight lines through arbitrary portions of a fundamentally rhythmic, non-stationary data plot. In particular, linear fitting fails to take account of meteorological-oceanographical-solar variations that are well established to occur at multidecadal and millennial time scales. Even assuming, wrongly, that global temperatures would have been unchanging in the absence of man-made greenhouse gas emissions, the correctness of IPCC's assertion depends upon the period of time considered (Davis and Bohling, 2001). For example, temperatures have been *cooling* since 8,000 and 2,000 years ago; *warming* since 20,000 years ago, and also since 1850 and since 1979; and *static* (no net warming or cooling) between 700 and 150 AD and since 1997 AD.

Global warming during the twentieth century occurred in two pulses, between 1910–1940 and 1975–2000, at gentle rates of a little over 1.5°C/century (British Meteorological Office, 2013). In contrast, natural warming at some individual meteorological stations during the 1920s proceeded at high rates of up to 4°C/decade or more (Chylek *et al.,* 2004). The first period (1910–1940) represents rates of global warming that are fully natural (having occurred prior to the major build-up of greenhouse gases in the atmosphere), whereas measurements made during the late twentieth century warming are likely exaggerated by inadequate correction for the urban heat island effect.

Comparison of modern and ancient rates of natural temperature change is difficult because of the lack of direct measurements available prior to 1850. However, high-quality proxy temperature records from the Greenland ice core for the past 10,000 years demonstrate a natural range of warming and cooling rates between +2.5 and -2.5 °C/century (Alley, 2000; Carter, 2010, Fig. 7), significantly greater than rates measured for Greenland or the globe during the twentieth century.

- *IPCC Postulate #2: The late twentieth century warm peak was of greater magnitude than previous natural peaks.* The glaciological and recent geological records contain numerous examples of ancient temperatures up to 3°C or more warmer than the peak reported at the end of the twentieth century. During the Holocene, such warmer peaks included the Egyptian, Minoan, Roman, and Medieval warm periods (Alley, 2000). During the Pleistocene, warmer peaks were associated with interglacial oxygen isotope stages 5, 9, 11, and 31 (Lisiecki and Raymo, 2005). During the Late Miocene

FIGURE 5
Key Facts about Global Climate Models

- Climate models project an atmospheric warming of at least 0.3°C over the past 15 years; in fact, temperature stasis or slight cooling has occurred.
- Climate models project an ocean warming of at least 0.2°C since 2000; in fact, no warming is observed.
- Climate models project the appearance of an upper troposphere hot-spot in tropical regions; none is observed.
- Climate models project late twentieth century warming should have occurred towards both poles; in fact, warming was confined to north polar regions.
- Climate models generally assume a climate sensitivity of 3°C for a doubling of CO_2 above preindustrial values, whereas meteorological observations are consistent with a sensitivity of 1°C or less.
- Climate models underestimate surface evaporation caused by increased temperature by a factor of 3, resulting in a consequential underestimation of global precipitation.
- Climate models represent aerosol-induced changes in infrared (IR) radiation inadequately, despite studies showing different mineral aerosols (for equal loadings) can cause differences in surface IR flux between 7 and 25 Wm^{-2}.
- Deterministic climate models have inherent properties that make dynamic predictability impossible; introduction of techniques to deal with this (notably parameterization) introduces bias into model projections.
- Limitations in computing power restrict climate models from resolving important climate processes; low-resolution models fail to capture many important regional and lesser-scale phenomena such as clouds.
- Model calibration is faulty, as it assumes all temperature rise since the start of the industrial revolution has resulted from human CO_2 emissions; in reality, major human-related emissions commenced only in the mid-twentieth century.
- Non-linear climate models exhibit chaotic behavior. As a result, individual simulations ("runs") may show differing trend values.
- Internal climate oscillations (AMO, PDO, etc.) are major features of the historic temperature record; climate models do not even attempt to simulate them.
- Similarly, climate models fail to incorporate the effects of variations in solar magnetic field or in the flux of cosmic rays, both of which are known to significantly affect climate.

*Source: "*Chapter 1. Global Climate Models and Their Limitations," *Climate Change Reconsidered II: Physical Science* (Chicago, IL: The Heartland Institute, 2013).

and Early Pliocene (6–3 million years ago) temperature consistently attained values 2–3°C above twentieth century values (Zachos *et al.*, 2001).

Figure 6 summarizes these and other findings about surface temperatures that appear in Chapter 4 of *CCR-II: Physical Science.*

- *IPCC Postulate #3: Increases in atmospheric CO_2 precede, and then force, parallel increases in temperature.* The remarkable (and at first blush, synchronous) parallelism that exists between rhythmic fluctuations in ancient atmospheric temperature and atmospheric CO_2 levels was first detected in polar ice core samples analyzed during the 1970s. From the early 1990s

FIGURE 6
Key Facts about Surface Temperature

- Whether today's global surface temperature is seen to be part of a warming trend depends upon the time period considered.
- Over (climatic) time scales of many thousand years, temperature is cooling; over the historical (meteorological) time scale of the past century temperature has warmed. Over the past 16 years, there has been no net warming despite an increase in atmospheric CO_2 of 8% – which represents 34% of all human-related CO_2 emissions released to the atmosphere since the industrial revolution.
- Given an atmospheric mixing time of ~1 year, the facts just related represent a test of the dangerous warming hypothesis, which test it fails.
- Based upon the HadCRUT dataset favored by the IPCC, two phases of warming occurred during the twentieth century, between 1910–1940 and 1979–2000, at similar rates of a little over 1.5°C/century. The early twentieth century warming preceded major industrial carbon dioxide emissions, and must be natural; warming during the second (*prima facie*, similar) period might incorporate a small human-related carbon dioxide effect, but warming might also be inflated by urban heat island effects.
- Other temperature datasets fail to record the late twentieth century warming seen in the HadCRUT dataset (Figure 3).
- There was nothing unusual about either the magnitude or rate of the late twentieth century warming pulses represented on the HadCRUT record, both falling well within the envelope of known, previous natural variations.
- No empirical evidence exists to support the assertion that a planetary warming of 2°C would be net ecologically or economically damaging.

*Source: "*Chapter 4. Observations: Temperatures," *Climate Change Reconsidered II: Physical Science* (Chicago, IL: The Heartland Institute, 2013).

onward, however, higher-resolution sampling has repeatedly shown these historic temperature changes precede the parallel changes in CO_2 by several hundred years or more (Mudelsee, 2001). A similar relationship of temperature change leading CO_2 change (in this case by several months) also characterizes the much shorter seasonal cyclicity manifest in Hawaiian and other meteorological measurements (Kuo *et al*., 1990). In such circumstances, changing levels of CO_2 cannot be driving changes in temperature, but must either be themselves stimulated by temperature change, or be co-varying with temperature in response to changes in another (at this stage unknown) variable.

- *IPCC Postulate #4: Solar forcings are too small to explain twentieth century warming.* IPCC authors have concluded solar forcing alone is inadequate to account for twentieth century warming, inferring CO_2 must be responsible for the remainder. Nonetheless, observations indicate variations occur in total ocean–atmospheric meridional heat transport and that these variations are driven by changes in solar radiation rooted in the intrinsic variability of the Sun's magnetic activity (Soon and Legates, 2013).

Incoming solar radiation is most often expressed as Total Solar Insolation (TSI), a measure derived from multi-proxy measures of solar activity (Hoyt and Schatten, 1993; extended and re-scaled by Willson, 2011; Scafetta and Willson, 2013). The newest estimates, from satellite-borne ACRIM-3 measurements, indicate TSI ranged between 1360 and 1363 Wm^{-2} between 1979 and 2011, the variability of ~3 Wm^{-2} occurring in parallel with the 11-year sunspot cycle. Larger changes in TSI are also known to occur in parallel with climatic change over longer time scales. For instance, Shapiro *et al*. (2011) estimated the TSI change between the Maunder Minimum and current conditions may have been as large as 6 Wm^{-2}.

Temperature records from circum-Arctic regions of the Northern Hemisphere show a close correlation with TSI over the past 150 years, with both measures conforming to the ~60–70 year multidecadal cycle. In contrast, the measured steady rise of CO_2 emissions over the same period shows little correlation with the strong multidecadal (and shorter) ups and downs of surface temperature around the world.

Finally, the IPCC ignores x-ray, ultraviolet, and magnetic flux variation, the latter having particularly important implications for the modulation of galactic cosmic ray influx and low cloud formation (Svensmark, 1988; Kirkby, *et al*., 2011). Figure 7 summarizes these and other findings about solar forcings from Chapter 3 of *CCR-II: Physical Science.*

- *IPCC Postulate #5: Warming of 2°C above today's temperature would be harmful.* The suggestion that 2°C

FIGURE 7
Key Facts about Solar Forcing

- Evidence is accruing that changes in Earth's surface temperature are largely driven by variations in solar activity. Examples of solar-controlled climate change epochs include the Medieval Warm Period, Little Ice Age and Early Twentieth Century (1910–1940) Warm Period.
- The Sun may have contributed as much as 66% of the observed twentieth century warming, and perhaps more.
- Strong empirical correlations have been reported from all around the world between solar variability and climate indices including temperature, precipitation, droughts, floods, streamflow, and monsoons.
- IPCC models do not incorporate important solar factors such as fluctuations in magnetic intensity and overestimate the role of human-related CO_2 forcing.
- The IPCC fails to consider the importance of the demonstrated empirical relationship between solar activity, the ingress of galactic cosmic rays, and the formation of low clouds.
- The respective importance of the Sun and CO_2 in forcing Earth climate remains unresolved; current climate models fail to account for a plethora of known Sun-climate connections.
- The recently quiet Sun and extrapolation of solar cycle patterns into the future suggest a planetary cooling may occur over the next few decades.

*Source: "*Chapter 3. Solar Forcing of Climate," *Climate Change Reconsidered II: Physical Science* (Chicago, IL: The Heartland Institute, 2013).

of warming would be harmful was coined at a conference organized by the British Meteorological Office in 2005 (DEFRA, 2005). The particular value of 2°C is entirely arbitrary and was proposed by the World Wildlife Fund as a political expediency rather than as an informed scientific opinion. The target was set in response to concern that politicians would not initiate policy actions to reduce CO_2 emissions unless they were given quantitative temperature targets to aim for.

Multiple lines of evidence suggest a 2°C rise in temperature would not be harmful to the biosphere. The period termed the Holocene Climatic Optimum (c. 8,000 ybp) was 2–3°C warmer than today (Alley, 2000), and the planet attained similar temperatures for several million years during the Miocene and Pliocene (Zachos *et al.*, 2001). Biodiversity is encouraged by warmer rather than colder temperatures (Idso and Idso, 2009), and higher temperatures and elevated CO_2 greatly stimulate the growth of most plants (Idso and Idso, 2011).

Despite its widespread adoption by environmental NGOs, lobbyists, and governments, no empirical evidence exists to substantiate the claim that 2°C of warming presents a threat to planetary ecologies or environments. Nor can any convincing case be made that a warming will be more economically costly than an equivalent cooling (either of which could occur unheralded for entirely natural reasons), since any planetary change of 2°C magnitude in temperature would result in complex local and regional changes, some being of economic or environmental benefit and others being harmful.

We conclude neither the rate nor the magnitude of the reported late twentieth century surface warming (1979–2000) lay outside normal natural variability, nor was it in any way unusual compared to earlier episodes in Earth's climatic history. Furthermore, solar forcings of temperature change are likely more important than is currently recognized, and evidence is lacking that a 2° C increase in temperature (of whatever cause) would be globally harmful.

4. Circumstantial Evidence

As its third line of reasoning, the IPCC presents circumstantial evidence regarding natural phenomena known to vary with temperature. The examples the IPCC chooses to report invariably point to a negative impact on plant and animal life and human well-being. When claims are made that such phenomena are the result of anthropogenic global warming, almost invariably at least one of the following three requirements of scientific confidence are lacking:

(1) *Correlation does not establish causation.* Correlation of, say, a declining number of polar bears and a rising temperature does not establish causation between one and the other, for it is not at all unusual for two things to co-vary in parallel with other forcing factors.

(2) *Control for natural variability.* We live on a dynamic planet in which all aspects of the physical and biological environment are in a constant state of flux for reasons that are entirely natural (including, of course, temperature change). It is wrong to assume no changes would occur in the absence of the human presence. Climate, for example, will be different in 100 years regardless of what humans do or don't do.

(3) *Local temperature records that confirm warming.* Many studies of the impact of climate change on wildlife simply assume temperatures have risen, extreme weather events are more frequent, etc., without establishing that the relevant local temperature records conform to the postulated simple long-term warming trend.

All five of the IPCC's claims relying on circumstantial evidence listed in Figure 2 are refutable.

- *IPCC Claim #1: Unusual melting is occurring in mountain glaciers, Arctic sea ice and polar icecaps.* What melting is occurring in mountain glaciers, Arctic sea ice and polar icecaps is not occurring at "unnatural" rates and does not constitute evidence of a human impact on the climate. Both the Greenland (Johannessen *et al.*, 2005; Zwally *et al.*, 2005) and Antarctic (Zwally and Giovinetto, 2011) icecaps are close to balance. The global area of sea ice today is similar to that first measured by satellite observation in 1979 (Humlum, 2013) and significantly exceeds the ice cover present in former, warmer times.

Valley glaciers wax and wane on multidecadal, centennial, and millennial time-scales, and no evidence exists that their present, varied behavior falls outside long-term norms or is related to human-related CO_2 emissions (Easterbrook, 2011). Figure 8 summarizes the findings of Chapter 5 of *CCR-II: Physical Science* regarding glaciers, sea ice, and polar icecaps.

- *IPCC Claim #2: Global sea level is rising at an enhanced rate and swamping tropical coral atolls.* Sea-level rise is not accelerating (Houston and Dean, 2011). The global average sea-level continues to increase at its long-term rate of 1–2 mm/year globally (Wöppelmann *et al.*, 2009). Local and regional sea levels continue to exhibit typical natural variability – in some places rising and in others falling. Unusual sea-level rise is therefore not drowning Pacific coral islands, nor are the islands being abandoned by "climate refugees."

The best available data show dynamic variations in Pacific sea level vary in accord with El Niño-La Niña cycles, superimposed on a natural long-term eustatic rise (Australian Bureau of Meteorology, 2011). Island coastal flooding results not from sea level rise, but from spring tides or storm surges in combination with development pressures such as borrow pit digging or groundwater withdrawal. Persons emigrating from the islands are doing so for social and economic reasons rather than in response

FIGURE 8
Key Facts about the Cryosphere

- Satellite and airborne geophysical datasets used to quantify the global ice budget are short and the methods involved in their infancy, but results to date suggest both the Greenland and Antarctic Ice Caps are close to balance.
- Deep ice cores from Antarctica and Greenland show climate change occurs as both major glacial-interglacial cycles and as shorter decadal and centennial events with high rates of warming and cooling, including abrupt temperature steps.
- Observed changes in temperature, snowfall, ice flow speed, glacial extent, and iceberg calving in both Greenland and Antarctica appear to lie within the limits of natural climate variation.
- Global sea-ice cover remains similar in area to that at the start of satellite observations in 1979, with ice shrinkage in the Arctic Ocean since then being offset by growth around Antarctica.
- During the past 25,000 years (late Pleistocene and Holocene) glaciers around the world have fluctuated broadly in concert with changing climate, at times shrinking to positions and volumes smaller than today.
- This fact notwithstanding, mountain glaciers around the world show a wide variety of responses to local climate variation, and do not respond to global temperature change in a simple, uniform way.
- Tropical mountain glaciers in both South America and Africa have retreated in the past 100 years because of reduced precipitation and increased solar radiation; some glaciers elsewhere also have retreated since the end of the Little Ice Age.
- The data on global glacial history and ice mass balance do not support the claims made by the IPCC that CO_2 emissions are causing most glaciers today to retreat and melt.

*Source: "*Chapter 5. Observations: The Cryosphere," *Climate Change Reconsidered II: Physical Science* (Chicago, IL: The Heartland Institute, 2013).

to environmental threat.

Another claim concerning the effect of climate change on oceans is that increases in freshwater runoff into the oceans will disrupt the global thermohaline circulation system. But the range of natural fluctuation in the global ocean circulation system has yet to be fully delineated (Srokosz *et al.*, 2012). Research to date shows no evidence for changes that lie outside previous natural variability, nor for any malign influence from increases in human-related CO_2 emissions. See Figure 9 for more findings about climate change and oceans from Chapter 6 of *CCR-II: Physical Science.*

- *IPCC Claim #3: Droughts, floods, and monsoon variability and intensity are increasing.* The link between warming and drought is weak, and pan evaporation (a measurement that responds to the effects of several climate elements) decreased over the twentieth century (Roderick *et al*., 2009). Huntington (2008) concluded on a globally averaged basis precipitation over land increased by about 2% over the period 1900–1998. However, changes in the hydrosphere of this type are regionally highly variable and show a closer correlation with multidecadal climate rhythmicity than they do with global temperature (Zanchettin *et al*., 2008).

Monsoon intensity correlates with variations in solar activity rather than increases in atmospheric CO_2, and both the South American and Asian monsoons became more active during the cold Little Ice Age and less active during the Medieval Warm Period (Vuille *et al*., 2012), suggesting there would be less volatility if the world becomes warmer. See Figure 9 for more facts about monsoons, droughts, and floods presented in Chapter 6 of *CCR-I: Physical Science.*

- *IPCC Claim #4: Global warming is leading to more, or more intense, wildfires, rainfall, storms, hurricanes, and other extreme weather events.* One of the few areas where the IPCC has distanced itself from the popular but false claims made by many environmentalists and politicians relates to extreme weather events. In 2012, an IPCC report acknowledged that a relationship between global warming and wildfires, rainfall, storms, hurricanes, and other extreme weather events has not been demonstrated (IPCC, 2012). The NIPCC team's analysis agrees. In no case has a convincing relationship been established between warming over the past 100 years and increases in any of these extreme events. Instead, the number and intensity of extreme events vary, and they wax and wane from one place to another and often in

FIGURE 9
Key Facts about the Hydrosphere

Oceans

- Knowledge of local sea-level change is vital for coastal management; such change occurs at widely variable rates around the world, typically between about +5 and -5 mm/year.
- Global (eustatic) sea level, knowledge of which has only limited use for coastal management, rose at an average rate of between 1 and 2 mm/year over the past century.
- Satellite altimeter studies of sea-level change indicate rates of global rise since 1993 of over 3 mm/year, but complexities of processing and the infancy of the method precludes viewing this result as secure.
- Rates of global sea-level change vary in decadal and multidecadal ways and show neither recent acceleration nor any simple relationship with increasing CO_2 emissions.
- Pacific coral atolls are not being drowned by extra sea-level rise; rather, atoll shorelines are affected by direct weather and infrequent high tide events, ENSO sea level variations, and impacts of increasing human populations.
- Extra sea-level rise due to heat expansion (thermosteric rise) is also unlikely given that the Argo buoy network shows no significant ocean warming over the past 9 years (Knox and Douglass, 2010).
- Though the range of natural variation has yet to be fully described, evidence is lacking for any recent changes in global ocean circulation that lie outside natural variation or were forced by human CO_2 emissions.

Monsoons, Droughts, and Floods

- Little evidence exists for an overall increase in global precipitation during the twentieth century independent of natural multidecadal climate rhythmicity.
- Monsoon precipitation did not become more variable or intense during late twentieth century warming; instead, precipitation responded mostly to variations in solar activity.
- South American and Asian monsoons were more active during the cold Little Ice Age and less active during the Medieval Warm Period. Neither global nor local changes in streamflow have been linked to CO_2 emissions.
- The relationship between drought and global warming is weak, since severe droughts occurred during both the Medieval Warm Period and the Little Ice Age.

*Source: "*Chapter 6. Observations: The Hydrosphere," *Climate Change Reconsidered II: Physical Science* (Chicago, IL: The Heartland Institute, 2013).

parallel with natural decadal or multidecadal climate oscillations. Figure 10 summarizes key facts on this subject presented in Chapter 7 of *CCR-II: Physical Science*.

- *IPCC Claim #5: Unusual melting of Boreal permafrost or sub-seabed gas hydrates is causing warming due to methane release.* Over historic time, methane concentration has increased from about 700 ppb in the eighteenth century to the current level of near 1,800 ppb. The increase in methane concentration levelled off between 1998 and 2006 at around 1,750 ppb, which may reflect measures taken at that time to stem leakage from wells, pipelines, and distribution facilities (Quirk, 2010). More recently, since about 2007, methane concentrations have started to increase again, possibly due to a combination of leaks from new shale gas drilling and Arctic permafrost decline.

The contribution of increased methane to radiation forcing since the eighteenth century is estimated to be only 0.7 Wm^{-2}, which is small. And in any case, no evidence exists that current changes in Arctic permafrost are other than natural. Most of Earth's gas hydrates occur at low saturations and in sediments at such great depths below the seafloor or onshore permafrost that they will barely be affected by warming over even one thousand years.

We conclude no unambiguous evidence exists for adverse changes to the global environment caused by human-related CO_2 emissions. In particular, the cryosphere is not melting at an enhanced rate; sea-level rise is not accelerating; no systematic changes have been documented in evaporation or rainfall or in the magnitude or intensity of extreme meteorological events; and an increased release of methane into the atmosphere from permafrost or sub-seabed gas hydrates is unlikely.

FIGURE 10
Key Facts about Extreme Weather Events

- Air temperature variability decreases as mean air temperature rises, on all time scales.
- Therefore the claim that global warming will lead to more extremes of climate and weather, including of temperature itself, seems theoretically unsound; the claim is also unsupported by empirical evidence.
- Although specific regions have experienced significant changes in the intensity or number of extreme events over the twentieth century, for the globe as a whole no relationship exists between such events and global warming over the past 100 years.
- Observations from across the planet demonstrate that droughts have not become more extreme or erratic in response to global warming. In most cases, the worst droughts in recorded meteorological history were much milder than droughts that occurred periodically during much colder times.
- There is little to no evidence that precipitation will become more variable and intense in a warming world, indeed some observations show just the opposite.
- There has been no significant increase in either the frequency or intensity of stormy weather in the modern era.
- Despite the supposedly "unprecedented" warming of the twentieth century, there has been no increase in the intensity or frequency of tropical cyclones globally or in any of the specific ocean basins.
- The commonly held perception that twentieth century warming was accompanied by an increase in extreme weather events is a misconception fostered by excessive media attention, and has no basis in facts (Khandekar, 2013).

*Source: "*Chapter 7. Observations: Extreme Weather," *Climate Change Reconsidered II: Physical Science* (Chicago, IL: The Heartland Institute, 2013).

5. Policy Recommendations

The Green Team–Red Team strategy outlined in the introduction presumes the existence of decision-makers in industry and government who make sensible policy decisions in light of the best-available research. Therefore, while a useful way to discover and expose all sides of an argument, a two-team strategy is not usually enough on its own to resolve an issue.

To date, most government signatories to the UN's Framework Convention on Climate Change have deferred to the monopoly advice of the IPCC in setting their national climate change policies. More than 20 years down the track, it is now evident this approach has been mistaken. One result has been the expenditure of hundreds of billions of dollars implementing energy policies that now appear to have been unnecessary, or at least ill-timed and ineffective.

The scientific findings of the NIPCC team point toward several policy recommendations quite different from those that have come from the IPCC and its related

agencies, bureaus, and commissions at the United Nations. We make the following recommendations:

- Climate-hazard response plans should take into account long-term trends, but the benefits should be suitably discounted and investments delayed until action is necessary and likely to be cost-effective. The risks created by longer-term climate change occur over periods of decades to hundreds or thousands of years. Urgent action to "stop global warming" is not needed, and in fact will almost certainly be wasteful or damaging to civil and economic liberties.

- Rather than rely exclusively on the IPCC for scientific advice, policymakers should seek out advice from independent, nongovernment organizations and scientists who are free of financial and political conflicts of interest. The Chinese Academy of Sciences took an important step in this direction by translating and publishing an abridged edition of the first two volumes in NIPCC's *Climate Change Reconsidered* series.

- Climate change, whether man-made or not, is a global phenomenon with very different effects on different parts of the world. Individual nations should take charge of setting their own climate policies based upon the hazards that apply to their particular geography, geology, weather, and culture – as India has started to do by setting up an advisory Indian Network on Comprehensive Climate Change Assessment (INCCCA) (Nelson, 2010).

- Recognize the theoretical hazard of dangerous human-caused global warming is but one small part of a much wider climate hazard – the extreme *natural* weather and climatic events that Nature intermittently presents us with, and always will (Carter, 2010). The 2005 Hurricane Katrina disaster in the U.S., the 2007 floods in the United Kingdom, and the tragic bushfires in Australia in 2009 demonstrate the governments of even advanced, wealthy countries are often inadequately prepared for climate-related disasters of natural origin.

- Climate change as a natural hazard is as much a geological as it is a meteorological issue. Geological hazards are mostly dealt with by providing civil defense authorities and the public with accurate, evidence-based information regarding events such as earthquakes, volcanic eruptions, tsunamis, storms, and floods (which represent climatic as well as weather events), and then planning to mitigate and adapt to the effects when such events occur.

The idea that there can be a one-size-fits-all global solution to address future climate change, such as recommended by the United Nations, fails to deal with real climate and climate-related hazards. It also turned climate change into a political issue long before the science was sufficiently advanced to inform policy-makers. A better path forward was suggested by Ronald Brunner and Amanda Lynch:

> We need to use adaptive governance to produce response programs that cope with hazardous climate events as they happen, and that encourage diversity and innovation in the search for solutions. In such a fashion, the highly contentious "global warming" problem can be recast into an issue in which every culture and community around the world has an inherent interest (Brunner and Lynch, 2010).

Conclusion

Few scientists deny that human activities can have an effect on local climate or that the sum of such local effects could hypothetically rise to the level of an observable global signal. The key questions to be answered, however, are whether the human global signal is large enough to be measured and if it is, does it represent, or is it likely to become, a dangerous change outside the range of natural variability?

NIPCC's conclusion, drawn from its extensive review of the scientific evidence, is that any human global climate signal is so small as to be embedded within the background variability of the natural climate system and is not dangerous. At the same time, global temperature change is occurring, as it always naturally does. A phase of temperature stasis or cooling has succeeded the mild twentieth century warming. It is certain that similar natural climate changes will continue to occur.

In the face of such facts, the most prudent climate policy is to prepare for and adapt to extreme climate events and changes regardless of their origin. Adaptive planning for future hazardous climate events and change should be tailored to provide responses to the known rates, magnitudes, and risks of natural change. Once in place, these same plans will provide an adequate response to any human-caused change that may or may not emerge.

Policymakers should resist pressure from lobby groups to silence scientists who question the authority of the IPCC to claim to speak for "climate science." *Climate Change Reconsidered II: Physical Science* reveals a scientific community deeply uncertain about the reliability of the IPCC's computer models, its postulates,

and its interpretation of circumstantial evidence. This criticism doesn't come from a "fringe" of the climate science community: It is stated plainly and repeated in thousands of articles in the peer-reviewed literature.

The distinguished British biologist Conrad Waddington wrote in 1941,

> It is … important that scientists must be ready for their pet theories to turn out to be wrong. Science as a whole certainly cannot allow its judgment about facts to be distorted by ideas of what ought to be true, or what one may hope to be true (Waddington, 1941).

This prescient statement merits careful examination by those who continue to assert the fashionable belief, in the face of strong empirical evidence to the contrary, that human CO_2 emissions are going to cause dangerous global warming.

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Authors, Contributors, and Reviewers of *CCR-II: Physical Science*

Lead Authors/Editors

Idso, Craig D.
Center for the Study of Carbon Dioxide and Global Change
USA

Carter, Robert M.
Emeritus Fellow
Institute of Public Affairs
Australia

Singer, S. Fred
Science and Environmental Policy Project
USA

Chapter Lead Authors

Ball, Timothy
Research Fellow
Frontier Centre for Public Policy
Canada

Carter, Robert M.
Emeritus Fellow
Institute of Public Affairs
Australia

Easterbrook, Don J.
Professor Emeritus of Geology
Western Washington University
USA

Idso, Craig D.
Center for the Study of Carbon Dioxide and Global Change
USA

Idso, Sherwood
Center for the Study of Carbon Dioxide and Global Change
USA

Khandekar, Madhav
Former Research Scientist
Environment Canada
Canada

Kininmonth, William
Science Advisor
Australian Climate Science Coalition
Australia

de Lange, Willem
Science and Engineering Department
The University of Waikato
New Zealand

Lüning, Sebastian
Geologist and Author
Germany

Lupo, Anthony
School of Natural Resources
University of Missouri
USA

Ollier, Cliff
School of Earth and Geographical Sciences
University of Western Australia
Australia

Soon, Willie
Independent Scientist
USA

Contributing Authors

Armstrong, J. Scott
Wharton School
University of Pennsylvania
USA

D'Aleo, Joseph
Co-chief Meteorologist
Weatherbell Analytic
USA

Easterbrook, Don J.
Professor Emeritus of Geology
Western Washington University
USA

Green, Kesten
International Graduate School of Business
University of South Australia
Australia

McKitrick, Ross
Department of Economics
University of Guelph
Canada

Ollier, Cliff
School of Earth and Geographical Sciences
University of Western Australia
Australia

Segalstad, Tom
Resource and Environmental Geology
University of Oslo
Norway

Singer, S. Fred
Science and Environmental Policy Project
USA

Spencer, Roy
Principal Research Scientist
University of Alabama in Huntsville
USA

Chapter Reviewers

Abdussamatov, Habibullo
Space Research Laboratory
Pulkovo Observatory
Russian Academy of Sciences
Russia

Bastardi, Joe
Co-chief Meteorologist
Weatherbell Analytic
USA

Battaglia, Franco
Professor of Environmental Chemistry
University of Modena
Italy

Bowen, David Q.
Professor Emeritus, School of Earth & Ocean Sciences
Cardiff University
UK

Clark, Roy
Ventura Photonics
USA

Courtillot, Vincent
Professor Emeritus
University Paris Diderot and
Institut de Physique du Globe
France

Essex, Christopher
Department of Applied Mathematics
University of Western Ontario
Canada

Evans, David
Independent Scientist, Sciencespeak.com, and Former Carbon Modeller
Australian Greenhouse Office
Australia

Floderus, Sören
Consultant
SF Bureau
Denmark

Franks, Stewart W.
School of Engineering
University of Newcastle
Australia

Friis-Christensen, Eigil
Professor Emeritus
National Space Institute
Technical University of Denmark
Denmark

Goldberg, Fred
Swedish Polar Institute
Sweden

Gould, Laurence
Professor of Physics
University of Hartford
USA

Gray, William
Emeritus Professor of Atmospheric Science
Colorado State University
USA

Gray, Vincent Richard
Climate Consultant
New Zealand

Hayden, Howard
Professor of Physics Emeritus
University of Connecticut
USA

Hovland, Martin
Professor Emeritus
Centre for Geobiology
University of Bergen
Norway

Kärner, Olavi
Atmospheric Sensing Group
Tartu Observatory
Estonia

O'Brien, James
Department of Earth, Ocean, and Atmospheric Science
Florida State University
USA

Paltridge, Garth
Emeritus Professor and Honorary Research Fellow
University of Tasmania
Australia

Rapp, Donald
Senior Research Scientist and Division Chief Technologist (retired)
Jet Propulsion Lab
USA

Ribbing, Carl
Department of Engineering Sciences, Solid State Physics
Uppsala University
Sweden

Scafetta, Nicola
Department of Physics
Duke University
USA

Shade, John
Industrial Statistics Consultant
UK

Sharp, Gary
Independent Consultant
Center for Climate/
Ocean Resources Study
USA

Solheim, Jan-Erik
Professor Emeritus
Department of Physics and Technology
University of Tromsø
Norway

Uriarte Cantolla, Antón
Sociedad de Ciencias Naturales Aranzadi
Spain

Weber, Gerd-Rainer
Independent Meteorologist
Germany

Editors

Karnick , S.T.
The Heartland Institute
USA

Bast, Diane Carol
The Heartland Institute
USA

Reviews of *Climate Change Reconsidered II: Physical Science*

"I fully support the efforts of the Nongovernmental International Panel on Climate Change (NIPCC) and publication of its latest report, *Climate Change Reconsidered II: Physical Science,* to help the general public to understand the reality of global climate change."

Kumar Raina
Former Deputy Director General
Geological Survey of India

"I was glad to see that a new report was coming from the NIPCC. The work of this group of scientists to present the evidence for natural climate warming and climate change is an essential counter-balance to the biased reporting of the IPCC. They have brought to focus a range of peer-reviewed publications showing that natural forces have in the past and continue today to dominate the climate signal. Considering the recent evidence that climate models have failed to predict the flattening of the global temperature curve, and that global warming seems to have ended some 15 years ago, the work of the NIPCC is particularly important."

Ian Clark
Department of Earth Sciences
University of Ottawa, Canada

"The CCR-II report correctly explains that most of the reports on global warming and its impacts on sea-level rise, ice melts, glacial retreats, impact on crop production, extreme weather events, rainfall changes, etc. have not properly considered factors such as physical impacts of human activities, natural variability in climate, lopsided models used in the prediction of production estimates, etc. There is a need to look into these phenomena at local and regional scales before sensationalization of global warming-related studies."

S. Jeevananda Reddy
Former Chief Technical Advisor
United Nations World Meteorological Organization

"NIPCC's CCR-II report should open the eyes of world leaders who have fallen prey to the scandalous climate dictates by the IPCC. People are already suffering the consequences of sub-prime financial instruments. Let them not suffer more from IPCC's sub-prime climate science and models. That is the stark message of the NIPCC's CCR-II report."

M. I. Bhat
Formerly Professor and Head
Department of Geology and Geophysics
University of Kashmir

"The claim by the UN IPCC that 'global sea level is rising at an enhanced rate and swamping tropical coral atolls' does NOT agree with observational facts, and must hence be discarded as a serious disinformation. This is well taken in the CCR-II report."

Nils-Axel Mörner
Emeritus Professor of Paleogeophysics & Geodynamics,
Stockholm University, Sweden

"Library shelves are cluttered with books on global warming. The problem is identifying which ones are worth reading. The NIPCC's CCR-II report is one of these. Its coverage of the topic is comprehensive without being superficial. It sorts through conflicting claims made by scientists and highlights mounting evidence that climate sensitivity to carbon dioxide increase is lower than climate models have until now assumed."

Chris de Freitas
School of Environment
The University of Auckland, New Zealand

"*Climate Change Reconsidered* is simply the most comprehensive documentation of the case against climate alarmism ever produced. Basing policy on the scientifically incomplete and internally inconsistent reports of the UN's Intergovernmental Panel on Climate Change is no longer controversial – *Climate Change Reconsidered* shows that it is absolutely foolhardy, and anyone doing so is risking humiliation. It is a must-read for anyone who is accountable to the public, and it needs to be taken very, very seriously."

Patrick J. Michaels
Director, Center for the Study of Science
Cato Institute

"CCR-II provides scientists, policy makers and other interested parties information related to the current state of knowledge in atmospheric studies. Rather than coming from a pre-determined politicized position that is typical of the IPCC, the NIPCC constrains itself to the scientific process so as to provide objective information. If we (scientists) are honest, we understand that the study of atmospheric processes/dynamics is in its infancy. Consequently, the work of the NIPCC and its most recent report is very important. It is time to move away from politicized science back to science – this is what NIPCC is demonstrating by example."

Bruce Borders
Professor of Forest Biometrics
Warnell School of Forestry and Natural Resources
University of Georgia

"The NIPCC's new report, *Climate Change Reconsidered II: Physical Science*, fires a scientific cannon shot across the bow of the quasi-religious human-caused global warming movement by presenting data, facts, and scientific method constructs of climate change science. I only wish the IPCC would become as objective. A recent column by a nationally recognized writer recalled Syria outlawing yo-yos in 1933 because they thought that yo-yo motion caused drought. The NIPCC report documents that the AGW movement has created its own yo-yo rather than shedding light on how Earth dynamic systems change with time. I applaud the NIPCC for bringing the scientific method back into what should always have been a scientific debate.

Lee C. Gerhard
Senior Scientist Emeritus, University of Kansas
Past Director and State Geologist
Kansas Geological Survey

"I support [the work of the NIPCC] because I am convinced that the whole field of climate and climate change urgently needs an open debate between several 'schools of thought,' in science and well as other disciplines , many of which jumped on the IPCC bandwagon far too readily. Climate, and even more so impacts and responses, are far too complex and important to be left to an official body like the IPCC."

Sonja A.Boehmer-Christiansen
Reader Emeritus, Department of Geography
Hull University
Editor, *Energy&Environment*

"The NIPCC report *Climate Change Reconsidered II* is a crucial document to get science right: Billions of $$ are being spent in research based on the assumption that human emissions of CO_2 drive dangerous climate change. Contemplating relevant peer-reviewed scientific literature, the CCR-II shows us why this basic assumption is wrong, turning irrelevant for society the results of a considerable part of the costly research carried out by the 'consensus scientific community' endorsing IPCC climate alarmism."

Albrecht Glatzle
Agro-Biologist
Retired Director of Research, INTTAS

THE NONGOVERNMENTAL INTERNATIONAL PANEL ON CLIMATE CHANGE

The Nongovernmental International Panel on Climate Change (NIPCC) is an international network of scientists first convened in 2003 to examine the same climate data used by the United Nations-sponsored Intergovernmental Panel on Climate Change (IPCC). Unlike the IPCC, the NIPCC is not a government agency and does not receive government funding. Whereas the mission of the IPCC is to justify control of greenhouse gas emissions, the NIPCC has no agenda other than discovering the truth about climate change.

CLIMATE CHANGE RECONSIDERED

Climate Change Reconsidered is a publication series produced by NIPCC and published by The Heartland Institute. Distinguished coauthors Craig D. Idso, Robert M. Carter, and S. Fred Singer have assembled and oversee an international team of scholars devoted to producing a thorough and unbiased review of the extensive research on climate change. Three volumes were published prior to the present publication: *Nature, Not Human Activity, Rules the Climate* (2008), *Climate Change Reconsidered: The 2009 Report of the Nongovernmental International Panel on Climate Change (NIPCC)* (2009), and *Climate Change Reconsidered: The 2011 Interim Report of the Nongovernmental International Panel on Climate Change (NIPCC)* (2011). All are available for purchase from The Heartland Institute and for free online at www.ClimateChangeReconsidered.org and www.nipccreport.org.

CCR-II: PHYSICAL SCIENCE

The current report, *Climate Change Reconsidered II: Physical Science,* is the most comprehensive and up-to-date review of climate science available from scientists free of bias caused by political interference. *CCR-II* combines the research and analysis of previous volumes in the series with new research published as recently as the third quarter of 2013 (well after the cut-off date for the IPCC's *Fifth Assessment Report*). Compared with past editions, this volume offers an expanded analysis of computer models, solar cycles, observed temperatures, and extreme weather. A second volume of *CCR-II*, on impacts, adaptation, and vulnerabilities, is planned for release in March 2014.

ABOUT THE COAUTHORS

Dr. Craig D. Idso is founder and chairman of the Center for the Study of Carbon Dioxide and Global Change. Since 1998, he has been the editor and chief contributor to the online magazine *CO2 Science.* He is the author of several books, including *The Many Benefits of Atmospheric CO_2 Enrichment* (2011) and *CO_2, Global Warming and Coral Reefs* (2009). His writing, which has appeared in many peer-reviewed journals, books, and independent reports, has addressed the benefits of atmospheric CO_2 enrichment on plant and animal life, ocean acidification, world food supplies, plant and animal extinctions, and the seasonal cycle of atmospheric CO_2. He has lectured in meteorology at Arizona State University (ASU) and was a faculty researcher in the Office of Climatology at ASU.

Dr. Robert M. Carter is a stratigrapher and marine geologist with degrees from the University of Otago (New Zealand) and University of Cambridge (England). His research publications include papers on taxonomic palaeontology, palaeoecology, New Zealand and Pacific geology, stratigraphic classification, sequence stratigraphy, sedimentology, the Great Barrier Reef, Quaternary geology, and sea level and climate change. He is the author of *Climate: The Counter Consensus* (2010) and *Taxing Air: Facts and Fallacies About Climate Change* (2013). Carter's professional service includes terms as head of the Geology Department, James Cook University, chairman of the Earth Sciences Panel of the Australian Research Council, chairman of the national Marine Science and Technologies Committee, and director of the Australian Office of the Ocean Drilling Program. He is currently an Emeritus Fellow of the Institute of Public Affairs (Melbourne).

Dr. S. Fred Singer is one of the most distinguished atmospheric physicists in the U.S. He established and served as the first director of the U.S. Weather Satellite Service, now part of the National Oceanographic and Atmospheric Administration (NOAA), and earned a U.S. Department of Commerce Gold Medal Award for his technical leadership. He later served as vice chairman of the National Advisory Committee for Oceans and Atmosphere. He is coauthor, with Dennis T. Avery, of *Unstoppable Global Warming Every 1,500 Years* (2007, second ed. 2008). Since retiring from the University of Virginia and from his last federal position as chief scientist of the Department of Transportation, Singer founded and directs the nonprofit Science and Environmental Policy Project.

One South Wacker Drive #2740
Chicago, IL 60606
www.heartland.org