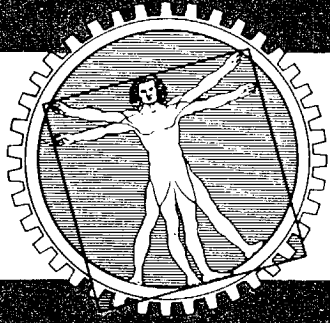


# Science, Technology



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## Global Climate Change: The State of the Debate

### Editor's Note:

*The following essay is the common product of 12 undergraduate students from across the United States who participated in the Global Climate Change and Society Program ([www.colorado.edu/Research/GCCS](http://www.colorado.edu/Research/GCCS)) during the summer of 2001. Through their research on issues related to global climate change, the students concluded that the core question of uncertainty does not lie within climate science, but comes instead from an inability to predict human activity. Based on that observation, this article issues a call for a much more wide-ranging discussion of the values relevant to how we live with each other and how we collectively inhabit the world.*

Robert Frodeman and Mark Bullock  
Co-Directors, Global Climate Change & Society Program

You pick up the morning paper and see a story about global warming on the front page. Reading the article over breakfast, you learn that global warming is definitely occurring. The article cites excessive anthropogenic releases of carbon dioxide as the cause of global temperature increases. Along with further increases in average global temperature, the article prophesies that global warming will cause extreme weather conditions, the spread of vector-borne disease, and an increase in social injustice.

The following morning, your paper carries an op-ed piece whose headline announces a message directly opposing the article from the day before. Perplexed, you sit down to your breakfast and read. The article argues for alternative, non-human causes of global warming. A companion article denies global warming is happening at all. You find yourself deeply confused and leave the house for work, unsure what to think.

This is a problem that confronts all of America on a daily basis. A recent article in the *Milwaukee*

*Journal Sentinel* [Franzen, 2001] painted a clear picture of the polarized global climate change debate:

Some environmentalists argue that global warming is a dire threat to human survival and could in the worst-case scenarios result in massive flooding, droughts and destructive storms. Some critics of global warming theory argue that it's all bunk; that all the science isn't in yet; that trying to meet this particular imagined threat will result in untold economic devastation.

You are not alone in finding yourself exhausted by the give and take of global climate change discussions. Uncertainty about global warming in the United States has resulted in an atmosphere of widespread confusion, paralyzing political progress in addressing the issue.

When all the arguments for and against global warming are pruned back to their roots, it becomes apparent the debate revolves around climate science.

Though some areas of climate science are uncertain, the scientific community has agreed upon a number of facts related to climate change. In 1988, the United Nations and the World Meteorological Organization established the Intergovernmental Panel on Climate Change (IPCC), an international body composed of atmospheric scientists whose purpose is, among other things, to gather and assess evidence for global warming (<http://www.ipcc.ch/>).

Since the IPCC studies began, consensus has grown on the following points: (1) the global average temperature is rising; (2) concentrations of greenhouse gases in the atmosphere are increasing; (3) greenhouse gases cause warming of the atmosphere by trapping and re-radiating thermal heat back toward earth; and (4) the consequences of global warming, though not understood on a regional level, will pose challenges such as changing weather patterns and rising sea levels.

In June, 2001, following the release of the most recent IPCC report [summaries: *Albritton et al.*, 2001; *Ahmed et al.*, 2001; *Banuri et al.*, 2001], the Bush Administration requested a report from the National Academy of Sciences as part of the administration's review of U.S. climate change policy [*Cicerone et al.*, 2001]. The report was commissioned for "assistance in identifying the areas in the science of climate change where there are the greatest certainties and uncertainties," and to investigate the constancy of the IPCC reports and committee responding to these inquiries included eleven eminent atmospheric scientists in the U.S., one of whom was the longtime climate change skeptic Richard Lindzen, from MIT. The committee members began their report by clearly stating, "Greenhouse gases are accumulating in Earth's atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise. Temperatures are, in fact, rising." [*Cicerone et al.*, 2001].

If scientists agree temperatures are definitely rising, why haven't we acted to reduce human impacts on climate? One reason is that while we know global warming is happening, we don't know the magnitude of the warming or the effects it will have. The world's climate scientists have agreed to statements that leave room for maneuvering, such

as projecting a 90% chance of "more hot days and heatwaves over nearly all land areas, fewer cold days, more intense precipitation events." These forecasts allow a great deal of interpretation by those who hear them. U.S. leaders would have less trouble developing a strategic response to global climate change if scientists declared with absolute certainty, "Unless we immediately shut down half the world's power plants, hurricanes and floods will destroy all civilization!" No such certainty will ever be possible.

Predicting the details of climate change is a complex scientific problem. Research can improve understanding but never fully resolve it. Predicting climate change is also a complex social science problem. Predictions depend on inputs of human behavior: how we live and how that influences atmospheric levels of greenhouse gases. The ability of scientists to predict the future climate is limited by this irreducible uncertainty about human choices and actions.

In the third assessment report on climate change, the IPCC offers thirty-five scenarios that attempt to summarize choices people might make about future world development [*Nakicenovic et al.*, 2001]. The scenarios, grouped into four umbrella storylines, account for various trends: globalization, economic growth, energy consumption, and population growth.

The first storyline assumes a globalized world with a very high rate of economic growth, high level of energy use, frequent development in new technology, and low population growth. The second storyline describes a world that remains fractured regionally, has high economic growth, high energy demands, slow technological change, and high population growth. The third storyline describes a globalized world with high economic growth, low energy use, alternative energy technologies, and low population growth. The fourth storyline describes a world of regionally-focused development with moderate economic growth, moderate energy demands, development of new technologies, and moderate population growth. Due to these differences in development trends, projected greenhouse gas emissions range from a decrease from present levels to several times present

levels. All the IPCC predictions of global temperature changes, weather impacts, biodiversity loss, etc. rely on one or another of these varied descriptions of the future world.

Policy makers in the U.S. appear not to acknowledge the importance of human behavior inputs in the climate prediction process. Leaders have centered decisions on the belief that more scientific research yields better predictions, which in turn enable efficient and effective global responses to climate change. In one of his latest speeches regarding climate change, President George Bush voiced his faith in this approach: "We will fully fund high-priority areas for climate change science over the next five years." Continuing, he said, "We propose a joint venture with the E.U., Japan, and others to develop state-of-the-art climate modeling that will help us better understand the causes and impacts of climate change." [Bush, 2001] But some researchers on climate science challenge this assumption. Dr. Mojib Latif, director of Germany's Max Planck Institute for Meteorology, recently stated, "We will of course improve our models, but I don't really see the biggest or most important results changing in the next 10 years. In terms of policy, the models have done their job" [Revkin, 2001]. Because the science of climate models is unlikely to produce substantial changes in the current climate predictions, policy makers need to move beyond the call for more scientific research.

But if we move beyond the call for more scientific research, what do we do? Society's choices regarding climate change will depend upon our values and how we speak about them, not on whether climate change science reaches greater degrees of certainty. Since the driving force that will shape our world is the value-based decision-making we engage in as individuals and communities, we should frame our discussion about climate change accordingly.

The significance and power of community decisions based on values is supported by the IPCC storylines' primary role in shaping climate predictions. The scenarios described above are only a few of the stories that could define the future, and yet even they reflect significantly different pictures of human values and actions. Regional versus global

interaction, fossil fuel versus renewable energy sources, and population growth versus population stabilization are some of the first value-based choices societies must face. For example, a regional approach to international relations would demonstrate values of autonomy and self-sufficiency, either leaning toward an 'every man for himself' mentality or engendering some geographically limited form of cooperation. A globalized approach would be based on overall cooperation, where knowledge and services are shared and people value contributing their talents while accepting those others might offer. The variety of development possibilities before us emphasizes the importance of actively deciding what kind of world we want to inhabit. Being conscious of our decision-making will help ensure the future accurately reflects things we value.

The Columbia River Pastoral Letter Project provides an outstanding model for the kind of values discussion we are calling for [Skylstad et al., 2001]. Over the last three years the project's goal has been to provide a forum for Native American communities, industry, and other economic interests, theologians, scientists, and environmentalists to voice their opinions on the future of the Columbia River, in order to "promote a vision of a just and sustainable way for the people of the region to relate to the river and its watershed." Such forums have helped to open discussion and empower Northwest communities to direct their development.

Global climate change can and should be addressed in the same way. Community discussions about values can do for the global climate change debate what more research and computer models cannot. For example, we might consider how we feel about our powerful position to alter the world by asking ourselves whether we value humility toward, or dominance of, nature. Embracing a more humble approach toward the natural world, as in the way we think about where we would like to live, we would consider the environment into which we were moving. For example, we would not choose to live in places prone to natural disaster, such as flood plains, or places naturally inhospitable to humans, such as deserts. On the other hand, if we valued the human ability to dominate nature, we would undertake projects such as building dikes and levees

to control rivers, and importing vast quantities of water to support ourselves in desert environments. Discussing values that underlie the global climate change debate--values like dominance and humility--will help us to move beyond bickering over the predictive science of global climate models. If we can decide how to live based on what we value, we can become actively involved in the creation of our own future.

The political and societal discussion of global climate has reached a state of gridlock. Current climate research focuses on developing more accurate models. However, such research rests upon the assumption that we have failed to recognize--that these models rely on predictive storylines which are based on our choices and the values we hold. Our values, not scientific prediction, lie at the center of the global climate change debate. To move beyond the state of gridlock we must discuss our values in an open and direct fashion. The problems we face with global climate change require thought and a deep dialogue about the ways we live with the Earth and will for the generations to come.

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#### Authors:

Glenn Willis, University of Washington

Robert Usiskin, Stanford University

Jonathan Takahashi, Carleton College

Adrienne Socci, Amherst College

John Silson, Haverford College

Lauren Ris, Willamette University

Laura Riihimaki, Wheaton College

Preetha Mani, Tufts University

Jessica Groshek, University of Wisconsin

Nathan Casebeer, University of California

Adam Braddock, University of Chicago

Shannon Belding, University of Puget Sound

Esther Ellsworth, Arizona State University

Mark A. Bullock, Southwest Research Institute

Corresponding author:

Robert L. Frodeman

Colorado School of Mines

301 Stratton Hall, 1005 14th St

Golden, CO 80401

Tel.: (303) 440-6776

Fax: (303) 735-1576

[frodeman@colorado.edu](mailto:frodeman@colorado.edu)