



Does climate change knowledge really matter?

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Climate science and climate policy have been tightly linked for more than two decades. Science is supposed to provide the factual basis for action on climate, and a single policy approach to dealing with climate (through the UN Framework Convention process) has been dominant throughout this period. As a result, debates about climate policy and debates about climate science are impossible to disaggregate, and opposition to the prevailing international climate regime is often expressed as distrust of the science. Until new policy options are available that can enfranchise more diverse political constituencies, climate science will continue to exist as a largely political phenomenon. © 2011 John Wiley & Sons, Ltd. *WIREs Clim Change*

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INTRODUCTION

On a hot day last August I was talking to a neighbor who keeps a garden along the alley behind my house in Washington, DC. We were commenting on a severe rainfall of the previous week, and he asserted that it was just another example of global climate change. I disagreed, saying that no particular local event could be linked to human-caused changes in the climate. He responded that he had lived in Washington all his life, and that over the past 5 years the weather was obviously growing more severe and variable—and that he knew climate change was the cause.

I insisted that he could not know this—that climate varies significantly across time and place, that one's ability as an individual to reliably compare recent weather events to those of the distant past was limited, and that many factors besides global warming contribute to both weather and weather impacts—while of course also being careful to say that I recognized climate change as presenting potentially daunting challenges for society.

Being civil people, we steered the conversation toward something we could agree on—that urban development patterns were responsible for much of the damage done by weather events on society. But then he couldn't keep himself from adding something along the lines of: 'if only these idiots would stop

driving their gas-guzzling sport utility vehicles'. Thus did he return to his original assertion, but with even greater diagnostic precision: individual choices were responsible for the changes to the atmosphere that in turn came back to haunt us in the form of more extreme weather events.

This is an extraordinary set of beliefs for a person to hold. The cause-effect chain that runs from the vehicle a person drives to the behavior of the global atmosphere back to the local weather is a comprehensive and apparently coherent cosmology, perhaps more reminiscent of ancient cosmologies putting humans at the center of the universe than more recent versions that reduce us to irrelevant statistical accidents. And as with ancient, pre-scientific cosmologies it combines intuitions based on individual experience and observation with powerfully supported explanations offered by those with high cultural authority—priests and the like in the old days, scientists today, of course.

THE WAY THINGS ARE SUPPOSED TO WORK

My neighbor was behaving according to what I will term 'the plan'. He accepts the statements of mainstream scientists, of authoritative science bodies like the Intergovernmental Panel on Climate Change (IPCC), of international environmental groups and media outlets that translate science for broader consumption, that climate change is a very serious problem, with well-known causes. He internalizes those statements, integrates them into his world view, and interprets them so that they are consistent with and

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in fact reinforced by his own experience, and so that they condition his expectations about the future. This is how things are supposed to be working so that we can deal with climate change—it is the rational way forward, where science shapes our understanding not just of reality but of appropriate action, and that is why I call it ‘the plan’.

Broadly speaking, the plan has two familiar components. The first component is that scientific knowledge about climate change, widely disseminated through society, will lead to action that will allow society to effectively confront and resolve the problem. Science will lead to action by compelling a convergence of people’s worldviews around the need to take action.

But what action? The second component of the plan is that this convergence of understanding will translate into a consequent convergence around what needs to be done. In this case, action has come to mean reducing greenhouse gas emissions and especially fossil fuel consumption, in order to minimize human interference with and disturbance of the global climate system, thus in turn reducing the negative impacts on society due to this disturbance of the climate.

These two components of ‘the plan’ came together institutionally and operationally about 20 years ago. The first assessment report of the IPCC, published in 1990, provided the scientific basis for the negotiation of the United Nations Framework Convention on Climate Change (UNFCCC) at the 1992 ‘Earth Summit’ in Rio de Janeiro. After that, the IPCC produced a continual series of reports and assessments on the state of the science, and the policy framework continued to evolve through the UNFCCC process, especially as specified through the 1997 Kyoto Protocol on Climate Change, which provides the mechanisms for action based on the requirement that nations must monitor, and some of them must reduce, their emissions of greenhouse gases relative to a certain baseline level (equal to their emissions in 1990) and according to certain timetables, using a variety of policy levers such as the creation of markets for carbon emissions, and the investment of rich country funds in advanced energy technology projects in poor countries. As such, the IPCC and UNFCCC processes have been the only game in town for climate change, and—here is the absolutely crucial point—the scientific basis and the policy framework have been inseparable siblings. They have grown up together and act in concert, even though they have distinctive identities and attributes.

My notion of ‘the plan’ is not a hypothetical construct or a rhetorical convenience or straw plan: it really is the way that various governmental decision-making bodies, civil society groups, and scientific

organizations have conceived of taking action on climate change, and you can find language to this effect in a thousand places, ranging from laws passed by Congress to UN documents to the web pages of environmental groups.¹ In fact, ‘the plan’ seems to conform so strongly to the way societies have framed the climate change issue, and to more broadly held notions of rationality and action, that what might seem bizarre is that I am bothering to recognize it in the first place as anything other than the way things simply ought to be done when addressing any difficult problem.

Getting back to my neighbor for a moment, what I want to note is that the two components of the plan—the science, and the action—are seamlessly integrated into his view of the world. He believes what the scientists and their translators and missionaries are telling him, he sees what he believes to be both the consequences and the culprits around him, and he supports the types of policies that people like him do support—to create a cap-and-trade market system for carbon emissions, for example.

But when you think about it, this view of things is made up of an incredibly complex *mélange* of confirmed facts (his direct observations), accepted facts (from authorities he trusts), beliefs, superstitions, nonsense, norms, and values which he integrates into what is for him a coherent world view. Of course we all do this all the time in trying to process reality in a way that makes the world comprehensible and tolerable for us. Yet, according to the plan, there is really only a single important independent variable dictating the structure of that *mélange*: the science of climate change, the fundamental factual basis upon which rational decisions must be made. And according to the plan, it is upon this factual basis that the right path for action is recognized and followed.

NOT ACCORDING TO PLAN

For this reason, the legitimacy and reliability of science—the enterprise of science itself, and its knowledge products—would seem to be the most important determinant of our ability to act. This is why the November 2009 public exposure of emails from the University of East Anglia Climatic Research Unit, which showed science in all of its messy, ugly reality,² and the discovery shortly thereafter of embarrassing errors in the 2007 IPCC assessment report,³ have loomed so menacingly in climate politics. Climate policy would seem to depend on public trust in a certain line of absolute scientific authority that was suddenly called into question. This is also why scientists who are skeptical of climate change get

so much of the blame for lack of progress—if it weren't for these 'Merchants of Doubt', as Oreskes and Conway have called them in their recent book,⁴ people would accept the factual conditions that dictate the need for correct action, and support such action.

All this would seem too obvious to bother with were it not for an enormous evidentiary embarrassment: after 20 years of rapidly increasing knowledge about the climate system, global greenhouse gas emissions continue to grow unabated. Emissions growth among rapidly emerging economies like China, India, and Brazil are likely to greatly exacerbate these persistently recalcitrant trends. Those countries that have managed to reduce their emissions relative to the 1990 baseline have mostly done so in ways and for reasons that have little or nothing to do with climate science and politics. Twenty years of climate science and climate policy have had no discernible impact on emissions, but over this same time, despite enormous increases in scientific knowledge about climate, the political controversy has not been reduced, but rather, along with emissions, continues to increase, culminating in the East Anglia and IPCC debacles, and continuing with political backlash in the US, and increasing public skepticism even in Europe.

Of course it is always possible to salvage a theory in the face of empirical contradiction. For example, Al Gore, writing in the *New York Times* in February 2010, explained: 'Over the years, as the science has become clearer and clearer, some industries and companies whose business plans are dependent on unrestrained pollution of the atmospheric commons have become ever more entrenched. They are ferociously fighting against the mildest regulation After all has been said and so little done, the truth about the climate crisis—inconvenient as ever—must still be faced'.⁵ The media has also come in for much blame, due to their desire for 'balance' in reporting, even when balance means juxtaposing assertions of well-accepted science by mainstream experts with the skeptical statements of marginalized scientists with questionable credentials.⁶ And then there are the skeptical scientists themselves: ideologically motivated, robustly funded by industry and conservative philanthropies, they confuse the public about the science, about who is to be believed, about what information to trust. I will return to them later.

But for the moment I want to take an empiricist's approach and explore the idea that the premises upon which the plan has been advanced have in fact been falsified by 20 years of failure. I want, in other words, to consider the idea that the assumed central and driving role for science at the heart of climate policy and climate science policy debates was wrong.

IF IT WEREN'T FOR THOSE SKEPTICS . . .

In the United States, and increasingly in the United Kingdom, France, and even Germany, the issue of climate change has sparked severe political polarization. This polarization centers less around the pros and cons of different policy options for responding to climate change—that would be healthy and desirable—than around the science itself.^{7,8} According to one recent Gallup poll,⁹ 74% of liberals in the United States believe that the effects of global warming are already occurring, while 60% of moderates believe this and only 30% of conservatives. Only 26% of liberals think that the seriousness of global warming has been exaggerated, while 67% of conservatives believe this. In the United States, that is, climate change *science* is an explicitly political phenomenon. We can predict with some confidence, for example, that my neighbor is a liberal, because he is a believer.

From the perspective of the plan, this congruence of political and scientific beliefs is the core of the challenge to action on climate, in that climate skeptics and the conservative organizations and industries that ally with them, aided by a credulous, misguided, or irresponsible media, have cast doubt on climate science and thus caused people to have false beliefs that prevent them from supporting necessary action. And if this is the problem, then the cure is clear: do a better job explaining why people should have confidence in mainstream climate science. Skepticism about science is a first-order obstacle to effective action.

In the United States, much weight and effort is being put behind this view of things. The US National Academy of Sciences has formed a Climate Education Roundtable, whose mission is to improve 'public understanding of climate science and climate change among federal agencies, the business community, non-profit, and academic sectors. The CCE Roundtable is poised to provide a critical mechanism for developing a coherent, national strategy to advance climate change education guided by the best available research evidence'.¹⁰ The US National Science Foundation has launched its Climate Change Education Partnership Program 'to meet that challenge when educating students, teachers, and the public about global climate change and its impacts'.¹¹ The non-profit Heinz Center for Science, Economics, and the Environment has formed the Institute for Science Communication and Policy Development, aimed at 'creating training programs for scientists and policy makers to help participants develop relationships and working partnerships toward the end goal of ensuring that scientific findings effectively inform public policy decisions'.¹² A recent article in the *PNAS*, the journal of the

US National Academy of Sciences, shows that 97% of actively publishing climate scientists believe that anthropogenic climate change is real, and that those few who remain unconvinced are both less expert, and less active in contributing to high quality science, than the mainstream.¹³ In *Merchants of Doubt*, Oreskes and Conway⁴ reveal in lurid detail all of the ideological, economic and even psychological motivations that lie behind scientists who are climate skeptics.

Yet there are a couple of fairly obvious reasons why this perspective—that progress in dealing with climate change requires convincing people about the science—is false or at least significantly inadequate. First, while climate skeptics seem to have attracted some political attention in the United States, and more recently in Europe, the fact is that no major global economy has had much success in significantly reducing carbon dioxide emissions as a result of policies aimed at fighting climate change. Between 2000 and 2007, for example—which is *after* emissions targets were assigned to industrialized nations via the Kyoto Protocol—German emissions declined 5%, France 2%, the UK 1%; Denmark showed no change, the United States and Netherlands increased about 2%, Japan increased about 4%, Spain by 16%.¹⁴ The numbers for the last several years are not all in, but most of these countries will show major declines due to the global economic crisis. The United States, for example, decreased its emissions by an incredible 9% in 2009, the largest single-year reduction since records started being kept in 1949.¹⁵ Overall, because there is little evidence that any country is on a path to decisive emissions reductions due to climate policies, the effect of climate skepticism in the United States is hard to gauge. The United States is not doing much worse than countries that seem to enjoy a robust social consensus on the reality of climate change, such as Denmark and the Netherlands, or than countries that have long been committed to reducing dependence on fossil fuels for reasons other than climate change, like Japan.

But a more important point is that major policy action *never* requires or achieves complete public support, and almost always proceeds in the face of ‘ferocious’ opposition, to use Mr. Gore’s adjective. Major policy changes are inevitably controversial because they threaten those who believe they benefit from existing policy frameworks, or who believe they will not benefit from the proposed changes. In the United States, major pieces of policy legislation have recently been enacted, on health care and financial reform, and both were done despite ferocious opposition, and with less public support than currently appears to exist for doing something about climate change. In these cases, there was strong disagreement about the nature of the

problems and about the appropriate role of government in addressing them, but historically important policies were nonetheless adopted.

To carry this point farther, the presence of vocal scientific skeptics does not have to block action. Much attention has been paid to the damaging influence of skeptical scientists in the pay of the tobacco industry who continually questioned scientific evidence about the addictiveness and health effects of smoking in an effort to block anti-smoking rules in the United States. Nonetheless, this is an area of policy where the United States has led the world, with progressive implementation of measures to discourage and prevent smoking implemented by policy bodies at the national, state, and local levels, and rates of adult smoking that are now considerably below those in much of Europe. Again, this has happened despite the aggressive activity of science skeptics in the United States in the pay of private industry—and also despite the fact that scientific literacy in much of Europe is considerably higher than in the United States.

Decisive political action does not demand consensus about the existence or nature of a problem. But neither does broad agreement about the reality of a problem mean that political processes can effectively converge around a policy agenda that leads to effective action. For example, in the United States, pretty much everyone seems to agree that immigration laws are ineffective and even counterproductive, that the war on drugs is a failure, that the tax code is a ridiculous mess, and that the social security program is unsustainable, but implementing comprehensive policies to address these problems effectively has proven to be beyond the capacity of the US political system.

Even when problems are comprehensively characterized, and potential solutions well recognized, effective action may not occur. Consider America’s great disaster of the past decade, Hurricane Katrina and the destruction of New Orleans in 2005. Scientists completely understood, decades in advance, what would happen when a major hurricane hit New Orleans—an occurrence that was completely inevitable, given the city’s location in the heart of the hurricane belt. Scientists and policy makers had long warned that patterns of environmental destruction, urban development, and socioeconomic inequity left the city exposed to precisely the sort of disaster that Katrina delivered.¹⁶ There were no ‘hurricane deniers’ claiming that the hurricane problem was science fiction. Most amazingly, it appears that the worst consequences of Katrina, could have been easily prevented through better construction and maintenance of the levees that were supposed to protect the city from the flood waters. Katrina offers a case not only

where the problem was completely characterized and expected—to an extent far beyond that which will ever be achieved for climate change—but where a simple, cost-effective intervention promised near-term benefits—again, in a way totally unavailable for climate change—and yet the catastrophe proceeded according to worst expectations.

CLIMATE KNOWLEDGE IS POLITICAL

Overall, then, there is little reason to think that the central explanatory factor in the failure of the United States and other nations to make significant progress in reducing greenhouse gas emissions has anything much to do with the state of either climate science or people's understanding about and acceptance of climate science. As a corollary to this point, there is also little reason to believe that efforts to overcome skepticism and disagreement by educating people about mainstream climate science, or by producing more scientific knowledge about the climate, is necessary for progress or would in fact lead to progress—and some reason to suspect, based on the evolution of public opinion, that this approach is backfiring.

Nonetheless, science remains the focal point in debates about climate policy. Why is this? Certainly *not* because people disagree about the *actual* science—most people know little or nothing about the actual science—but because the science stands in for the politics. The climate science that you believe in pretty much dictates the climate policy you believe in. And there is a very good reason why this is the case: Climate science, as articulated through the authoritative IPCC, became linked to and synonymous with a single policy agenda, the UNFCCC-Kyoto process, starting in 1992. Indeed, this policy regime explicitly evolved as a response to and outgrowth of the scientific conclusions of the IPCC. Any scientific conclusion consistent with the possibility of 'dangerous anthropogenic interference with the climate system' could be understood as an endorsement of the UNFCCC regime because it was the only available option. Climate policy became understood as having one central goal: emissions control monitored and enforced at the national level as part of a top-down, coordinated international governance regime. Climate science served one main purpose: to advance that regime.

In America, climate science thus came to mean Kyoto science, cap-and-trade science, Al Gore's science—and nothing else. If you were an American liberal, then, climate science fit into an attractive vision of a fragile global environment, of global environmental governance, energy efficient technologies, socially responsible corporations, and global economic equity.

This is my neighbor's vision. But climate science is not creating the worldviews that condition my neighbor's attitudes about science. It is the opposite: those worldviews are what create an amenable cultural and cognitive environment for the science. This is backwards from the way we like to think of these things, from the way events are supposed to unfold according to the plan, and from the apparent assumptions that drive political debate.

And what if you were an American conservative? Scientific claims about climate change would similarly be interpreted in the light of the policies that those claims were used to justify. In this case, however, the underlying worldview would typically include distrust of international governance regimes and the United Nations; dislike of big government bureaucracies and economic manipulations requiring complex regulatory oversight or 'industrial policy'; and deep philosophical suspicion of programs seeking to modify social behavior. So climate skepticism finds a receptive audience in conservatives because it is consistent with conservative ideology. What makes it consistent is the fusion of climate science with a single policy path, a path that conservatives will almost automatically reject because it conflicts with beliefs about how action ought to be taken and what its goals ought to be. If climate science equals the existing policy regime—and it does—then anti-climate science equals opposition to that regime.

Political beliefs about climate became synonymous with scientific beliefs because only one political path existed. You either bought into the UNFCCC-Kyoto regime or you were against doing anything about climate. Meanwhile the regime was utterly unequal to managing the complexities of the systems that it sought to control: the global atmospheric system, the global energy system, international and national political and economic systems, even the cognitive systems of individual humans. Nor was the regime sufficiently inclusive to come anywhere close to enfranchising all or most of the important stakeholders. The two most important players—the private sector (especially the energy industry), and the emerging industrial nations—were in fact left out of the process in the early going—the former by exclusion, the latter by exemption—a blunder from which climate policy has never recovered. So the science and the policy were formally fused 20 years ago—but the necessary—and necessarily inclusive—conditions for a viable political process had yet to be established.

Supporters of the existing climate regime continue to believe that the problem is one of convincing the opposition about the truth of the science. One reason they believe this is that they can imagine no other policy approach than the one created at the

1992 UN Conference in Rio de Janeiro. After all, the science dictates the policy. Al Gore writes: ‘There is no readily apparent alternative [to the Kyoto framework] that would be any easier politically. It is difficult to imagine a globally harmonized carbon tax or a coordinated multilateral regulatory effort. The flexibility of a global market-based policy . . . is the option that has by far the best chance of success’.⁵

And in the conclusion to *Merchants of Doubt*, Oreskes and Conway (Ref 4, p. 272) write: ‘So it comes to this: we must trust our scientific experts on matters of science, because there isn’t a workable alternative’.

Both arguments—one about the policy, one about the science—make the same assertion: there is no alternative. But they are really the same argument—trusting the science means trusting the policy regime. But then distrusting the policy regime must mean distrusting the science. And this is the massively confused, incredibly unimaginative state that climate policy finds itself in, committed to a single model of action that has yielded no progress after 20 years, where the scientific skeptics are increasingly blamed as the cause of this failure when in fact they are a symptom of it.

IT’S ABOUT ALTERNATIVES, NOT KNOWLEDGE

But of course there *are* policy alternatives that could liberate both the politics and the science. To provide one self-serving example, I recently co-authored, along with 13 colleagues from five countries, a white paper entitled *The Hartwell Paper: A New Direction for Climate Policy After the Crash of 2009*.¹⁷ In it, we outline three basic principles that should guide climate change policies, none of which demand the regimented control of the global energy and economic system that is central to the UNFCCC-Kyoto process. In brief, the principles are:

1. ‘To ensure that the basic needs, especially the energy demands, of the world’s growing population are adequately met’, where adequacy means ‘energy that is simultaneously accessible, secure and low-cost’ (p. 10). Today, about 1.5 billion people lack access to reliable energy sources. This number needs to decline in the future, not increase, meaning that the shared human dignity of a growing global population will require more energy, not less. A commitment to the protection of human dignity must therefore interpret this growing demand as an imperative to explore new innovation paths for delivering energy that

is clean, reliable, and affordable. This necessary diversification of energy supply will offer continually unfolding opportunities for decarbonization of the global energy system.

2. ‘To ensure that we develop in a manner that does not undermine the essential functioning of the Earth system’ (p. 10) beginning with the ‘actions that can command the broadest assent and achieve the quickest results, such as reduction of black carbon, and protection of tropical forests’ (p. 20). The failed approach to climate change ignored what is perhaps the most important reality of political action: you cannot trade near-term costs that are large and certain for long-term benefits that are highly uncertain in magnitude, distribution, and timing. It is therefore the near-term paths toward sustainability that need to be the focus of political and economic investment. Successes over short time horizons in turn allow the experience of positive political feedbacks from successful policies to leverage future, more difficult actions.
3. ‘To ensure that our societies are adequately equipped to withstand the risks and dangers that come from all the vagaries of climate, whatever may be their cause’ (p. 10). Shared global vulnerability to climate is rooted strongly in the organization of society, including its structural inequalities, and such vulnerabilities create an incentive to adapt regardless of one’s views about the causes and future risks of climate change. Building more resilient societies—societies with a greater capacity to avoid, adapt to, and respond to a range of unpredictable events—is a challenge whose resonance cuts across ideology and embraces a wide range of personal experiences.

These are, of course, highly general principles, but they are inclusive of a generous range of more specific policy choices. They aim at building political support through the clear potential for shared benefits, reinforced by the positive lessons of past social and technological innovation, and building on future successes and positive feedbacks wherever they may occur.

Thus, the most important point made in the Hartwell paper is that climate is not one problem that can be solved through a frontal assault backed by rational scientific analysis and unifying policy frameworks, but a multitude of interconnected problems and issues interwoven with the fabric of culture, politics, technology, economics, and nature—an emergent condition of modernity. The failed approach of the past two decades treated every conceivable

issue, from global poverty to biodiversity to infectious disease resurgence to energy use, as a reason to reduce greenhouse gas emissions. Our approach is exactly the opposite. ‘Lose the object and draw nigh obliquely’, a dictum of landscape architecture, is Hartwell’s watchword, by which we mean that a successful politics of climate will be advanced upon the pursuit of multiple agendas, pursued along politically feasible lines, for their own sakes, with progress toward climate management as a contingent benefit of the successful pursuit of these agendas.

‘The plan’ for addressing global climate change required the shackling of science to a single policy regime. This regime has demonstrated little capacity to put the world on a path that can decisively improve its prospects for dealing with the climate challenge. Central to this failure has been the belief

that political disputes centered around climate change could be tamed through scientific argumentation and explication. Yet the politics has gotten worse, even as the body of knowledge has expanded and improved. Meanwhile, and perhaps more dangerously, the cultural legitimacy of science as a source of disinterested, reliable insight into reality has been badly damaged.

Progress waits not on better science, nor on better communication of science to those who are politically alienated from mainstream climate science, but on new approaches that focus first on the articulation of an inclusive and compelling politics built on rich array of possibilities for the future. Only then can the meaning of science for action become clear, and the necessary agendas for future research emerge. You have to get the politics right before you can get the right science.

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