A TURNING POINT IN CLIMATE CHANGE COMMUNICATION PRIORITIES

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Abstract

Within the past year or so, the cultural landscape, political discourse, and news reporting on climate change have changed in significant and specific ways. This paper identifies some of these changes and the new message and outreach priorities that they create. The paper argues that the public is not as disinterested as it might seem, but that meaningful engagement is inhibited by features of Americans' cultural identity, social norms, and a lack of specific information about the scope and scale of the challenge that would enable action. Adjusting communications programs accordingly has the potential to encourage a shift to more sustainable behavior and improve public engagement in the climate policy debate. Communicators can respond effectively by developing new information resources that address emerging questions and by focusing outreach activities on various kinds of social dialogue.

1. Introduction

The autumn of 2008 is a potential turning point for communicating with the public and policymakers about climate change. After years of debate about the complexities of climate science and human attribution of global warming, the time has come to respond to emerging public interest in the consequences—threats to the aesthetic value of nature and society's basic needs for food, water, and shelter—and questions about society's capacity to respond.

Several factors have converged to make this possible. Just four years ago, when the National Academy of Sciences opened its museum in the nation's capital, its global warming exhibition quoted a 2001 study by the National Research Council: "The changes observed over the last several decades are likely mostly due to human activities, but we cannot rule out that some significant part of these changes is also a reflection of natural variability." (p. 1). Equivocal though the language was, it accurately conveyed the state of the science at that time. While the message reached a science-literate audience and important players in the policy arena, its language could never have convinced the general public that global warming represents an urgent and extremely serious threat. The science was suggestive but inconclusive and its implications were too complex for most non-experts to grasp easily.

Researchers have also documented how journalistic practices and the well-financed disinformation campaign sowed doubt about climate science during and after that time (Corbett & Durfree, 2004; Krosnick, Holbrook, Lowe, & Visser, 2006; McCright, 2007). But for all practical purposes, overcoming uncertainty about the scientific evidence is no longer the defining communications challenge.

In 2007, the scientific community issued its unambiguous statement that climate change is occurring and that human activities are almost certainly the main cause (IPCC, 2007a). Although the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) was hotly debated when it was released in 2007, journalists have since abandoned their practice of including opposing viewpoints when reporting on climate science, and recent surveys show a rise in the public's certainty that global warming is a serious problem (Krosnick, 2008). Today, climate change is treated as an established fact by the mainstream news media and this signals a significant change in priorities for climate communications. Die-hard contrarians on conservative talk radio notwithstanding, the ideological debate that had fueled controversy about the scientific evidence is shifting to questions about society's response, and these issues now deserve careful attention.

Climate scientists joined this transition in 2007 and 2008 when they began to address how much warming it would be prudent for humanity to allow and, consequently, where to cap concentrations of greenhouse gases (GHGs) in the atmosphere. A recent paper by Hansen, Sato, Kharecha, Beerling, Masson-Delmotte, Pagani, et al. (2008); the 2007 Bali Climate Declaration by Scientists, which was signed by more than 200 climate experts; and the official policy of the European Union (EU) all assert that humanity should limit the rise in global average surface temperatures to no more than 2°C above pre-Industrial levels. Given the temperature increase that already occurred during the 20th century (+0.8°C)[1] and future warming that is already in the climate system pipeline (+0.6°C)[2], the +2°C limit sets a very high bar for humanity's response, and it is unclear whether the public fully appreciates what these recommendations urge humanity to do.

The Bali Declaration and Hansen, et al., recommend that societies reduce CO_2 concentrations from the present level—around 385 ppm—to 350 ppm[3] within decades. The EU target of 500 ppm would actually yield a warming of 3.2°–4.0°C.[4] Of course, the United States has not endorsed any limit at all. Nevertheless, these recommendations and, more importantly, the evidence upon which they are based, finally begin to frame one of the central questions in the debate about climate change: shall we limit greenhouse gases and, if so, to what degree? After all, if humanity does not agree to set a limit, climate

[1] IPCC, 2007a; Hansen, et al., 2008

[2] This figure from Table SPM.6 (IPCC, 2007a) agrees with Hansen, et al., (2008), for fast feedbacks (equilibration of ocean thermal inertia). Hansen, et al, assert that a portion of an additional +1.4°C that is in the pipeline due to the slow surface albedo feedback could also be expected during this century, but the timing is unknown.

[3] The Bali recommendation is translated from ppm-CO_2-equivalent to ppm-CO_2 using Table SPM.6 (IPCC, 2007a, p. 21).

[4] Ibid.

policies will probably continue to vary among nations and humanity's future will be governed more by means than ends; cost and convenience rather than a decision about what constitutes an acceptable level of change.

Meanwhile, the IPCC and U.S. Climate Change Science Program (CCSP) have been developing information recourses that will help address other important questions in the policy debate as well: who is most vulnerable to the impacts of climate change and what are those impacts likely to be? In addition to the AR4 discussion of "risks and key vulnerabilities" (IPCC, 2007b), the CCSP has issued assessment reports about the impacts of extreme weather and effects of climate change on human health and welfare in the continental United States (2008)[5]. The questions that these reports address resonate with a trend in news reporting and an apparent, although not yet fully measured, trend in public interest. Today, communicators need to present the consequences of climate change in terms of risks and vulnerabilities and describe possible responses that families, various organizations and social groups, and society as a whole can consider and act upon.

2. Have Public Attitudes Really Changed?

Climate change remains a relatively low national priority (Pew Research Center for People and the Press, 2007). The partisan divide that opened during the 1997 Kyoto Protocol negotiations (Krosnick, Holbrook, & Visser, 2000) has not vanished. Consumer behavior has not changed dramatically in favor of low-carbon choices during the past year, except perhaps in response to higher fuel prices. But this does not mean that Americans are unconcerned; on the contrary, the sense of urgency among the public seems to be high—higher, apparently, than it is among policymakers (Bowman, 2008; Leiserowitz, 2007a; Michaelis, 2007).

Whether Americans would accept the all-out national commitment to reducing carbon emissions that Hansen and other scientists have called for is unknown. Public opinion surveys are developed largely in response to the news and policy agenda, so researchers have never asked Americans to consider public investment at the level of the Marshall Plan or the Apollo program, or societal change on the scale of America's response to World War II (Bowman, 2008).

On the contrary, everyone from the Bush administration (McCright, 2007) to Al Gore has effectively framed global warming as a matter of individual consumer choice. Although their objectives have been diametrically opposed, the effects of their communications campaigns on the public have been more-or-less the same. The public has yet to see and understand a detailed plan that would limit global warming to 2°C or any other target. Policy-level solutions seem vague and the whole matter seems to rest in the hands of

[5] See also *Scientific assessment of the effects of global change on the United States* and *Weather and climate extremes in a changing climate*.

politicians who are reluctant to face the issues head on. These realities, combined with the Bush administration policy of voluntary, market-based emissions reductions, redirect the climate question to consumers.

In the marketplace, where consumers might make a difference, communications campaigns tend to focus on impractical extremes that leave most consumers on the sidelines. At one extreme, communicators demonstrate the environmental efficacy of large capital investments, such as elaborate new homes and LEED-certified buildings. Very few families or businesses will ever undertake such projects. At the other extreme, average consumers are urged to take very small steps, such as reusing shopping bags or changing a few light bulbs.

The inefficacy of individual-scale shopping choices in the face of a global threat is apparent to everyone, and it undermines behavioral change (Roser-Renouff & Nisbet, 2008). Additionally, Michaelis has observed that consumers tend to feel trapped in their consumption habits (2007). He notes that consumption patterns express very powerful social norms that mediate status and power. Consumer choices help define social roles, enhance a sense of belonging, and symbolize our pursuit of the Good Life.

The psychic power of these norms conflicts with and often overwhelms ideas about reducing carbon emissions. Maibach found, for example, that Republicans and Democrats act almost identically when it comes to adopting sustainable behaviors even though they avow very different views on the issues (2007). Choosing sustainable behavior is more dependent upon norms that are established within families through discussion and agreement about priorities. It should be no surprise that lifestyles and consumption patterns are shaped collectively more than individually, and that as long as climate change is perceived as a matter of individual choice, Americans will feel disenfranchised and locked into the status quo (Maichelis, 2007; Roser-Renouff & Nisbet, 2008).

Another very deep psychological challenge may also be at work. As early as 1989, Bill McKibben observed that climate change and ozone depletion—two human impacts on the global atmosphere—effectively destroyed the ideal of unspoiled nature (1989). Because we have changed the entire atmosphere, humanity can no longer regard any place on the Earth's surface, nor within the upper 1,000 meters of the ocean, as untouched. Climate change actually commits humanity to managing the atmosphere, in effect managing the natural world, for decades or even centuries to come. The idea that nature exists beyond our reach has been taken away from us.

Communicators need to recognize how profound this message is. Global warming is more than scary. It also threatens strongly held and rarely examined features of our collective psyche: the value of a pristine environment, the abundance of natural resources that lie beyond our reach, and our freedom to exploit the commons without causing irreparable harm. The loss of these ideals may be deeply disturbing to many people. Moreover, climate science intrudes upon religious beliefs about our value as a species, our place in and obligations to the natural world, and some of our notions about the Good

Life. Climate change might, in fact, represent an important focal point in the long-standing debate about the relationship between science and religion in our society.

These are inherently collective matters, not issues that individuals can cope with on their own. Michaelis (2007) concludes: "messages directed at individuals have little effect. The most effective strategies are those that engage people in groups, and give them opportunities for developing their understanding and their narratives about consumption in dialogue together" (p. 245).

At the civic level, where society's top priorities are decided, scientists and communicators have yet to convey that climate risks are immanent and that effective, affordable solutions are truly possible. Leiserowitz observes that many Americans still think climate change will only harm other species, people in distant lands, and future generations (2007a), even though these widespread perceptions are not supported by scientific evidence. Numerous authors have observed that merely acknowledging the evidence does not make climate change a high national priority (Moser & Dilling, 2007). People also need to think they can solve the problem. Addressing these two issues must become a defining focus for climate communications now and in the future.

In spite of these challenges, the vast majority of Americans (84%) already think climate change is occurring and nearly all (94%) say they are willing to change some behavior to help the environment (ABC News/Washington Post/Stanford, 2006). A majority is willing to pay higher prices for more efficient cars and sustainable energy (Bannon, DeBell, Krosnick, Kopp, & Aldous, 2007; Leiserowitz, 2007a). They have preferences about where higher costs should be applied, and they want the additional revenue that accrues from higher energy costs to be spent developing low-carbon energy alternatives. Bannon, et al., also found that the majority favors carbon regulations over cap-and-trade schemes, suggesting perhaps, that people want a sure thing and are suspicious of plans that they suspect could be undercut by market manipulation. Many studies find majorities who think government must do more if society is to limit global warming and consumers are to adopt more sustainable lifestyles (Bannon, et al., 2007; Leiserowitz, 2007a; Michaelis, 2007).

These findings do not imply that Americans hold uniform views about climate change today. A large number of those Americans who think global warming is real—possibly more than half of them—still express doubts (Krosnick, 2008). Nevertheless, the number of true naysayers is actually quite small; Leiserowitz measured their numbers at just 7% of the population (2007b). Despite their loud voice on talk radio, communicators should probably bypass this group's agenda and focus instead on the issues that leave so many other Americans concerned but uncertain and believing that there is nothing they can do to help stop global warming.

3. Specific Communications Goals

Climate change communicators develop campaigns for many different reasons. Their ranks include policy advocates, educators, technical experts, businesses, media outlets, and citizens who take an active role in climate communications for a variety of personal reasons. Consequently, they may be focused on long-term and short-term objectives that are not necessarily complementary.

Stepping back from competing objectives, the overarching goal is to help humanity respond effectively to the threats posed by climate change. More specifically, communicators can (1) help motivate and enable a decision about whether and where to cap the rise in global temperatures and, hence, greenhouse gas concentrations in the atmosphere and (2) help motivate and sustain the kind of social dialogue that will enable people to achieve whatever goal they ultimately choose.

Social scientists have found that greater knowledge does not necessarily increase concern about global warming and some have argued that further investment in climate literacy is unlikely to change public attitudes (Krosnick, et al., 2006; Moser & Dilling, 2007). While these findings are robust, researchers have not yet tested exactly what people know (Bowman, 2008). Specifically, science communicators have not yet delivered an information framework that helps people understand the consequences of climate change or evaluate possible solutions. Moreover, anecdotal evidence suggests that some people begin to favor emissions reductions after learning what they would have to do in order to adapt to climate change. But the central purpose of science education today might not be motivational. Instead, science can develop the framework for evaluating risks and policy response options. Because this information must come from the most credible scientific sources, the informational aspects of climate change communication will continue to be expert-driven and delivered from the top down.

The second goal requires an entirely different approach. Whatever society ultimately decides to do, long-term management of climate change depends upon establishing shared understandings about common interests. Limiting global warming to any particular level seems unlikely if the issue remains politically contentious over the long haul. As Michaelis observes (2007), "Ultimately, the greatest potential for a shift towards sustainable lifestyles might be through a change in culture—that is, a shift in assumptions about human nature, our relationship to the world around us, the nature of human society, and our aspirations for the Good Life" (p. 258).

Experts from many disciplines including ethics, economics, religion, history, international relations, and social science, would inform such a dialogue, but the dialogue must include everyone, experts and non-experts alike. The issues reach beyond emissions targets and technologies to encompass the different worldviews, values, needs, perspectives about fairness and justice, hopes, and fears that people have. The communications goal is not to engineer a particular outcome, but to initiate the dialogue and enable Americans to explore the issues together. This is, in fact, the beauty of the situation: when people

respond to a challenge together they have the capacity to reinvent society in unpredictable ways. While the transitions might be unpleasant, the new understandings and norms that emerge can fulfill people's aspirations for the Good Life. Psychologist Michael Argyle found that happiness is greatly determined by family, social relationships, and meaningful work (as cited in Michaelis, 2007), and people will inevitably strive to maximize these characteristics in the years ahead. So, in contrast to an expert-driven information framework, the social dialogue itself would be a bottom-up project.

4. Social Dialogue: Engaging People Where They Work

How can communicators engage the public in social learning and dialogue? The most obvious answer is to focus on places where social interactions already occur and where groups of people would be predisposed to form new collective narratives and social norms. The workplace is one such environment, and it has been woefully underserved.

Most Americans work and a growing number of businesses and institutions are making efforts to "go green." These organizations tend to form project teams that identify technology and process changes (Esty & Winston, 2006; James, Smith, & Doppelt, 2007). Their work often leads to new behavioral norms among co-workers and create new corporate values with which workers can identify. As new norms and values take root in organizations and become public, they are likely spread to workers' families and other social situations as well. Business organizations also respond to champions: risk-takers who succeeded. Their examples tend to become "best practices" in their industries. So, the positive effects of successful communications with businesses are likely to become widely known and widely copied (Arroyo & Preston, 2007).

Changes in the business community can also send signals to other parts of society. As Arroyo and Preston note (2007), "Although the scientific community is associated with greater credibility, when businesses go public about integrating climate change into their bottom lines, it sends a powerful message about the realities of climate change and the means of addressing it" (p. 335).

The social dynamics in businesses are not open-ended and dialogues among co-workers might not encompass some important, deeply felt concerns. Businesses are hierarchical and they are chiefly concerned with competitive objectives. Nevertheless, businesses are action and teamwork oriented. There is a great, untapped potential within businesses of every size—not just the largest companies—for eliminating waste, reducing carbon emissions, and establishing new behavioral norms among peers.

Climate educators and other communicators should make climate change the primary focus of the "green business" movement. Organizations that become engaged will discover that reducing greenhouse gas emissions actually helps them achieve other economic and sustainability goals as well, including saving energy, conserving raw materials, cutting pollution, reducing compliance costs, and minimizing environmental liability and public image risks. But businesses need specific information and hands-on training to address

their results-oriented concerns, and they need to be encouraged to treat climate change as their top green priority.

While executives in large companies have the resources to forecast strategic risks and opportunities, few managers or workers are equipped or empowered to address such large questions. Rank and file workers who participate in "green teams" need practical information that includes hard facts about specific actions, emissions reductions, and cost-savings (Arroyo & Preston, 2007). Communicators have yet to develop such information with a climate focus. Furthermore, the same information problems that plague consumers also hinder organizations: communications and incentives focus on the extremes and leave most organizations on the sidelines. Few companies will ever make the large-scale capital investments that capture media attention, but they currently lack reliable information that helps them prioritize operational-level choices.

Specifically, businesses need carbon emissions inventories that they can apply to their circumstances. For example, a recent study end-to-end of food production and transportation revealed that eating less red meat and dairy products has a larger effect on GHG emissions than eating locally grown foods (Weber & Matthews, 2008). The results were surprising, even to the authors, and they contradict the priorities many people and businesses are recommending.

Studies of this kind are rare and those that exist are rarely interpreted for managers. Questions arise in business about the environmental efficacy of choosing certain raw materials over others, domestic vs. foreign sourcing, emissions from production vs. transportation, the impact of air travel, and more. In the absence of reliable information, many businesses and green advisors are essentially guessing. Moreover, the lack of reliable information is readily apparent to managers, and many organizations are reluctant to do anything at all for fear of falling victim to "greenwashing."

5. Deeper Kinds of Social Dialogue

While the workplace represents a large, high-value, and untapped market for climate communications, outreach in other social settings is also necessary. In the absence of national political leadership, grassroots engagement might be the only way to help Americans consider the issues. But even if political priorities change, the implications of stringent CO_2 reductions are so profound that a deeper discussion involving most Americans would still be important.

The most effective model for social discourse is "dialogue"—a type of conversation that improves mutual understanding but is not necessarily concerned with problem-solving (Regan, 2007; Yankelovich, 1999). The goal is not even to establish common ground: in dialogue, people express their concerns openly, genuinely listen to the concerns of others, and suspend the desire to win points. These conversations might ultimately enable lasting agreements to be made, but their purpose is to build trust and understanding.

Genuine dialogue requires training or trained facilitators, so it would be difficult to conduct dialogue on the scale of an entire society. It would be useful, however, to conduct dialogues among influential opinion leaders from various walks of life in a large number of communities. These "influencers" would naturally engage with their own social networks in a much larger, although less refined, conversation about norms and commitments.

Choosing effective messengers and facilitators becomes especially important in this kind of outreach. Agyeman, Doppelt, Lynn, and Hatic point out, for example, that low income and minority communities reject top-down communication about environmental issues (2007). Many authors have observed that people interpret information through the lenses of their political affiliations, religions, and memberships in other groups. The main reason to develop genuine dialogue, in fact, is to resist a one-size-fits-all approach to climate solutions and let the voices of many constituencies and individuals be heard. As Agyeman, et al, observe, effective communications within many communities depends on listening to the people who live there.

Relatively few people feel comfortable talking openly about climate change today, yet encouraging people to speak out loud is a powerful way to change their relationships to the issue. Enabling people to talk about climate change at work, at church, at home, and in other social situations would begin to move people off of the sidelines.

6. New Information Requirements

Individually and at work, Americans are asking for new information resources: a framework for understanding the most important consequences and tools that helps them evaluate risks and opportunities, understand whether global warming can be capped without destroying the economy, appreciate the scale and scope of policy-level options, prioritize their personal and organizational-scale actions, and enable them to act.

The time has come to acknowledge that the world is already committed to profound changes, but that the extent—or severity—of those changes can still be adjusted if humanity takes action very soon. Scaring people about the risk of overwhelming consequences makes no sense if there is no information about appropriate responses but this, in effect, is precisely what communicators have done.

When translating scientific information about consequences and responses for general audiences it is important not to over-explain, as scientists often do. Since most people already accept the reality of global warming, it is not necessary for everyone to learn the intricacies of the climate system. Increasing climate literacy among school children will pay off when the students become adults, but today's adults would benefit from a short-list of key ideas.

Some background perspectives are important too: (1) human activities now dominate the climate system, (2) greenhouse gases, once emitted, lead to consequences that we cannot control, (3) today's emissions will cause climate change for many decades, (4) we

cannot change course after impacts begin to occur, (5) society is already committed to some changes and must adapt to them, and (6) reducing GHG emissions and adapting to global changes will involve all sectors of American society and all nations. But, like the evidence of global warming itself, these ideas might be fairly well understood already and they do not help people make specific decisions. Therefore, researchers should test whether communicators can simply acknowledge them as background and move on.

Scientists have already developed an information framework about GHG caps and future emissions trajectories. AR4 contains a chart that compares various GHG concentrations with associated warming, plus the range of years in which emissions would need to peak and the degree to which emissions would have to be reduced by the year 2050 (IPCC, 2007a, Table SPM.6, p. 20). This summary provides the best available tool for evaluating various GHG caps and response timetables and its content should become household knowledge. The public would also benefit from knowing that climate scientists are weighing in with recommended caps.

A much more difficult task is to correlate impact risks with the various levels of warming identified in the chart. AR4 takes a step in this direction, but the correlations are less specific than many people would probably like (IPCC, 2007b, Table 19.1, pp. 787-789). Mark Lynas' *Six Degrees* provides a more detailed and narrative approach (2008). While the inherent uncertainties are significant, the general framework tells a compelling story. The CCSP assessments referenced earlier also provide information about impacts on the United States with correlations to the IPCC SRES scenarios. Similarly, the California Climate Change Center provides impact projections for the state based on SRES ranges (2006). Lenton, et al., address another crucial factor, which is the risk of crossing tipping thresholds at unknown points in the coming decades (Lenton, Held, Kriegler, Hall, Lucht, Rahmstorf, et al., 2008), while Barnett and Pierce assess profound regional changes that are already underway (2008). These assessments can be used as the raw materials from which to create more specific and useful presentations about risks and vulnerabilities.

Not all climate impacts matter to people. Krosnick, et al., found that people are most concerned about society's basic needs—threats to food, water, and shelter (e.g., coastal storms, inland flooding, wildfires)—and the aesthetic value of nature (2006). People are also motivated by threats to animal species but they are not especially moved by species migration or the extinction of plant species. Nor are people inspired by information about severe weather, which they tend to regard as naturally variable. Researchers have yet to measure public concern about impacts on national security. Several studies demonstrate that people are motivated by threats to society, not to themselves (Krosnick, et al, 2006; Miller and Ratner, 1998; Sears and Funk, 1991). Therefore, communicators should focus attention on impacts that threaten aesthetic nature and society's most basic needs with an emphasis on risks to society as a whole.

Science communicators can also help by avoiding confusing technical distinctions. For example, Hansen, et al., express their recommended GHG limit as 350 ppm CO_2 (2008). The Bali Declaration uses 450 ppm CO_2-equivalent, which amounts to the same thing

(2007). While the scientific reasons for using different measures are sound, the public would benefit from a single measure that is easily understood and remembered.

Shorthand facts that provide behavioral feedback can also be helpful. For example, a car that gets 20 mpg emits about a pound of CO_2 per mile.[6] Anyone can do the arithmetic, and many people actually do. Moreover, many people are amazed to learn that half of a given pound of CO_2 will probably end up in the ocean while the other half remains aloft for many decades, warming the planet a little more every day. Uncomplicated examples of this type can provide the kind of immediate feedback that enables personal-scale and organizational-scale change.

Assuming Americans choose to cap GHGs, how can society actually reduce emissions? Communicators have not done a good job of answering this question with concrete information. The Pacala-Socolow stabilization wedges, for example, demonstrate the scale of the challenge, the efficacy of today's technologies, and the need for every sector of society to be involved (2004), but information about investment costs and other practicalities is hard to find. The public would benefit from a straightforward information about energy and CO_2 emissions: current and projected growth in population and demand for resources, the status of fossil fuel reserves, available renewable energy resources, the current global and national energy mix, and—importantly—the potential for emissions reductions through conservation. Information about economic costs should compare the cost of mitigation approaches that start today with the costs for adaptation and faster mitigation later due to delay (Stern, 2007; Yohe, Andronova, & Schlesinger, 2004).

Finally, neither individuals nor the nation are in this alone. Although the U.S. did not ratify the Kyoto Protocol, the government did sign the UN Framework Convention on Climate Change and shares in its obligations. And, the U.S. will be part of the 2009 Copenhagen negotiations on an agreement to follow Kyoto. In the context of these negotiations and responsibilities to other countries, and recognizing that those who contributed the least to climate change will probably suffer the most from its impacts, climate change can be linked to deep values that might help people modify their views and norms. As is often noted, Americans have responded to great challenges in the past and those responses resonate with ideals about American ingenuity, economic leadership, the peoples' ability to band together in the face of threats, a community's ability to care for its children and grandchildren, generosity of spirit, being good neighbors, and the nation's international competitiveness. Demonstrating that other countries are ahead of the U.S. in responding to climate change, and that their citizens are less divided than ours on the issues (Kull, 2007), might give greater priority to these values in the climate debate. Researchers should work with communicators to test the impact that these values actually have on the public.

[6] A car that gets 40 mpg emits half that amount, while one that gets 10 mpg emits twice as much.

7. The Next Step

While many authors have been correct in saying that further education about climate science will not engender greater public concern, scientists and science communicators have yet to address the consequences of climate change coherently, or the efficacy of specific responses with information that would be helpful to non-experts. It would be a mistake to assume, therefore, that further education about climate change is irrelevant. In fact, further education is urgently needed, but with a new focus on these questions. Information must become more accessible and actionable than it has been to date. These improvements would deliver more fully on the obligation that scientists have to society. Richard Somerville describes it this way: "Scientists can't make policy; they can only provide sound science as in input to wise policy" (2007). Today, "sound science" means developing and disseminating information that helps people decide what to do about climate change.

The public and policymakers must fill in the rest, but communicators and educators have a vital role to play in this process too. They can help by shifting the target of their campaigns from individuals to social groups. This is interactive, hands-on, grassroots-level work, and it deserves a level of support that is commensurate with support for mass media communications. Such a shift would give people a meaningful voice within their own families, among co-workers, and ultimately within larger communities. Workplace discussions, for example, would encourage individuals to make public commitments about their values and choices. These and other kinds of social interactions, especially genuine dialogue among influential community leaders, would encourage the kind of cultural change that will be necessary as Americans confront global change.

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