

Summary Report:

A Meeting to Assess Public Attitudes about Climate Change

Sponsored by the National Oceanic and Atmospheric Administration
and the George Mason University Center for Climate Change Communication
April 8, 2008

Written by:

Tom Bowman - Bowman Design Group

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On April 8, 2008, a meeting was held at the National Oceanic and Atmospheric Administration Climate Program Office in Silver Spring, Maryland, to discuss the state of research into public attitudes and behavior about climate change, and to explore priorities for future research and public outreach. Participants included principal investigators and climate communications professionals from federal agencies, universities, and the private sector. This report summarizes the discussions and reflects the contributions of the experts who were present. Readers should be aware that, although the main points offered in this report express broad agreement among the experts, there may be some areas in which experts disagree about the solidity of the data. The report does not attempt to summarize the published work of the principal investigators, some of which is captured in the bibliography.

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Executive Summary and Suggestions for Communicators:

The following observations emerged from a one-day discussion among researchers who are working to understand public attitudes and behavior around climate change.

- Multiple communities and disciplines are involved in attitudinal and behavioral research on climate change. These groups of researchers have somewhat different goals and approaches.
- The maturity of research among these communities varies, but the experts rated the overall maturity in this field at roughly two on a scale of five.
- Additional research is needed in the very near term in order to help policymakers, educators, communicators, and the news media respond to the climate challenge in a timely manner.
- Experts agreed on some guidelines for writing high-quality survey questions in order to minimize the influence that poorly constructed surveys sometimes have in news coverage.
- Experts provided several suggestions to help communicators improve public engagement with climate change. These suggestions are based on their professional experience, results of various surveys and polls, and the broader literature in social and political psychology, but the following list is incomplete. The full report provides additional ideas, explanations and rationale, and caveats that communicators should be aware of as they consider these suggestions.

Suggestions for encouraging government action on climate change:

- Grow the “issue public” (i.e., those who could not be any more passionate than they already are about the issue).
- Activate the issue public to become politically engaged (issue publics for other issues are usually activated when they perceive legislative threats to their concerns).
- Communicate to members of Congress (and their staff) their constituents’ sense of urgency about climate change, which may be greater than is generally recognized.

Suggestions for growing the size of the issue public and increasing issue concern among the broader public:

- Focus attention on threats to society, as well as opportunities for economic growth, evolving commercial markets, and emerging job opportunities, recognizing that societal concerns and interests motivate political action more effectively than self-interest on a wide variety of issues.

- Link bad news about threats with good news about the efficacy of responses (neither is especially effective without the other).
- Provide a clear, concise factual framework that helps people weigh the pros and cons of various policy options.
- Begin talking about adaptation as a steppingstone to mitigation (when people come to appreciate climate change risks they want to minimize them).

Suggestions for changing consumer behavior:

- Focus on changing social norms (norms strongly influence actual behavior, often overwhelming cognitive understanding and self-perceptions).
- Focus on personal efficacy (my actions will make a difference; my voice will be heard).
- Remove barriers to beneficial behavior (inconvenience, high cost, etc.) so that sustainable behavior becomes default behavior.

Comments about the value of climate literacy and science education:

- Programs that invest additional resources in climate science education as a means of increasing issue concern among the public have been criticized recently because (1) the public already reports good understanding of the issue and self-reporting is apparently reliable, and (2) knowing more about the problem does not necessarily lead to increased issue concern or behavioral change. However, researchers have not yet measured exactly what the public knows or how efficacious various specific pieces of information might be.
- A second function of climate literacy—separate from increasing issue concern—is helping people understand and weigh various policy and consumer options. Researchers have not yet measured public understanding of policy efficacy information. In fact, there is some evidence that many Americans are unconvinced that policies can mitigate climate change effectively.

Some factors that are thought to be important but have not yet been measured:

- Personal experience with the changing climate is influential. The extent to which vicarious experience is influential has not yet been measured.
- Values and affective responses influence issue concern and voting behavior. Researchers have not yet measured which values would be most effective in changing the issue priority of climate change.
- Americans are willing to pay more to mitigate greenhouse gas (GHG) emissions, but their willingness to make an all-out national commitment to GHG emissions stabilization has not been measured.

- Social norms influence behavior and many different kinds of organizations are struggling to change norms within their own cultures. Although work has been done on cultural change in some organizations, researchers have not yet fully tested the most effective ways to change norms across society.
- Families adopt larger numbers of sustainable behaviors when parents and their children talk about global warming and are in agreement with one another, but how significantly this influences issue concern has not yet been measured.
- We know that removing barriers to desirable behavior is important, but researchers have not yet measured which barriers are most important to remove, or to remove first (e.g., the high cost of photovoltaics, the inconvenience of using public transportation in some places, the danger of commuting by bicycle in some places, the challenges of managing employees who work at home, ignorance over how food is grown and where it comes from, etc.).

Introduction

With an increasing sense of urgency, policymakers, the public, opinion researchers, communicators, and the news media are confronting climate change. Many are aware that decisions made in the very near term will determine the long-term severity of climate change impacts upon the environment, public health, the global economy, global security, and civil society. Decision-makers and communicators would benefit from a thorough understanding of public attitudes and behavioral influences as they evaluate possible responses and interventions. They would also benefit from an enhanced capacity to track indicators of attitudinal and behavioral change in the coming years.

The present moment is also unusual in the history of public opinion research. The political environment will inevitably change with the next Presidential administration, making this an opportune time to give the public a clear voice. But the moment also carries great risk if research is not coordinated and survey reports nullify one another. This unfortunate result has already occurred due to widespread reporting of results from surveys that used questionable methodologies and gave misleading results. On an issue as contentious as climate change, identifying and adopting best practices will go a long way toward giving policymakers reliable insights into public opinion.

This report brings the perspectives of researchers and climate change communicators together in an informal assessment of the state of current knowledge about public and policymaker attitudes and recommendations for future research. Participants from the research community and federal agencies represented three different orientations toward research and communications:

Political Attitudes Research—reflecting a 15-year history of surveys into public attitudes about the seriousness and priority of climate change as a national policy issue;

Behavioral Research—reflecting, in part, a 30-year history of advocacy research and social marketing in public health that informs the design and measures the results of interventions intended to change behavior (e.g., reduce smoking, lower blood pressure); and

Climate Literacy Education—reflecting efforts by science-based federal agencies, such as NOAA and NASA, and informal science institutions (museums, aquariums, etc.) to create a more informed and engaged citizenry by improving public understanding of climate change science.

Clearly, these three orientations overlap in theory and practice, and this report does not attempt to draw lines between them. But their distinction helps clarify some key features that are unique to each perspective in terms of research goals and underlying assumptions.

Inevitably, such diverse orientations yield a report that includes both descriptions of present knowledge about public attitudes and suggestions to communicators about what this knowledge might imply for the design of outreach programs. Questions raised by communicators also suggest research avenues that have yet to be explored and might be invaluable in the design of effective public engagement programs in the future.

Researchers rated the overall maturity of this field, measuring public attitudes about climate change, at roughly two on a scale of five, indicating that there is solid evidence in some areas, but that many questions also remain. Researchers also identified a short list of best practices that, if employed wherever possible, would improve the value of survey results across the board.

Research Orientations and Assessments

Political Attitudes Research

The dominant thread in public attitudes research, and the one with the longest history, is descriptive and explanatory rather than advocacy-based and is focused primarily on questions about the public's policy inclinations.

- Does the public accept the mainstream scientific view of climate change?
- More recently, does the public accept various mitigation options and their attendant costs?
- How do different versions of news stories influence public opinion?

Surveys have looked extensively at some of the underlying causes of political attitudes as well. Another set of questions is also emerging that, in some ways, bridges with public health perspectives by looking at a wider variety of underlying reasons for public attitudes, as well as predictors of actual civic behavior.

- How does the public perceive climate risks?
- To what extent does knowledge—as opposed to affective responses, values, underlying worldviews, and personal experience—influence attitudes?
- How do people perceive greenhouse gas mitigation options?
- What roles do vicarious experiences and narratives play in affecting opinion and behavior?

What Is Known?

Results across many surveys and over many years reveal some important trends and reliable data points. Most notably, the public's sense of urgency has grown significantly, especially within the past twelve to eighteen months. In the simplest terms, an overwhelming majority of Americans now believes that global warming is happening, that humans are at least partly responsible for causing it, and that the net effects will be harmful. A majority favors starting immediately to reduce greenhouse gas (GHG) emissions and is willing to pay at least some higher costs for energy and even higher taxes if they directly enable emissions reductions.

The public is beginning to see climate change as an imminent risk, which represents a large and recent shift in perceptions. Working against this perception is the widespread thought that climate change will only affect other species and people in distant lands. This juxtaposition of perceptions—those that motivate and those that inhibit issue commitment—reveals some of the apparent contradictions in public attitudes.

For example, the so-called “issue public”—people who could not be more passionate about the issue than they already are and who could, if activated, influence national policy—is one of the largest ever measured at 18% of the public. The issue public about climate change is uniquely like-minded when compared to issue publics on other issues, with an overwhelming majority favoring government action to reduce GHG emissions. One third of the issue public for climate change is made up of registered Independents (swing voters) and a few Republicans. Surveys to date offer no data on the percentages that live in swing states. On the other side of the issue spectrum, surveys indicate that ideological contrarians, as opposed to skeptical reviewers of the science, are overwhelmingly male, Caucasian, conservative, religious, Republican, and that they get most of their information from talk radio.

Between these two groups lie the majority of Americans. They rate climate change as the number one environmental issue, but behind the war in Iraq, the economy, health care, and education on issue priority lists. This relatively low issue priority ranking can be understood, at least in part, by looking at how strong their convictions are. Using Jon Krosnick's list of

factors that are necessary for an issue to be a top priority, it is apparent that climate change is solid only in two of five categories: (1) that global warming is occurring and (2) that humans are at least partly responsible. The public is more divided on the other three factors: (3) thinking that the net effects will be harmful, (4) that we can solve the problem, and (5) being certain about their views. The question of whether Americans think mitigation policies can be effective is significant and will be discussed later in this report.

It is apparent that the public's sense of risk has been growing over the past year and that a sense of certainty about their views is also growing, but the percentage of Americans who are "extremely sure" of their views remains low. Indeed, the public's willingness to take high-cost steps to reduce GHG emissions is strongly correlated to perceptions of scientific consensus, and the extent and validity of scientific consensus have been targets of political campaigns against policy action.

But the American public expresses a greater sense of urgency than policymakers seem to realize. Public support for national mitigation policies (e.g., higher CAFE and renewable energy standards) and international agreements to reduce GHG emissions is higher than it is among members of Congress. Although measuring attitudes among legislators is difficult, there is some evidence suggesting that policymakers assume the public would not support mitigation policies. Moreover, there seems to be very little communication between the public and policymakers on this issue. For example, there does not appear to be a strong relationship between growing public support for GHG mitigation and Congressional voting on the McCain-Lieberman Climate Stewardship Act of 2003. Even so, there is evidence that climate change is beginning to converge with other issues, such as energy and trade, and that the political landscape might be changing.

From an international perspective, climate change is among the strongest predictors of negative attitudes toward the United States. Many Americans are unaware that other industrialized nations are working to control GHG emissions and that the U.S. is not. Americans also appear to be more divided on the climate issue than their counterparts in other nations. The partisan divide in the U.S. appears to be widening and is larger than that observed in other nations.

What is Not Known?

Although the sense of urgency and imminent risk are growing public concerns, it is not entirely clear whether Americans appreciate the scope of the problem or the scale of responses necessary to stabilize and significantly reduce GHG emissions. There are indications that some in the business community, including the insurance and investment banking industries, are recognizing and assessing very large-scale risks. There is also evidence that people perceive a disconnect between the simple consumer actions they are being encouraged to undertake (e.g., change just one light bulb, buy a hybrid car, recycle, etc.) and the scale of global emissions reductions necessary to stabilize or reduce atmospheric CO₂ levels. This observation, in combination with the public's willingness to undertake at

least relatively low-cost policy actions suggests that Americans have some awareness of the appropriate scale and scope. But whether Americans are ready to accept an all-out effort on the scale of the nation's response to World War II—as a growing number of climate scientists are calling for—has not been measured.

There is strong evidence that Americans think in societal terms about large problems, not solely in terms of their own pocketbooks. There are suggestions that people want to be good neighbors and do their part if other nations are doing theirs. But these observations have not been thoroughly tested yet. For example, it is not known how Americans define “societal concern” about climate change: does it encompass the United States alone or the entire global community? How strongly do Americans include future generations in their societal concern?

Suggestions for Communicators

Given this summary, what might be effective ways to motivate public engagement, to raise the priority of climate change as a policy issue, and to encourage policy action?

If the goal were to spur government action, one strategy would be to grow the issue public. A motivated issue public tends to make itself heard at all levels of government and can influence action. Even though the issue public for climate change is one of the largest ever measured, there is nothing in the data that suggests it has reached its maximum size potential. Even at its current size, the issue public could have a strong impact on policy if it were motivated into action. However, issue publics are typically activated in response to legislative threats. A second approach would be to inform members of Congress who are out of sync with their constituents on this issue, and to explore potential political costs of inaction.

If the goal is to engage the broader public and to move climate change higher on their list of top-priority issues, then several approaches emerge from the summary. Communication and education campaigns should seek to increase public understanding that there is broad scientific consensus, and to demonstrate the efficacy of mitigation and benefits of particular options. The public might need a framework for thinking about mitigation and adaptation policy choices. Such a framework would provide information about the pros and cons, and costs and benefits, of various policy options. For example, the *Stern Review* suggests that society faces a choice between spending significantly less than 5% of GDP to mitigate climate change vs. as much as 20% of global GDP if society does not act. An approach that engages the public with policy benefits and costs needs to overcome the widespread perception that policy actions might be too costly and, ultimately, ineffective. Communicators could help the public see and understand the levels of risk associated with various policy options.

Framing climate change as an environmental issue might not be an impediment to bipartisan support for policy action, as some communicators believe. It is not entirely clear how the majority view that climate change is the nation's top environmental priority squares with the intense partisan divide that grew out of the 1997 Kyoto Protocol debate, or how that divide applies to various specific questions. Although many Republicans regard environmentalists as

economically irresponsible, this view is not strongly connected to the climate issue. And although Americans express strong concerns about the environment, this observation is not intended to suggest that framing climate change as a converging issue that also includes public health, energy, trade, economic, and global security concerns would not be effective.

Surveys indicate that Americans respond strongly to the idea that society is threatened, and climate change is less a personal than societal issue for most people. As noted earlier, many Americans seem to believe that they will not experience harmful impacts of climate change personally. Whether their perceptions are correct deserves further consideration, as does the question of how widespread this perception really is. The literature on self-interest in political decision-making suggests that the strongest arguments for reducing GHG emissions would emphasize risks to society rather than narrow self-interest. However, the public's response to messages about personal well-being in the face of climate change should be tested.

How can our understanding of public attitudes about policy action be improved? Communicators from federal agencies and the private sector, journalists, and policymakers, often have difficulty reconciling survey results that seem to nullify one another. Communicators are not always equipped to evaluate the quality of various methodologies and the results they yield. People working in the communications and policymaking arenas would benefit from some consistent approaches that are known to deliver reliable results. A few suggestions are offered here.

Asking people to select "the most important" problem suggests that society only focuses on one problem at a time, which is not the case. This type of question is an artifact of omnibus national surveys and yields misleading results.

Likewise, any question with response alternatives that are either agree/disagree or a rating scale ranging from strongly agree to strongly disagree should be dropped because responses tend to be distorted by acquiescence response bias.

Finally, researchers should drop the New Environmental Paradigm battery of questions because it mixes a variety of different, independent beliefs.

Behavioral Science Research

While exploring underlying factors that shape attitudes is nothing new in climate change opinion research, an emerging focus on behavioral science is pushing research in new directions. Experts from the public health community, including federal agencies such as the CDC, are beginning to work on climate change mitigation and adaptation problems. These agencies and researchers are quite comfortable investing in advocacy research, testing theories of behavioral change, and evaluating intervention tactics and strategies in an effort to promote the public welfare by minimizing risks to human health. The explicit connections between research and intervention (i.e., "social marketing") are probably the most significant difference between this orientation and that described above, but it would be a mistake to

assume that public health researchers are necessarily any less rigorous in their descriptive assessments as a result. Nor is it accurate to say that they are interested only in consumer behavior and personal habits. Influences on consumer behavior are also connected to civic behavior, and public support for policies that remove obstacles and/or encourage reduced-carbon lifestyles is an important aspect of behavioral change for both individuals and society as a whole.

Public health research is bringing a new focus on the consumer and behavioral science into a field that has emphasized expert-driven education about climate change. As a result, there is an effort to identify points where intervention can make a difference. For example, public health professionals note that significant behavior change occurred decades after the public already understood the personal risks associated with smoking. Large-scale behavioral changes—big reductions in the number of smokers—occurred when smoking was reframed as harmful to others. Public awareness that tobacco companies had lied and intentionally addicted people to their products played a role as well. Lessons learned during public health campaigns about smoking, cholesterol reduction, etc., are just beginning to be applied to the climate problem. As a result, research in this area is less mature than that described in the previous section.

What Is Known?

Although the number of studies in this area is still small, some themes have already emerged. One theme is that Republicans and Democrats adopt virtually identical numbers of consumer-level sustainable behaviors, such as recycling and using alternative transportation. Consumer behavior seems to be much more strongly correlated to whether parents and their children talk about global warming and whether they are in agreement.

Personal experience with climate change is also strongly correlated to issue concern. Many Americans from across the political spectrum seem to favor mitigation policies when they see changes in environments that matter to them. This may be one reason why so many Republicans accept climate change as an important environmental concern, even though they tend to regard environmentalists unfavorably.

Voting behavior is also influenced by personal experiences, values, and affective responses. Vicarious experiences, in which people watch or hear others describe climate changes they have witnessed first hand, also appear to influence issue concern. But the strength of vicarious influences is not yet known.

As mentioned in the previous section, there are strong indications that perceptions of societal risk from climate impacts are stronger drivers of issue concern than perceptions of personal risk. People have also shown a willingness to favor policy action that benefits society even when it may mean some cost to themselves. For example, the marketplace is seeing growth in “green consumerism,” and so-called “green behavior” seems to be driven by concerns about society as a whole. This concern is not yet apparent at the level of citizen (political) behavior

and the underlying causes are not fully known. For example, the extent to which Americans see themselves as personally at risk or safe from climate change might be shifting and is not fully understood.

One apparent driver of behavioral change is a connection between risk and efficacy of action. People are more willing to acknowledge a problem, even one that causes overwhelming fear, if the problem is paired with credible solutions. In fact, avoidance of harm seems to be a stronger motivator than attraction to benefits, but the solutions to the problem must seem credible. Solutions must be actionable (i.e., not blocked by social or infrastructure barriers) and effective in overcoming the problem. As noted in the previous section, many Americans seem to think that the mitigation solutions being offered might prove to be ineffective, too expensive, or both. For example, changing a few light bulbs looks like a trivial response to a global-scale problem; encouragement to use public transportation goes unheeded in places where efficient infrastructure is lacking; and building a new energy infrastructure in the U.S. seems expensive, especially if emissions reductions on the home front seem likely to be overwhelmed by emissions growth abroad.

Perceptions of personal efficacy appear to be critical motivating factors in behavior change. People are more willing to respond to severe risks and very bad news when they believe their actions will make a difference and/or their voices will be heard. It is worth noting that mitigation actions at the consumer and policy levels have typically been presented in terms of loss: high economic cost, reductions in comfort and convenience, and constraints on personal and economic freedom. Mitigation policies and behaviors have not yet been framed in terms of their societal co-benefits, such as cleaner air, greater energy independence, longer-term economic benefits, new jobs and new commercial markets.

Social norms are a second crucial influence on behavior. People act according to perceived social norms; they tend to do what others are doing, even when they think they are behaving differently in accordance with ideological principles or intellectual positions. Given this strong influence, providing feedback about norms might be an effective way to motivate behavioral change. For example, if social pressure to reduce one's carbon footprint grows, then comparing one's own footprint with those of other, similar people might prove influential. Understanding how the various social norms that currently inhibit lower-carbon behaviors work in various situations would be useful information for intervention designers to have.

What Is Not Known?

Although behavioral influences have been studied for decades in the public health arena, the study of climate-related behavior is just beginning. Which values and messages are most important for influencing behavior, reinforcing or altering social norms, and establishing a sense of personal efficacy? Many hypotheses have been introduced from other disciplines, but there is currently a lack of experimental work on various values and message frames regarding global warming.

What is the role of knowledge in behavior change? There is evidence that knowing about scientific consensus, having a mental framework for thinking through consumer and policy choices, and establishing causal connections between personal behavior and climate impacts are important, both as motivators and as necessary tools for evaluating options. But digging deeper, the influence of various specific pieces of knowledge has yet been measured. Various aspects of risk are also just beginning to be examined.

Scientists continue to improve climate models and the ability to estimate the degree to which human activities are increasing the risk of droughts, heat waves, and severe weather events (e.g., >90% confidence that human activities are doubling the risk of an *x*-type of event of *y*-magnitude). Would improving these so-called “operational attributions” motivate changes in consumer and civic behavior? There is some evidence that people are already accustomed to living in a risky world, so whether incremental improvements in the accuracy of attributions would be influential is an important question. A related question is how news reporting of operational attribution might influence public attitudes. But these questions have not yet been examined thoroughly.

Various aspects of personal efficacy are not fully understood yet either. For example, how do people connect their personal choices with the scale of action that is required to overcome a global problem? Given the long-term nature of the climate challenge, how can single action bias—the tendency to take one action (e.g., change a light bulb, buy a hybrid car, or cast one vote) and believe the problem is solved—be overcome? Which social and institutional pressures that inhibit beneficial behaviors would be most helpful to remove?

Considering questions of influence, how much do children affect their parents on the climate issue? How would engaging children influence their parents’ attitudes and behavior? Would teaching children and/or adults about possible climate change tipping points move a larger segment of the public into issue commitment?

Educators and communicators frequently debate such questions because the current literature from surveys, polls, and experiments provides mixed signals. Some confusion arises when misleading results from poorly constructed surveys are widely publicized. Since communicators are not typically specialists in survey methodologies, they would benefit from coordination among researchers who can provide such expertise. Communicators would also benefit from message-testing studies that provide additional insights into behavioral motivations around climate change.

Suggestions for Communicators

Some of the influences described here—the power of societal concern, personal and policy efficacy, and social norms—align strongly with the issue priority factors described in the discussion of public policy research. Although a host of detailed behavioral science questions have yet to be asked, the outlines of the public engagement problem are familiar.

What sorts of interventions might be most effective in raising the priority of the climate issue and growing the issue public? Behavioral science research suggests that three categories of factors should be considered. These factors overlap in various ways with the suggestions made in the previous section, yet they are described with an emphasis on consumer behavior here.

Values linkages are one factor. Since values linkages are complex and have not yet been studied thoroughly, this report does not attempt to recommend a list of values that would be especially appropriate for climate change (e.g., appeals to Americans' capacity to overcome great challenges, other patriotic appeals, various global and intergenerational responsibilities, appeals about the value of nature and other species, etc.). Identification with social groups and their norms is a second factor and social norms would be a productive focus of intervention research. A third factor involves establishing a sense of personal relevance and efficacy, which have been difficult connections for the public to make with the climate issue. There is evidence that many Americans think the impacts of global warming will not be felt in the United States. People may be largely unaware of emerging scientific research that is beginning to suggest that Americans could, in fact, experience significant impacts in the coming decades. Communicators have yet to find ways to engender confidence that personal choices and behavior will make a difference, or that one's voice will be heard. Given these questions, the potential value of encouraging personal connections should not be ignored.

Climate Literacy Education

Many climate change education and outreach programs have attempted to help the public understand the best scientific evidence and concepts necessary to participate in policy debate, and to make more informed personal choices. Some federal agencies, including NOAA and NASA, and many informal science institutions (museums, aquariums, etc.) have invested in such science-based education programs as the centerpieces of their public outreach campaigns.

It would be unfair to say that all such programs are intended to increase the public's issue concern. Providing information to issue-interested people has been the primary goal of many such programs. But some others have tried to use climate literacy as a way to move the public toward greater issue concern. When viewed from a behavioral science perspective, these so-called "information deficit model" programs may, in fact, be naive because increased knowledge does not necessarily trigger behavioral change.

Climate literacy education is a cognitive, expert-driven approach to public engagement. Scientific information is constrained by the boundaries of current knowledge and the limitations imposed by good professional practices in the sciences. As a result, education programs tend not to be very responsive to affective issues (fears and aspirations) or new questions that might be on people's minds from day to day. Some of the public's most urgent questions lie at the cutting edge of research, and scientists are often unwilling or unable to address them to the public's satisfaction.

Moreover, the public's questions often reach beyond the scientific evidence into other policy-relevant domains, such as economics, geopolitics, and ethics. Science-driven climate literacy programs typically pay little attention to such concerns and offer very little information about the efficacy of policy options and consumer choices. If the goal is to motivate issue commitment, it would seem that investing further in climate literacy campaigns that focus entirely on climate science might have only a limited impact. But education and communications design are complex and certain aspects of climate literacy might, in fact, prove to be very important.

What is Known?

There is strong evidence that people report their knowledge of a subject accurately during surveys because self-reported knowledge correlates well to quiz responses. A very large majority of Americans report that they understand climate change. This finding suggests that employing the information deficit model to encourage issue concern might, indeed, have marginal value.

But other factors suggest that the situation might be more nuanced. Science literacy in the United States is not very high. And given the complexity of climate science, confusion over whether scientific consensus exists, and questions about whether a majority of people think effective mitigation solutions are possible, a more detailed examination of what people actually know might be valuable.

What Is Not Known?

Climate educators who work with an expert-driven content delivery model do not yet have detailed feedback mechanisms that can measure which specific pieces of information are most useful or how the public interprets various messages. Additional research is needed in order to understand exactly what the public knows, what the public wants to know, and how people employ the knowledge they gain.

Researchers have not yet tested public understanding of several concepts that many scientists consider crucial. For example, do most Americans understand the quantitative nature of the climate problem: that various GHG concentrations in the atmosphere—parts per million—force the climate system differently? Do they have a framework for understanding the level of risk associated with various concentration numbers (ppm)? Do they understand the time lag between emissions and impacts or the long-lasting influence CO₂ has upon the atmosphere? Do they know that the current rate of climate change exceeds the capacity of many species and ecosystems to adapt? Do they know what climate system tipping points are and the risks they imply, or where various tipping points might lie on a graduated scale of GHG concentrations? Do they understand how societies rely on climate stability to provide basic resources and services? While general knowledge of global warming is high for most

Americans, and specific knowledge might be high for some issue-interested segments of the population, it is not clear how knowledge of specific ideas correlates to various levels of issue concern.

Similarly, what do people know about the costs and efficacy of various mitigation options? Findings in the Public Policy Research section of this report suggest that efficacy issues have yet to be communicated effectively and that public awareness of important details has yet to be measured. In fairness, mitigation issues are very complex and communicators have difficulty formulating information for the public when experts are reluctant or unable to provide meaningful, specific guidelines. There is strong evidence that solutions messages need to be credible and in sync with the scale of the challenge. As a result, the potential impact of mitigation efficacy information on issue concern remains somewhat ambiguous, but could be profound.

To the extent that climate literacy education has focused on response options the emphasis has been almost entirely on GHG mitigation. A serious national discussion about adaptation to climate change has yet to begin. Some in the public health field have suggested that discussing adaptation strategies inevitably leads people to greater issue concern about mitigation (i.e., as people learn about the consequences of climate change their desire to avoid those consequences grows). This perspective is new; the more common view among informal educators and some scientists has been that splitting the public's attention between mitigation and adaptation either adds too much complexity to the subject or causes people to give up on mitigation altogether. These hypotheses have not yet been fully tested.

Suggestions for Communicators

There is strong evidence that the public is not fully aware of the degree of scientific consensus about climate change, the efficacy of policy-level responses, or potential benefits to society of significantly reducing carbon emissions. Efforts to raise issue concern and grow the issue public might benefit from a focus on these particular factors.

Moreover, finer-grain measurement of public climate literacy would help educators and communicators design outreach programs that address the most relevant questions. Inevitably, education programs need to address risk because it is unlikely that scientists can dramatically improve on the degree of certainty about the severity and/or timing of impacts in the near term. The IPCC has asked authors to focus on risks and reasons for concern, and these rubrics seem appropriate for public education also.

Finally, research tools that test climate literacy might need to measure economics, ethics, and other content knowledge in addition to climate science knowledge. After all, values, affective responses, and other factors necessarily converge with cognitive learning from across multiple disciplines whenever science informs public policy questions.

Limitations and Opportunities in Public Attitudes Research

Policy research has been largely driven by questions that are relevant to policy matters before Congress. In developing ranges of policy options and economic costs for testing, for example, researchers have selected credible figures from authoritative sources, such as the IPCC, the *Stern Review*, and federal assessments that are within the ballpark for issues on the Hill. Such metrics necessarily fall far short of much more stringent mitigation options—the “all-out national effort” to mitigate GHG emissions called for by a growing number of climate scientists, economists, and ethicists.

The all-out national commitment required by stringent policy options is often likened to the economic and cultural transformation that accompanied America’s response to World War II. And the commitment of public dollars for technology development and deployment is often compared to the Apollo program of the 1960s. Researchers have not yet asked the public about their attitudes toward such commitments. There is evidence that the public is more ready for stringent action than policymakers realize, and that people want policymakers to ask more of them. But how willing Americans are to take such extraordinary steps has not been tested.

Researchers also point out that public attitude studies have been conducted primarily at the national level. As a result, they do not provide insight into regional differences that might be of interest to federal, state, and local government agencies and policymakers.

Finally, message-testing strategies used in the public health community have not yet become a major part of research in the climate arena. The benefits of such research are well understood by the public health community, and research programs focused on testing messages and concepts would be invaluable to designers of public intervention programs.

Conclusion: Where We Stand

This report makes no attempt to provide comprehensive guidance to communicators, since no such guidance is possible yet. Instead, this informal assessment demonstrates that research on public attitudes has matured sufficiently to identify meaningful trends in Americans' sense of seriousness about climate change, as well as some of the underlying reasons for their level of concern.

But the application of behavioral science and advocacy research to climate change is just getting underway and has yet to answer many questions that communication designers have an urgent desire to know. Many participants strongly expressed a perception that funding for additional serious research studies is needed very soon. Americans are becoming increasingly concerned about climate change and it is important to create a broader and deeper body of high-quality research results as an aid to educators, communicators, and decision-makers.

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