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Communicating the Risks of Global Warming:

American Risk Perceptions, Affective Images and Interpretive Communities

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Introduction

Large majorities of Americans believe that global warming is real and consider it a serious problem, yet global warming remains a low priority relative to other national and environmental issues and lacks a sense of urgency.[1] To understand this lack of urgency, the study on which this chapter is based examined the risk perceptions and connotative meanings of global warming in the American mind and found that Americans perceive climate change as a moderate risk that will predominantly impact geographically and temporally distant people and places. This research also identified several distinct interpretive communities of climate change: segments of the public that conceptualize and respond to the issue in very different ways. The chapter concludes with five strategies to communicate about global warming in ways that either resonate with the values and predispositions of particular audiences or that directly challenge fundamental misconceptions.

Public risk perceptions are critical components of the socio-political context within which policy makers operate. Public risk perceptions can fundamentally compel or constrain political, economic and social action to address particular risks. For example, public support or opposition

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[1] This chapter builds on the findings from a national study (Leiserowitz, 2003) on American risk perceptions of global warming.

to climate policies (e.g., treaties, regulations, taxes, subsidies, etc.) will be greatly influenced by public perceptions of the risks and dangers of climate change.

In this context, American public risk perceptions of climate change are critical for at least two reasons. First, the United States, with only 5% of the world's population (U.S. Census Bureau, 2005), is currently the world's largest emitter of carbon dioxide, the primary heat-trapping gas, alone accounting for nearly 25% of global emissions (Marland et al., 2003). Per capita, Americans emit 5.40 metric tons of carbon each year. By comparison, the average Japanese emits 2.55 tons per year, while the average Chinese emits only 0.60 and the average Indian only 0.29 tons per year (Marland et al., 2003). Second, successive U.S. presidents and congressional leaders have been at odds with much of the world community regarding the reality, seriousness and need for vigorous action on climate change. For example, in 1997, just prior to the Kyoto climate change conference, the U.S. Senate passed a nonbinding resolution (95-0) co-sponsored by Robert Byrd (D) of West Virginia and Chuck Hagel (R) of Nebraska, which urged the Clinton administration to reject any agreement that did not include emission limits for developing as well as industrialized countries, arguing that to do so would put the U.S. at a competitive economic disadvantage (Senate Resolution 98, 1997). Further, in 2001 President George W. Bush renounced a campaign pledge to regulate carbon dioxide as a pollutant, withdrew the United States from the Kyoto Protocol negotiations, and proposed national energy legislation to increase drilling for oil and natural gas, mining for coal, and build over a thousand new fossil-fuel burning power plants (Pianin, 2001; Revkin, 2001; United States, 2001).[2] Clearly, the American public will play a critical role, both in terms of their direct consumption of fossil fuels and resulting greenhouse gas emissions, and through their support for political leaders or government policies to mitigate or adapt to global climate change.

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[2] These basic tenets of energy policy have not been changed in the energy policy discussions in 2005.

Since the year 2000, numerous public opinion polls demonstrate that large majorities of Americans are aware of global warming (92%), believe that global warming is real and already underway (74%), believe that there is a scientific consensus on the reality of climate change (61%), and already view climate change as a somewhat to very serious problem (76%) (Leiserowitz, 2003; PIPA, 2005). Further, of the 92% of Americans who have heard of global warming, large majorities, including Republicans and Democrats, conservatives and liberals, support a variety of national and international policies to mitigate climate change, including regulation of carbon dioxide as a pollutant (77%), improving auto fuel efficiency (79%), subsidizing the development of renewable energy (71%), and ratifying the Kyoto Protocol (88%) (Leiserowitz, 2003). At the same time, however, Americans continue to regard both the environment and climate change as relatively low national priorities. For example, in a 2000 Gallup poll, the environment ranked 16th on Americans' list of most important problems facing the country. Further, global warming ranked 12th out of 13 environmental issues, just below urban sprawl (Dunlap and Saad, 2001). Thus Americans paradoxically seem highly concerned about global warming, yet view it as less important than nearly all other national or environmental issues. What explains this paradox? Additionally, why do some Americans see climate change as an urgent, immediate danger, while others view it as a gradual, incremental problem, or not a problem at all?

While useful, public opinion polls have limited ability to explain public risk perceptions of global climate change. Most polls use only relatively simple, holistic measures of concern (e.g., "how serious of a threat is global warming"), which provide little insight into the determinants and components of public risk perception. For example, a critical finding of recent research on risk perception is that public perceptions are influenced not only by scientific and

technical descriptions of danger, but also by a variety of psychological and social factors, including personal experience, affect and emotion, imagery, trust, values and worldviews – dimensions of risk perception that are rarely examined by opinion polls (Slovic, 2000).

Research attention has recently focused on the role of affective imagery in risk perception. *Affect* refers to the specific quality of "goodness" or "badness" experienced as a feeling state (with or without conscious awareness) or the positive or negative quality of a stimulus. *Imagery* refers to all forms of mental representation or cognitive content. "Images" include both perceptual representations (pictures, sounds, smells) and symbolic representations (words, numbers, symbols) (Damasio, 1999: 317-321). In this sense, "image" refers to more than just visually-based mental representations. Affective images thus include "sights, sounds, smells, ideas, and words, to which positive and negative affect or feeling states have become attached through learning and experience" (Slovic et al., 1998: 3). The study of affective images in risk perception attempts to identify, describe, and explain those images that carry a strongly positive or negative emotional "charge," and guide risk decision-making. For example, an early study found that many of the images the American public associated with the stimulus "nuclear waste repository" (images such as death, cancer, and the mushroom cloud) evoked strong feelings of dread and judgments that a "nuclear waste repository" was an extremely dangerous risk (Slovic et al., 1991). More broadly, these images also influenced risk perceptions of nuclear energy and were strongly associated with intended voting behavior (Slovic et al., 1991) and support (or the lack thereof) for construction of new nuclear power plants (Peters and Slovic, 1996).

To explore the role of affective imagery in American global warming risk perceptions, policy preferences and behaviors, a national survey was conducted from November 2002 to February of 2003. The study was implemented with a 16-page mail-out, mail-back survey of a

representative sample of the American public. A total of 673 completed surveys were returned

for an overall response rate of 55.4%. Compared to population distributions from the 2000 U.S.

Census, the sample over-represented males (65%) and persons 55 and older (47%). The results

were weighted by sex and age to bring them in line with actual population proportions.

Risk perceptions of global warming

This study found that Americans as a whole perceived global climate change as a moderate risk

(Figure 1). On average, Americans were somewhat concerned about global warming, believed

that impacts on worldwide standards of living, water shortages and rates of serious disease are

somewhat likely and that the impacts will be more pronounced on non-human nature.

Importantly, however, they were less concerned about local impacts, rating these as somewhat

unlikely. The moderate level of public concern about climate change thus appears to be driven

primarily by the perception of danger to geographically and temporally distant people, places and

non-human nature.

[insert Figure 1 about here]

This conclusion is confirmed by the results of a separate question that asked respondents

to indicate which scale of climate change impacts was of greatest concern to them (Table 1).

The question asked, "Which of the following are you <u>most</u> concerned about? The impacts of

global warming on …(1) you and your family; (2) your local community; (3) the U.S. as a

whole; (4) people all over the world; (5) non-human nature; or (6) not at all concerned."

[insert Table 1 about here]

A clear majority of respondents (68%) were most concerned about the impacts on people around the world and non-human nature. Only 13% were most concerned about the impacts on themselves, their family or their local community. This may help explain why global climate change remains a relatively low priority in issue ranking surveys (e.g., Dunlap and Saad, 2001). Higher ranking national issues (e.g., the economy, education, health care, etc.) and environmental issues (clean air, clean water, urban sprawl) are all issues that are more easily understood as having direct local relevance. "Global" climate change, however, is not yet perceived as a significant local concern among the American public. Former Speaker of the U.S. House of Representatives Tip O'Neill once famously stated "all politics are local." To the extent that this is true, climate change is unlikely to become a high-priority national issue until Americans consider themselves personally at risk.

Affective images of global warming

Affective images were measured using a form of word association to the stimulus "global warming." Respondents were asked to provide the first thought or image that came to mind when they heard the words "global warming." Each association was then rated by the respondent using a scale ranging from –5 (very negative) to +5 (very positive). A content analysis of these associations identified a total of 24 distinct thematic categories. The top eight categories, however, represent 97% of all respondents (Figure 2). Associations to melting glaciers and polar ice were the single largest category of responses, indicating that this current and projected impact of climate change is currently the most salient image of global warming among the American

public. This was followed by generic associations to heat and rising temperatures (Heat), impacts on non-human nature (Nature), ozone depletion (Ozone), images of devastation (Alarmists), sea-level rise and the flooding of rivers and coastal areas (Flooding/Sea-Level Rise), references to climate change (Climate Change), and finally associations indicating skepticism or cynicism about the reality of climate change (Naysayers). Mean affect scores (below) indicate that "global warming" had negative connotations for almost all respondents. Alarmist images of disaster produced the strongest negative affect, while naysayers displayed very low negative affect.

[insert Figure 2 about here]

Thus, two of the four most dominant images (melting ice and non-human nature), held by 34% of all respondents, referred to impacts on places or natural ecosystems distant from the everyday experience of most Americans. Most of the references to "heat" were relatively generic in nature and likely indicated associations with the word "warming" in "global warming." Finally, 11% of Americans provided associations to the separate environmental issue of stratospheric ozone depletion, indicating that a substantial proportion of Americans continue to confuse and conflate these two issues (see also Bostrom and Lashof, this volume). Thus, 61% of Americans provided associations to impacts geographically and psychologically distant, generic increases in temperature, or to a different environmental problem.

These results help explain the paradox in public risk perceptions, in which Americans appear concerned about climate change, but do not consider it a high priority relative to other national or environmental issues. This study found that, in aggregate, Americans perceive climate change as a moderate risk, but think the impacts will mostly affect people and places that

are geographically distant. Critically, this study found that most Americans lack vivid, concrete, and personally-relevant affective images of climate change.

Further, one of the most important findings was what was missing in these results. There were no associations to the impacts of climate change on human health. There were no associations to temperature-related morbidity and mortality (e.g., heat stroke), health effects of extreme weather events (tornadoes, hurricanes or precipitation extremes), air-pollution health effects (e.g., asthma and allergies), water and food-borne disease (e.g., cholera, E-coli, giardia), or vector and rodent-borne disease (e.g., malaria, West Nile Virus, Hantavirus Pulmonary Syndrome) all of which are potential health consequences of global climate change (McMichael and Githeko, 2001; National Assessment Synthesis Team, 2001; Patz et al., 2000). Yet, human health impacts are likely to be among the greatest dangers of climate change for human societies, especially for the poor and children in developing countries (as well as the poor in developed nations) who lack access to adequate nutrition, clean water or medical care (IPCC, 2001: 12; Watson and McMichael, 2001).

This finding that Americans do not currently associate global warming with impacts on human health is supported by the results of four questions which asked respondents to estimate the current and future human health effects of global warming (Figure 3). On average, Americans said that current deaths and injuries due to global warming number in the hundreds, and in 50 years will number only in the thousands. Perhaps more importantly, 38% to 41% of respondents selected "don't know" as their answer to these four questions – by far the dominant response. This is another strong indication that Americans do not currently perceive global warming as a grave danger to human health either now or in the future. Further, this research also found that very few Americans associate global warming with extreme weather events, like

heat waves, hurricanes, and droughts – all of which may increase in severity due to global warming.

[insert Figure 3 about here]

Interpretive communities of climate change

The above aggregate results, however, gloss over substantial variation in risk perceptions within the American public. In particular, this study identified several distinct "interpretive communities" within the American public. An interpretive community is defined as a group of individuals that share mutually compatible risk perceptions, affective imagery, values, and sociodemographic characteristics. Risk perceptions are socially constructed, with different interpretive communities predisposed to attend to, fear and socially amplify some risks, while ignoring, discounting or attenuating others. For example, this study found one interpretive community that perceived climate change as a very low or non-existent danger – climate change "naysayers." This group, identified by their affective images, was subsequently found to be predominantly white, male, politically conservative, holding pro-individualism, pro-hierarchism and anti-egalitarian values, anti-environmental attitudes, distrustful of most institutions, highly religious, and to rely on radio as their main source of news (Leiserowitz, 2003). This interpretive community was significantly different than all other respondents (excluding alarmists) on thirteen different risk perception variables (Figure 4). Further, the "naysayer" interpretive community articulated five distinct reasons why they doubted the reality of global climate change:

1) Belief that global warming is natural ("Normal earth cycles" "It is just the natural course of

events" "A natural phenomenon that has been going on for years").

2) Hype ("It is not as bad as the media portrays" "The 'problem' is overblown" "Environmentalist hysteria").

3) Doubting the science ("There is no proof it exists" "Around ten years or so ago it was global cooling" "Junk science").

4) Flat denials of the problem ("A false theory" "There is no global warming").

5) Conspiracy theories ("Hoax" "Environmentalist propaganda" "Scientists making up some statistics for their job security").

[insert Figure 4 about here]

The diversity of these responses demonstrates that climate change naysayers had different rationales for their disbelief, ranging from acceptance of the reality of climate change (although naturally-caused or overblown) to flat denials and outright conspiracy theories. This interpretive community is thus predisposed to discount or flatly reject scientific assessments of climate change. While only 7% of the U.S. adult population (or approximately 12 million people) according to these survey results, naysayers are politically active, are significantly more likely to vote, have strong representation in national government and powerful allies in the private sector (see also McCright, this volume).

This study also identified a contrasting interpretive community with high risk perceptions of climate change – alarmists. Some members of this group provided extreme images of catastrophic climate change, such as: "Bad…bad…bad…like after nuclear war…no vegetation" "Heat waves, it's gonna kill the world" "Death of the planet." Alarmists held pro-egalitarian,

anti-individualist and anti-hierarchist values, were politically liberal, strongly supported government policies to mitigate climate change (including raising taxes) and were significantly more likely to have taken personal action to reduce greenhouse gas emissions. This interpretive community was significantly different than all other respondents (excluding naysayers) on every risk perception variable (Figure 4). It is also important to note, however, that all other respondents had climate change risk perception levels much closer to alarmists than naysayers. This demonstrates that most Americans are predisposed to view climate change as a significant danger, albeit not as extreme as the alarmists, while climate change naysayers have substantially lower risk perceptions than the rest of American society.

Education and communication strategies

Overall, the findings of this study help explain the paradox in American risk perceptions of global warming. While large majorities of Americans believe global warming is real and consider it a serious problem, global warming remains a low priority relative to other national and environmental issues. In other words, global warming currently lacks a sense of urgency (Moser and Dilling, 2004). Most of the American public considers global warming a moderate risk that is more likely to impact people and places far distant in space and time. These findings suggest that multiple communication strategies are needed.

Strategy 1: Highlight potential local and regional climate change impacts.

Local threats are generally perceived as more salient and of greater urgency than global problems. This suggests that efforts to describe the potential national, regional and local impacts of climate change and communicate these potential impacts to the public are critical. As

Rajendra Pachauri, chair of the Intergovernmental Panel on Climate Change recently argued, "…there is an opportunity for much political debate when you start to predict the impact of climate change on specific regions. But if you want action you must provide this information" (Schiermeier, 2003). The IPCC and many other scientific teams are currently working to develop and improve regional and local-scale models of climate change impacts. Meanwhile, some potential regional impacts may already be predicted with a significant degree of certainty (e.g., reduced snow pack in the Pacific Northwest; National Assessment Synthesis Team, 2001: 415-418; Mote et al., 2005). Yet other local and regional-scale impacts are still difficult to predict and remain highly uncertain (e.g., climate change impacts on respiratory diseases, see National Assessment Synthesis Team, 2001: 447). Educators and communicators can already draw on studies of the local and regional impacts of climate change in the United States, with appropriate caveats on scientific certainty (see below). Examples include the U.S. National Assessment, *Climate Change Impacts on the United States* (e.g., National Assessment Synthesis Team, 2001); a series of regional reports describing the current and projected impacts of climate change on American ecosystems produced by the Union of Concerned Scientists and the Ecological Society of America (e.g., Field et al., 1999; Twilley et al., 2001; Kling et al., 2003; see also Cole and Watrous, this volume); state-by-state reports produced by the U.S. Environmental Protection Agency (EPA, 2005); and countless regional case studies appearing in the scientific literature.

Strategy 2: Climate change is happening now.

Immediate threats are generally perceived as more salient and of greater urgency than future problems. This suggests that educators and communicators should highlight the *current* impacts of climate change around the world, which in some places are already profound. For example,

climate change is already having severe impacts on the Arctic, including the U.S. state of Alaska (Arctic Monitoring and Assessment Program, 2005). Alaska's climate has warmed about 4°F since the 1950's and 7°F in the interior during winter. The state experienced a 30% average increase in precipitation between 1968 and 1990. The growing season has lengthened by two weeks. Sea ice has retreated by 14% since 1978 and thinned by 60% since the 1960s with widespread effects on marine ecosystems, coastal climate, and human settlements. Permafrost melting has caused erosion, landslides and damaged infrastructure in central and southern Alaska. Recent warming has been accompanied by "unprecedented increases in forest disturbances, including insect attacks. A sustained infestation of spruce bark beetles, which in the past have been limited by cold, has caused widespread tree deaths over 2.3 million acres on the Kenai Peninsula since 1992, the largest loss to insects ever recorded in North America" (National Assessment Synthesis Team, 2001; see also McNeely and Huntington, this volume). Robert Correll, lead scientist of the recent international Arctic Climate Impact Assessment recently said, "If you want to see what will be happening in the rest of the world 25 years from now, just look at what's happening in the Arctic" (Borenstein, 2003).

Other recent studies have documented warming-related changes in ecosystems and species behavior in the United States (e.g., Clean Air-Cool Planet and Wake, 2005; Parmesan and Galbraith, 2004; Root et al., 2005). These provide convincing evidence that climate change is not just a problem for the future, but one affecting species, ecosystems and human communities right now.

The affective image results reported above demonstrate that when Americans think of global warming, they are already predisposed to think of melting ice and glaciers in the Arctic, with strongly negative affect. Thus the frame for illustrating the severity of climate change in the

Arctic is already well established in the American mind. What is needed now are the concrete details, images and stories of climate impacts – on people, places, economies, cultures, and ecosystems – to fill out the picture, bring the issue to life, and help people understand the potential dangers for the rest of the world. In short, educators and communicators need to make global climate change *local* and to discuss climate change in *present*, as well as future tense.

Strategy 3: Highlight the potential impacts of climate change on human health and extreme weather events.

This research found that the American public does not currently associate global warming with any impacts on human health. Communicators need to articulate and emphasize these impacts, which are among the most serious consequences of projected climate change. An emphasis on the projected impacts on human health is also likely to elevate public concerns about global warming, especially compared to the associations currently dominant (melting ice, generalized heat, and impacts on non-human nature). Some of these health implications are relatively well understood (e.g., increased likelihood of heatstroke), while others remain more uncertain (impacts on asthma) (National Assessment Synthesis Team, 2001). Physicians for Social Responsibility (PSR) is an example of an organization doing this kind of educational outreach. PSR has produced a series of state-by-state reports on the projected impacts of climate change on human health and conducted a public education campaign, including a lecture series by concerned physicians (PSR, 2004).

Likewise, this research found that few Americans associate global warming with extreme events, such as heat waves, hurricanes, flooding or drought, despite the fact that all are projected to increase in severity due to climate change. Extreme events are vivid, dramatic, and easily

understood. Further, extreme events happen each year and thus provide recurring "teachable moments" to explain the potential impacts of future climate change. For example, in 2004 severe to extreme drought continued to grip much of the West, while wildfire incinerated a record 6.3 million acres in Alaska alone (Rippey, 2004; National Climatic Data Center, 2004). While neither of these events can be definitively said to be caused by global warming (causal connections with climate change can only be determined through analysis of long-term trends), these events are consistent with scientists' projections of the future impacts of global warming and may be harbingers of things to come. Educators and communicators can highlight the connections between climate change, human health, and extreme weather events, while being careful to respect current levels of scientific understanding.

Strategy 4: Talk openly about remaining uncertainties.

While communicators and educators should highlight those impacts that are scientifically more certain, some potentially important impacts (e.g., human health) are still relatively unpredictable. In the absence of certainty about particular impacts, what should communicators do? Critically, they should never suggest more scientific certainty than actually exists. Definitive claims based on uncertain science are vulnerable to attack, potentially mislead the public, and can irrevocably destroy trust and credibility. What communicators can do, however, is openly describe and discuss the known likelihood and severity of potential impacts and narrate scenarios that describe possible local and regional futures. To make these possible futures more "imaginable," communicators can use appropriate historical and geographic analogues. When there remains significant uncertainty about a specific impact, communicators should explain why the uncertainty exists, e.g., because the science hasn't been done yet or the systems involved are so

complex that science has yet to understand them sufficiently. It is also important to recognize that scientific uncertainty alone is not an adequate justification for inaction or business-as-usual. Rather, it suggests that, at a minimum, it would be prudent to expect the unexpected, develop contingency plans, and adopt adaptive management strategies.

Strategy 5: Tailor messages and messengers for particular interpretive communities.

This research also identified several distinct interpretive communities within the American public – groups of individuals who share mutually compatible risk perceptions, affective imagery, values and socio-demographic characteristics. Each of these interpretive communities is likely to respond to information about climate change in very different ways. Messages about climate change need to be tailored to the needs and predispositions of particular audiences; in some cases to directly challenge fundamental misconceptions, in others to resonate with strongly held values.

For example, educators and communicators must specifically target those members of the public who confuse global warming with the ozone hole. This study found some Americans continue to believe global climate change is caused by stratospheric ozone depletion – a critical misconception also identified by mental models researchers (e.g., Kempton et al., 1995; Bostrom et al., 1994; Read et al., 1994; see also Bostrom and Lashof, this volume). The ozone hole became a public issue several years before global warming was widely reported in the media. Kempton et al. (1995: 67) found that when Americans first learned about global warming and the "greenhouse effect" they assimilated this new information into pre-existing mental models of the ozone hole. This led to several important misconceptions and confusions between the two environmental issues. For example, many people reason that if there is a "hole" in the ozone

layer and a global "greenhouse" effect, then there must be a "hole" in the "greenhouse." This "hole" either allows more solar radiation into the biosphere—warming the planet, or alternatively, the "hole" is allowing heat to escape—cooling the planet. This metaphorical reasoning is logical, but of course incorrect. Thus, many Americans still hold inaccurate beliefs about the causes of global warming, which leads them to support inappropriate solutions. These "solutions" can range from choosing not to buy an aerosol spray can, despite the fact that "sprays containing CFC's have been banned in the US for [three] decades" (Cutter, 1993: 53), to the solution proposed by one survey respondent:

The problem of global warming is the hole in the ozone layer over Antarctica, right? Scientists can produce ozone in labs, right? The solution is simple. A huge amount of ozone should be created, then a team should fly it to Antarctica. Once there, a plane should fly at a high altitude, meanwhile releasing the ozone into the torn ozone layer. Then, the pollution worldwide should TRY to be regulated. Hey, I'm not saying it'll work, but it's worth a try (Leiserowitz, 2003).

Educators need to target the source of the confusion – the inappropriate application of knowledge about the ozone hole to the problem of global warming. What makes this complicated, however, is that there do exist links between the two issues, although not in the way the public believes. First, the CFC's that destroy ozone are also highly efficient greenhouse gases that trap heat and thus increase global warming, although their contribution is relatively small compared to the carbon dioxide produced by fossil fuel burning (IPCC, 2001). Thus, while thinning of the ozone layer itself does not cause climate change, the same culprit (CFC's) is

involved in both environmental problems. Another complication is that while the ozone hole does not cause global warming, there is evidence that global warming is exacerbating ozone destruction. As recently reported by Cambridge University, climate change appears to be generating an increase in the number and spatial extent of stratospheric ice clouds, which provide a platform for the chemical reactions which destroy ozone (University of Cambridge, 2005; Brown, 2005). Thus, there may be a causal link between the two issues, but the reverse of what is commonly and mistakenly believed.

While these complications certainly make educational efforts more difficult, they also present an opportunity. If this causal link between climate change and ozone depletion is borne out by further research, educators and communicators do not have to convince people that their current understanding is completely wrong; instead they need to invert the causal sequence – climate change actually contributes to ozone depletion, not the other way around. Further, these recent findings also suggest a complex causal link between climate change and cancer – global warming produces more stratospheric ice clouds, which catalyze more ozone destruction, which allows more ultraviolet light to reach the Earth's surface, which can cause cancer. Relatively rapid international action to ban ozone-depleting chemicals was in part driven by the dread evoked in mass publics by the finding that unprotected exposure to sunlight could now lead to a greater risk of skin cancer or other health implications (e.g., cataracts). This newly discovered causal link – from climate change to stratospheric ozone depletion to increasing cancer risks – has the potential to provide additional scientific and public pressure for action on climate change.

Meanwhile, a different set of strategies would be needed to convince naysayers that global warming is a serious concern. This group will be difficult to reach, however, as many appear to distrust scientists, governments, environmentalists, and the media as sources of

information. This may help to explain why increasing scientific certainty, information, and media reports about climate change have not convinced this minority of the public (who are also more likely to vote). Naysayers are also more likely to get their information from conservative talk radio, thus may only acquire information and perspectives that reinforce their disbelief. Further, increased scientific certainty and information may serve only to strengthen some naysayers' conspiracy theories (see McCright, this volume).

Some may argue that engaging professional climate change naysayers only lends them credibility and gives their views more weight than they deserve; thus climate change scientists, activists and educators should ignore them. This is a mistake. While a small, but vocal minority of the public (that is also more likely to vote), this interpretive community includes leading politicians, contrarian scientists, political pundits, Washington think tanks and major corporations that have already greatly influenced public opinion and government policy. Left unchallenged, they will continue to cast doubt on climate science and scientists and impede public policies to mitigate or adapt to climate change. Further, the research reported here suggests that some naysayers could yet be convinced to support policies to reduce fossil fuel use, in some cases with more scientific evidence, in others with framings that resonate with strongly held values, or with messengers that they already trust. For example, some naysayers may respond favorably to a focus on the economic opportunities presented by the global effort to shift energy production toward renewable energy. Entrepreneurial innovation will be critical to this effort and the global marketplace will amply reward those individuals and companies that are best positioned to provide the energy and jobs of the future. Other naysayers may be more persuaded by the national security implications and consequences of continued fossil fuel dependency, which range from the economic, political and military resources devoted to

acquiring and protecting American access to oil in the Middle East (and the geopolitical consequences) to the potentially destabilizing consequences of climate change on governments, economies and societies around the world. Columnist Thomas Friedman of the New York Times has recently argued for a "geo-green" strategy to end American and world dependence on fossil fuels by developing alternative sources of energy, which will both reduce future climate change and further neo-conservative goals to undermine totalitarian regimes and promote freedom and democracy in the Middle East by cutting off the oil revenues that support them (Friedman, 2005a; 2005b). Likewise, Set America Free is an organization that proposes a large-scale investment in alternative energies to reduce American dependence on fossil fuels, and to thus "deny adversaries the wherewithal they use to harm us; protect our quality of life and economy against the effects of cuts in foreign energy supplies and rising costs; and reduce by as much a 50% emissions of undesirable pollutants" (Set America Free, 2005). The organization includes prominent members such as Gary Bauer (conservative evangelical leader and 2000 Republican candidate for president), Robert McFarlane (former National Security Advisor under President Reagan), and James Woolsey (former director of the CIA under President Clinton). A parallel movement advocating for action on climate change is also emerging from the religious community, including evangelical Christians. Religious groups, including the National Association of Evangelicals, "argue that global warming is an urgent threat, a cause of poverty and a Christian issue because the Bible mandates stewardship of God's creation" (Goodstein, 2005). Some religious leaders argue that "climate change would have disproportionate effects on the poorest regions of the world," and "caring for the poor by reducing the threat of global warming is caring for Jesus Christ," thus addressing climate change is a moral and ethical requirement (The Rev. Jim Ball quoted in Goodstein, 2005; see also Bingham, this volume). All

of these are examples of organizations, messages and messengers that are more likely to reach and persuade climate change naysayers than traditional scientific or environmental arguments.

Alarmists, however, already exhibit grave concern regarding the issue. They strongly support policies to mitigate climate change and are already predisposed to be attentive to and believe scientist, government and environmentalist messages regarding climate change risks. On the other hand, some of these respondents hold extremely negative images that go well beyond scientific assessments of climate change risks. These extreme responses are often apocalyptic, predicting "the end of the world" or the "death of the planet." These are overreactions to an otherwise very serious problem and may lead some to a sense of resigned fatalism. Further, these dystopic visions provide ammunition to naysayers who in turn claim that global warming is a hoax perpetrated by "doomsayers" and "Chicken Littles" (Moser and Dilling, 2004; and Moser, this volume).

Overall, however, these and other research findings demonstrate that Americans as a whole are already predisposed to view climate change as a significant risk and to support local, national and international action to reduce the heat-trapping gases that are warming the globe. What is lacking is a sense of public urgency, strong leadership and political will.

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Figure 2.1: American risk perceptions of global warming
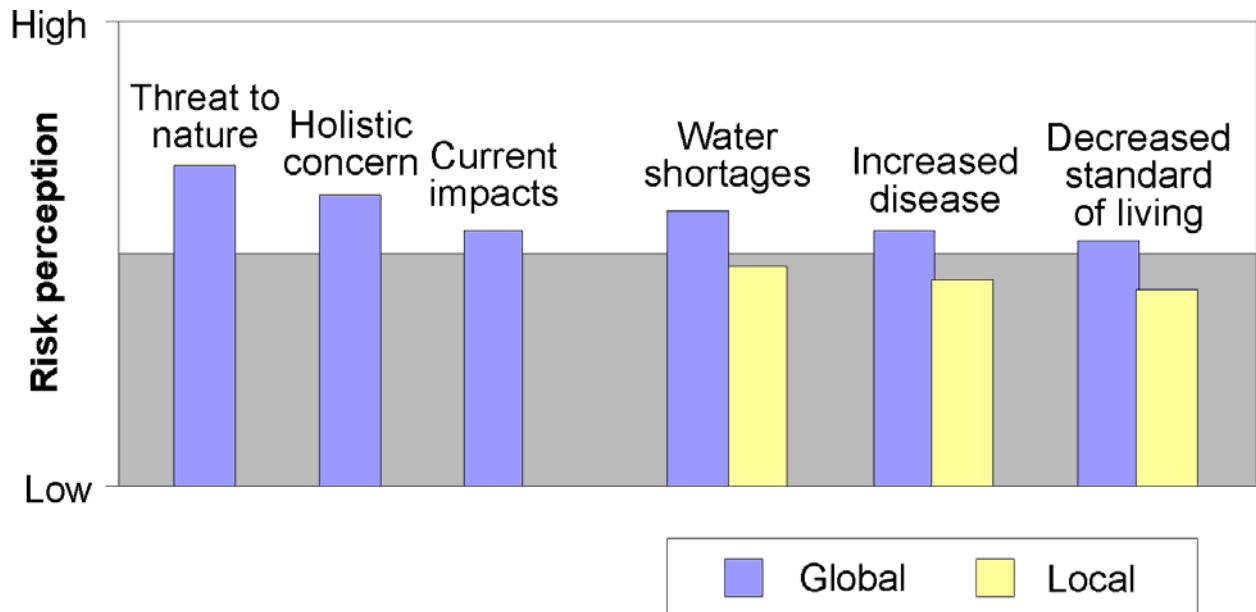
Scales range from 1 (low) to 4 (high). Response categories include seriousness of threat to nature and current impacts around the world (not at all to very serious); level of concern about global warming (not at all to very concerned); and the likelihood of specific impacts locally and worldwide (very unlikely to very likely). $n = 590$.

Source: A. Leiserowitz (2005) Decision Research
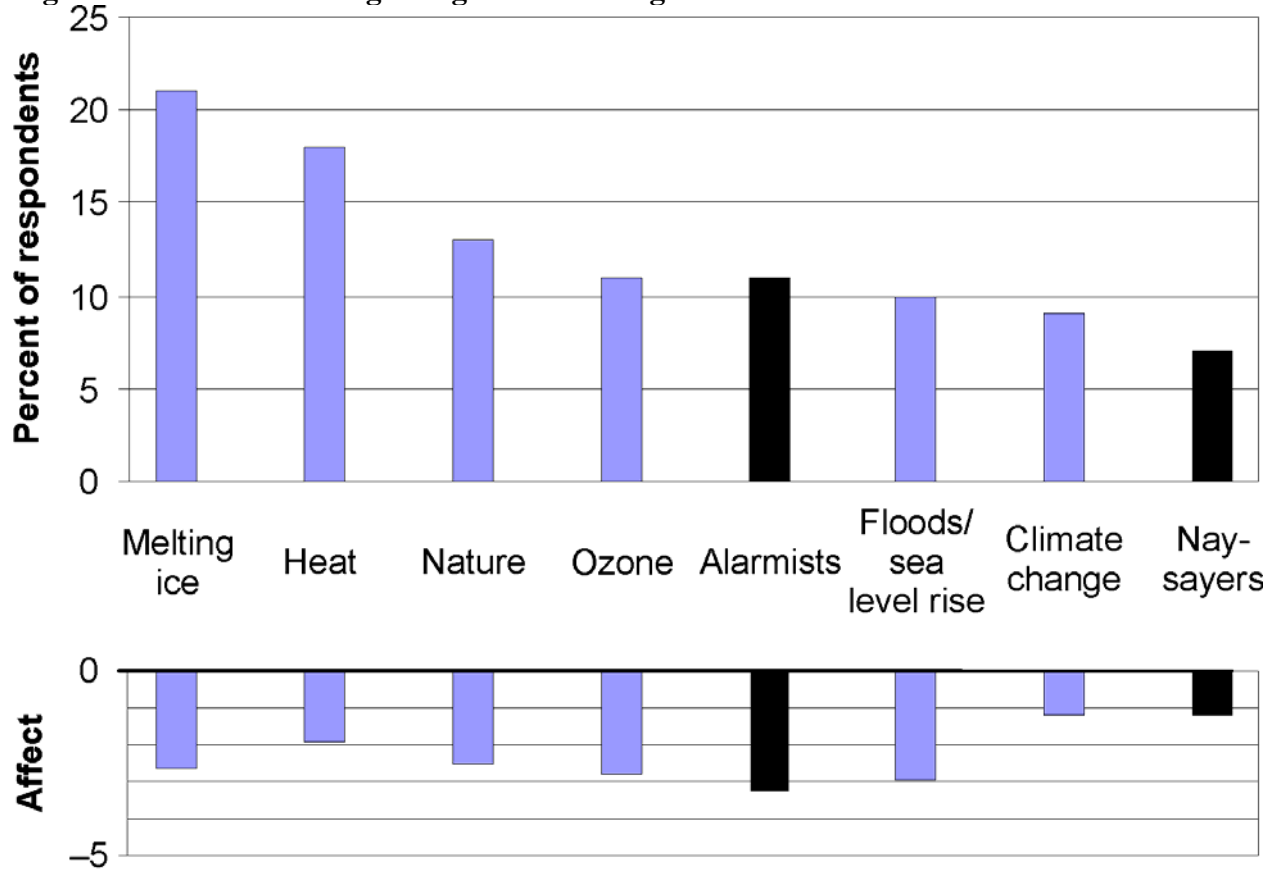
Figure 2.2: American images of global warming

Figure 2. American images of global warming. Affect was rated on a 10-point scale where +5 = *very positive* and –5 = *very negative*.

Source: A. Leiserowitz (2005), Decision Research

Figure 2.3: American mean estimates of current and future impacts on human health
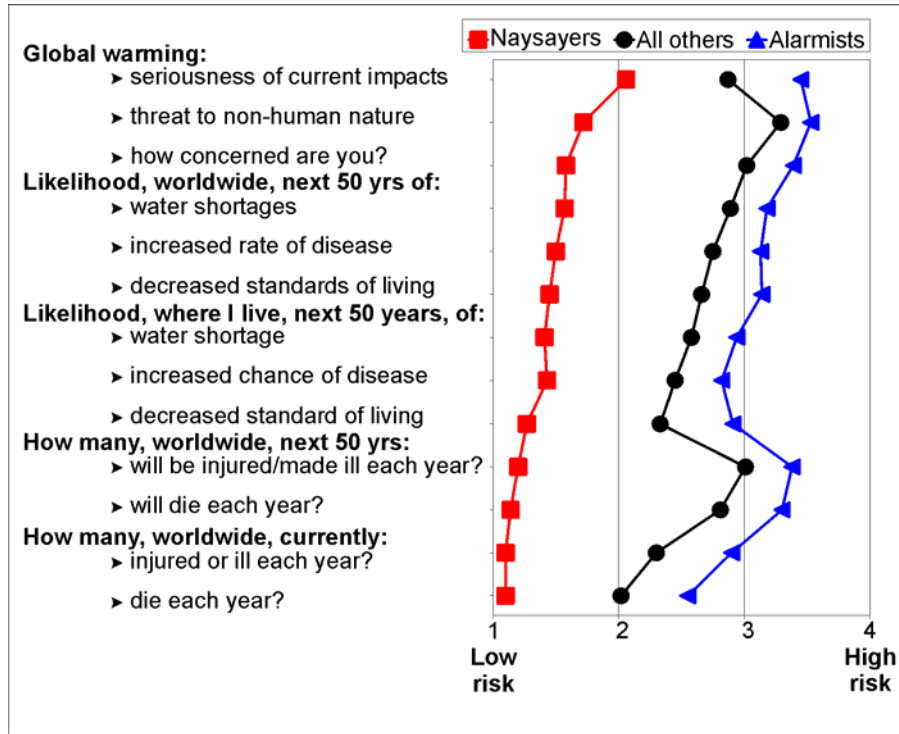
American Estimates of the Numbers of Deaths, Illnesses, and Injuries Each Year Due to Global Warming
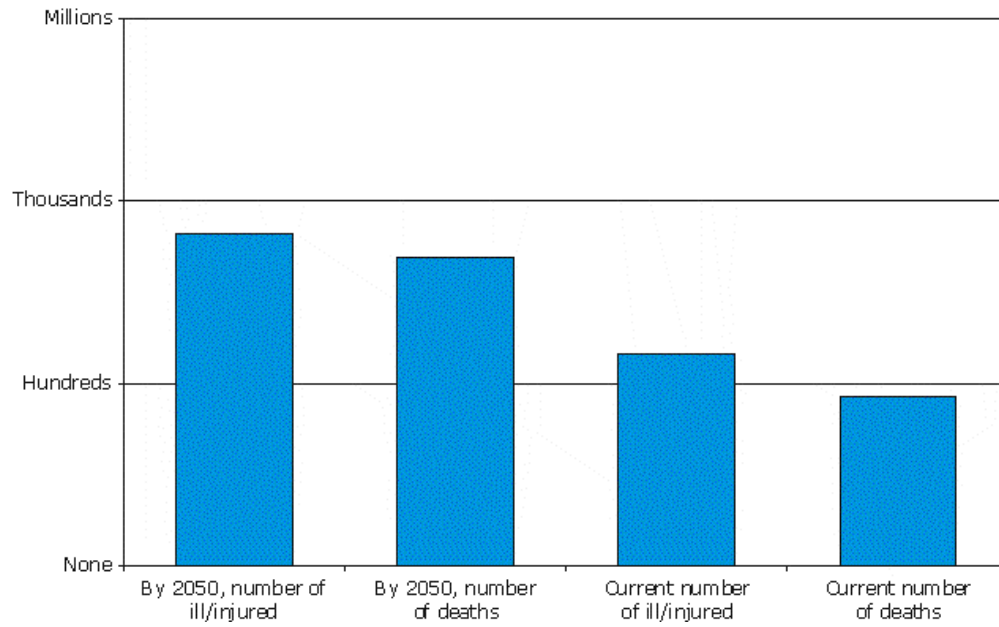
(n = 307 to 330)

Source: A. Leiserowitz (2005), Decision Research

Figure 2.4: Mean risk perceptions of global warming

Source: A. Leiserowitz (2005), Decision Research

Tables

Table 2.1. Most concerned about impacts on?

	Percent	*Cum. Percent*
You and your family	12	12
Your local community	1	13
The U.S. as a whole	9	22
People all over the world	50	72
Non-human nature	18	90
Not at all concerned	10	100
Total	100	

n = 551

Source: A. Leiserowitz (2005), Decision Research