

# RECENT EVOLUTION OF THE CLIMATE CHANGE DIALOGUE IN THE UNITED STATES

BY AMANDA C. STAUDT



A broad range of climate-related initiatives has contributed to a shift in the public discourse on climate change away from questions of scientific uncertainty and toward potential impacts and response options.

**The dramatic aftermath of Hurricane Katrina provided a concrete perspective of the potential dangers of a warmer climate, even though the storm could not be attributed directly to climate change. (Photo: New Orleans, Louisiana, 11 September 2005 by Lieutenant Commander Mark Moran, NOAA Corps, NMAO/AOC)**

**W**hen it comes to climate change, the tenor of media coverage and policy discussions has noticeably shifted in the past couple years. As recently as 2004, there was a widespread sentiment among climate change scientists that the media gave undue emphasis to the perspectives of climate skeptics. Yet over the past year, articles published in the mainstream media rarely question the scientific consensus. Even during its 2006 session, U.S. Congressional hearings and other seminars for policymakers often focused on making a strong case that the climate is changing because of human activities and that we should do something about it. In 2007, most of the climate-related dialogue among lawmakers has focused on figuring out how to solve the problem, whether through new legislation ►

**TABLE 1. Selected poll results from 2007.**

Poll dates	Views on global warming	Views on government actions
<b>30–31 Jan 2007</b> Fox News/Opinion Dynamics Corporation (2007) poll of 900 registered voters nationwide	<b>82%</b> believe global warming exists	Not available
<b>11–14 Mar 2007</b> Gallup poll of 1,009 adults nationwide (Saad 2007)	<b>59%</b> think the effects of global warming have already begun to happen	Not available
<b>5–10 Apr 2007</b> <i>Washington Post</i> /ABC News/Stanford University (2007) poll of 1,002 adults nationwide	<b>84%</b> think that the world's temperature probably has been going up slowly over the past 100 yr	<b>49%</b> think the federal government should do much more to deal with global warming and 20% think it should do somewhat more
<b>19–22 Mar 2007</b> Center for American Progress poll of 500 registered voters nationwide (Podesta et al. 2007)	<b>76%</b> believe the effects of global warming are apparent now	<b>60%</b> believe we must take action now or it will be too late to stop global warming
<b>20–24 Apr 2007</b> CBS News/ <i>New York Times</i> (2007) poll of 1,052 adults nationwide	<b>49%</b> believe global warming is having a serious impact now and 36% believe that global warming will have an impact in the future	<b>52%</b> think global warming should be a high priority for government leaders

Note: Polling results provide insight into the perspectives of the American public but are subject to limitations (e.g., due to the wording of the questions or to the influence of current events that may sway opinions). The sampling errors for these polls are around  $\pm 3\%$  at the 95% confidence level.

to establish national limits on greenhouse gas emissions, adding climate-related clauses to bills that address agricultural or wetland management, or crafting energy policy with climate as an integral consideration.

These transitions reflect the convergence of several different factors. Numerous efforts have been undertaken in recent years by the scientific community, the media, state and local governments, nongovernmental organizations (NGOs), businesses, and other groups to communicate the state of scientific understanding of climate change and to begin to take action. While no single factor can be credited with causing this change in public discourse, it is useful to survey the broad range of activity on climate change

and to reflect on the roles of these activities and the influences they may have on each other.

### RECENT POLLS OF U.S. PUBLIC OPINION ABOUT CLIMATE CHANGE.

Polis of the U.S. public conducted in spring 2007 indicate that a strong majority of the population is convinced that global warming is happening (Table 1). These numbers have inched up over the past few years. For example, those who agreed that global warming had already begun to happen ranged between 48% and 54% in Gallup polls conducted between 1997 and 2005, compared to 59% in 2007 (Brewer 2005; Saad 2007; Nisbet and Myers 2007). Some of the polls listed in Table 1 also found strong support for increased governmental efforts to seek solutions to global warming. Such solutions could include limiting greenhouse gas emissions by fostering development of alternate fuels, setting emissions standards for business and industry, or imposing mandatory controls on greenhouse gas emissions. In addition, Gallup (2007) found broad support for various actions that individuals could take, ranging from using fluorescent light bulbs in the home (69% agreed that they should be doing this) to buying a hybrid car (62%) to “spending several thousand dollars to make your home as energy efficient as possible” (78%).

Although widespread public acceptance that global warming is happening has been the case for

**AFFILIATIONS:** STAUDT—National Wildlife Federation, Reston, Virginia

**CORRESPONDING AUTHOR:** Amanda C. Staudt, National Wildlife Federation, 11100 Wildlife Center Drive, Reston, VA 20190

E-mail: [staudta@nwf.org](mailto:staudta@nwf.org)

The abstract for this article can be found in this issue, following the table of contents.

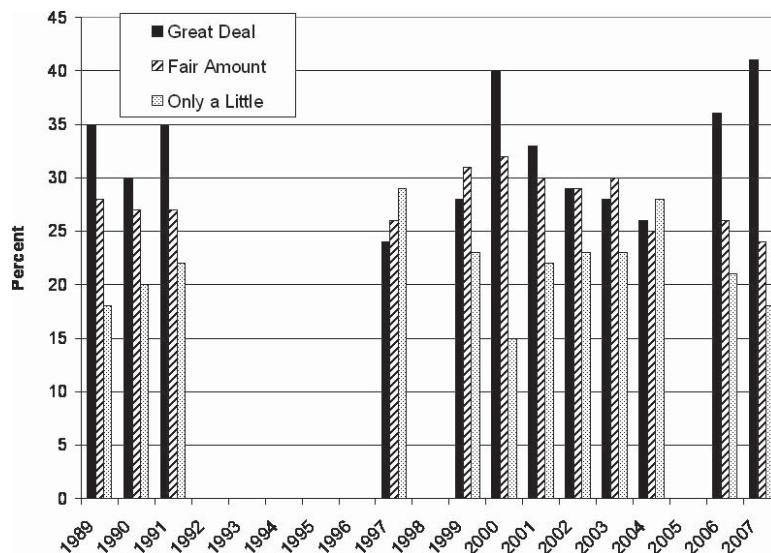
DOI:10.1175/2007BAMS2476.1

In final form 21 December 2007  
©2008 American Meteorological Society

several years, the issue has increased in prominence recently. Gallup has asked survey participants to what extent they are worried about global warming in polls conducted during 12 of the last 19 yr (Fig. 1). Forty percent of respondents indicated that they were worried a “great deal” in 2000, in the midst of the presidential campaign in which Al Gore and George W. Bush were the leading contenders. Those worried a great deal dropped by nearly 15 percentage points during 2001–04, when terrorism and the war in Iraq dominated public discourse. This trend reversed in 2006 and 2007, with 41% of the survey participants indicating that they are concerned a great deal in 2007.

Surveys conducted in 2003 and 2006 by Curry et al. (2007) asked participants what they thought the most important environmental problem facing the United States was. In 2003, only 11% of respondents considered climate change to be the most important environmental problem and 10% listing it as the second most important. It ranked sixth behind water pollution, destruction of ecosystems, toxic waste, overpopulations, and ozone depletion. In 2006, climate change was clearly the top environmental concern, with 34% of respondents listing it as their biggest concern and 15% listing it as their second biggest concern.

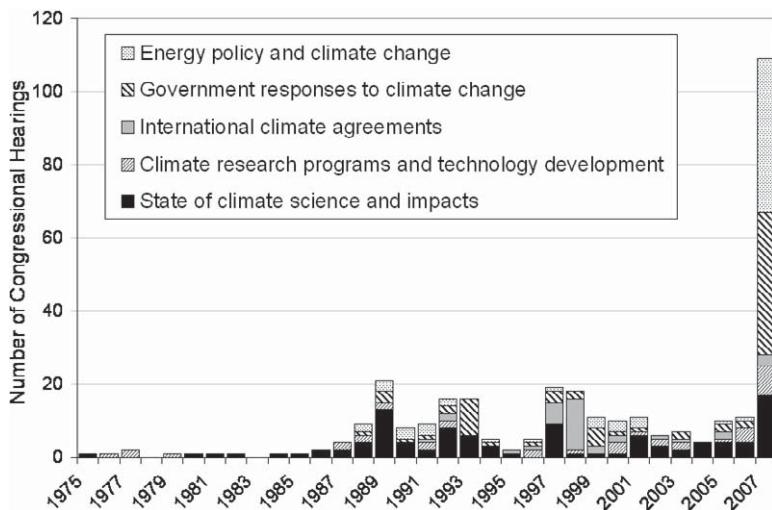
**U.S. CONGRESS FOCUSED ON CLIMATE CHANGE.** Congress has held over 300 hearings on climate change since the mid-1970s (Fig. 2). Previous years have seen a spike in the number of hearings, although nothing matches the recent flurry of activity. For example, there were over 20 climate change hearings in 1989. Many addressed the understanding of climate change, the likely impacts of continued warming, and possible policy steps for curbing greenhouse gas emissions. In addition, draft legislation to establish the Global Change Research Act, which became law in 1990, was discussed by this Congress. The years 1997 and 1998 saw another surge of climate-related hearings on the Hill, including 19 hearings over the two years that explicitly refer to the international climate negotiations underway on the Kyoto Protocol.



**Fig. 1. Gallup has asked the same question in polls going back to 1989: “I’m going to read you a list of environmental problems. As I read each one, please tell me if you personally worry about this problem a great deal, a fair amount, only a little, or not at all . . . The ‘greenhouse effect’ or global warming.” The polls were conducted in Mar–early Apr except for 1997, which was conducted in late Oct, and 1989, which was conducted in early May. The remaining 15%–22% of responses not shown either answered that they were “not at all” worried or that they had no opinion (Saad 2007).**

An unprecedented number of climate-related hearings have been held by the U.S. Congress in 2007. In this single year, 44 hearings were held by four different Senate committees and 65 hearings were held by eight different House committees. The House Energy and Commerce Committee alone held 10 major hearings on climate change and called over 50 witnesses between January and April. The Senate Committee on Environment and Public Works held 21 hearings in 2007, most specifically addressing policy responses.

Although it appears from the number of hearings that 2007 brought a dramatic shift in congressional interest in climate change, it actually reflects a trend over the past several years. According to the Pew Center for Global Change, there were seven climate-related legislative proposals introduced in the 105th Congress (1997–98), 25 in the 106th Congress (1999–2000), over 80 in the 107th Congress (2001–02), 96 in the 108th Congress (2003–04), and 106 in the 109th Congress (2005–06) ([www.pewclimate.org/what\\_s\\_being\\_done/in\\_the\\_congress/109th.cfm](http://www.pewclimate.org/what_s_being_done/in_the_congress/109th.cfm)). In the current Congress, there are at least seven competing proposals alone for major cap-and-trade programs that would regulate greenhouse gas emissions, along with numerous other bills related to global warming.



**FIG. 2. Number of congressional hearings held each year in which climate change was addressed. Sources: for 1975–Sep 2006, National Environmental Trust (2006); for Oct 2006–Dec 2007, Web sites of the following Congressional committees: Senate Committees on Environment and Public Works; Energy and Natural Resources; Commerce, Science, and Transportation; and Agriculture, Nutrition, and Forestry; House Committees on Agriculture, Energy and Commerce, Natural Resources, Oversight and Government Reform, Science and Technology, Transportation and Infrastructure, Ways and Means; and the House Select Committee on Energy Independence and Global Warming.**

In 2005, a Senate resolution calling for meaningful solutions to climate change was passed with a vote of 54–43. This resolution—which is the only bill broadly addressing action on climate change to pass either house of Congress—was nonbinding and therefore relatively politically benign. The bills under discussion by the current Congress propose specific policy solutions, with clear implications for the economy and the American public, thus requiring more political will to enact. The fact that many senior legislators, on both sides of the aisle, have invested resources in writing draft legislation is indicative of how serious this Congress is taking the issue.

The great emphasis on global warming starting in 2007 is certainly related to the change in majority political party for both houses of Congress in the 2006 midterm elections. The change in leadership means that Democratic members of Congress now chair and therefore define the agenda of important committees. In her new leadership position, Speaker of the House Nancy Pelosi specifically identified global warming as a priority issue. She created the Select Committee on Energy Independence and Global Warming to hold hearings and draw attention to the issue. Select committees are relatively rare and one way that a Speaker can clearly identify priority issues. Speaker Pelosi also

charged the relevant House committees to draft legislation to address energy independence and global warming by Independence Day. Finally, Speaker Pelosi’s commitment to the issue was further reinforced by her appearance before the House Science Committee prior to a hearing on the Intergovernmental Panel on Climate Change’s (IPCC) Working Group I report—a rare appearance for someone in her capacity.

Highlighting climate as a top agenda item for this Congress is perhaps not surprising given the attention to the issue during the 2006 campaign season. Many campaign advertisements highlighted energy issues and alternative energy options. Polls show that more than half of voters considered global warming as a factor in their choice among candidates ([www.zogby.com/News/ReadNews.dbm?ID=1194](http://www.zogby.com/News/ReadNews.dbm?ID=1194)). Climate change is likely to be a factor in the 2008 presidential campaign, with 12 out of 18 candidates in the race as

of 12 September 2007 having articulated positions on carbon cap-and-trade targets, automobile fuel efficiency, renewable energy standards, and other climate policies ([www.heatison.org/content/blank/candidate\\_chart](http://www.heatison.org/content/blank/candidate_chart)).

### FACTORS THAT CONTRIBUTED TO THE SHIFTING EMPHASIS IN PUBLIC DISCOURSE.

The confluence of several factors has contributed to the evolution in U.S. public opinion and political activity related to climate change. It is impossible to pinpoint a single deciding factor. Activities on at least four different fronts were important. These include efforts within the scientific community, personal experiences that contributed to individuals making up their minds, multifaceted media coverage, and a broad collection of activities by state and local government, nongovernmental organizations, and the business community.

*Efforts of the scientific community.* Since the 2001 release of the IPCC Third Assessment Report (Houghton et al. 2001), the scientific community has made several advances that have effectively contributed to a convincing case that climate change is a real and serious phenomenon. The Fourth Assessment

Report of the IPCC provided a compelling overview of the breadth of scientific evidence on climate change (Solomon et al. 2007; Metz et al. 2007; Parry et al. 2007). Among the important advances is the resolution of several longstanding scientific disputes, in particular three that frequently have been cited by the community of climate skeptics:

- First is the question of whether solar variability could explain the upward trend in surface temperature of the past 30 yr. No data support solar attribution of warming over the last several decades and remaining hypotheses for a solar explanation lack key theoretical support and observational evidence (Lean 2005). In fact, Lockwood and Frohlich (2007) recently published an analysis showing that trends in the sun's variability have been opposite of the warming trends of Earth in the last 20 yr.
- A second example is the discrepancy between ground-based observations of surface temperature and observations from satellite and balloon platforms (NRC 2000). The first synthesis and assessment report of the Climate Change Science Program (CCSP 2006) and the related research papers (Mears and Wentz 2005; Santer et al. 2005; Sherwood et al. 2005) provide definitive reconciliation of these datasets. The CCSP report states that the "significant discrepancy no longer exists" (CCSP 2006, p. 1).
- A third example is the surface temperature records of the past 2,000 yr and to what extent they indicate that recent warming is unusual. A National Academies report (NRC 2006) helped clarify how to put current observations in the context of proxy measurements from the past two millennia. The authors concluded with a high level of confidence that "global mean surface temperature was higher during the last few decades of the 20th century than during any comparable period of the preceding four centuries," and that it is "plausible that the Northern Hemisphere was warmer during the last few decades of the 20th century than during any comparable period over the preceding millennium."

More generally, the scientific community has contributed to the preponderance of evidence now available on climate change and its impacts. Assessment reports like those produced by the IPCC and the Arctic Climate Impact Assessment (ACIA 2004) provide an important service by synthesizing the breadth of scientific knowledge. The ACIA was especially effective in involving stakeholders throughout the

process and communicating the assessment results, with separate documents prepared for different audiences (NRC 2007). Furthermore, the regional focus of this assessment enabled it to convey a coherent storyline about the likely impacts of climate change in that region. Indeed, other regions of the world would benefit from such in-depth assessment.

The release of major assessment reports is also important in that they provide a newsworthy event likely to be covered by the media, thereby reaching an audience beyond the scientific community. Only on rare occasions do individual scientific papers benefit from national news coverage. That said, a number of papers in recent years that explicitly address climate-related issues with direct implications on humans—for example, heat waves (Meehl and Tebaldi 2004) and the possibility of a more arid climate in the Southwest (Seager et al. 2007)—have been covered widely in the press. These papers directly take on scientific questions of public interest and in some cases were pitched to the media with news releases prepared by the home institutions of the authors, signaling a more proactive effort to make science relevant to a broader audience.

Scientific academies and professional societies have likewise become more forthright and definitive about the likely impacts of climate change and the need to take action. In June 2005, the science academies of the Group of Eight (G8) nations plus Brazil, China, and India released a statement on the global response to climate change. The U.S. National Academy of Sciences signed off on the statement because it was consistent with the body of reports published by the organization (as summarized in Staudt et al. 2005). A second statement released in May 2007 by the same group along with Mexico and South Africa reiterates the view that action to address climate is needed and also promotes improvements in efficiency as an important first step. In February 2007 the American Meteorological Society issued a position statement on climate change (available online at [www.ametsoc.org/POLICY/2007climatechange.pdf](http://www.ametsoc.org/POLICY/2007climatechange.pdf)), which is consistent with the views of the IPCC and the reports of the National Academies. The American Association for the Advancement of Science adopted a statement in December 2006 expressing that the "scientific evidence is clear" and "the time to control greenhouse gases is now" (available online at [www.aaas.org/news/releases/2007/0218am\\_statement.shtml](http://www.aaas.org/news/releases/2007/0218am_statement.shtml)). The American Geophysical Union revised its position along the same lines in 2003 (statement available online at [www.agu.org/sci\\_soc/policy/positions/climate\\_change.shtml](http://www.agu.org/sci_soc/policy/positions/climate_change.shtml)).

Despite improvements in communicating climate science to the media, public, and politicians, gaps in understanding persist. In some cases, these audiences are apt to jump to conclusions about natural phenomena that the science does not necessarily support, for example, attributing specific weather events to climate change. In others, public understanding may lag the scientific consensus, possibly hindering governmental responses. Thus, the scientific community must continue to be proactive in effectively communicating what is understood about climate change to broader audiences.

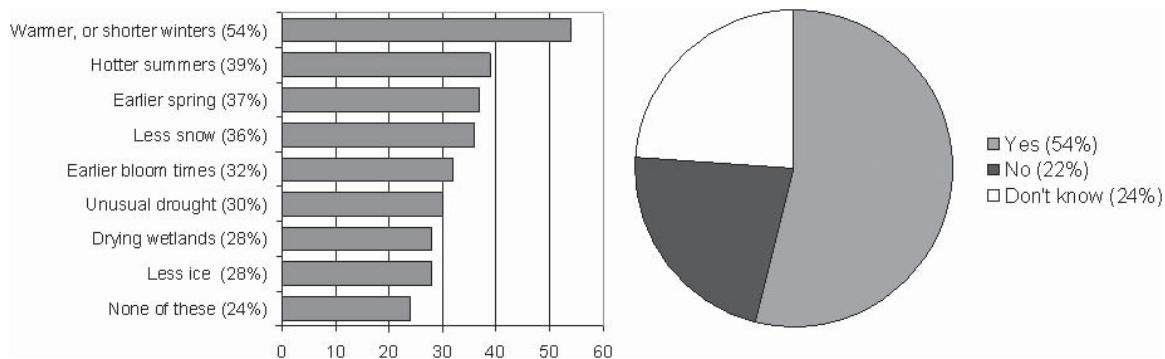
*Personal experience causing individuals to make up their minds.* Part of the recent shift in public attitudes might reflect that individuals are beginning to see more evidence of climate change in their own backyards. Take, for example, a 2006 survey of hunters and anglers conducted by the National Wildlife Federation. Because many sportsmen and women return to the same hunting and fishing grounds year after year, they have a long-term perspective on local changes to the environment. In line with surveys of the general public, 76% of hunter and angler respondents indicated that they “agree that global warming is currently occurring.” As shown in Fig. 3, a majority of the survey participants had observed some climate-related trend and over half of those who had observed a trend attributed it to global warming. It stands to reason that such observations of their local environment contributed to their views on global warming.

In addition to individual experiences, there have been several major climate-related events in the past few years that have garnered media attention and captured public concern. First and foremost

is the devastation wrought by Hurricanes Katrina and Rita in fall 2005. Because they coincided with an active debate within the scientific community regarding the potential impacts of climate change on hurricanes, many news articles linked these two hurricanes and the active 2005 hurricane season to climate change (Curry et al. 2006). Hence, the dramatic images and impacts of Hurricanes Katrina and Rita provided a more concrete perspective for the general public of the potential dangers of climate change, even though it is not possible to attribute any specific hurricane to human-induced climate change and the scientific community had not yet reached consensus. A Gallup poll conducted in March 2006 found that 35% of participants thought that global warming was a major cause of the increase in strength of hurricanes in recent years, 33% thought it was a minor cause, and only 32% thought global warming was not a cause or had no opinion (Gallup 2007).

Other climate-related events that have been the subject of media attention include the major European heat wave in August 2003, active wildfire seasons in the western and southeastern United States the past couple of years, the decline of snowpack and extensive drought in the western United States, and the plight of the polar bear due to declining sea ice extent. The number, and in many cases alarming impacts, of these events contribute to an increasing perception that something is changing in our climate.

*Role of the media.* The issue of global climate change has been covered in all media outlets during the past few years. Newspapers, such as the *New York Times* and the *Washington Post*, have regularly covered the issue for many years. What is more notable is the



**Fig. 3. (left) Responses to “Have you observed any of the following conditions where you live?” (right) Responses to “Do you believe that the weather conditions you observed are related to global warming?” Results from a poll conducted in Apr 2006 by the National Wildlife Federation of over 1,000 hunters and anglers. Respondents had an average age of 53 yr, voted close to 2-to-1 Bush over Kerry in 2004, 75% were male, and 50% were evangelical Christian. Sampling error is less than  $\pm 3.1\%$ .**

expansion of coverage in other papers. For example, starting on 30 May 2006, *USA Today*—commonly thought of as a bellwether of moderate public opinion—ran four days of coverage on climate change with a total of 11 articles plus a major graphic explaining how climate change works. The stories covered topics ranging from the possible impacts on wine regions, ski resorts, and the Everglades to efforts of corporate America and individuals to address climate change.

Climate change was also the subject of movies (e.g., *An Inconvenient Truth* released in 2006 and *The Day After Tomorrow* in 2004), television specials (e.g., “Melting Point: Tracking the Global Warming Threat,” CNN Presents 22 April 2006; “Global Warming: What You Need to Know,” a Tom Brokaw special on the Discovery Channel, 9 July 2006), and a weekly show on The Weather Channel (*The Climate Code with Dr. Heidi Cullen*). Numerous magazines have run climate change as their cover story, including *Vanity Fair*, *U.S. News and World Report*, *Time*, *National Geographic*, *The Economist*, and *Sports Illustrated*. These recent articles typically do not question the scientific consensus that climate is changing, as is illustrated in the 3 April 2006 cover story in *Time* magazine titled, “Be Worried. Be Very Worried.” This broad-based media coverage has certainly reached a wide audience within the United States.

In addition to expanding media coverage of climate change in recent years, there appears to have been a shift away from reporting on climate change in a way that gives undue weight to the perspectives of a few climate skeptics, found to be a problem as recently as a few years ago (Boykoff and Boykoff 2004; Oreskes 2004). Although no comprehensive analysis is yet available of recent media treatment of climate change, anecdotal evidence seems to support this general impression. For example, the *USA Today* coverage in May 2006 led with the headline “The Debate’s Over: Globe is Warming.” The suite of articles did not question whether the climate was changing, but rather focused on potential impacts and response options. Another example is how Rupert Murdoch, chairman and CEO of News Corp. (FOX News, *The New York Post*, and other media outlets) and a renowned conservative, recently pledged to incorporate messages about taking action on climate change into the company’s newspapers and news programming, as well as other television programming and movies ([money.cnn.com/2007/08/14/news/companies/pluggedin\\_gunther\\_murdoch.fortune/index.htm](http://money.cnn.com/2007/08/14/news/companies/pluggedin_gunther_murdoch.fortune/index.htm)). This shift likely reflects the increased

weight of scientific evidence, but also possibly the efforts among journalists to critique their treatment of global warming, especially in newspaper coverage, and identify ways to address shortcomings (e.g., Pryor 2006).

**Broad coalition of action and political support.** A broad range of state and local governments, businesses, interest groups, and charitable foundations have been actively advocating and implementing efforts to reduce greenhouse gas emissions. The diversity of groups who are engaged in the issue of global warming is remarkable. Their efforts in many cases have interacted synergistically to further advance the policy agenda.

Historically, states have frequently led the way in implementing environmental regulation, often experimenting with policy approaches that are later adopted by the federal government [e.g., air quality management as discussed in NRC (2004)]. Addressing climate change has been no different. The Pew Center on Global Climate Change recently reported on the various climate initiatives that states are taking (Pew Center on Global Climate Change 2007), including

- 29 states have developed climate action plans and 14 have set statewide emissions targets;
- in February 2007, five states established the Western Regional Climate Action Initiative, in which they agree to set emissions targets for greenhouse gases and create a market-based system to aid in meeting that target;
- 10 states in the Northeast and mid-Atlantic are participating in the Regional Greenhouse Gas Initiative (RGGI), a cap-and-trade system to reduce carbon dioxide emissions from power plants in the region;
- 23 states and the District of Columbia have standards for the amount of electricity that must come from renewable sources; and
- California has adopted a greenhouse gas emissions standard for new light-duty vehicles and 13 states have expressed their intention to follow the California standards.

The collection of state efforts, especially the possibility of being required to comply with multiple different emissions standards, is one factor that has spurred some businesses to begin demanding federal action. Most notably, the U.S. Climate Action Partnership (USCAP) debuted in January 2007 and its membership as of September 2007 includes 27 large

companies and 6 nongovernmental organizations. The stated goal of USCAP is to pursue an “environmentally effective, economically sustainable, and fair climate change program” with the goal of reducing greenhouse gas emissions 10%–30% within 15 yr and 60%–80% by 2050 (USCAP 2007). These targets are ambitious and consistent with scenarios designed to stabilize atmospheric carbon dioxide equivalent at between 445 and 490 ppm (Metz et al. 2007b). Many companies also cite their bottom line as a reason to be proactive in their approach to climate change, seeing the opportunities of new green markets as well as the potential liabilities associated with continuing with business as usual.

While the business world has been considering the impact of global warming on their bottom line, many in the faith community have been crafting a moral argument in support of action to reduce the impacts of climate change. Numerous religious organizations have articulated their support for reducing greenhouse gas emissions because humankind has a responsibility for stewardship of the Earth, because of the social justice issues involved among different nations, and because of intergenerational justice concerns. For example, in February 2006, more than 85 evangelical leaders in the United States signed onto the Evangelical Climate Initiative ([www.christiansandclimate.org](http://www.christiansandclimate.org)), although some in the evangelical community publicly disagreed with this stance. Yet, just a year later, in January 2007, a joint statement was released by evangelical Christian and scientific leaders ([www-tc.pbs.org/now/shows/343/letter.pdf](http://www-tc.pbs.org/now/shows/343/letter.pdf)) calling on government leaders to take action to reduce greenhouse gas emissions. This second statement was unanimously endorsed by the National Association of Evangelicals, which represents 45,000 churches and 30 million churchgoers in the United States. Likewise, the Coalition on the Environment and Jewish Life has called upon government and business leaders as well as the Jewish community and other Americans to take appropriate actions ([www.coejl.org/climatechange/gw\\_jewishresponse.php](http://www.coejl.org/climatechange/gw_jewishresponse.php)). Although certainly not all religious organizations and leaders have become actively engaged in the issue, discussions of climate change among many entities of the faith community have provided yet another critical avenue for raising awareness of the issue and momentum for federal, state, and local efforts to address it.

Finally, many NGOs and charitable foundations have become vocal advocates of climate mitigation and measures to help humans and wildlife adapt to inevitable changes. Some of these NGOs have been

engaged with the climate issue since the 1980s, for example, members of the Climate Action Network, an international coalition of 365 NGOs. Others are newer to the public discourse on climate, reflecting a growing recognition that projected changes will impact their interests. For example, many fish and wildlife organizations have recently become more active, including American Rivers and Ducks Unlimited. Charitable foundations have also become more engaged, especially by seeking to spur technological development. Notable examples include the Doris Duke Charitable Foundation, which recently launched a \$100 million Climate Change Initiative to help “build a clean-energy economy”; the Automotive XPrize, which offers a multimillion dollar prize to those who develop a commercially viable car that gets the equivalent of 100 miles per gallon by 2009; and the Virgin Earth Challenge, which will award \$25 million for the development of a commercially viable design that removes anthropogenic greenhouse gases from the atmosphere.

*Other contributing factors.* By no means do these four categories encompass the full breadth of activities underway in the United States to address climate change or all the factors that have contributed to the recent shifts in public discourse on the topic. Beyond the examples mentioned here, initiatives have been adopted by colleges and universities, cities and other local governments (e.g., the U.S. Mayor’s Climate Protection Agreement, [usmayors.org/climateprotection/agreement.htm](http://usmayors.org/climateprotection/agreement.htm)), and any number of individuals who have started their own campaigns for change (e.g., the Pump ‘Em Up initiative started by 9-yr-old Savannah Walters in 2001 to urge people to keep their tires properly inflated, [www.pumpemup.org](http://www.pumpemup.org)).

Furthermore, increasing international pressure, especially from European countries, certainly has had an impact. Some European nations have used the meetings of the G8 as a platform for bringing attention to the issue of global warming and for pressuring the United States to take a more aggressive stance in seeking solutions. Likewise, the Kyoto Protocol coming into effect in 2005, despite the withdrawal by the United States in 2001, demonstrated a strong international commitment to moving forward with solutions to climate change. The protocol strengthened the formation of a carbon market in Europe and moved forward discussions of a future international climate treaty, which would include the United States. The fact that the international community is taking the issue of climate change seriously, including pub-

licly criticizing the lack of U.S. response, likely has influenced the perspectives of the American public and policymakers.

**SUMMARY.** For several years now polls have shown that a large segment of the U.S. population believes that global warming is underway. Yet, until recently the public dialogue was typically dominated by discussion of the scientific debate, with the press and other media often giving nearly equal weight to the evidence of climate change on the one hand and the views of a few skeptics on the other. The U.S. Congress had devoted relatively little attention to crafting climate-related legislation. Recent polling results now indicate that Americans consider global warming to be the most serious environmental problem facing the nation and the world. The current Congress has had a large number of hearings on climate change and is actively considering a range of relevant legislation.

Efforts on many different fronts—from the scientific community to state and local governments to businesses and NGOs—contributed to shifting attitudes toward climate change. Because so many different activities were happening at the same time, it is difficult to identify specific initiatives that were significantly more influential. Indeed, it is likely that the current momentum on global warming policy and other actions is due to interacting impacts of the various factors. As major scientific uncertainties were resolved and the media coverage migrated away from an emphasis on uncertainty, the rationale for taking action was strengthened by corporate America, the faith community, and traditional conservationists. Public interest generated in part from the expanding media coverage of the issue motivated towns, cities, counties, and states to take action. The increasing number of localities to pass or consider specific legislation, along with analysis of how being proactive about global warming might benefit their bottom line, made corporate America take notice. Now major U.S. companies are joining together with environmental NGOs to demand federal legislation to address global warming, and the U.S. Congress is considering many such bills.

While it is tempting to identify one or two factors that are more primary than others in shaping public opinion on climate change, doing so is not a straightforward task. Indeed, on a topic as complex as climate change, different factors and ways of communicating resonate with different people. Some will need to observe a change in their immediate environment. Others will be convinced when their church or

another moral authority takes a stance. Others will look to the scientific community or the media. Thus, the shifting public opinion on climate change could not have happened without the convergence of all these different players. A multitude of communication strategies was needed to reach the broad audiences required to change public opinion widely.

The scientific community has helped advance the global warming dialogue by producing credible assessments, pursuing and resolving research questions of interest to policymakers and the public, and being more assertive in discussing the implications of scientific findings with a broader audience. These efforts will be even more crucial as the nation continues to seek solutions to global warming. Scientists will need to continue playing a pivotal role in the years to come, especially by

- seeking ways to better communicate to the general public about the link between human activities and observed climate changes and about the opportunities for mitigation;
- carefully evaluating how various policy proposals—ranging from mitigation efforts such as augmented use of biofuels or strategies for carbon sequestration to options for helping humans and wildlife cope with inevitable climate changes—will impact the natural environment, humans, and the economy;
- continuing to engage proactively with the media to lessen the threat of unbalanced coverage and to educate the general public; and
- welcoming opportunities to inform the efforts of government at all levels, nongovernmental organizations, and community groups.

The question in U.S. public policy now turns to identifying mitigation and adaptation solutions to climate change. The U.S. Congress is devoting significant time to hearings related to climate change and to crafting relevant legislation. No longer is climate change policy only the domain of narrow interest groups or a few outspoken members of Congress. The voices demanding that the United States take action span the political spectrum, including corporate America, the faith community, and conservationists alongside the environmental community.

**ACKNOWLEDGMENTS.** Thanks to Julie Demuth of the National Center for Atmospheric Research, Tim Warman, Paul Joffe, and Ben McNitt of the National Wildlife Federation, and two anonymous reviewers, who provided helpful feedback on drafts of this article.

## REFERENCES

- ACIA, 2004: *Impacts of a Warming Arctic*. Cambridge University Press, 139 pp.
- Boykoff, M. T., and J. M. Boykoff, 2004: Balance as bias: Global warming and the US prestige press. *Global Environ. Change*, **14**, 125–136.
- Brewer, T. L., 2005: U.S. public opinion on climate change issues: Implications for consensus-building and policymaking. *Climate Policy*, **4**, 359–376.
- CBS News/*New York Times*, cited 2007: Americans' views on the environment. [Available online at [www.cbsnews.com/htdocs/pdf/042607environment.pdf](http://www.cbsnews.com/htdocs/pdf/042607environment.pdf).]
- Curry, J. A., P. J. Webster, and G. J. Holland, 2006: Mixing politics and science in testing the hypothesis that greenhouse warming is causing a global increase in hurricane intensity. *Bull. Amer. Meteor. Soc.*, **87**, 1025–1037.
- Curry, T. E., S. Ansolabehere, and H. J. Herzog, cited 2007: A survey of public attitudes towards climate change and climate change mitigation technologies in the United States: Analyses of 2006 results. MIT LFEE 2007-01 WP. [Available online at [sequestration.mit.edu/pdf/LFEE\\_2007\\_01\\_WP.pdf](http://sequestration.mit.edu/pdf/LFEE_2007_01_WP.pdf).]
- FOX News/Opinion Dynamics Corporation, cited 2007: [Available online at [www.foxnews.com/projects/pdf/020207\\_global\\_warming\\_web.pdf](http://www.foxnews.com/projects/pdf/020207_global_warming_web.pdf).]
- Gallup, cited 2007: Gallup's pulse of democracy: Environment. [Available online at [www.gallup.com/poll/1615/Environment.aspx](http://www.gallup.com/poll/1615/Environment.aspx).]
- Houghton, J. T., Y. Ding, D. J. Griggs, M. Noguer, P. J. van der Linden, X. Dai, K. Maskell, and C. A. Johnson, Eds., 2001: *Climate Change 2001: The Scientific Basis*. Cambridge University Press, 881 pp.
- Karl, T. R., S. J. Hassol, C. D. Miller, and W. L. Murray, Eds., 2006: *Temperature Trends in the Lower Atmosphere: Steps for Understanding and Reconciling Differences*. CCSP, 164 pp.
- Lean, J., 2005: Living with a variable sun. *Phys. Today*, **58**, 32–38.
- Lockwood, M., and C. Frohlich, 2007: Recent oppositely directed trends in solar climate forcings and the global mean surface air temperature. *Proc. Roy. Soc. A*, doi:10.1098/rspa.2007.1880.
- Mears, C. A., and F. J. Wentz, 2005: The effect of diurnal correction on satellite-derived lower tropospheric temperature. *Science*, **309**, 1548–1551.
- Meehl, G. A., and C. Tebaldi, 2004: More intense, more frequent, and longer lasting heat waves in the 21st century. *Science*, **305**, 994–997.
- Metz, B., O. R. Davidson, P. R. Bosch, R. Dave, and L. A. Meyer, Eds., 2007: *Climate Change 2007: Mitigation*. Cambridge University Press, 35 pp.
- National Environmental Trust, cited 2006. Congressional hearings addressing global warming: A 30-year legislative history. [Available online at [www.net.org/warming/docs/Leg\\_Hist\\_on\\_GlobalWarming.pdf](http://www.net.org/warming/docs/Leg_Hist_on_GlobalWarming.pdf).]
- Nisbet, M. C., and T. Myers, 2007. The polls trends: Twenty years of public opinion about global warming. *Pub. Opin. Quart.*, **71**, 444–470.
- NRC, 2000: *Reconciling Observations of Global Temperature Change*. The National Academies Press, 85 pp.
- , 2004: *Air Quality Management in the United States*. The National Academies Press, 401 pp.
- , 2006: *Surface Temperature Reconstructions for the Last 2,000 Years*. The National Academies Press, 145 pp.
- , 2007: *Analysis of Global Change Assessments: Lessons Learned*. The National Academies Press, 196 pp.
- Oreskes, N., 2004: The scientific consensus on climate change. *Science*, **306**, 1686.
- Parry, M. L., O. F. Canziani, J. P. Palutikof, P. J. van der Linden, and C. E. Hanson, Eds., 2007: *Climate Change 2007: Impacts, Adaptation and Vulnerability*. Cambridge University Press, 976 pp.
- Pew Center on Global Climate Change, cited 2007: Learning from state action on climate change: March 2007 update to *Climate Change 101: State Action*. [Available online at [www.pewclimate.org/policy\\_center/policy\\_reports\\_and\\_analysis/state/index.cfm](http://www.pewclimate.org/policy_center/policy_reports_and_analysis/state/index.cfm).]
- Podesta, J., D. J. Weiss, and L. Nichols, cited 2007: Americans urgently want action on energy independence and global warming. Center for American Progress. [Available online at [www.americanprogress.org/issues/2007/04/environment\\_poll.html](http://www.americanprogress.org/issues/2007/04/environment_poll.html).]
- Pryor, L., 2006: *Slow Fuse: Journalistic Approaches to Climate Change*. The Aspen Institute, 53 pp.
- Saad, L., cited 2007: Did Hollywood's glare heat up public concern about global warming? Concern about global warming is up slightly over past year. Gallup News Service. [Available online at [www.gallup.com/poll/26932/Did-Hollywoods-Glare-Heat-Public-Concern-About-Global-Warming.aspx](http://www.gallup.com/poll/26932/Did-Hollywoods-Glare-Heat-Public-Concern-About-Global-Warming.aspx).]
- Santer, B. D., and Coauthors, 2005: Amplification of surface temperature trends and variability in the tropical atmosphere. *Science*, **309**, 1551–1556.
- Seager, R., and Coauthors, 2007: Model projections of an imminent transition to a more arid climate in southwestern North America. *Science*, **316**, 1181–1184.
- Sherwood, S. C., J. R. Lanzante, and C. L. Meyer, 2005: Radiosonde daytime biases and late-20th century warming. *Science*, **309**, 1556–1559.
- Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Millers, Eds., 2007:

- Climate Change 2007: The Physical Science Basis.* Cambridge University Press, 996 pp.
- Staudt, A. C., N. Huddlestone, and S. Rudenstein, 2005: *Understanding and Responding to Climate Change: Highlights from National Academies Reports.* The National Academies Press, 20 pp.
- USCAP, 2007: A call for action: Consensus principles and recommendations from the U.S. Climate Action Partnership: A business and NGO partnership. [Available online at [www.us-cap.org](http://www.us-cap.org).]
- Washington Post/ABC News/Stanford University*, cited 2007: Poll: Environment trends. [Available online at [www.washingtonpost.com/wp-srv/nation/polls/postpoll\\_environment\\_042007.html](http://www.washingtonpost.com/wp-srv/nation/polls/postpoll_environment_042007.html).]