

**Engaging the Public in Science Policy Controversies:  
Insights from the U.S. Climate Change Debate**

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Nearly forty years ago, sociologist Dorothy Nelkin commissioned a series of case studies examining the nature of controversies over science and technology (1978; 1984; 1992). In the decades since, the multiple lines of research inspired by these original studies has identified a generalizable set of insights that inform our understanding of contemporary science policy debates, and that provide guidance for how to effectively engage decision makers and the public.

According to Nelkin, debates that emerged during the 1970s such as those over nuclear energy, environmental pollution and genetic engineering were fundamentally controversies over political control: Who gets to decide the future of these technologies or the actions to address these problems? Which values, interpretations, and worldviews matter? Is science and technology being deployed in the public interest or on behalf of special interests? In the 1980s, controversies over fetal tissue research, animal experimentation, and the teaching of evolution in schools featured a new emphasis on moral absolutes. For combatants in these debates, there could be no compromise. Notably, each case study reflected intensifying tensions in modern society and competing visions for the future, including “disagreement over the appropriate role of government, the struggle between individual autonomy and community goals,” wrote Nelkin (xi).

In these controversies, traditional approaches to science communication that emphasized the translation and dissemination of expert knowledge were poorly equipped to reduce conflict or promote consensus. In fact, such efforts were more likely to backfire than be successful. The reason, as Silvio Funtowicz and Jerome Ravetz (1992) explained, was that in these controversies uncertainty and complexity were high, decisions were perceived as morally urgent, and as a result reaching agreement among a plurality of stakeholders depended on negotiating competing interests and values. In other words, even though science policy controversies featured different competing claims to scientific authority, such claims often only obscured underlying values-based differences. As a consequence, in those cases where the expert community focused narrowly on the dissemination of scientific evidence, this strategy

tended to reinforce entrenched positions, since such evidence is often sufficiently tentative enough to indefinitely support the values-based arguments of competing sides (Sarewitz 2005).

Frustrated for decades by their inability to resolve political conflicts over science and technology, many scientists blamed public ignorance, irrationality, or superstition when a social group ignored their advice or disputed their expertise. Following the 1987 Chernobyl nuclear disaster, sociologist Bryan Wynne (1992) in a series of studies challenged these dominant assumptions on the part of the expert community. In examining why English sheep farmers doubted government scientist warnings about local soil and livestock contamination from Chernobyl's continent-wide fallout, Wynne proposed that their skepticism of scientific advice was strongly filtered by feelings of distrust and alienation rather than ignorance or irrationality, feelings that were forged by local history, communication mistakes by scientists, and among farmers, a perceived threat to their way of life.

Various scholars also tracked the strategic use of language, metaphors, images and cultural allusions as they appeared in news coverage of science policy debates. These researchers studied the process by which advocates and journalists selectively "framed" the social and political relevance of nuclear energy and biotechnology. Were these technologies innovative breakthroughs destined to drive social progress and economic growth, a Frankenstein's monster out of control, or an unstoppable train that had already left the station? Were solutions dependent on holding industry and elected officials accountable, on following the advice of experts, and/or on following majority opinion? Scholars tracked these competing interpretive packages and social representations as they evolved across years, policy arenas, media outlets and countries, noting their influence on public opinion and policy formulation. They concluded that a common set of social meanings could be expected to define the trajectory of public debate, and that these common frames of reference were identifiable across controversies (Bauer and Gaskell 2002; Gamson and Modigliani 1989; Nisbet 2009a; Nisbet and Lewenstein 2002).

In combination with this research on the media and framing, social scientists in the early 2000s began to more closely examine the cognitive and social factors that shape individual attitudes, beliefs, and preferences. Among the general public, scientific knowledge was found to be only one factor among several influencing public attitudes; and was only weakly correlated to policy preferences (Allum, Sturgis, Tabourazi and Brunton-Smith 2008). Instead, studies showed that knowledge was filtered by way of an individual's social and political identity. Under conditions when trusted political leaders disagreed on policy and strategically communicated these differences to the public, highly knowledgeable members of the public who identified with these leaders tended to be the most divided in their opinions. Polarization among the most knowledgeable members of differing social groups has been observed in studies of debates over stem cell research (Nisbet 2005), nanotechnology (Brossard, Scheufele, Kim and Lewenstein 2009), genetic testing (Allum, Sibley, Sturgis and Stoneman *in press*), climate change (Kahan et al. 2012) and other topics.

If Dorothy Nelkin were alive today, it would be fascinating to read her analysis and thoughts on the multiple strands of research that she inspired. Just as relevant would be Nelkin's analysis of the intense debate over climate change as it has evolved in recent years in the United States and the controversy over food biotechnology as it has developed in Europe over the same time period. In both cases, trusted political leaders and advocates have framed what is at stake in a manner that resonates strongly with the worldviews and outlook of differing social groups and segments of the public. The resulting polarization in attitudes has been reinforced by the ability of differential meanings and divisive interpretations to spread by way of online news, commentary, and social media. Moreover, in both the U.S. and Europe, efforts to change the status quo – either to pass climate legislation or to end the ban on genetically modified crops – have been blocked by opponents who benefit from structural advantages within the political system.

In these debates, frustrated advocates (and increasingly many scientists), call for ever more aggressive confrontation of their opponents, believing that such strategies are the only way to achieve desired policy outcomes in the face of dire stakes. Yet even though such efforts may be an essential feature of social change, for the expert community and their allied organizations, other strategies are needed if some semblance of consensus or agreement is to be achieved. In this regard, navigating the terrain of science policy controversies requires a careful understanding of the factors that seed polarization; and the strategies available for restoring cooperation, for decreasing the perception of entrenched group differences, and for building broader consensus.

Specific to the debate over climate change, as I review in this chapter, research suggests that a first strategy includes going beyond the polarized, oppositional parties involved and bringing to the conversation a greater diversity of trusted societal leaders who can frame the issue in a manner that resonates with the identity and cultural background of broader segments of the public. A second strategy starts with experts and their institutions who in serving as “honest brokers” must be pro-active in expanding the range of technological options and policy choices considered by decision-makers and the public. Finally, a third strategy involves substantive investment in the civic capacity of society to discuss, debate, learn about, and participate in policy decisions via localized media and public forums.

## **WHY AMERICANS DISAGREE ABOUT CLIMATE CHANGE**

Instead of a conventional environmental threat like smog or acid rain, scholars argue that climate change is more accurately defined as a “wicked problem.” Such problems are the product of multiple social, ecological, and technological systems, are difficult to define, have no clear solution, and are seemingly intractable, often plagued by chronic policy failures and intense disagreement. Wicked problems require almost constant risk reduction, conflict management, and political negotiation that seldom bring an “end” or resolution. Like poverty or war, climate change is not something likely to be solved, eliminated or ended, but rather a condition that society will struggle to understand, make sense of, and do better or worse at in managing (Hulme 2009; Rittle and Webber 1973).

The recently published *Oxford Handbook on Climate Change and Society* reflects the difficulties experts face in reaching consensus on the nature of climate change as a social problem and the actions needed. Across 47 chapters and 600 pages, the editors invited top international scholars to help them "lay out the various ways that climate change affects society, and what society might do in response." Easy answers, however, were not forthcoming. The scholars contributing to the volume represented "substantial differences when it comes to identifying what matters, what is wrong, what is right, how it got to be that way, who is responsible, and not least, what should be done," note the editors. "Commissioning, reading, and editing these contributions has left us acutely aware of the limitations of human knowledge – and the major constraints on intelligent human action—when it comes to complex socio-ecological systems (Dryzek, Norgaard and Schlosberg 2011, p. 4).

Though experts have difficulty defining adequate solutions to climate change, the problem has presented the opportunity for a number of advocates and policy entrepreneurs to promote prescriptions that align with their preferred future. As science policy scholar Roger Pielke Jr. (2011, p. 62) aptly summarizes: "Climate change is a bit like a policy inkblot on which people map onto the issue their hopes and values associated with their vision for what a better world would look like."

Consider the example of Bill McKibben, who in 1989 published *The End of Nature*, recognized as the first popular book about climate change. In this book and in many subsequent works, he warned that humans had become the "most powerful source for change on the planet," a potentially catastrophic achievement that marked an end to our traditional understanding of nature. Climate change, unlike other environmental problems, was not conventionally solvable; our best hope was to avert the most devastating impacts, McKibben wrote. Yet he was deeply skeptical of technological approaches to the problem such as genetic engineering or nuclear energy (Nisbet 2013).

The only possible path to survival, he argued, was through a fundamental reconsideration of our worldviews, aspirations and life goals and the creation of a new consciousness that would dramatically reorganize society, ending our addiction to fossil fuels, economic growth and consumerism. In this pastoral future free of consumerism or material ambition, Americans would rarely travel, experiencing the world instead via the Internet, grow much of their own food, power their communities through solar and wind, and divert their wealth to developing countries. Only under these transformational conditions, argued McKibben, would we be able to set a moral example for countries like China to change course, all in the hope that these countries will accept a "grand bargain" towards a cleaner energy path (Nisbet 2013).

Other climate advocates offered a different outlook and set of prescriptions intended to address climate change. Author Amory Lovins and former U.S. Vice President Al Gore agree that limits to economic growth should be respected, but they also assume limits can be stretched if the right policies and reforms are adopted, enabling environmentally sustainable

development to continue indefinitely. The main policy action endorsed by these advocates is to increase the cost of carbon-based energy through “pricing mechanisms” like a carbon tax or cap and trade system so that solar, wind, and other innovative technologies become more competitive and industries more energy efficient. In this, business leaders and industry are viewed as valuable partners, and action on climate change defined as potentially profitable (Nisbet 2013).

Presented with these two visions for what climate change means for the transformation of society and the economy, it is not surprising that the fossil fuel industry and their allies among conservative political leaders have opposed any effort to limit greenhouse emissions, often rejecting outright the conclusions of climate scientists who they see as aligned with advocates like Gore. To block policy action, the fossil fuel industry and their political allies have manufactured doubt in the news media about the reality of man-made climate change, exaggerated the economic costs of action, ridiculed environmentalists, intimidated scientists, and manipulated the use of scientific expertise in policy-making (McCright and Dunlap 2010).

In doing so, conservatives like Oklahoma Senator James Inhofe have personalized the issue in cultural and geographic terms, using frames of reference that resonate with right wing to moderate members of the public living in states or working in industries that strongly depend on fossil fuels. In speeches, press releases, and on his Senate blog, Inhofe casts doubt on the conclusions of the Intergovernmental Panel on Climate Change and other major scientific organizations, selectively citing scientific-sounding evidence. To amplify his message, Inhofe takes advantage of the fragmented news media, with appearances at television outlets, such as Fox News and on political talk radio. For example, in a February 2007 Fox & Friends segment titled, “Weather Wars,” Inhofe deceptively argued that global warming was in fact due to natural causes and mainstream science was beginning to accept this conclusion. Inhofe asserted, unchallenged by host Steve Doocy, “those individuals on the far left, such as Hollywood liberals and the United Nations,” want the public to believe that climate change is manmade (Nisbet 2009a).

In a series of “cultural cognition” studies, Yale University’s Dan Kahan and colleagues have identified a set of worldviews, cultural dispositions and social processes that help explain why the competing views for society offered by McKibben, Gore and Inhofe make achieving political consensus on climate change so difficult. Building on a framework first introduced by Mary Douglas and Aaron Wildavsky (1982), Kahan and colleagues employ an index of survey measures that classify members of the public by their respective orientations towards either hierarchical and individualist worldviews (which correspond generally with more traditionally right wing political views) or their opposing orientation towards a communitarian and egalitarian outlook (which correspond generally with more left wing political views) (Kahan et al. 2012).

Members of the public scoring high on hierarchical and individualist values tend to be skeptical of environmental threats like climate change since they intuitively sense that actions to reduce environmental risks will adversely impact commerce and industry, institutions that

they deeply value and respect. In contrast, for members of the public scoring high in terms of communitarian and egalitarian values, policy actions that restrict commerce and industry are viewed as benefiting the broader community and the most vulnerable in society. This segment of the public readily accept the risks posed by climate change since actions to restrict greenhouse gases from industry are consistent with their vision for what a better world would look like (Kahan et al. 2012).

As the example of Inhofe makes clear, these differences in cultural worldviews, hopes, values and visions for society are reflected and reinforced by way of dramatic changes in the media system over the past decade. In today's era of the 24-hour political news cycle, commentators and bloggers on the political left and right rely on the latest insider strategy, negative attack, or embarrassing gaffe to appeal to ideologically motivated audiences, connecting almost every policy issue to the broader struggle for control of American politics between liberals and conservatives. In this regard, the divisiveness and rancor that typifies online commentary about climate change is driven in part by what Tufts University scholars Jeffrey Berry and Sarah Sobieraj characterize in a series of studies as the media "outrage industry." This discourse culture specializes in provoking emotional responses from audiences, trading in exaggerations, insults, name calling, and partial truths about opponents and reducing complex issues to "ad hominem attacks, overgeneralizations, mockery, and dire forecasts of impending doom" (Berry and Soieraj 2008; Berry and Sobieraj 2014).

Moral outrage in the media feeds on and spreads by way of Americans' face-to-face conversations and online social networks. In recent decades, as people have sorted themselves into like-minded residential areas, workplaces, and political districts, the similarity of Americans' social, political, and geographic enclaves has increased appreciably (Abramowitz, 2010). As a result, on climate change, many Americans are unlikely to report personally knowing people who hold different views from their own. Instead, the "political other" is a caricature offered at blogs, on talk radio, or on cable news. For Hierarchical Individualists, those who support action on climate change are "eco-fascists" and for Communitarian Egalitarians those who express doubts are "denialists." In each case, the opposing side is viewed as incapable of either reason or compromise.

Editorial and business decisions at prestige news outlets have also unwittingly boosted polarization on climate change. *The New York Times* and *Washington Post*, most notably, have cut back on news coverage of climate change and other science issues, letting go of many of their most experienced reporters, allowing advocacy-oriented media outlets and commentators to fill the information gap. As a consequence, careful reporting at these outlets on the technical details of science and policy has been replaced by morally framed interpretations from bloggers and advocacy journalists at other outlets. Online news and commentary are also highly socially contextualized, passed along and preselected by people who are likely to share worldviews and political preferences. If an individual incidentally "bumps" into news about climate change by way of Twitter, Facebook, or Google +, the news item is likely to be the subject of meta-commentary that frames the political and moral relevance of the information. Taking advantage of these self-reinforcing spirals, advocacy groups devote considerable resources to flooding

social media with politically favorable comments and purposively selected stories (Scheufele and Nisbet 2012).

Even when individuals, prompted by a focusing event like extreme weather or a major scientific report, do decide to seek out more information about climate change via Google and other search engines, further selectivity is likely to occur. In this case, liberals might choose to search for information on “climate change,” and encounter one set of differentially framed search results; whereas a conservative searching for information on “global warming” encounters an entirely different set of search results. Not only does word choice shape the information returned through Google, but so does the past browsing and search history of the individual, adding an additional layer of selectivity and bias to the information encountered (Brossard 2013).

## **PROMOTING CONSENSUS AND EMPOWERING THE PUBLIC**

Frustrated by the political paralysis on climate change, environmentalists and their political allies have invested in ever bolder, more urgent efforts to build a politically powerful base of support for action on climate change. Writing in a 2012 cover article at *Rolling Stone* magazine that quickly became a social media sensation, Bill McKibben called for a new sense of “moral outrage” directed at the fossil fuel industry. Given the urgency of climate change, “we need to view the fossil-fuel industry in a new light,” he argued. “It has become a rogue industry, reckless like no other force on Earth. It is Public Enemy Number One to the survival of our planetary civilization” (McKibben 2012).

Drawing comparisons to the civil rights and anti-apartheid movements, McKibben urged readers to join his organization 350.org in protesting against the proposed XL Keystone tar sands oil pipeline and to pressure local universities, colleges, churches, and governments to divest their holdings in fossil fuel companies. In a 2011 cover article at *The Nation* magazine, 350.org board member and best-selling author Naomi Klein (2011) argued the need for climate activists to copy the political strategies of the U.S. conservative movement: “Just as climate denialism has become a core identity issue on the right, utterly entwined with defending current systems of power and wealth, the scientific reality of climate change must, for progressives, occupy a central place in a coherent narrative about the perils of unrestrained greed and the need for real alternatives.”

In his own cover article the same year at *Rolling Stone*, Al Gore (2011) also drew parallels to the U.S. civil rights movement, urging readers to “become a committed advocate for solving the crisis” by speaking up in everyday conversations when people express doubts about the threat. He encouraged readers to join his advocacy group the Climate Reality Project and to contact newspapers and television programs to “let them know you’re fed up with their stubborn and cowardly resistance to reporting the facts of this issue.” As part of these efforts, the Climate Reality Project has organized a series of 24 hour web broadcasts that “bring together artists, scientists, celebrities, economists, and other experts to explore the many ways we’re all paying for carbon pollution in our daily lives — wherever we may live — and how we

can solve this with a market price on carbon.” For the 2011 event, the Climate Reality Project temporarily took over the Twitter and Facebook accounts of almost 800,000 supporters who had signed over access, flooding their social media networks with messages in an effort to drive traffic to the event hosted by Gore. “[We] will focus the world’s attention on the full truth, scope, scale and impact of the climate crisis. To remove the doubt. Reveal the deniers,” Gore said of his echo chamber efforts (NBC News Bay Area 2011).

Though in the short term, these advocacy efforts might bring much needed political pressure on key elected officials, in the long term such strategies if not also balanced by alternative investments by the expert community may only intensify polarization and policy gridlock. Consider that among the key findings of Kahan and his colleagues (2012) is that the most knowledgeable and cognitively sophisticated Hierarchical Individualists and Egalitarian Communitarians tend to be the most divided in their views of climate change. A major reason, they argue, is that in comparison to their less informed counterparts, these individuals are better attuned to what other members of their cultural group think and believe. It is the desire to remain aligned with the outlook of others in their cultural group that strongly shapes their opinion on climate change.

Therefore, the more that those involved in the climate change movement are perceived by the broader public to be predominantly liberal, Democratic-leaning, and Egalitarian Communitarian in their outlook, the more likely those with differing cultural identities are to dismiss climate change as a threat and to view policy actions to address the problem as in conflict with their vision of society and their future. To off-set these barriers to consensus building, the expert community and their partners need to recruit opinion-leaders from a greater diversity of societal sectors; and to encourage these opinion-leaders to “frame” climate change in ways that resonate with their respective cultural groups, activating feelings of concern, responsibility and obligation.

**Promoting new frames of reference and cultural voices.** With these evidence-based principles and goals in mind, in a series of studies conducted with George Mason University’s Edward Maibach and several colleagues we investigated how a diversity of Americans understand the health and security risks of climate change and how they react to information about climate change when it is framed in terms of these alternative dimensions. In this research funded by the Robert Wood Johnson Foundation, our goal was to inform the work of public health professionals, municipal managers and planners, and other trusted civic leaders as they seek to engage broader publics on the health and security risks posed by climate change.

Framing climate change in terms of public health stresses climate change’s potential to increase the incidence of infectious diseases, asthma, allergies, heat stroke, and other salient health problems, especially among the most vulnerable populations: the elderly and children. In the process, the public health frame makes climate change personally relevant to new audiences by connecting the issue to health problems that are already familiar and perceived as important. The frame also shifts the geographic location of impacts, replacing visuals of remote Arctic regions, animals, and peoples with more socially proximate neighbors and places across

local communities and cities. Coverage at local television news outlets and specialized urban media is also generated (Nisbet 2009a; Weathers, Maibach, and Nisbet *in press*).

Efforts to protect and defend people and communities are also easily localized. State and municipal governments have greater control, responsibility, and authority over climate change adaptation-related policy actions. In addition, recruiting Americans to protect their neighbors and defend their communities against climate impacts naturally lends itself to forms of civic participation and community volunteering. In these cases, because of the localization of the issue and the non-political nature of participation, barriers related to polarization may be more easily overcome and a diversity of organizations can work on the issue without being labeled as “advocates,” “activists,” or “environmentalists.” Moreover, once community members from differing political backgrounds join together to achieve a broadly inspiring goal like protecting people and a local way of life, then the networks of trust and collaboration formed can be used to move this diverse segment toward cooperation in pursuit of national policy goals (Nisbet, Markowitz, & Kotcher, 2013; Weathers, Maibach, and Nisbet *in press*).

To test these assumptions, in an initial study, we conducted in depth interviews with 70 respondents from 29 states; recruiting subjects from 6 previously defined audience segments. These segments ranged on a continuum from those individuals deeply alarmed by climate change to those who were deeply dismissive of the problem. Across all six audience segments, individuals said that information about the health implications of climate change was both useful and compelling, particularly when locally-focused mitigation and adaptation related actions were paired with specific benefits to public health (Maibach, Nisbet, Baldwin, Akerlof, and Diao 2010).

In a follow up study, we conducted a nationally representative Web survey in which respondents from each of the 6 audience segments were randomly assigned to 3 different experimental conditions allowing us to evaluate their emotional reactions to strategically framed messages about climate change. Though people in the various audience segments reacted differently to some of the messages, in general, framing climate change in terms of public health generated more hope and less anger than framed messages that defined climate change in terms of either national security or environmental threats. Somewhat surprisingly, our findings also indicated that the national security frame could “boomerang” among audience segments already doubtful or dismissive of the issue, eliciting unintended feelings of anger (Myers, Nisbet, Maibach, and Leiserowitz 2012).

In a third study, we examined how Americans perceived the risks posed by a major spike in fossil fuel energy prices. According to our analysis of national survey data, approximately half of American adults believe that our health is at risk from major shifts in fossil fuel prices and availability. Moreover, this belief was widely shared among people of different political ideologies and was strongly held even among individuals otherwise dismissive of climate change. Our findings suggest that many Americans would find relevant and useful communication efforts that emphasized energy resilience strategies that reduce demand for fossil fuels, thereby limiting greenhouse emissions and preparing communities for fuel

shortages or price spikes. Examples include improving home heating and automobile fuel efficiency, increasing the availability and affordability of public transportation, and investing in government-sponsored research on cleaner, more efficient energy technologies (Nisbet, Maibach and Leiserowitz 2011).

Among the public interest organizations applying similar research-based principles to their communication strategies is ecoAmerica (which I have worked with as a consultant and advisor). As part of their MacArthur foundation-funded “Momentus” campaign, ecoAmerica is collaborating with opinion-leaders and organizations recruited from societal sectors new to the climate change debate including public health, faith communities, business, higher education, and local municipalities. Their goal is not only to empower a more nationally representative “choir” of cultural voices, but also to promote a new framing of the issue. This new narrative features strong themes of national unity, pride and common identity; emphasizing the risks to public health, communities, and the economy; and the possibility of progress if Americans’ can come together to defend their local communities against the impacts of climate change (ecoAmerica 2013).

**Diversifying policy options and technological choices.** Apart from recruiting new voices and emphasizing new frames of reference; the expert community can also balance the efforts of climate advocates by expanding the range of policy options and technologies considered. As Roger Pielke Jr. (2007) argues, instead of allowing their expertise to be used in efforts to promote a narrow set of policy approaches, experts and their institutions must act independently as “honest brokers” to expand the range of policy options and technological choices under consideration by the political community. The broader the menu of policies and technologies under consideration, the greater the opportunity for compromise among decision-makers.

Pielke (2011) notes that polls show the public for several years has favored action on climate change but at low levels of intensity, suggesting that it is not a lack of public support limiting policy action. “The challenge facing climate policy is to design policies that are consonant with public opinion, and are effective, rather than try to shape public opinion around particular policies,” he argues (p. 43). “A broad portfolio of technologies and practices should be supported...despite the fact that no one energy technology will be universally popular,” he writes. Eventually, tough choices will be needed politically about what technologies to deploy, but that “should not preclude innovation, lest we limit our options before those options are even available” (p. 229). In this case, he argues that once next generation technologies are available that make meaningful action on climate change lower-cost, then much of the argument politically over scientific uncertainty will diminish.

In their research on cultural groups, the findings of Kahan and colleagues’ (2011) strongly suggest that perceptions of climate change are policy and technology dependent and that consensus is more likely to occur under conditions of a diverse rather than narrow set of proposed solutions. In these studies, when Hierarchical Individualists read that the solution to climate change was more nuclear power or geoengineering, their skepticism of expert

statements relative to climate change decreased and their support for policy responses increased. In contrast, when the solution to climate change was framed as stricter pollution controls, Hierarchical Individualists acceptance of expert statements on climate change decreased, whereas Communitarian Egalitarians increased. “It isn’t the case, of course, that carbon- emission controls are the only policy response to climate change risks; technologies that furnish a substitute for and that offset the effects of greenhouse-gas-producing energy sources can contribute, too,” write Kahan and his colleagues. “Many of these alternatives, such as nuclear power and geoengineering, are likely to convey cultural resonances that affirm rather than threaten hierarchical and individualist confidence in the power of human ingenuity to overcome environmental constraints on economic production.”

If we apply Pielke and Kahan’s reasoning to the climate debate, it follows that building political consensus on climate change will depend heavily on experts and their institutions calling attention to a broad portfolio of policy actions and technological solutions, with some actions such as tax incentives for nuclear energy, government support for clean energy research, or proposals to defend and protect local communities against climate change impacts more likely to gain support from both Democrats and Republicans. As effective honest brokers, scientists and their institutions should pro-actively encourage journalists, policymakers, and the public to discuss a broad menu of options, rather than tacitly allow (or sometimes promote) efforts by climate activists, bloggers and commentators to limit debate to just a handful of options that fit with their own ideology and cultural outlook.

I observed the dynamics identified by Pielke, Kahan, and others while conducting my own research analyzing a group of major U.S. foundations and funders who had bet heavily on the ability of technocratic expertise to overcome political differences on climate change and in the process committed the mistake of investing in an ideologically narrow set of policy goals and technologies (Nisbet, 2011). In 2006, several of the country’s wealthiest foundations hired a consulting firm to comprehensively survey the available scientific literature and to consult more than 150 leading climate change and energy experts. The result of this intensive undertaking was the 2007 report *Design to Win: Philanthropy’s Role in the Fight Against Global Warming*.

Leading the report was the recommendation that “tempering climate change” required a strong cap and trade policy in the U.S. and the European Union, and a binding international agreement on greenhouse gas emissions. The report predicted that passage of cap and trade legislation would “prompt a sea change that washes over the entire global economy.” The report included little to no discussion of the role of government in directly sponsoring the creation of new energy technologies. The report was additionally notable for the absence of any meaningful discussion of social, political or technological barriers. Instead, the authors offered a decidedly optimistic outlook: “The good news is that we already have the technology and know-how to achieve these carbon reductions—often at a cost savings.”

To understand how this planning document shaped the investment strategies of major funders, I analyzed available records as of January 2011 for 1,246 climate change and energy-

related grants distributed by nine aligned foundations between 2008 and 2010. These aligned foundations were among the wealthiest in the country, included several of the top funders of environment-related programs, and were either sponsors of the *Design to Win* report or described themselves as following its recommendations.

Approximately \$368 million was distributed across the 1,246 individual grants. The funding provided by the nine foundations reflected a pattern of support focused on achieving a clear set of policy objectives as outlined in the *Design to Win* report. Funding included \$39 million associated with activities in support of cap and trade policies; \$32 million associated with efforts at reaching an international agreement or influencing the policies of a specific country; and \$18.7 million associated with efforts at limiting or opposing coal-fired power plants.

Funding patterns also reflected the *Design to Win* report's framing of climate change as a physical threat that required primarily scientific and economic expertise to solve rather than investments in research that would inform communication campaigns, or in investments in public participation and dialogue. More than \$48 million in grants were associated with policy analysis or economic impact analysis; \$17 million with environmental impact analysis; and \$13 million given directly to support university-based programs. In comparison, there was either very limited or no funding focused on the role of government in promoting innovation or on development of technologies favored by political conservatives like nuclear energy, carbon capture and storage, or natural gas fracking. Nor was there equivalent investment in important human dimensions of the issue, such as adaptation, health, equity, justice or economic development. Similarly, very few grants supported initiatives designed to better understand public opinion, to evaluate communication strategies, and/or to promote media resources across states and regions.

**Investing in civic capacity and public deliberation.** The expert community will also need to invest in re-building the America's civic capacity to discuss, debate, and participate in collective decisions. In this regard, universities and other research institutions can serve a vital function in facilitating public dialogue about climate change, by working with philanthropic funders and community partners to sponsor local media platforms and public forums, by convening stakeholders and political groups, and by serving as a resource for collaboration and cooperation. In fact, cities and local regions are the contexts where we can most effectively experiment with communication initiatives that challenge how each of us debate, think and talk about climate change as a social problem. In these forums, new cultural voices can be heard, new cultural framings and meanings emphasized, and innovative policy approaches and technological options discussed.

"The idea here is not just to highlight points of communality and sites for compromise," write political scientists Hayley Stevenson and John Dryzek (2012), "but also to provide possibilities for contestation and the reflection it can induce." Similarly, as New York University's Jay Rosen (2012) notes, on complex problems like climate change: "There is no kumbaya moment. You never get everyone on the same page," and you never reach consensus.

Yet as he argues, “what’s possible is a world where different stakeholders ‘get’ that the world looks different to people who hold different stakes.”

By building up our local and regional communication capacity, we can also start to set the conditions for eventual change in national politics, by rewiring our expectations and norms relative to public debate; and by forging relationships and collaborations that span ideological differences and cultural worldviews. Consider a recent example of a university-led public engagement initiative on climate change that was successful in overcoming culturally motivated and group-based polarization. Organizers at George Mason University and the U.S. Naval Academy surveyed the public in a coastal Maryland county to better understand their risk perceptions related to sea level rise and coastal flooding. Not surprisingly, respondents’ worldviews as measured in terms of Hierarchical-Individualism and Communitarian-Egalitarianism were among the strongest predictors of risk perceptions. “Local policy discourses on sea-level rise are not emerging into a neutral arena, but one in which cultural meanings have already begun to form,” noted the research team. “In this environment, traditional communication strategies of providing ‘objective’ assessments are unlikely to staunch further issue polarization” (CASI 2013).

Yet when the university organizers brought together a sample of 40 local residents to participate in a professionally moderated dialogue about sea level rise and coastal flooding, among Hierarchical Individualists their doubts about the risks posed by the threat decreased. For these Hierarchical Individualists, the research team reasoned that the process of skillfully moderated public deliberation focused on a local threat made community-wide membership a more salient consideration than their specific cultural identity and political outlook (CASI 2013).

Face-to-face dialogue should be complemented by new online media forums that bridge, blur and add context to perspectives on climate change; expanding discussion of policy options and technological solutions; and thereby offering an alternative to the moral outrage that dominates most online commentary. A leading model for such a forum is Andrew Revkin’s Dot Earth blog, part of *The New York Times* opinion section. As a veteran science reporter, Revkin via his blog not only functions as an explainer and informed critic of science, but he also serves as a convener, facilitating discussions among a diversity of experts, advocates, and various publics, while contextualizing the uncertainty relative to specific claims, technologies, and policy approaches (Fahy and Nisbet 2011; Nisbet 2013). Revkin explains that his ultimate focus at Dot Earth is the “broader exploration of new ways to make information work – to give ideas the best chance of getting where they are needed to help advance our relationships to the environment and each other” (Revkin 2009). Rather than frequently advocating for a position, he prefers posing questions, describing answers from experts and others, an approach that Bill McKibben has criticized as “relentlessly middle-seeking” (Nisbet 2013). But as Revkin writes, he views his role mainly as “interrogatory – exploring questions, not giving you my answer ... I think anyone who tells you they know the answer on some of these complex issues is not being particularly honest” (Revkin 2009).

The principles that inform Revkin's blogging at *The New York Times* should also shape the design and sponsorship of media forums sponsored by universities and their partners. As regional newspapers suffer financially and cut coverage of public affairs generally and climate change specifically, new forms of non-profit, university-based media platforms will be needed if regions of the country are to have the civic capacity to make informed decisions and choices. A leading prototype for such an initiative is *Ensi*, a foundation-funded web magazine launched by the Institute on the Environment at the University of Minnesota ([www.ensia.com](http://www.ensia.com)). The online magazine's mission is to use news, commentary, and discussion to identify and inspire new approaches to climate change and other environmental problems. To do so, *Ensi* features reporting by top freelancers; commentaries by experts and thought leaders; and a TED conference-like event series that is broadcast and archived online.

## CONCLUSION

Successfully navigating controversies such as those over climate change and food biotechnology not only requires a sophisticated, research-based understanding of the factors shaping these debates, but also an acceptance that there are strong limits to what even the best funded and most carefully planned public engagement strategy can accomplish. In this chapter, I have reviewed three such strategies that research suggests may be effective at softening disagreement and creating the opportunity for consensus and agreement. They include investing in new frames of reference and cultural voices; pro-actively widening the menu of policy options and technological options considered; and investing in localized public and media forums that sponsor dialogue, diverse interactions, and collaboration around new ideas and solutions.

Despite the evidence supporting the efficacy of these strategies, the application of research-based principles to science policy controversies does not guarantee conflict resolution, no matter how much we might wish such knowledge to hold the key to reducing polarization and brokering consensus. Research findings are often messy, complex, and difficult to translate into practice. They are also contingent and subject to revision based on new research; changes in the dynamics surrounding an issue; or in applying across issues and social contexts. Moreover, no matter how knowledgeable and adept the expert community might be in applying research to their public engagement efforts; resolution of intensely polarized debates take years, if not decades to resolve; and requires the different sides in a debate to give ground, negotiate and compromise. In no case is this more likely to be true than in the debate over climate change. Yet in the case of climate change, the major question therefore is if resolution will come too late, preventing society from managing the most serious risks.

Hopefully sooner rather than later, the main drivers of eventual resolution and agreement are most likely to be deeper changes in the political system; demographic and social trends; external shocks such as natural disasters; and/or breakthroughs in technologies. Applying insights from research on science policy controversies can help bend these dynamics more strongly to one side's favor; or to accelerate this long-term process in incremental ways.

In the meantime, as observers and participants in the debate, we can all benefit from the wisdom, reflection, and insight that such research can provide.

Final thoughts therefore belong to Dorothy Nelkin (1992, p. xxiv) who in her last edited volume of case studies offered the following outlook: “Based on competing social and political values, few conflicts are in reality resolved. Even as specific debates seem to disappear, the same issues reappear in other contexts.... The persistence of controversy suggests that the issues described in this book are hardly unique events. Rather, they are part of a significant tendency in American society to reassess the social values, the priorities, and the political relationships that underlie technical decisions.”

## **KEY QUESTIONS**

Q1: How are the factors shaping disagreement and polarization over food biotechnology in Europe and climate change in the United States similar? What factors are different? Are there factors and dynamics highlighted in this chapter that you believe are peculiar to the United States?

Q2: Besides framing climate change in terms of either environmental risks or public health threats, what other frames potentially exist and which of these meanings might help overcome polarized differences? Why? What frames might exist in brokering consensus over food biotechnology in Europe?

Q3: Do you agree that a main role for scientists and other experts should be to expand the menu of technological choices and policy options considered in the debate over climate change? How do you feel about considering nuclear energy, geoengineering, and carbon capture and storage as possible strategies for managing the risks of climate change?

Q4: What values or worldviews do you think intuitively influence how you perceive the risks of climate change and evaluate the various possible technological approaches to the problem?

Q5: Do you agree that activist approaches such as those pursued by Bill McKibben and 350.org have the potential to inadvertently promote greater polarization? What benefits do you see to these types of social movement building and civil disobedience strategies?

Q6: What role should scientists and their organizations play relative to political advocacy? Are the stakes so high on issues like climate change and food biotechnology that scientists should engage in more traditional forms of activism? Why or why not?

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