COMMUNICATING CLIMATE CHANGE: CLOSING THE SCIENCE-ACTION GAP

SUSANNE C. MOSER AND LISA DILLING

1 INTRODUCTION

THE first decade of the twenty-first century was a big one for climate science and policy. Climate change steadily rose on the policy agenda of nations, regions, states, and cities. Ironically, it was also the decade in which public opinion vacillated on the reality of climate change and its human causation. Public opinion surveys dipped to new lows in the US, the UK, and Australia at the end of 2009 (Hanson 2009; Riddell and Webster 2009; Pew Research Center 2009b). Amidst what was called the greatest economic 'downturn' since the Great Depression, and a cooler, less extreme year in many regions across the globe, public concern about global warming dropped significantly even as scientific findings of accelerating impacts proliferated (e.g. Solomon et al. 2007). Commentators suggest the world is seeing a case of 'apocalypse fatigue' (Nordhaus and Shellenberger 2009).

This state of public opinion raises critical questions as to the effectiveness of twenty or more years of public education, outreach, and engagement approaches used to render a complex scientific issue meaningful and actionable for lay audiences. A growing body of literature on public attitudes, as well as on other aspects of the communication process, can help us understand not only the larger trends in public opinion, but also the challenges and opportunities for more effective approaches to climate change communication. While we are also concerned about the seeming lack of public engagement, we don't agree with the superficial diagnoses (and frequently implied disdain) that lay publics apparently don't care or don't 'get it.' Instead, we believe important insights can be gained from better understanding the way climate change has been communicated to date and how this communication has been received and interpreted. Based on these insights, we see something of a 'perfect storm' that has made communication of climate change so challenging, and thus limited its role in enabling public engagement and support for action: the characteristics of

climate change itself (Jamieson, this volume; Steffen, this volume), the not-surprising politicization and its institutionalization (Dunlap and McCright, this volume; Hajer and Versteeg, this volume), the cognitive and psychological ways of processing information (K. M. Norgaard, this volume), and the structural challenges pertaining to the media used for communication. We focus on those aspects not discussed by others in this Handbook.

Before we detail some of the common approaches to climate change communication, we should make several assumptions and understandings explicit. First, what do we mean by 'engagement'? If communication succeeds in bridging the science-action gap, it does so by fostering public engagement with climate change. This involves a cognitive, an affective, and a behavioral dimension, i.e. people grapple mentally with and gain understanding of the issue; experience an emotional response, such as interest, concern, or worry; and actively respond by way of changes in climate-relevant behavior or political action (Lorenzoni et al. 2007; Moser 2009b; Moser and Dilling 2007; NRC 2002). This definition of engagement illustrates three normative assumptions on which our chapter rests. First, while science alone can never compel us to action (which instead rests on a value-driven interpretative judgment of the meaning of scientific findings), we believe science has sufficiently well established that climate change is underway, that the problem is mostly human-caused, and that there are significant threats to human and environmental systems (Solomon et al. 2007; Parry et al. 2007). This evidence warrants, in our view, immediate and significant actions to reduce climate change-related risks. Second, in a democracy policy action requires public input, support, or quiet consent, and implementation requires active engagement of the public. And third, communication is an essential means to link scientists, politicians, and the public, and thus can and should play an important and constructive role in enabling public engagement with climate change.

While we do not promote particular responses to climate change or advocate for particular policies here, our goal is to present insights from the multidisciplinary research literature on how communication can be shaped and carried out to assist in the task of engaging the public more effectively on climate change. While communication alone may not close the science-action gap, communication—cognizant of the pertinent literature that tells us what works and what doesn't—offers a better chance of reaching the goal of effective and meaningful public engagement. We claim that communication of climate change has been less effective than one might wish for four main reasons. Communicators have assumed that:

(1) a lack of information and understanding explains the lack of public engagement, and that therefore more information and explanation is needed to move people to action ('Inspiration with information');

(2) fear and visions of potential catastrophes as a result of inaction would motivate audiences to action ('Motivation by fear');

(3) the scientific framing of the issue would be most persuasive and relevant in moving lay audiences to action ('One size fits all'); and

(4) mass communication is the most effective way to reach audiences on this issue ('Mobilization through mass media').

Below we offer more detailed diagnoses of each and make suggestions for potential remedies based on the extant literature.

2 Opportunities and Challenges for Improving Communication

2.1 Inspiration with Information

Climate change is a challenging issue to convey. One reason lies in the fact that its principal culprits—carbon dioxide and other heat-trapping greenhouse gases—are colorless, odorless gases, and the long-term average changes set in motion by them have emerged only recently from the daily, seasonal, and interannual 'noise' of variability. Relative to human perceptual capacities, the problem is building far too slowly to be noticed by the lay eye, and the early environmental impacts of climate change have mostly occurred (and are clearly noticed) in regions far from where the majority of mid-latitudinal audiences live. The lack of direct experience makes climate change—at least for now—fundamentally a problem that requires signaling, illustrating, and explaining by those who have expert knowledge to those who don't. Communication is essential.

Unsurprisingly, communicators often assume that a lack of information and understanding explains the lack of public concern and engagement, and that therefore more information and explanation is needed to move people to action. This assumption has been studied widely and is known as the knowledge or information deficit model (Bak 2001; Sturgis and Allum 2004).

Evidence abounds that much communication is guided by this assumption: Former US Vice President Al Gore's movie *An Inconvenient Truth*, magnified by his books, inexhaustible lecture tour, and communication trainings (<www.theclimateproject.org>), are prominent examples, as are countless news and informational articles and presentations in which the science of climate change leads, features prominently, and is defended.

The information deficit model, however, is problematic in a number of ways, foremost because this deep-seated, if flawed belief assumes that information and understanding are *necessary and sufficient* conditions for behavioral or political engagement. Those guided by the deficit model believe that better problem understanding by way of more or 'better' information automatically eliminates any skepticism, raises concerns, and inevitably leads to the appropriate behavioral or policy response. At worst, it assumes people have to be 'little scientists' to make effective decisions.

Despite years of research showing the inaccuracy of this model, many still let it guide their communication efforts (Nisbet and Scheufele 2009). Moreover, this model can be detrimental in particular through the condescension that may emerge if the public is seen as or portrayed by communicators as irrational or ignorant (ibid.). Clearly, much can be said for broad public education in the principles and methods of science in general and in climate science specifically. A sturdier stand in science education may leave lay individuals less susceptible to misleading, factually untrue argumentation. But ignorance about the details of climate change is NOT what prevents greater concern and action. While knowledge about the causes of climate change is moderately correlated with appropriate behavioral responses (O'Connor et al. 2002), and deeper understanding of systems primes audiences to more readily understand the magnitude of the required response (Sterman 2008), there is also evidence that better knowledge about climate change does not

necessarily raise concern, and even better understanding about possible solutions does not necessarily result in efficacious behavior (Gardner and Stern 2002).

Instead, deeply held pro-environmental values and beliefs, incentives, perceived benefits, skill and a sense of efficacy, social support, peer pressure, and practical assistance have been shown to foster behavior change (Downing and Ballantyne 2007; Gardner and Stern 2002; Semenza et al. 2008; Takahashi 2009). Even concerned individuals ready and willing to act on their conviction that climate change is a problem may encounter obstacles. For example, getting an energy audit for one's house but no help in prioritizing, how to select a contractor, finance the work and navigate other problems involved in retrofitting a home can thwart the intentions of even the most committed. Information has even been found to undermine concern and action: learning more about climate change may feel like 'having done something,' may feel overwhelming and disempowering, or even reinforce the desire to hold on to the status quo (Kahlor and Rosenthal 2009).

2.2 Mobilization by Fear

So maybe it is not that lay audiences need more information about climate change; maybe it's a matter of grabbing their attention? If people are not interested in the more complex or dry scientific questions about a global, difficult-to-visualize, seemingly distant issue, maybe a few pictures of fear-evoking weather-related catastrophes will do? Maybe what is needed are some hard-hitting fear appeals—images and projections of negative climate change impacts that evoke worry, feelings of loss, or dread—to bring the putatively distant risks of climate change closer to home and thus motivate people to take action.

In fact, there is plenty of evidence that communicators resort to these evocative means of communication: A *Time Magazine* cover in 2006 featured the now emblematic picture of the polar bear on melting ice and the headline warned in big bold letters, 'Be worried. Be *very* worried.' Countless news clips in papers, on television, or in ad campaigns use imagery of catastrophic flooding, drought, or people suffering in heat. Book titles speak of emergencies, catastrophes, and crisis (Kolbert 2006; Kunstler 2005). Words, images, tone of voice, and background music convey danger, darkness, pending doom. Increasingly, not just the messages of scared or passionate advocates but even serious scientific discussions of 'dangerous interference' in the climate system, tipping points, high-risk consequences, the 'runaway' greenhouse effect, or geoengineering as an 'emergency' response evoke apocalyptic fears in lay audiences.

Many climate change communicators believe that a sufficient dose of fear can serve as an effective motivator to increase the issue's urgency and get people to 'do something.' Certainly, fear appeals should help prioritize the issue as it keeps slipping behind more pressing matters such as jobs, the economy, terrorism, health, or any other issues dominating our daily lives (Nisbet 2009; Pew Research Center 2009a).

The principal problem with fear as the main message of climate change communication is that what grabs attention (dire predictions, extreme consequences) is often not what empowers action. Numerous studies have documented that audiences generally reject fear appeals (or their close cousin, guilt appeals) as manipulative (Moser 2007c; O'Neill and Nicholson-Cole 2009). Conservative audiences—at least on climate change—have been shown to be particularly resistant to them (Jost et al. 2007). Effective action motivators

avoid being blatant and offer solutions that help audiences translate their concern into feasible and effective actions (Floyd et al. 2000). Fear appeals or images of overwhelmingly big problems without effective ways to counter them frequently result in denial, numbing, and apathy, i.e. reactions that control the unpleasant experience of fear rather than the actual threat (APA 2009; CRED 2009). This is particularly important in light of the fact that individuals have been shown to only have a 'finite pool of worry,' in which issues rise and fall (Weber 2006). An excessive focus on negative impacts (i.e. a severe 'diagnosis') without effective emphasis on solutions (a feasible 'treatment') typically results in turning audiences off rather than engaging them more actively.

Clearly these findings pose difficult dilemmas for communicators: Should we avoid telling what scientists have established as facts and reasonable outlooks about the seriousness, pace, and long-term commitment of climate change? Should we instead only discuss energy- and money-saving actions and convey pictures of hope by focusing on the easy actions, the 'doability' of mitigation? Should we perpetuate the idea that there are fifty 'simple ways to save the planet,' just to spare lay publics rather appropriate anxiety? Existing research suggests otherwise. While neither alarmism nor Pollyannaism seem to yield desired results, wise integration of strategies may well result in greater engagement. First, communication that affirms rather than threatens the sense of self and basic worldviews held by the audience has been shown to create a greater openness to risk information (Kahan and Braman 2008). Second, risk information and fear-evoking images should be limited and always be combined with messages and information that provide specific, pragmatic help in realizing doable solutions. These solutions must be reasonably effective in reducing the problem, especially together with other solutions being implemented. Importantly, communicators must establish a sense of *collective* response, especially by people in like social and cultural groups. Moreover, solutions should be broadly consistent with individuals' personal aspirations, desired social identity, and cultural biases (CRED 2009; Segnit and Ereaut 2007). Finally, given the ideological polarization around responses to climate change (discussed below), the legitimate experience of fear and being overwhelmed, and the deep and lasting societal changes required to address the problem, there is an important place for facilitated dialogue and structured deliberation of the issues as they emerge (Kahan and Braman 2006). Such deliberation has been shown to improve interpersonal knowledge and trust of people with very different values, provide critical social support and affirmation, increase openness to different opinions and risk information, and thus to enable decision making, rather than obstruct it (Nagda 2006).

In the end, communicators must temper their own temptation to persuade with fear by recognizing that issues have attention cycles (McKomas and Shanahan 1999). Climate change is not always going to be on the top of people's agendas. But communicators can make important gains by framing climate change and solutions in ways that link them to more salient (local) issues people consistently care about—the economy, their children, their health and safety.

2.3 One Size Fits All

The science and scientists have been central to climate change communication. As we discussed above, however, knowledge is not sufficient to motivate action; to the contrary, as

the focus of much debate it has been used to delay action. Maybe even more problemati-cally, science has been assumed to be of central interest to most audiences. However, the science of climate change is not nearly as interesting to most audiences as some might wish. The big 'take-home' message why anyone should care is often lost in jargon and 'he said—she said' debates. At worst, technical information or scientific debates over minute details beyond the grasp of the non-inducted can be experienced as exclusionary or even condescending. Finally, when experts tell lay audiences about the technical aspects of climate change, typically in one-way communication, there is little room for dialogue, building a shared understanding of the problem and possible solutions. In short, science is not the most resonant grounding for a fruitful exchange on climate change. To rethink how communicators might reach audiences more effectively, the audience itself must become the first concern.

The importance of identifying the audience that has decision-making power or influence over an intended outreach goal cannot be overstated. Many communicators, however, are primarily concerned with the message or information they want to convey and rush over the critical question who they are trying to reach with it. Once the relevant audience is identified, communicators must try to understand what people care about, what they value and how they think about climate change and related matters (e.g. energy, environment). Audience segmentation studies can provide important insights and communication stra-tegies, but may be too general to apply to a specific (e.g. local) audience (Downing and Ballantyne 2007; Leiserowitz et al. 2008).

Trying to better understand the audience will reveal what issues and language resonate with individuals and groups, which values are important, what aspirations they have (as parents, as professionals), as well as any preexisting knowledge of the climate change issue, common mental models, and possible misconceptions. Audiences also differ by the infor-mation channels they use, what messengers are credible to them, and what challenges they may face in implementing any desired action. Audience segmentation clearly indicates that a 'one size fits all' approach will almost certainly fail. Without solid audience knowledge, outreach campaigns may not generate more than fleeting attention, fail to meet the information needs people have, and generate values and world-view-based resistance to considering the information communicated (Dickinson 2009; Jost and Hunyady 2005).

Deeper understanding of the audience also helps identify the best ways to frame an issue. Framing—through words, images, tone of voice, messengers, and other signals—provides essential context for people to make sense of an issue; it triggers a cascade of responses and can prime an audience for action or not.

Extensive research in risk perception, cognitive psychology, and the influence of cultural world-views on both, suggests that individuals view incoming information through a 'cultural' lens, i.e. they understand and evaluate information through a filter that is colored by their general beliefs about society, the world, and right or wrong. According to Kahan and Braman (2006: 148), 'culture is prior to facts in the cognitive sense that what citizens believe about the empirical consequences of [certain actions or] policies *derives* from their cultural worldviews.' Incoming information—however framed—may be rejected upon very quick (intuitive) judgment if it evokes some kind of threat to the listener's sense of self, i.e. if it challenges his or her deeply held beliefs or those of the group he or she most identifies with (Kahan et al. 2007). By the same token, people tend to selectively hear and collect evidence that supports their beliefs and underlying values—a confirmation bias (CRED

2009; Kahan and Braman 2008). A number of deep-seated psychological needs explain these first and even more considered reactions to information about climate change risks and may be at the heart of audience segmentation (Jost and Hunyadi 2005). They may also explain why there is such enormous ideological polarization around the issue (Gastil et al. 2006; Jost et al. 2008), despite a very strong scientific consensus on the fundamentals of anthropogenic climate change (Doran and Zimmerman 2009; Oreskes 2004).

Messengers—those who convey a message—are part of the framing. It is thus important that the messenger is consistent with the way the message is framed or else the importance and credibility of the message is undermined (FrameWorks Institute 2002). Historically, climate change—predominantly framed as a scientific issue—has been communicated by experts, or else scientists were the primary sources and voices in media reports (Nisbet 2009). And while scientists working in relevant fields are generally credible and trusted as information sources (NSF 2009), they are not the most trusted or most appropriate source with every audience or with any message (Cvetkovich and Löfstedt 2000). If climate change is framed as a moral issue, religious leaders may have greater suasion (Wardekker et al. 2009). If taking action on climate change is seen as an economic issue, it may be most credibly conveyed by a business person who has done it (Arroyo and Preston 2007). If climate change is framed as a national security issue, spokesmen such as former CIA director James Woolsey can serve as a trusted messenger (Nisbet 2009). If the audience is a teenage crowd, 'hip' celebrities may be able to generate enthusiasm and engagement (Boykoff and Goodman 2009), but teenagers already active in the climate movement may do so even more effectively (Isham and Waage 2007). The clear message from these findings is that messengers must be trusted and trigger a frame that opens a door for the message.

Care must be taken, however, that trusted messengers are also knowledgeable messengers. For example, on the question how good, convenient, cheap, or easy to use an energy-efficient appliance is, one's friend or neighbor may be trusted the most, even if they do not possess the greatest expert knowledge on how effective the action is (Gilbert et al. 2009). Importantly, trust in individuals roots in positive (personal) experiences in specific contexts or in certain expectations based on 'proxies' (e.g. past performance, credentials, or expertise) and can translate to other areas, even if the expertise doesn't (Wolf et al. 2010).

Trust in the messenger is particularly important in the context of a problem like climate change that is invisible, uncertain, seemingly remote in time and space, scientifically and morally complex, and which may pose significant demands on citizens' scientific literacy and their behaviors (Marx et al. 2007). Individuals not inclined or able to systematically process a large amount of (sometimes conflicting) complex or difficult to understand information will use heuristics—mental shortcuts—to make up their minds about it (Kahneman et al. 1982). Thus, for example, trust can be based on a messenger belonging to one's own social or cultural group (Cialdini 1993; Agyeman et al. 2007). In other instances, trust in a message can be enhanced if it comes from an outsider—perceived to be more objective and credible in situations where conflict and distrust exist among 'insiders' (Fessenden-Raden et al. 1987). Whether or not a messenger is persuasive to a certain audience also depends on the type and intensity of interaction between them (Maibach et al. 2008). Finally, messengers must be chosen carefully as they can be polarizing in certain contexts (a good example is former Democratic US Vice President Al Gore) (Dunlap and McCright 2008; Kahan et al. 2007). In short, there is no simple guidance as to who will be trusted, who is credible, and who the 'best' messenger is—it all depends on the audience and context, and must fit the frame.

2.4 Mobilization through Mass Media

All too often, communication campaigns assume that mass media is the most effective way to reach the wide audiences needed for mobilization around climate change. The appeal of reaching large numbers through television, newspapers, and the internet glosses over the fact that information passed along through media-ted channels is often 'consumed' without great attention, quickly discarded or ignored. It also tempts us to ignore the structural changes occurring in the media landscape that affect the quality and diversity of news, and social divides (Moser 2009b, 2010). Because the assumed goal of most communication on climate change is not only to reach an audience, but to actively engage people, understanding the effectiveness of different channels is critically important.

Research in the health field, where public service announcements and behavior change campaigns promoting healthy behavior have been used for some time, is relevant here. While mass media channels can sometimes reach millions of people, persuasive media campaigns only evoke a change in health behavior in a small percentage of the audience (9 percent and slightly higher if the behavior is legally enforceable, Maibach et al. 2008). Health issues tend to be more personal than climate change, thus we might find climate change messages to be even less effective at engaging the audience through media channels. Not surprisingly, many advocates focus not on climate change at all, but on more tangible issues, such as household energy use, cost savings, or energy security, and employ social marketing campaigns to affect behavior change (Kollmuss and Agyeman 2002; McKenzie-Mohr 2000).

In general, while mass media are important for agenda-setting, face-to-face communication is more persuasive than mass media communication (Lee et al. 2002). Several aspects make face-to-face communication more salient and effective: first, it is more personal; second, non-verbal cues can allow the communicator to gauge how the information is being received in real time and respond accordingly; direct communication also allows for dialogue to emerge; and finally, the trust between individuals participating in a two-way exchange goes a long way toward engaging and convincing someone. Interactive communication, whether face to face or over the internet, improves health outcomes and behavior change (Abroms and Maibach 2008). Not surprisingly, some have suggested employing a two-step flow in communicating climate change—from a source to an influential to the ultimate audience—to bank on the benefits of face-to-face, more direct communication (Nisbet and Kotcher 2009).

One of the limitations of mass media channels is the inability to tailor messages to particular audiences, although certainly strategic choices can be made about the publication used, the timing and placement of ads, and so on. Several recent studies suggest that different audiences relate to distinct frames, goals, messages, and messengers and have preferences as to the communication channels they frequent (Agyeman et al. 2007; Featherstone et al. 2009; Leiserowitz et al. 2008). Thus, choosing the appropriate channel with a tailored message is more likely to reach and actively engage a specific audience (Moser 2007a, 2007b).

3   Communication in Context:
Some Conclusions

In some sense, communication on climate change has been spectacularly successful. Across nations, nearly everyone in surveyed populations has at least heard of the issue and many

can identify at least some important climate change impacts (Leiserowitz 2007). However, upon deeper exploration, we find that understanding is superficial, personal concern is relatively low and ever-susceptible to be overwhelmed by more immediate, salient threats and interests. And while a majority favors generic 'action,' support for those that affect people's pocketbook such as carbon taxes or increased gasoline prices declines sharply, especially during economically difficult times (Moser 2008).

Faced with these facts, communicators tend to resort to well-worn strategies to raise concern and elicit active engagement. First, they attempt to increase public understanding and provide more information on the assumption that knowledge is the major stumbling block to action. Second, they resort to fear tactics to motivate action, if often only to achieve the opposite effect. Third, in banking on the credibility and overall consensus of thousands of scientists, they insist on the scientific framing of climate change as the most compelling story, regardless of the differences among audiences. And finally, they try to reach the masses through traditional communication channels, while disregarding the power and advantages of different channels, especially interpersonal ones.

Clearly, communication on climate change is only part of the picture. Raising awareness and discussing an issue does not directly result in behavior change or policy action. Other factors, especially policy options, windows, and barriers, come into play. Thus, for communication to be effective in leading to active engagement, it must be supported by policy, economic, and infrastructure changes that allow concerns and good intentions to be realized (Moser and Dilling 2007; Ockwell et al. 2009). No matter how much communicators may exhort individuals to use less energy, for example, if people have no alternative to heat their homes or get to work in a timely manner, such efforts may fail. Educating about the benefits of energy-efficient appliances will not produce results if easy ways to implement these changes are not provided (Dilling and Farhar 2007). In short, communication for social change must consist of efforts to increase the motivation to make a change and help to lower the barriers to realizing it (Moser and Dilling 2007).

In this chapter, we articulate a role for communication that is broader than some communicators might assume: it is not just a way of conveying information to, or persuading, a passive receiver. Rather, we suggest that people in a democratic society are best served by actively engaging with an issue, making their voices and values heard, and contributing to the formulation of societal responses. Imposing a deluge of scientific facts and technocratic solutions on a populace without discussion and awareness of risks and choices is likely to lead to resistance and opposition (Moser 2009b). There is no easy answer to societal discussions of value-laden issues with big stakes for everyone involved (as heated debates over regulating carbon emissions and siting wind farms suggest). Thus, effective communication serves two-way engagement, which—ultimately—enables societal action.

Given limited resources and attention spans, climate change communicators should re-examine their strategies in light of the insights from communications research. We must challenge our assumptions about climate change communication and acknowledge its most useful modes and roles. Better understanding the audience will help identify the most appropriate framings, messengers, and messages that will most powerfully resonate with different people. Audience-specific use of communication channels for 'retail communication' may in the end be more cost-effective than mass communication that speaks to no one really. If creatively combined with engagement in forums for direct dialogue, communicators can take advantage of economies of scale, persuasive power, and social capital to achieve their goals.

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