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Journal:	*The International Encyclopedia of Geography: People, the Earth, Environment, and Technology*
Manuscript ID:	IEGE-14-0310.R1
Wiley - Manuscript type:	Entry
Date Submitted by the Author:	n/a
Complete List of Authors:	Moser, Susanne; Susanne Moser Research & Consulting,
Keywords:	communication, democracy, global warming, environmental perception, environmental risks/threats, language, media, new media
Free Text Keywords:	place, visualisation, uncertainty, social media, self and identity
Abstract:	

Climate Change Communication

Susanne C. Moser

Susanne Moser Research & Consulting, and Stanford University

promundi@susannemoser.com

Word Count: [2,707 main text + 289 references + 44 cross-reference = 3,044]

Abstract [179 words]

Effective climate change communication is a central concern for geographers and others wishing to convey the science and impacts of climate change to lay publics, policy-makers and managers, and to engage in meaningful discourse on response options. The interdisciplinary field of climate change communication has grown rapidly since the early 2000s, with major research foci on messaging, language and imagery; messengers; communication channels; the media; and audience segmentation. As the science of climate change moved its primary focus from detection and attribution of observed changes to improvements in climate models, to climate change impacts, vulnerabilities and responses options, so shifted the foci in communication. While the concerns early on were on conveying the physical science of climate change, related uncertainties and mitigation options, more recent emphasis is on engaging the public on impacts and adaptation. The widening disconnect between the growing scientific consensus on the reality, human causation and urgency of climate change on the one hand and the lagging societal response on the other remains a persistent challenge for climate change communication, particularly in North America and Australia.

Main Text

Introduction. Communicating climate change – as a special case of science and risk communication, and as an opportunity for civic engagement with global environmental change – is among the greatest communication challenges in contemporary society. The social-scientific interest in climate change communication has risen over the past decade in response to the growing understanding in the problem and the lagging societal response (Moser 2010). Over this period, understanding of climate change communication has grown significantly, although it remains difficult because of the nature, scope, scale and speed of the problem, the enormous political and financial stakes involved, and the changing societal context that shapes people's receptivity of the issue (Whitmarsh et al. 2011; Moser & Dilling 2007).

For some, communicating climate change is a matter of science education and as such a desirable goal in itself; for others, it is a means to increase scientific literacy so as to increase people's capacity to participate in an informed manner in the decisions of a democratic society. For yet

others, communicating climate change serves advocacy, i.e., informing and mobilizing society for or against certain courses of climate action. The resulting politicization of climate change science has also created considerable interest in how to effectively counter disinformation campaigns and overcome societal and political polarization on the issue (McCright & Dunlap 2011).

Geographers' interest in climate change communication. Given both physical and human geographers' long-standing involvement in the study of global (climate) change, communication is a central concern for them. As humans modify the climate, environment and life support systems of the planet, and thus cause a fundamental shift in human-environment interactions, including in the availability of natural resources and the occurrence of climatic hazards, climate change communication becomes a foundational skill and tool for geographers. Geographers are interested in conveying and explaining observed and projected changes in the environment – a task made more difficult by the fact that the causes and early impacts of climate change are difficult to see, slow to emerge, and challenging for lay audiences to connect systemically. This makes climate change communicators part of the "early warning" system of a society and thus part of the human response to climate change.

In addition, for many geographers, effectively communicating the causes, risks and response options to climate change is a matter of practical necessity and ethical obligation. Not only as educators and researchers in multidisciplinary teams, but as expert informants of policy debates or management responses, as consultants, and as individuals participating in civil society, geographers are grappling with how best to communicate the issue to different audiences. With geography's expertise in Earth science and human-environment interactions, its unique interest in linking phenomena across space and scale, and its ability to understand change in the richness of place-based and regional contexts, geographers are well positioned to help society understand climate change, facilitate meaningful interpretation of the science, and foster an informed debate about possible responses.

Focal areas for climate change communication. The practice and study of climate change communication have centered on different aspects of climate change. Early on, interest was primarily in articulating the *science* of climate change, i.e., establishing its existence, providing multiple lines of evidence for its reality, explaining its causes, particular the growing understanding of its human causation and how scientists have come to know and become confident in this conclusion, as well as illuminating the complex challenge of global climate modeling and future projections of climate change. Much of the communication challenge with regard to climate science has been in simplifying complex science for audiences with varying levels of science literacy. This involves identifying useful mental models that help individuals understand the fundamental aspects of the problem, and to help audiences sort out (scientifically unsubstantiated, but nevertheless frequently repeated) counterclaims asserting that climate change is not real, not human caused, and not significant or certain enough to warrant action.

A second major focus of climate change communication are the emerging and future *impacts* of climate change, and the ecological and societal vulnerabilities in different regions and sectors to these consequences. For communicators, there have been both opportunities and challenges in that focus. Climate change impacts as the concrete manifestations that "bring climate change home" (Slocum 2004) offer communicators an opportunity to make the abstract topic of concern visible, tangible and meaningful to audiences (Moser 2014). Years ago, communicating impacts typically involved pointing to the future, to places far from where the majority of humanity lived, and to other species – such as polar bears on melting ice floes or low-lying islands in the Pacific ocean being inundated by the rising sea. These science- and necessity-driven ways of "distancing" climate change in space and time matched the human propensity for psychological distancing (Spence et al. 2012), i.e., the common desire to keep threats at arm's length as a way to manage the psychological impact of taking the magnitude and profundity of global climate change seriously. More recently, the early consequences of climate change have become evident in every region of the world and thus offer opportunities to link the observed with the scientifically understood and with future projections. In turn, this challenges communicators to not only find ways to communicate what is (and is not yet) understood in scientifically credible ways, but also to help people process their affective responses (e.g., worries, fears, guilt, denial, hopelessness) to these emerging and projected impacts (Swim et al. 2011).

The third major focus in climate change communication (as in the climate change science field more generally) is on *response options*. With regard to communicating climate change mitigation, i.e. efforts to reduce the *causes* of anthropogenic climate change, one major challenge has been to persuade society of the human causation of contemporary climate change, and thus of humanity's responsibility for minimizing future climate change. Concurrent is the challenge of conveying just how substantial the reductions in emissions from energy consumption, transportation, land use and industrial activities need to be if society wishes to avoid significant disruption of life support systems, economies and livelihoods, human safety and well-being and place identity. A third set of challenges in communicating mitigation lies in translating complex policy mechanisms and associated responsibilities and roles for different actors at different scales of governance into understandable approaches and clear actions.

Communicating the complementary response of adaptation, i.e., the diverse set of strategies and options for preparing for and minimizing the risks of negative *impacts* from climate change and for taking advantage of possible positive consequences, is a more recent challenge. Many view this as a growing opportunity to "make climate change real," to take actions that produce immediate and tangible results (as opposed to the delayed climate-related benefits of emission reductions), and to address local challenges that diverse interests may be able to rally around. However, the concept of adaptation is still unfamiliar to people, and to some it signals passivity, defeat, and competition to mitigation. Research on whether or not these assumptions and perceptions are borne out in reality and on how to best to communicate adaptation is only beginning to emerge (Moser 2014).

A range of related but more specific issues have emerged, such as the deliberate modification of the climate system through various geoengineering approaches, or carbon capture and storage, that communication researchers are also beginning to examine. In all of these instances, common communication concerns revolve around public perceptions and understanding, linguistic preferences, mental models, beliefs and attitudes toward responses, the willingness to fiscally or politically support a particular course of action, and what roles different actors may (or should) play in any of them.

Messaging, language and imagery. While the categorical areas of climate change communication directly mirror the concerns of climate change researchers more generally, it is far from obvious exactly what, how much, and in what words and imagery the substance of climate change should be communicated. Information needs, levels of understanding, cognitive processes, cultural values, and the context in which information is being communicated are among the key influences on what information different audiences take up, accept, understand and perceive as persuasive, how they interpret and retain it, and on whether or not and how it influences their behavior (Swim et al. 2011; Hulme 2009; Moser & Dilling 2007).

Particular attention in this context has been paid to mental models, i.e., the conceptual, symbolic, often intuitive ways in which we represent real-world processes in our minds. Mental models are simplified explanations, constructed and reinforced by language, images, symbols, sounds, colors and tone of voice. They predispose us to think about problems and associated solutions in certain ways, e.g., the "greenhouse effect" offers a mental model of global warming that likens the effect of heat-trapping gases in the atmosphere to the panes of a greenhouse, which allow sunlight to come through, but heat to be retained inside the greenhouse (Figure 1).

Considerable applied research thus has also gone into research on messaging, i.e., what and how best to communicate climate change, including:

- how to avoid the conceptual confusion of weather and climate;

- word associations and preferences such as climate change vs. global warming, or adaptation vs. preparedness;

- the benefits and drawbacks of different mental models such as carbon pollution vs. greenhouse effect; and

- resonance of different frames, such as economic vs. national security vs. moral reasons for acting on climate change) (Whitmarsh et al. 2011; Moser & Dilling 2007).

More recently, communication researchers have also become interested in the use of imagery, especially iconic imagery and graphics, in conveying climate change messages (O'Neill & Smith 2014) (Figure 2).

Communicators and trusted messengers. Historically, scientists in academia and other research institutions were the primary communicators of climate change – a logical result of scientists discovering and working to understand this global, but at first "invisible" problem. With growing understanding of the far-reaching implications of climate change, however, spokespeople from non-governmental organizations, politicians, government agency representatives, and influentials from other sectors of society (e.g., faith and business communities, entertainment) have become common messengers in the public arena. Communication researchers have examined the various roles they play with regard to science translation, advocacy, agenda setting, education, moral suasion, and political influence. A key factor in the amount of influence is the degree to which the messenger is perceived as a trusted source of information (and judgment) among a given audience (Moser & Dilling 2007).

Communication channels and the role of traditional and new/social media. Another focus in climate communication research is the pathway through which different audiences hear and learn about climate change and through which they communicate about it. The strongest focus has been on mediated forms of communication. In particular, the important roles of the media as communicators, translators and explainers of emerging science, as shapers of public and policy agendas, as influentials on public understanding of science and the scientific consensus on climate change, but also as amplifiers or attenuators of influential voices in the public debate are key research foci (for ongoing tracking and analysis of climate change media coverage see: http://sciencepolicy.colorado.edu/media_coverage/). A critical understanding of these roles of the media requires a consideration of the political economy of the media industry, journalistic norms, editorial and professional influences on what, how often, and how climate change is being communicated, and of the influence of technology on social interactions, cultural expectations, and changing civic behavior (Boykoff 2011). This has also led to a growing interest in the role and potential/limits of non-traditional media (new and social media, internet, Web 2.0).

An important, if quantitatively smaller body of work on the topic of communication channels focuses on direct interpersonal, face to face, or virtual communication. As the oldest form of communication, the research and practical focus on direct communication and dialogue was somewhat neglected in the face of the rapidly rising technology-based, mediated forms of communication. A range of disciplines (from neuroscience to psychology and beyond) had contributed to a better understanding of the observed politicization and polarization in public opinion on climate change, i.e., the ideologically and values-driven divergence in public understanding and opinion about climate change, and the resulting antagonistic exchange among divergent factions of society. Based on these insights, dialogic approaches to communication of climate change (use of active, two-way conversation as opposed to one-way information delivery) are being increasingly studied and explored in practice .

Understanding audiences. Deliberate or strategic communication, i.e., communication aimed at achieving an intended outcome (such as a certain level of climate literacy, or public support for a certain climate policy), aligns the contents to be communicated with the communication

channel(s) and messenger(s), as well as with frames, mental models and language that are meaningful and resonant with a particular audience. This requires communicators to move away from thinking of a generalized "public" and instead clearly define and understand particular publics so that climate communication can be tailored accordingly.

In fact, considerable research has gone into understanding different audiences. The longest-standing strand of research in this regard has focused on tracking public perceptions of and attitudes toward climate change, as well as public understanding of climate change (science), including identifying dominant beliefs and key gaps in understanding (e.g., Gallup, Pew and Stanford opinion polls). Because different messengers have come under attack over time, public opinion surveys also commonly now track attitudes toward scientists and other prominent communicators (e.g., on trustworthiness). Opinion surveys are also used to track public preferences among response options. Mostly, these have focused on mitigation such as different energy sources or particular policy mechanisms, e.g., energy efficiency standards, a carbon tax, cap and trade system, but increasingly they also ask about adaptation and geoengineering.

Communication researchers are interested in better understanding different audiences' belief systems, worldviews and values that shape how and to what extent climate change information is taken up and how it is interpreted (e.g., cultural cognition of risk, www.culturalcognition.net). Another audience-focused research interest is gaining traction among climate communication researchers as the limits of an exclusively cognitive approach to engaging publics is becoming more apparent: affect and emotional responses to climate change play an important role in people's responses to this global problem; worry, fears, anger, grief, guilt, hope and other feelings affect people's valuation of the seriousness and urgency of climate change, their assessment of the need for and possibilities of personal and societal response, as well as their level of continued cognitive, behavioral, civic, and political engagement (Swim et al. 2011).

The cumulative insights on differences among publics has led to different audience segmentation studies. For example, early approaches focused on demographic variables (e.g., age, gender, ethnicity), finding, for example, that women across cultures appear to be more concerned about climate change than men and wish to see a more urgent and comprehensive response. Others have differentiated audiences mostly along political ideological lines, finding that more liberal, left-leaning audiences tend to be more convinced about the science of climate change, show greater concern and feel greater urgency to take strong action on climate change than their more conservative, right-leaning counterparts. They also have tracked the growing polarization in climate change attitudes and beliefs, particularly in the US. A more recent variant of audience segmentation research distinguishes audiences by prevalent cultural worldviews and belief systems (e.g., Leiserowitz and colleagues' ongoing survey since 2008 on "Global Warming's Six Americas", which is based on cultural theory, Leiserowitz et al. 2008, for regular updates see: http://environment.yale.edu/climate/)).

In summary, different audiences share different convictions about the reality, human causation, urgency and severity of climate change; they trust different messengers, and preferentially use different media channels; and they share different concerns, emotional responses, and preferences for responses (e.g. level of government involvement, regulation vs. free-market, voluntary or individual actions). The notable polarization over the past 20 years of climate change communication, resulting in a self-reinforcing process of opinion hardening, without necessarily increasing climate science literacy, has resulted in a very challenging communication environment. This has led to a growing interest among both researchers and communicators in the possibilities of reducing that polarization, bridging differences and finding common ground among divided societal factions and elevating climate literacy to reduce the gap between the ever stronger scientific consensus on the reality, causation, and urgency of climate change and lay audiences' and policy-makers' understanding and responses to climate change.

SEE ALSO: affect; Anthropocene, the; behavioral geography; civil society; climate adaptation/mitigation; climate and societal impacts; climate literacy; climate change policy; climate change, adaptation and societal transformation; climate change, concept of; democracy; environment and everyday life; environment and the media; environmental citizenship; environmentalism; global climate change; visualization

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Key Words:

Communication; democracy; global warming; environmental perception; environmental risks/threats; language; media; new media

Figure Captions:

Figure 1: The greenhouse effect has long served as a mental model to explain how certain natural and human-generated gases trap heat closer to the Earth's surface and warm up the planet.

Source: U.S. Environmental Protection Agency, 2012, *Climate Change Indicators in the United States, 2nd edition*, Washington, DC, USA: US EPA, p.3. Available from: http://www.epa.gov/climatechange/science/indicators/download.htm.

Figure 2: Research into the use and impact of iconic imagery on issue salience and people's personal sense that they are able to do something about climate change (self-efficacy) has revealed that images of climate change impacts (such as extensive flooding, [l]) can increase

salience but undermine self-efficacy. By contrast, images that help envision a clean energy future [r] promote self-efficacy (O'Neil and Smith 2014).

Sources: [left] Flooding in Khyber Pakhtunkhwa Province, Pakistan, 5 August 2010, photo by Horace Murray, U.S. Army, http://www.defenseimagery.mil. [right] Solar panels on top of the Denver Museum of Nature and Science, Denver, Colorado, Feb. 17, 2009, photo by The White House.
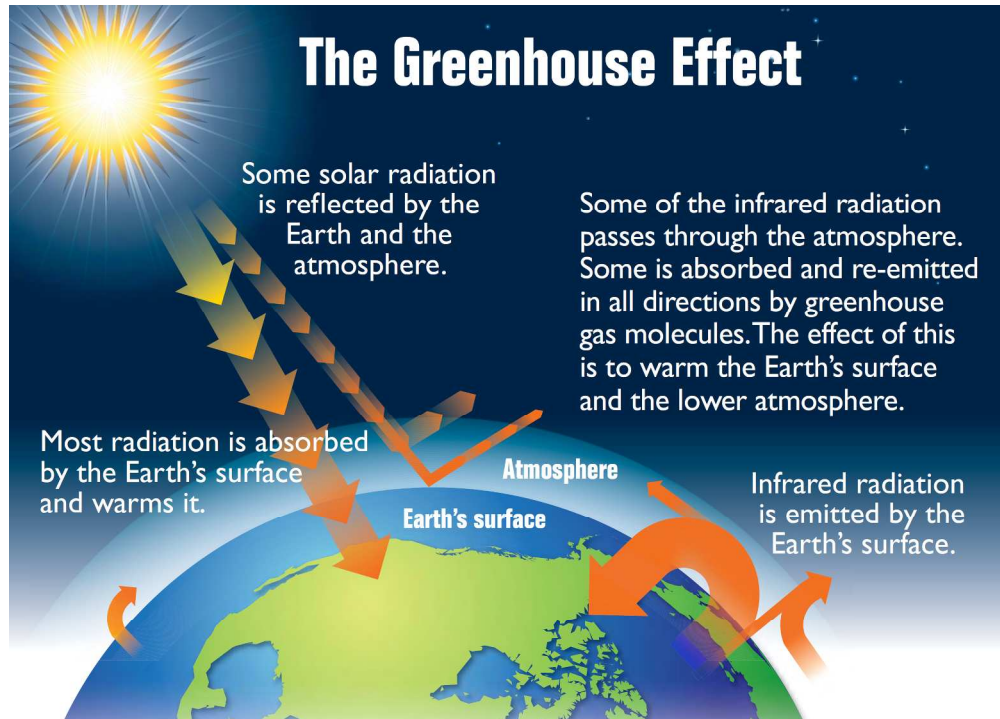
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