Communicating climate change: conduits, content, and consensus

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Climate change has been the subject of increasing efforts by scientists to understand its causes and implications; it has been of growing interest to policymakers, international bodies, and a variety of nongovernment organizations; and it has attracted varied amounts of attention from traditional and, increasingly, online media. These developments have been aligned with shifts in the nature of climate change communication, with changes in how researchers study it and how a variety of actors try to influence it. This article situates the theory and practice of climate change communication within developments that have taken place since we first reviewed the field in 2009. These include the rise of new social media conduits for communication, research, and practice aimed at fine tuning communication content, and the rise to prominence of scientific consensus as part of that content. We focus in particular on continuing tensions between a focus on the part of communicators to inform the public and more dialogic strategies of public engagement. We also consider the tension between efforts to promote consensus and certainty in climate science and approaches that attempt to engage with uncertainty more fully. We explore the lessons to be learnt from climate communication since 2009, highlighting how the field remains haunted by the deficit model of science communication. Finally, we point to more fruitful future directions for climate change communication, including more participatory models that acknowledge, rather than ignore, residual uncertainties in climate science in order to stimulate debate and deliberation. © 2015 Wiley Periodicals, Inc.

INTRODUCTION

We drafted a first version of this article in 2009[1] in the midst of events such as the failure of the UN Framework Convention on Climate Change Conference of the Parties in Copenhagen in 2009 (Conference of the Parties 15), Climategate,[2–6] which happened the same year and set the scene for an entrenched debate between supporters of mainstream climate science and their detractors,[7–9] and repercussions from a global recession that shifted ordinary people's attention and priorities from saving the planet to saving money. Around 2009, there still was hope that 'better' climate change communication would increasingly and relatively straightforwardly lead to better global and local climate change policies with popular uptake of such policies. Such hopes have been dented in the intervening years and public interest in climate change has dwindled, at least as measured through trends for search terms on Google.[10] Studies of public opinion in a variety of countries indicate a mixed picture, with some evidence of increasing concern, but also currents of skepticism concerning the extent or likely dangers of climate change.[11,12]

At the same time, scholarly interest in 'climate change communication' has increased. One can observe an upward trend that accelerated after 2010 when our article was published. According to the

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Scopus database, as of May 2015, 311 articles have been published on 'climate change communication,' with the most 'relevant' being our 2010 article entitled 'Theory and language of climate change' (cited 42 times on Scopus, 78 times on Google Scholar in May 2015).

In this second edition of the article, we do not attempt to review all these new publications, especially since searching Scopus for 'climate change communication' does not necessarily capture all papers on the topic and omits many practical climate change communication activities. We have used three criteria to guide our decision on which literature to cover in this new review. First, we have sought to accommodate some of the developments in the subject area itself, e.g., the legacy of Climategate and how scientists, activists, and communicators have sought to balance certainties and uncertainties. Second, we have sought to address the rise of social media as a new conduit for communication alongside traditional media. Third, we develop our 2010 critique of the transmission models of climate change communication via a critical review of the recent Consensus Project which emphasizes scientific consensus as a persuasive device in climate communication. Recently, this has been a particularly high profile aspect of the approach concerned with providing the public with more information about climate change.

The discussion in this article is structured around several tensions which are discernable in contemporary communication about climate change, and which represent dilemmas in discussions of how climate change can be communicated. The first of these tensions is a theme we first considered in 2010, namely the tension between the deficit model in science communication (maintaining that the public is uninformed and needs educating) versus the paradigm that promotes the idea of engagement and critical, inclusive dialogue. When we were writing our original piece, a good deal of the effort made to communicate about climate change involved trying to find an optimum way of framing and wording messages so that the public would absorb them. Whilst a number of initiatives still proceed in this way, the growing presence of discussions of climate in new media and the spread of opportunities for interaction via these new platforms has provided researchers with novel ways of making sense of how climate change is collectively formulated, and, possibly, acted upon. Moreover, they underscore the notion that messages are not merely one-way, but, especially in new media, involve multiple actors communicating with one another. Accordingly, it is timely to critically examine the work on this subject and assess the progress of different ways of thinking about scientist and activist

warnings of climate change and their audiences in the broader public and in policymaking circles.

A further tension in our discussion concerns the emerging issue of how climate change communication addresses the question of uncertainty.[13] This is inherent in the differing levels of (un)certainty the IPCC attaches to its conclusions and the calibrated language it uses to convey these to the wider public and policy makers,[14] as well as in the predictions of activists and communicators in the public sphere. There is a related tension in views about how uncertainty should be managed in a context where some try to minimize, or indeed maximize, uncertainty in public pronouncements, while others wish to include a degree of uncertainty in climate discussions. These tensions inform how the public is conceived and addressed, the kinds of communication that are deemed most desirable, and even the nature of messages themselves.

These tensions have been particularly evident since 2009, which has seen some soul-searching about the nature of climate science, especially relating to issues of openness and transparency,[15] about the boundaries between science, politics, and advocacy[16,17] and about the politicization and polarization of the climate change debate.[18,19] The emergence of social media brought with it some hope of more democratic debates,[14] although opening up public spaces for debate has brought opportunities for incivility as well as deliberation.[20] In the process, the role of climate change communication in this treacherous science-politics landscape has come under increased scrutiny, with fundamental disagreements over whether it can be possible to communicate climate science in an apolitical way.[21,22]

In this context, a new science of science communication,[23] of which climate change communication is a part, has emerged, informed by an increasing number of psychological studies trying to understand deep-rooted tensions that still characterize climate change debates and public attitudes to climate change. Alongside new theories, new practices of climate change communication rooted in some of these theories have been promoted (for an overview of this burgeoning literature, see Wibeck[24]), as well as new communication strategies such as consensus messaging.

In the following sections, we first provide a critical, and necessarily selective, meta-analysis of recent work on climate change communication informed in part by current work undertaken by the authors. First, we provide an overview of the media conduits for climate change communication, updating our review of the traditional media before turning to the rapidly burgeoning area of social media research. Second, we focus on the content of climate change communication,

outlining the connections between psychological research and applied climate communication work 'in the field.' Third, we focus on consensus messaging as a prominent recent example of psychological research being applied in the field. Fourth, and finally, we draw together these strands to demonstrate how climate change remains haunted by a deficit model approach to science communication, and explore the lessons for more fruitful future directions.

CONDUITS

Traditional Media

While traditional media analysis is still a buoyant subfield within climate change communication research, online media analysis has begun to attract increasing scholarly attention. We first summarize some recent contributions to the established field of study dealing with traditional media before turning our attention to the newer field dealing with climate change debates within social media.

In 2014,[25] a meta-analysis of 133 studies of the role of media in climate change communication showed that research activity had increased in quantity and broadened in scope, including more countries, more types of media, and different methodological approaches. Within this burgeoning literature, Western countries and print media continued to be the dominant research topics,[25] although broader, international analyses are now beginning to appear. For example, a comparison between 27 countries showed that climate change coverage increased in all countries between 1996 and 2010, although there were significant differences between countries in the extent of growth and media attention.[26] However, since this period there have been signs of these trends reversing, with late 2009 marking a peak in print media coverage of climate change, driven by the Copenhagen summit and Climategate.[27] The big picture has been of declining media interest since these events[28] although there have been recent spikes in interest, especially around extreme weather events, IPCC reports and new developments in climate policy and politics.[27] This suggests that the Paris climate summit in late 2015 (Conference of the Parties 21) may see a significant increase in media attention.

Since 2010, country specific and comparative studies of media coverage have flourished,[29] with one international study showing that political advocates for climate policy have been far more visible in media articles than skeptical voices.[30] Another study found that while in most UK newspapers climate change is accepted as a problem and political solutions to addressing it are being discussed, some newspapers in the United States still debate the scientific evidence for human induced climate change.[29]

This provides an insight into how climate change has become an increasingly politicized subject since its arrival on the public agenda in 1988.[31] For example, a content analysis of articles published in the *New York Times*[32] found 'a gradual decline in the volume of material within the 'Science' topic and an expansion of themes classified under the 'Politics' topic' between 1995 and 2010. After 2010, there was an increase in discussions around mitigation technologies from carbon capture and storage to fracking, alongside a hope that new types of technologies such as fracking, might allow a breathing space for thinking about future ways of reducing carbon emissions.[33,34] Allied to this, there have been a number of detailed studies of the metaphorical, and inherently political, framing, and social representations of climate-related issues such as geoengineering,[35] carbon capture and storage,[36] and fracking.[37–39] Ongoing attempts to overcome the abstract nature of scientific knowledge have also resulted in studies of visualization[40] and press conferences[41] to emerge as subfields of climate change communication research.

Such moves from abstract science to material mitigation (and increasingly adaptation) involve complex interactions between the producers and consumers of media texts, giving climate change different meanings in different places at different times. This context-specific making and remaking of climate change meaning has been described as a 'circuit of culture,'[42] which contrasts with the globalized visions of climate change that have percolated into society from climate science.[43] In the years since this paper's first publication in 2010, the cultural circuit of media communications about climate change has changed dramatically. As well as the shift from the abstract/scientific to the material/political, the structures within which meaning-making takes place have changed, with the dominance of mainstream media being challenged by interactive, social media.

Social Media

Whilst climate issues still feature in the mainstream media, the online environment has provided a new and expanding arena for such discussions. Climate scientists have taken to blogs, Twitter, and other social media platforms to enter into dialogue with a diverse range of actors including colleagues in their own professional communities, political activists, and 'lay' publics.[44,45] This has opened up new areas of research around the role of the internet in efforts to engage with

multiple audiences and evaluate how different stake-holders participate in online debates.[46]

One of the first applied linguists to study blogs in the context of climate change communication was Koteyko.[47] She argues that for scholars interested in studying the conceptualizations of climate change, blog discussions provide a rich source of data due to their relative spontaneity, interactivity, and multiple possibilities for content creation, enabling the manifestation of a large number of voices that can be analyzed almost in real time. The internet is viewed as a rhetorical context providing multiple publics with the opportunity to engage with developments in science and policy, and contest elite messages.[48] Koteyko et al.[49] further demonstrate how climate change communication scholars can systematically retrieve data from blogs and apply text analysis and data visualization tools to establish both macro- and micropatterns of language use by different discourse communities. For example, U.S. states with Republican voting patterns have been found to be more likely to originate Twitter comments using the term 'global warming' and frame it as a 'hoax' than states with a preponderance of Democrat voters, where the term 'climate change' was more frequently used and was framed as a real problem requiring attention.[50]

Discussions on blog platforms enable spaces for rhetorical invention which can foster discussion, reveal instances of contestation, and help generate alternative networks of scientific knowledge production. Blogs were a key influence on newspapers in the creation of media hype around Climategate, both in terms of the level of attention afforded to the controversy and the type of language being used.[51] Sharman[52] critically examines the climate skeptical blogosphere investigating whether a focus on particular themes contributes to the positioning of the most central blogs. More recently, a large-scale analysis of the English-language blogosphere combined content analysis of topics with study of the network structure.[53] Moving beyond a polarized view of climate change debates, the authors examined nuanced differences between skeptics and accepter communities on the blogs and they identified one large community of skeptics and several climate change accepter communities. Meanwhile, Matthews[54] provides a useful insight into the reasoning of those who publicly question climate science on blogs. Furthermore, comments left underneath blogs or online newspaper articles provide insights into the meanings given to climate change by readers beyond elite media discourses.[14,55] This pluralization of meanings is consistent with climate change's shift from the scientific to the political, but also poses a challenge for 'moderation' between

individuals approaching the issue from different cultural and political perspectives.[56] This highlights the importance of both the dynamics and contexts for online participation in climate change discussions, and the complex interplay between the social, instrumental, and technological determinants of participation.[57]

Perhaps as a reaction to the increasing role of politics in discussions about climate change some have called for increased communication from scientists.[44] Schäfer emphasizes that increasing the number of stakeholders involved in online discussions has not improved the robustness of scientific information available or the quality of the debates; he also notes that 'impacts on the broader public appear to be limited so far.'[58] Climate scientists have used blogs to communicate a variety of aspects of knowledge which have been less evident in formal scientific publications for a number of years.[59]

Recent studies suggest that the number of climate scientists participating in social media conversations is increasing. For example, an analysis of postings on Twitter around the publication of the IPCC's report of the physical science basis of climate change (Assessment Report 5, Working Group 1) showed physical scientists and social scientists participating in conversations with journalists, activists, NGOs, and members of the public.[60] This analysis, based on coded conversations of participants on Twitter according to whether or not they expressed support for the IPCC, found that the densest network of conversational connections occurred between individuals in the UK and Europe with contesting views. A study of Twitter messages containing generic hashtags about climate change[61] found some similar 'open forums' of contestation, but concluded that discussions were more likely to take place within more homogenous enclaves of opinion. The authors conclude that 'Overall, social media discussions of climate change often occur within polarized "echo chambers."'[61] Such studies suggest that it is possible for online communities to contribute both to bipartisan engagement as well as enabling polarization. However, quantitative 'big data' analysis needs to be treated with caution, as it can become abstracted and divorced from key contexts which give social media postings their meaning(s).[62] For social media analysis to realize its full potential, quantitative analysis must be undertaken in tandem with qualitative, ethnographic analysis of social media postings and interactions. Notwithstanding these methodological observations, in the next section we consider efforts to fine tune the content of climate communication through the application of psychological research 'in the field.'

CONTENT

Climate change communication researchers, psychologists in particular, have begun to study the wide spectrum of voices and views in the climate change debate. Whilst many studies have found that individuals are broadly aligned with the position espoused by the IPCC, there are others who consider the impending changes are likely to be more catastrophic and immediate, and some who whole-heartedly reject the idea of anthropogenic climate change. Equally, it is possible to find constituencies endorsing climate change policies, mainly focusing on mitigation, whereas others reject such policies but sometimes endorse adaptation measures.[52,63] Such plurality of views has prompted contrasting strands of applied research, focusing either on dispelling climate change 'myths'[64] or trying to create a space for a more open dialogue in which various voices and opinions can participate.[65,66] In the following, we first summarize some aspects of the psychological and historical efforts being made to gain insights into changes in climate change communication and then go on to detail more applied efforts at climate change communication informed by such studies and other survey-based approaches.

Within research dealing with psychological issues, efforts are made to understand the political and cultural roots of diverse attitudes to climate change. Several recent studies focus on message content and cognitive and attitudinal variables to provide insights into climate change communication. Bain et al.[67] found that, in the United States, those skeptical of anthropogenic climate change were more likely to support environmental actions if these were justified in terms of economic benefits or making people more considerate of one another. Focus on hope and potential solutions can be more effective in inducing support for mitigation policies if the audience is initially skeptical.[68] Messages focusing on technical solutions promote less polarization in recipients. Messages focusing on fear and predictions of adverse events can increase skepticism, perhaps because they disrupt underlying 'just world' beliefs and can reduce people's intentions to perform mitigating actions.[69] A U.S. study[70] suggests that news about potential adverse effects may motivate liberals toward mitigation actions but may make conservatives more skeptical.

These studies indicate that there is no single message that will appeal to all political persuasions. Neither is it simply a matter of providing people with scientific information: in the United States, conservative skeptics may be well informed[68] and scientifically literate.[71] To address these kinds of complexities, some authors have attempted to condense and summarize the findings and produce what one may call 'best practice guides.' One of the best-known of these guides showed that 'in order for climate science information to be fully absorbed by audiences, it must be actively communicated with appropriate language, metaphor, and analogy; combined with narrative storytelling; made vivid through visual imagery and experiential scenarios; balanced with scientific information; and delivered by trusted messengers in group settings.'[72] Such strategic climate change communication relies not only on psychological studies but also on increasingly sophisticated opinion polls.[73] This type of research is applied 'in the field' by outreach organizations such as *Climate Communication* in the United States[74] and the *Climate Outreach and Information Network* (COIN)[75] and the *Talking Climate*[76] website in the UK. The latter is novel in providing a bridge between climate change communication academics and practitioners, providing updates on the latest academic research and considering how this could inform practice.

Much applied work focuses on finding the most effective means by which climate science communicators can persuade the public of the importance of climate change. Some researchers believe the key to finding these means lies in a greater understanding of the affective, cognitive, and attitudinal variables that provide cues for effective communication. An example of such an endeavor is the *Time for Change?*[22] report on climate change communication, a collaboration between climate scientists, policy analysts, and science and technology studies scholars. The report focuses on the role of climate scientists in contributing to public and policy discourse and decision-making on climate change. It recommends the establishment of a 'professional body for climate scientists […] to provide a unifying purpose and to offer leadership.' It also advocates training for climate scientists in how to engage in communication more transparently and to ideally see it is as an opportunity for 'co-production.' The authors comment that '[a]ctive critical self-reflection and humility when interacting with others should become the cultural norm on the part of all participants in the climate discourse.' The report places the onus of communicating 'policy-relevant' climate science on the shoulders of the scientists themselves, a potentially risky strategy as communication efforts coming from those perceived by some to be 'an interested party'[77] might not necessarily be well received. However, this appears likely to be a problem to be dealt with rather than avoided; climate science is entangled with multiple ideas about how our societies may look in the future so has inevitably become a site of politics and contestation.[78,79] Perhaps more problematic is the report's call for a climate science 'meta-narrative,' echoing calls elsewhere for

scientists to 'speak with one voice.'[80] As we argue in the next section, attempts to formulate a unified narrative are unlikely to yield a solution to climate change communication dilemmas.

CONSENSUS

An increasingly prominent example of a unified climate communication message involves the formulation and dissemination of a scientific 'consensus' on anthropogenic climate change. We place a particular focus in this article on consensus messaging for academic and practical reasons. Academically, consensus messaging marks a continuation of key assumptions regarding the relationship between science and public from previous science communication models that see the public as needing to be informed and persuaded. Practically, consensus messaging has become increasingly visible in recent years, with a high profile academic article claiming that 97.1% of academic papers expressing a position on climate change either explicitly state or imply that warming has taken place and has been primarily caused by human activities.[81] The paper's authors have sought to increase the impact of their paper through the 'Consensus Project' that aims to 'communicate the overwhelming scientific agreement on anthropogenic (human-caused) global warming to the public at large.'[82]

The '97%' claim has become a climate change communication meme, inspiring a blog,[83] a popular television comedy program[84] and even being tweeted by President Barack Obama, albeit embellishing the original claim by asserting that the consensus was about 'dangerous' climate change.[85] The Consensus Project has been justified by the reported existence of a 'consensus gap' between the quantified level of consensus in the scientific literature and the awareness of this consensus in the general public (as measured through opinion polling), which is believed to constitute a 'roadblock that has for two decades inhibited public support for climate action.'[86] This is an example of the classical technique of 'argument from authority,' where the credibility and authority of climate science is invoked as a means of persuasion. Two academic papers support this approach, providing evidence of correlation between awareness of the scientific consensus and support for climate policy,[87] and which showed that supplying information about the 97% consensus to a sample of pedestrians increased their acceptance of anthropogenic global warming.[88] This evidence, in conjunction with the Consensus Project's extensive media coverage[89] might confirm the value of this strategy against what some call the 'Merchants of Doubt.'[90] However,

evidence from within psychology and other disciplines suggests a need for caution.

First, within psychology there is an argument that the 97% strategy fails to take into account the importance of cultural effects on assimilation of information, and that as members of the public take up more entrenched positions on climate change, increasing the supply of information about climate science may have less success in terms of altering their views on climate change.[91] Second, exploring correlation between variables and conducting laboratory studies cannot supply definitive evidence about climate change communication strategies. Science communication takes place in an open system, where competing messages exist. Even if the merchants of doubt disappeared, many other concerns will continue to compete for the attention of publics, diluting the immediate focus placed on climate change in laboratory studies.[92] Kahan[93] argues that the Consensus Project failed to provide significant new information about consensus in climate science,[94-97] and that media coverage of previous consensus studies did not increase the percentage of the public who believes that humans are mostly responsible for recent increases in the Earth's temperature: 'Such a strategy has already been tried in the real world. *It didn't work.*' Kahan found that members of the public selectively appropriate knowledge based on their political affiliations and cultural group identities. In the United States, where attitudes to climate change are most strongly a party political issue Democrat voters are most attentive to anthropogenic sources of warming whereas Republican voters focus on non-anthropogenic causes of climate change. This happens, says Kahan, irrespective of 'scientific literacy' and may explain why, despite a decade of studies, practical climate communication interventions and much media coverage, emphasizing scientific consensus and anthropogenic climate change remain politically divisive issues in the United States.

Third, by putting science at the front and centre of communication efforts, advocates of the 97% strategy place science in the firing line of those who oppose particular climate policies. This focus on science is not restricted to climate communicators; the UK's Climate Change Act[98] states that the national target for reducing carbon emissions can only be amended with 'significant developments in scientific knowledge about climate change, or European or international law or policy.' When science, rather than democratic political engagement, becomes the main plank upon which policy is built, it is unsurprising that science becomes a target for political opponents of policy. As Demeritt[99] presciently argued, attempts to substitute climate

science for climate politics merely prolong the debate over whether or not the science is 'sound.' Within this context, the importance of the continued repercussions from 'Climategate' in 2009 becomes apparent, as they derail science-focused communication efforts. It may be that climate communicators who focus on science are taking their cues from an assumption that scientific consensus begets political consensus.[43,79,99] However, as well as being poorly founded on evidence, such an assumption may also be damaging to attempts to address climate change: the causes and consequences of climate change are likely to be diverse, suggesting a multiplicity of ways in which problems related to climate change could be addressed.

A focus upon the encomium of 97% consensus tends to restrict discussion in the public sphere to those areas where substantial consensus can be mustered, such as whether warming has taken place or the presence of an anthropogenic component. It may be more difficult to address the diversity of processes and mechanisms that contribute to periods of change or stability in climate, such as ocean processes,[100] the role of volcanic activity,[101] or the ongoing concerns about relationships between climate models and instrumental records and the extent to which these differ.[102] In other words, it focuses discussion on areas of high consensus rather than areas of complexity.

Perhaps then, a useful direction in communication about climate is to focus not only on consensus but to seek to celebrate the disagreements which necessarily flow from such a complex multilevel issue as climate change.[103] Such an overtly political approach to climate change communication accepts both that hard-to-overcome cultural barriers exist in talking about many aspects of climate change (including climate science), and that *dialogue* which is inclusive of human values provides greater promise than top-down efforts at science education.[91] Recent reports aimed at practitioners of science communication have offered advice on knitting together both values and scientific knowledge[104,105] with an understanding of the importance of 'put[ting] yourself in the audience's shoes.'[106] Experts tend to see the public as having a limited grasp of uncertainty—hence the appeal of 'consensus'—but there are many examples of phenomena where laypeople think effectively about uncertainties, such as in sport or gambling.[13] Indeed, even where lay understandings of risk diverge from expert statistical estimates of risk, clearly, as Slovic and others point out,[107] they are emotionally textured and informed by a variety of cultural world-views, and represent something considerably more complex than the failure of educational messages.

LESSONS FROM THE PAST AND DIRECTIONS FOR THE FUTURE

Lessons from the Past

It is worth pausing at this point to reflect on the kinds of models of science and the public implied in many of the efforts described above focusing on informing and persuading the public. Climate communication appears haunted by older 'deficit' models of science communication, with an underlying assumption that the public is somehow lacking in knowledge or is insufficiently aware of impending dangers. In this view the job of the scientist or science communicator is to persuade the public into alignment with the kind of scientific consensus promoted by the Consensus Project.[81,86] This model of the public as deficient and as a body that needs to be educated and persuaded underlies a great deal of advice about climate communication. This is what we might describe as the traditional paradigm of science communication that itself is founded on the deficit model of public understanding of science.[108]

For example, in a short but spirited article Hassol[109] describes several such techniques whereby scientists can communicate in terms akin to those understood by putative members of the public, including metaphors and simple story telling. This focus on telling stories in simple terms and repeating simple messages is pursued further by Somerville and Hassol[110] and also combined with consensus messaging. Whilst this project is ongoing, as we have noted before, scientific communication is about rather more than simply well-chosen metaphors or stories judged sufficiently simple for the public to assimilate.[111] As Wynne[112] notes, these themselves can be read back to disclose how scientists conceive of the public (Box 1).

Indeed, this preoccupation with finding the language of the common man or woman as a vehicle of public engagement is perhaps the latest manifestation of the older concern that the public is somehow deficient in knowledge.[113]

According to this view, alignment between the public and the putative scientific consensus will be enhanced if more colloquial language is adopted, recognizing the variations in meaning across social groups. Once again, however, in this view, the scientific framing of the issue and the public's ignorance is taken for granted and the stage is set for the kind of manipulation of publics to a scientific agenda described by Cooke and Kothari.[114] Instead, argue Felt and Wynne,[115] it might be possible to conceive of a different model of communication and engagement which allows a more dynamic relationship to develop, enables participants to 'challenge entrenched assumptions, interests, power-structures, and imaginations,' and is

RETHINKING EFFECTIVE COMMUNICATION: A FOCUS ON UNCERTAINTY AND LOCAL ISSUES

Communication does not exist in a vacuum: audiences hold particular values and views that will influence their interpretation of new information. Rather than assuming such influences to be nefarious and in need of correction, we identified the importance of two-way dialogue and lively debate as inherent to productive deliberation about possible futures in a changing climate. This means that future studies of climate communication 'in the field' should be given greater weight than laboratory-based studies aimed at behavior change. In this context, it is important to note that climate scientists, climate communicators, and social scientists are beginning to debate uncertainty and complexity more openly. These activities need to continue alongside consensus messages, as only in this way can suspicions that may linger over the scientific process be overcome. Alongside such processes, more local climate change communication activities are necessary, as it is at the local rather than the global level that scientific uncertainties, especially about risks and impacts, persist and have to be discussed openly and honestly. A key finding of our 2010 review was that much of the literature sought to present 'visions of effective climate change communication' based on assessments of communication audience, style, and goals. We also found that finding the right words, metaphors, and strategies with which to communicate is necessary, but insufficient for good public engagement. These findings remain valid today and in light of our review of more recent climate change communication literature.

more fully cognizant of the capabilities of people to deliberate, discuss, and deduce solutions independent of interventions from experts and governments. Such a model runs contrary to the assumptions of the old public understanding of science model that are encoded in the Consensus Project and the work of Hassol: the public as a body in need of enlightenment and persuasion by 'experts.' This, as Felt and Wynne[115] describe, suggests that 'interest appears focused on new procedures more to justify established imaginations and commitments, and to procure 'trust' for what remain essentially unchanged imaginations, habits-of-thought,

and decision-making processes.' It reflects 'persistently technocratic, reductionist, and exclusive functioning of the underlying governance culture itself.' Felt and Wynne remain optimistic that a more effective and creative dialogue is possible, with the recognition that science and government are part of the very societies they seek to control. The response is to focus on '"opening up" the ways in which the "answers" depend on the "questions" and the framing of analysis…[to] facilitate the nurturing and maturing of more open and diversely creative discursive spaces on the roles and purposes of science in governance.'[116]

In summary, many studies reviewed in this article are rooted in 'visions of effective climate change communication'[1] which draw on such communication maxims as the importance of engaging people emotionally, carefully defining communication goals and knowing one's audiences. Even where dialogue is advocated, this is often formulated in an expert-informed manner and experts are the arbiters of reality. As we have described, and as critics of simple public understanding of science models such as Wynne[117] have pointed out, there often exists in these approaches an implicit model of the audience which may not be subject to empirical scrutiny—a kind of expert 'folk model'[13]—and which may assume from the outset a degree of ignorance or deficit. We argue that this is a poor perspective from which to undertake dialogue, a position supported by a first-hand account from three climate scientists active on social media: 'online conversations can be unpredictable, rambunctious, and frustrating, they are often personally and professionally rewarding … conversations are more successful than lessons.'[44]

Directions for the Future

Anticipating future challenges and developments in dialogues about the world's climate is as difficult as predicting the climate itself. Nevertheless, it is possible to point to four future directions for climate change communication research and practice.

First, one of the most pressing issues is how scientists and communicators address the question of uncertainty and complexity.[118] Echoing Somerville and Hassol's[110] enthusiasm for simple messages, sometimes experts are wary of including complexity and uncertainty in public discussions of climate change. Such a view is also expressed by some journalists, such as James Randerson speaking to the House of Commons Science and Technology Committee where he expresses concern about the risks of 'playing up uncertainties' and how that might lead to the sowing of doubt.[119] Yet as Wynne[120] reminds us, and as some climate scientists

are beginning to advocate themselves,[121] indeterminacy is a central part of human inquiry. Indeed, many of the key parameters in climate change, like temperature records, climate sensitivity values, or ocean heat content estimates are complex human constructions in terms of how they are assembled, what they mean and their political trajectories as they are used by scientists and other interest groups. Rather than simply being objects of scientific discovery, these might best be seen as 'epistemologically and indeed ethically complex, strictly indeterminate, *heuristics*.'[120] This is not to undermine the case for action, but rather to advocate a richer understanding of human processes in discovery, dissemination, and political decision making than is often found at present.

There is also a practical benefit to addressing uncertainty. At the moment, a curious individual browsing the internet for information on topics such as the degree of uncertainty attached to environmental measurements, the role of adjustments and missing data in temperature records or comparing present day weather events with those of the past, is likely to encounter people skeptical of mainstream scientific claims on these issues. This means that robust and persuasive accounts of the processes involved in creating data sets, and the measures of uncertainty attached to these, would be a valuable part of the argument from the point of view of those seeking to deploy these factors in public discussion. Many key variables are complex assemblages inferred from a variety of primary data sources and are, as Wynne reminds us, epistemologically and ethically complex too.[120]

Second, as well as emotionally charged predictions of dramatic change, it is important to find a way of talking about relatively gradual processes or periods of stability. For example, predictions of comparatively modest change in temperatures over the next few years are arising from a variety of sources such as the UK Met Office's decadal forecasts and from studies of ocean processes.[122] Similarly, the so-called 'pause' or 'hiatus' in temperature rise in recent years has prompted discussion in both lay and academic circles. One communication strategy is exemplified by Michael Mann in *Scientific American*,[123] namely to describe this as a 'faux pause' and reaffirm predictions of accelerated and dangerous warming in the near future. Some concerned commentators have even suggested that discussing the 'pause' represents a hazardous 'seepage' of climate skeptics' agendas into both the academic sphere[124] and the mainstream media.[125] Yet, this is only part of the story. Rather than being a distraction from the overall narrative of impending peril, discrepancies and anomalies are often integral to scientific observation and academic discourse.[126] Some climate scientists and media analysts have taken up the opportunity provided by the 'pause' to encourage more diverse climate change communication strategies and to encourage rather than distract from uncertainty communication.[44,121] More overt engagement with uncertainty could render 'public lives, public uptakes, and public engagements more resilient, and practically rewarding.'[120]

In the light of these two issues, we would like to repeat our plea for policymakers, scientists, and communicators to look beyond simple transmission models or public understanding models of the relationship between expert knowledge and 'lay knowledge.' These embody a limited view of the relationships between science and society, a limited view of the public and curiously truncated view also of communications research as being about finding the right words and checking if people have listened. They may also, as Welsh and Wynne caution,[127] actually help to create a public which is passive and apparently ill-informed. Studying how the competing voices of climate change are framed by various stakeholders in different media (from print media to Web. 2.0) can help gage public opinions and reactions to the issue of climate change and its mitigation. Whereas traditional media such as newspapers have been extensively studied, attempts to examine the construction of climate mitigation issues in emergent social groups, blogs, and other new media are still relatively uncharted territory.[128] These proliferating sites of debate, engagement, and knowledge construction offer new ways of thinking about climate change and its attendant risks. They offer the possibility that each case can 'develop its own logic of participation'[115] and new actors can develop their own voices and their own ways of harnessing science and technology.

Third, the study of climate change communication itself can change the social landscape. New ways of thinking about politics, power, and social structure are afforded by discussions of climate change.[129,130] Darier and Schüle[131] found that awareness of global environmental issues is always contextualized in broader perspectives and is not exclusively 'environmental' and may be informed by features of national cultures. Although studies of public perceptions cannot directly tell policy makers which specific policy initiatives could work in practice, they can, however, give indications of what is likely to be acceptable to citizens, and more importantly why or why not.

Fourth, it is valuable to recognize that there may not be a single effective way to communicate about climate change to all audiences. To this end, rather than seeing the public as a body of people whose opinions need to be guided, there are promising areas of work where studies of public perceptions and commitments

inform the framing of messages and what they should say. Using this method, a team of researchers[132,133] examined public understanding and perception of climate change to develop a brochure for the general public, which was iteratively refined via discussion with the audience. Studies of public perceptions[134–136] can provide evidence of what people currently know and believe about climate related issues, with the goal of facilitating better communication between all parties about the respective risks and benefits of climate change. Lorenzoni and Hulme[137] discussed several future scenarios with participants and elicited a desire on the part of their informants to see more information about how the predictions were derived and the kinds of evidence they were based upon, also uncovering questions of trust and a wish to explore the shorter-term local impact of possible changes. Such findings chime with our earlier plea for more effective engagement with the detailed processes of how measures and predictions are compiled and arrived at.

CONCLUSION

In summary, the last 5 years have seen a continued tension between traditional efforts to inform and educate the public and a growing interest in the role of a variety of more interactive and inclusive media as both an index of interest in climate change dialogues and as a means of facilitating and informing discussion in the public sphere. Allied to this, we have seen further development of the idea of a more inclusive model of the policymaking process. Such a deliberative democracy approach can help people become collectively engaged with a task and enable them to acquire the knowledge and technologies to address it,[138] rather than being passive recipients of communication content designed to ensure they are 'on message.'[139,140] Embedded in the deliberative democracy approach is the notion that communication technologies change social relationships and that these in turn modify the technologies.[141] More radically, it may be that we should actively embrace sources of dissensus, rather than consensus, as they provide a fruitful means of reaching decisions within democratic societies.[103] Such sources of dissensus are likely to include deeply rooted cultural and political values[71,104,106] that are unlikely to be reconcilable, but must be treated seriously and as legitimate within a properly functioning democracy.[142] A lively debate with acknowledgement of difference and uncertainty can best be understood not as a failure of consensus or a deficiency of knowledge but as a means of 'keeping public engagement with science authentically alive and not under the control of agents whose own culturally embedded assumptions, imaginations, and practices may well be part of the problem.'[115]

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