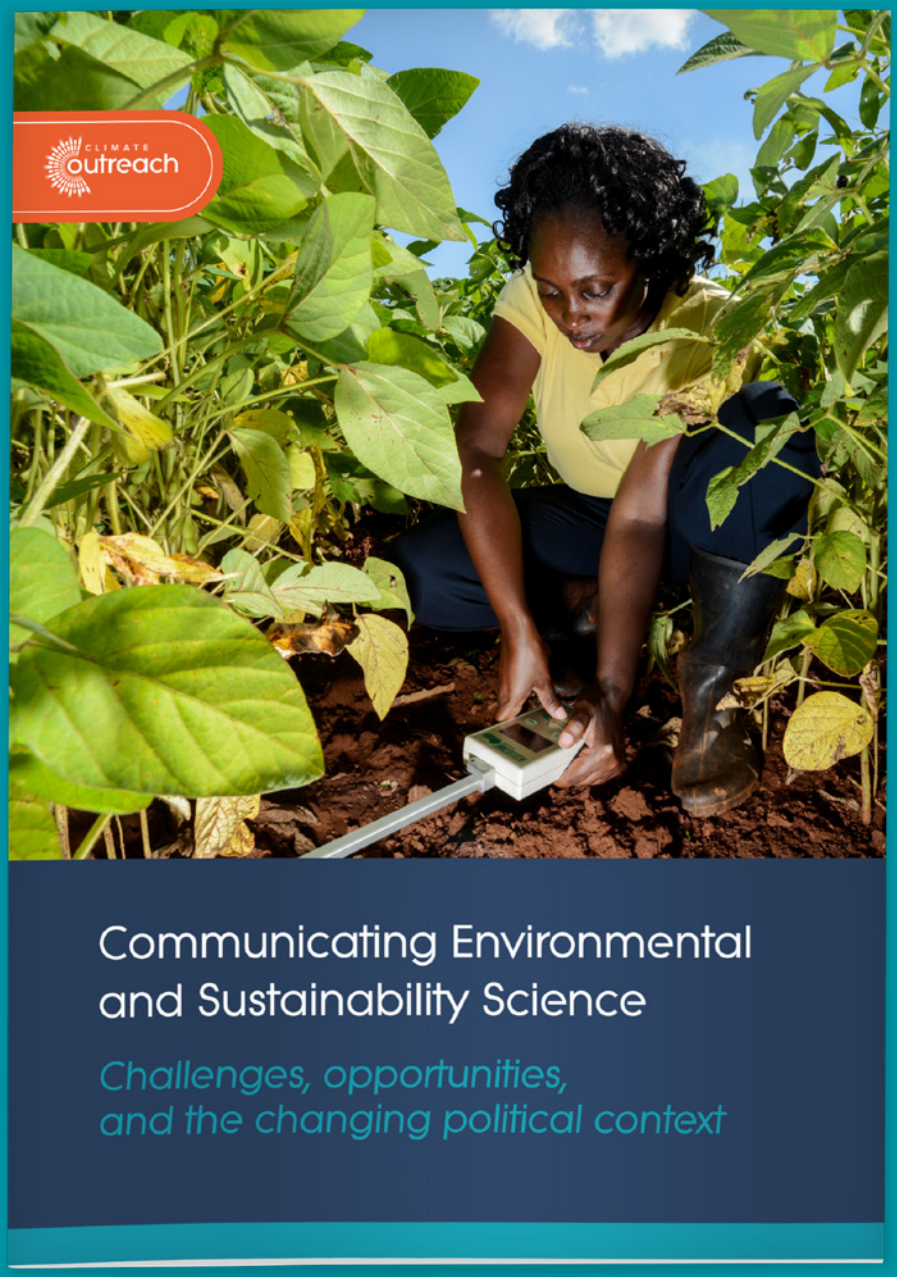

Part 3 of 5

Progress in the field: a synthesis of key trends in environmental science communication research

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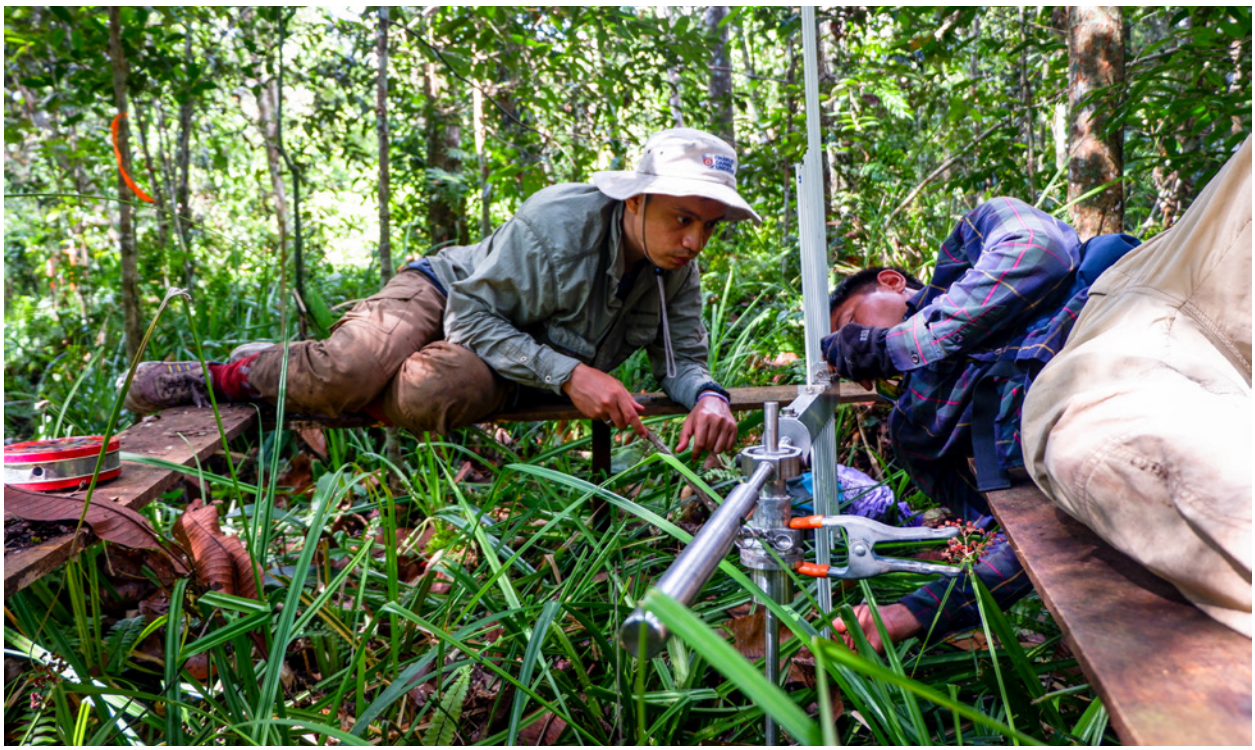
Progress in the field: a synthesis of key trends in environmental science communication research

Introduction

Having introduced some key concepts and ideas underpinning environmental science communication and engagement and mapped out the landscape in the earlier sections of this report, we provide here a succinct and concise summary of key research trends in the field. We noted earlier in the report three recent and comprehensive summaries of the research base (Nisbet & Markowitz, 2016; NASEM, 2017; HM Government, 2017), and focus here on three research themes:

- The growing importance attributed to using frames and narratives to align messages with the needs, values and identities of different audiences.
- Challenges around communicating uncertainty and scientific consensus in climate science.
- The role of trust in building public engagement with scientific evidence.

These themes are prominent in the three reports listed above (and by extension the literature these reports summarise), and they additionally represent our judgment of what constitutes promising areas for future research. For each theme we summarise the current state of the research, and flag why these trends are likely to continue to be important going forward.



Researchers measure peat surface elevation change in Central Kalimantan, Indonesia.
Photo: Sigit Deni Sasmito/CIFOR

Values and frames

Values are 'guiding principles in the life of a person', and are distinct from beliefs or attitudes, in that they are relatively stable and fixed (Schwartz, 1992). Values, along with worldviews and political ideology, are much more fundamental in shaping views about contentious issues in environmental science than people's level of knowledge about a particular subject (Corner & Clarke, 2016). Values are the essence of identity - people identify with in-groups who share their values, and against out-groups who espouse contradictory values. This identification through shared values is the bedrock upon which specific attitudes to scientific issues such as climate change are founded (Maio, 2015). As a result, there has been growing interest in developing and testing communication 'frames' for environmental science which connect with different audience values (Corner et al., 2014).

There are many different definitions of what a 'frame' is (Nisbet, 2009), but all broadly agree that framing refers to the casting of information in a certain light to influence what people think, believe, or do. Frames are likely to influence judgments about complex science-related debates when they are relevant to an individual's existing ways of organising, thinking about, and interpreting the world (NASEM, 2017). It is important to align the framing of science messaging with the intended audience's political views when communicating environmental science because "formal knowledge constitutes only part of non-experts' appraisals of environmental risks" (Capstick et al., 2016; Slovic et al., 2007). How a message is framed, and therefore received by a particular audience, is also critical to such appraisals.

"Values, along with worldviews and political ideology, are much more fundamental in shaping views about contentious issues in environmental science than people's level of knowledge about a particular subject."

Climate change, for example, could be framed as a grave environmental risk, a public health threat, or an opportunity for innovation and economic development (NASEM, 2017). In the case of GMOs, information framed in terms of social progress and improving quality of life may fit one individual's way of thinking about the issue, while a frame that focuses on public accountability and right to know about scientific developments may appeal to another (NASEM, 2017). Campbell and Kay (2014) described the phenomenon of 'solution aversion' among US conservatives, arguing that Republicans' scepticism towards scientific knowledge about climate change and the environment is actually explained by a conflict between their ideological values and the most popular solutions to environmental problems, rather than the scientific evidence itself. This repeats findings from Kahan (2015), showing that politically conservative individuals tend to interpret expert advice on climate change more favourably when they are made aware that the possible responses to the problem do not simply include regulation and renewable energy, but also nuclear power and geo-engineering, actions that for them symbolize human resourcefulness.

Overall the science of science communication remains a developing body of knowledge (NASEM, 2017; Corner & Clarke, 2016). For example, despite the orthodoxy that positive messaging (i.e. emphasising the benefits of a particular environmental science policy or goal) is more effective than a focus on the risks, recent research has challenged this (Bernauer & McGrath, 2016; Fielding & Hornsey, 2016). One study found that, when testing positively framed messages about climate

change, including a 'counter-frame' that encompassed anti-climate change or 'denial' themes consistently undermined the impact of the positive frames (McCright et al., 2013). This suggests that even though framing-based approaches can produce measurable shifts in public views, they may be fragile or temporary (Corner & Clarke, 2016).

"There is a need to move beyond simple alterations in message framing, to a consideration of the role of stories as a way of building more sustainable and meaningful engagement."

Unsettled results such as these led one leading environmental journalist to recently dismiss the value of message-framing, suggesting that 'magic words' would not alter people's longstanding beliefs and perspectives, which are grounded in deep-rooted (and therefore unchangeable) values and worldviews (Roberts, 2016). Certainly, despite the extensive literature on differentially framing messages about environmental science for public audiences, there remains much more work to be done to improve our understanding about the longevity and efficacy of framing, in terms of meaningful changes in public engagement. But whilst it seems there are some tangible limits to the effectiveness of tweaking individual words and phrases to 'reframe' messages about environmental science, the limitations of this type of approach are not because language, words, and phrases are unimportant for public engagement. On the contrary, most attempts at linguistic reframing have arguably not gone far enough (NASEM, 2017), limiting themselves to the exchange of a small number of words in an otherwise fairly 'standard' message (Corner & Clarke, 2016).

Values and narratives

In the context of environmental science communication we define narratives as stories that describe a problem, lay out its consequences and suggest solutions (Hermville, 2016). Whilst research into framing is primarily an investigation into the content of environmental science messaging, research into narratives is largely motivated by a concern to move beyond simple alterations in message framing, to a consideration of the role of stories as a way of building more sustainable and meaningful engagement with science (Corner & Clarke, 2016). The concept of using 'narratives' for communication has become increasingly common among climate communicators (Smith et al., 2014). Most people (non-scientists) make sense of the world primarily through stories, rather than numbers and graphs (Corner & Clarke, 2016; Shaw, 2016). The use of narratives can help public audiences understand complex and abstract science issues (NASEM, 2017; Nisbet & Markowitz, 2016) and make the science easier to remember and process (Bekker et al., 2013; Dahlstrom, 2014; Kanouse et al., 2016; Winterbottom et al., 2008) relative to traditional forms of scientific communication.

Communicating science in the form of narratives appears to be more effective when those narratives use language that reflects the values of the audience (Corner et al., 2012; Kahan et al., 2010; Lord et al., 1979; Maibach et al., 2010; McCright et al., 2016; Munro & Ditto, 1997). Metaphors and analogies have a particularly important role to play in aligning messages with the values of the intended audience. Metaphors, by acting as heuristics or mental shortcuts which the audience use to evaluate complex information (NASEM, 2017; Shaw & Nerlich, 2015; Tversky & Kahneman, 1974),

makes engagement strategies more inclusive and relevant to a broader spectrum of the public (Peters et al., 2006; Sinayev & Peters, 2015) whilst also presenting the messages in a way that can help circumvent the polarisation that characterises responses to the presentation of facts and statistics (Kahan et al., 2012).

The narrative approach is not without its critics. The recent NASEM report maintains that 'despite the difficulty that numeric information poses for many people, it is sometimes the best way to promote understanding of the science, as experiments in communication about climate change, health, and the environment have demonstrated' (Budescu et al., 2009; Myers et al., 2015; Peters et al., 2014). What seems clear, however, is that a better understanding of how audiences with different value orientations engage with environmental science – through differently-framed messages and narrative-based approaches – is a promising area for future research (see the final section of this report: Gaps and opportunities for environmental science communication research).

Communicating uncertainty & consensus

Communicating the uncertainties inherent in any area of science is a major, ongoing challenge. A great deal of research has explored this topic, but because the definition of what counts as uncertainty remains contested, uncertainty is likely to remain a key focus of science communication research in the future (Landström et al., 2015; Collins & Nerlich, 2015; Hollerman & Evers, 2017). Because of the nature of scientific inquiry (where a premium is placed on exploring new areas rather than repeating established statements of fact), scientists often focus on what they don't know before emphasising points of agreement (Corner et al., 2015; NASEM, 2017). But this can give the impression that there is a lack of agreement amongst scientists on the basic facts of an issue, and can be a barrier to engagement with climate change in particular (Corner et al., 2015).

"Consensus messaging shares many characteristics of the discredited information deficit model that demands the public unquestioningly accept the authority of science."

It is often the case that uncertainty in science is misinterpreted by the public as ignorance (Freudenburg et al., 2008; Johnson & Slovic, 1995; Funtowicz & Ravetz, 1992; National Research Council, 2014; Rosa et al., 2013), and it is well-established that in many countries around the world, members of the public dramatically overestimate the uncertainty associated with climate change science and underestimate the level of scientific consensus (Lewandowsky et al., 2015; van der Linden, 2014; van der Linden et al., 2015).

In response, research has focused on methods of more effectively communicating uncertainty in climate science, with a consistent recommendation emerging around the importance of emphasising the overwhelming scientific consensus on anthropogenic climate change (van der Linden, 2014). One investigation into the effect of consensus messaging argued that when people learn that most scientists agree about climate change, they are more likely to believe that global warming is occurring and to express support for policies aimed at mitigating it (Ding et al., 2011). Another research paper concluded that communication that conveys a high degree of scientific consensus on an issue can increase people's acknowledgment of that consensus (van der Linden et al., 2015). A recent meta-analysis (Hornsey et al., 2016) of dozens of academic studies that have analysed the factors that predict belief in the reality and seriousness of climate change argued that

judgements of the scientific consensus played a major role, leading some to dub acceptance of the scientific consensus as a 'gateway belief' on which other climate-related opinions are predicated (van der Linden et al., 2015).

Despite these findings, the value of the consensus message approach has been questioned by some. Consensus messaging shares many characteristics of the discredited information deficit model that demands the public unquestioningly accept the authority of science (Pearce et al., 2015, p. 618), and is an approach that has not previously shifted people's opinions on climate change. Scientists, campaigners, and politicians have relentlessly reiterated the fact that scientists agree that humans are changing the climate for the worse - and still the disparity between scientific and public opinion remains (Kahan, 2015). Other commentaries have argued (Corner & Clarke, 2016) that claims that reiterating the consensus is an effective (and even 'non-political') tool in the climate change communication box (Maibach et al., 2014) should be treated with caution - in reality it is no more possible to pursue a non-political strategy of public engagement on climate change than it is to issue a neutral statement about abortion or GMOs (Corner & Clarke, 2016).

This doesn't mean that it is impossible to communicate about the consensus effectively – simply that the scientific consensus alone cannot overcome deep-rooted divides that stem from differences in values, worldviews, and political beliefs, or judgments about the trustworthiness (or otherwise) of those communicating the consensus. Thus, the topic of uncertainty and and consensus communication - not just for climate change but for other environmental science topics too - remains an area that is likely to be of interest for many years to come.

Trust and expertise

As current debates about 'fake news' and 'post-truth' discourse (explored in more detail in the next section of this report) show, the level of trust in scientific evidence - and in the communicators conveying the evidence - is a crucial determinant of whether a communication is received positively or dismissed. Trust is a 'key perceptual short cut' used by the public when forming opinions about complex and controversial topics (Nisbet and Markowitz, 2016, p. 3). Trust and credibility - in both the message and the messenger - define the extent to which the public will pay attention to a scientific message, the belief they will have in the message and the level of support they will give to the policy implications of the science (NASEM, 2017).

Research has found that trust is (in part) a function of the degree to which the audience identify with the messenger, and feel they hold experiences, political beliefs, and values in common (NASEM, 2017). Other key factors are the messenger's perceived level of expertise and the audience's beliefs about the messenger's motives (NASEM, 2017). Research shows consistently high levels of trust in scientists in Europe (Dunlap et al., 2016) and the US (National Science Board, 2016). The National Academy of Sciences recently reported that for information about GMOs, for example, scientists at universities and medical professionals are seen as relatively trustworthy sources of information, while industry sources are seen as least trustworthy (NASEM, 2017).

However, scientists cannot automatically assume that they are seen as trusted experts by the audience, especially when communicating scientific evidence with important policy implications. For example, confidence in scientific leaders appears to vary with gender, age, and ethnicity, being somewhat lower among women, older Americans, and nonwhites (National Science Board, 2016). Nisbet and Markowitz (2016, p. 3) report that levels of trust can vary across scientific issues and political beliefs, and as one interviewee for this report noted, there are structural economic factors that determine who benefits from scientific innovation and progress, and who is 'locked out' of

these gains, which can have a profound impact on levels of trust in scientific institutions. Politically conservative groups are more sceptical of "impact scientists," (e.g. climate scientists) who examine the environmental and health impacts of technology and industrial activities. These same groups hold greater trust in so-called "production scientists" such as engineers or chemists who produce new technologies and marketable products. In contrast political liberals tend to doubt scientific advice on nuclear energy and "fracking," technologies they view as furthering the interest of corporations rather than the public (Nisbet & Markowitz, 2016).

"Trust is a 'key perceptual short cut' used by the public when forming opinions about complex and controversial topics."

In summary, research to date suggests that trust in science is a nuanced and multidimensional concept, involving a complex social relationship between the audience, individual scientists, and science as an institution. A better understanding of the interplay between these different aspects of trust and how this relates to different audience perspectives looks likely to be an important focus for research in environmental science communication as debate over the 'post-truth' discourse continues.

Full report sections

Access the full report at
https://climateoutreach.org/resources/communicating-environmental-sustainability-science

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