



FEATURE

Scientists are from Mars, Laypeople are from Venus: An Evidence-Based Rationale for Communicating the Consensus on Climate

John Cook and Peter Jacobs

INTRODUCTION

The insights available from social science research are key to understanding people's attitudes to climate change, and to developing communication outreach strategies that are effective in fostering meaningful societal action (Hackman and others 2014; Lorenzoni and Whitmarsh 2014). Social psychology explores the ways in which group dynamics and cultural values influence attitudes towards climate change. Cognitive psychology explores how people update their beliefs in response to information, using randomized experiments to explore how different groups respond to different messages. A large and increasing number of public surveys have examined attitudes towards climate change and what drives those attitudes.

While many factors influence how people think about climate change, an increasing body of evidence indicates that correct understanding of the high level of scientific agreement that humans are causing global warming is an important "gateway belief," a belief that in turn influences a number of other beliefs and attitudes about climate change (Ding and others 2011; Lewandowsky and others 2013; van der Linden and others 2014). However, numerous surveys indicate the public in many countries believe that there is significant disagreement among climate scientists about whether humans are causing global warming (Kohut and others 2009; Comres 2014; Leiserowitz and others 2014). (Note that the term "belief" is used here from a psychological perspective and is not necessarily equivalent to "faith" in the religious sense. Rather, it indicates the degree of acceptance of a scientific proposition such as climate change.)

In contrast, a number of studies have found overwhelming agreement among climate scientists that humans are causing global warming. The most comprehensive analysis of peer-reviewed climate research to date found that among papers from 1991 to 2011 stating a position on human-caused global warming, 97.1% endorsed the consensus (Cook and others 2013). This work was a continuation of a 2004 meta-analysis of scientific papers from 1993 to 2002 obtained through a literature search using the phrase "global climate change" that found no papers rejecting the consensus (Oreskes 2004). A survey of Earth scientists found that among climate scientists most actively publishing climate research, 97% agreed that humans were significantly raising global temperature (Doran and Zimmermann 2009). An

analysis of public statements by scientists about climate change found that among scientists who had published peer-reviewed climate papers, 97% had signed statements endorsing the consensus (Anderegg and others 2010). This analysis also found that the consensus scientists possessed substantially higher expertise and scientific prominence than scientists rejecting the consensus. A subsequent study found that papers published by contrarian scientists that purport to challenge the scientific consensus have been robustly challenged in the scientific literature and shown to be significantly flawed (Abraham and others 2014). Multiple lines of independent evidence (public statements, private expert opinion, and the scientific literature) point to an overwhelming consensus among the relevant scientific community.

Consequently, there is a significant gap between public perception of scientific agreement and the actual 97% consensus. This discrepancy has been termed the “consensus gap” (Cook 2013). The consensus gap leads to lower belief among lay people in the reality of climate change and as a result, an overall lack of support for policies to mitigate the change.

THE ROLE OF PERCEIVED CONSENSUS IN CLIMATE ATTITUDES

A number of factors drive attitudes towards climate change and support for climate policy, with the roadblocks inhibiting support for climate action characterized as “dragons of inaction” (Gifford 2011). Some of these “dragons” preventing climate action include ignorance of the realities of climate change, feelings of helplessness, and political ideology.

A growing body of evidence indicates that public misperception of consensus is a key “dragon of inaction.” Perceived consensus, or the awareness of the high level of agreement among climate scientists about human-caused global warming, is a “gateway belief” driving a range of climate attitudes such as belief in global warming, attribution of global warming to human activities, concern about climate impacts, and public support for mitigation policies (Ding and others 2011; McCright and others 2013; Stenhouse and others 2013; Aklin and Urpelainen 2014). Among Republicans, perceived consensus is the strongest predictor of belief in global warming (Rolfe-Redding and others 2012).

Consequently, the fact that the general public are significantly misinformed about the consensus has societal consequences. As already mentioned, a number of public surveys have found that the public are largely unaware or misinformed about the level of scientific agreement about human-caused global warming. A significant proportion of the citizenry of the United States think scientists still disagree about human-caused global warming (Leiserowitz and others 2012; Pew 2012), while only around one in ten Americans correctly estimate that more than 90% of climate scientists agree that humans are causing global warming (Leiserowitz and others 2014). Similarly, only 11% of the public in the United Kingdom are aware that nearly all scientists agree with the consensus (Comres 2014) and a survey of fifteen countries found low perceived consensus in all countries (University of Maryland 2009).

The existence of the consensus gap, and its role in impeding lay public support for climate action, creates an opportunity for communicators to close the consensus gap and remove one of the more significant “dragons of inaction.”

THE EFFICACY OF CONSENSUS MESSAGING

Scientists face major challenges in communicating complex climate concepts such as the greenhouse effect and the carbon cycle. In contrast, communicating the scientific consensus is as simple and memorable as communicating a single number: 97% of climate scientists agree that humans are causing global warming.

Randomized experiments testing the effect of consensus messaging have found that it significantly increases perceived consensus (Kotcher and others 2014, as well as unpublished work by John Cook and Stephan Lewandowsky). Consensus messaging also increases belief in human-caused global warming (Bolsen and others 2013; Lewandowsky and others 2013).

Different methods of communicating scientific consensus have been tested experimentally. One experiment testing textual variations (for example, “97%,” “9 out of 10,” or “97 out of 100”) found that the most effective expression of consensus was the phrase “Based on the evidence, 97% of climate scientists have concluded that human-caused climate change is happening” (Maibach and others 2013). The pie chart shown in Figure 1 has been found to be one of the most effective visual communication methods, especially among conservatives (van der Linden and others 2014).



FIGURE 1. *Effective method of communicating the 97% consensus.*

Drawing on results from these tests, communication experts recommend that climate scientists set the record straight by clearly and persistently communicating the scientific consensus on climate change (Maibach and others 2014).

MISCONCEPTIONS ABOUT CONSENSUS MESSAGING

Despite the body of evidence underscoring the importance of consensus messaging and direct calls from the science communication community, some scientists argue against focus-messaging the consensus for a multitude of reasons. It is instructive to examine these arguments in light of the body of social science evidence.

One objection is that the science communication should emphasise evidence rather than consensus. This misunderstands the purpose of consensus messaging, which isn't put forward as "proof" of human-caused global warming. Rather, consensus messaging takes into account how people think about complex scientific issues such as climate change. In these situations, people rely on expert opinion as a heuristic, or mental shortcut, to inform their views (Petty 1999). Communication of the consensus reflects recognition of how people think about climate change; it communicates the state of scientific understanding, which is built on the body of evidence.

Another objection to consensus messaging is the assertion that the "public understanding of the climate issue has moved on" and that a more appropriate topic for public discussion is mitigation solutions (Hulme 2013). However, many surveys have found that public understanding *hasn't* moved on (Comres 2014; Leiserowitz and others 2014). This underscores the importance of an evidence-based approach to understanding public attitudes towards climate change. Ironically, this objection fails to grasp that moving the public debate to mitigation is precisely one of the potential outcomes of consensus messaging. Those seeking to maintain the consensus gap do so in order to delay discussion of solutions.

Conversely, this lack of shift in public opinion has inspired another objection to consensus messaging. This argument is that as perceived consensus hasn't shifted over the last decade, consensus messaging must not work (Kahan forthcoming). Kahan argues that communicating consensus has failed to shift public opinion due to ideological polarization, with liberals predisposed to accept the consensus while conservatives are predisposed to reject consensus messaging (Kahan and others 2011). However, consensus messaging has been found to be *most* effective amongst conservatives, despite their ideological predisposition against acceptance of climate science. In experiments testing the impact of consensus messaging, the greatest increase in perceived consensus occurs among conservatives (Kotcher and others 2014).

Nevertheless, the "stasis" argument does raise an interesting question. If consensus messaging is effective, then why has the consensus gap been so persistent over the last decade? Figure 2 provides some insight, showing the results of a survey of representative Americans who were asked to estimate what percentage of climate scientists agree that fossil fuel burning by humans is causing global warming (from unpublished work by John Cook and Stephan Lewandowsky). Participants were also surveyed about their degree of support for unregulated free markets (that is, markets operating with minimal to no government interference), which served as a proxy measurement for political ideology (Heath and Gifford 2006). Participants who indicated higher levels of support for unregulated free markets showed lower perceived consensus, indicating the influence of political ideology on climate attitudes.

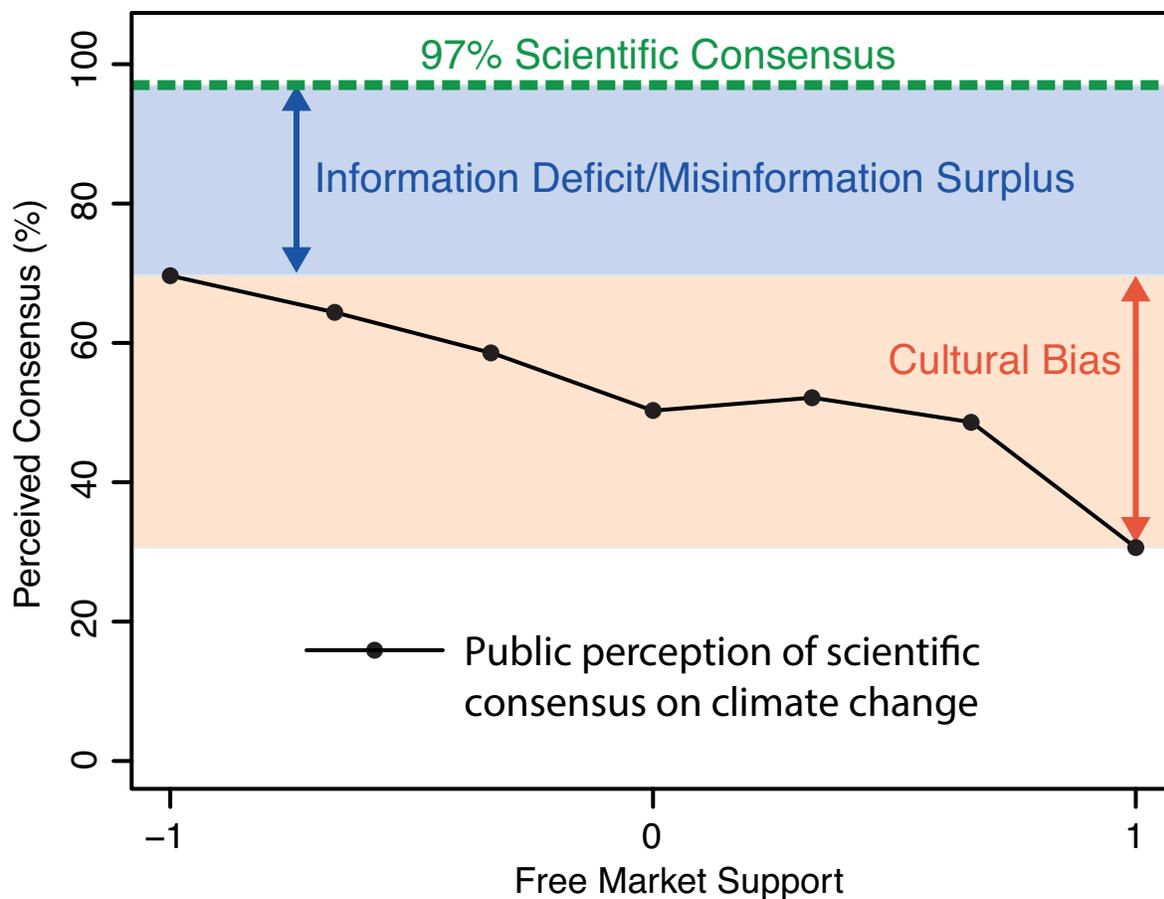


FIGURE 2. Perceived consensus amongst a representative sample of Americans. Horizontal axis represents political ideology, measuring free-market support (using data from unpublished work by John Cook and Stephan Lewandowsky).

However, even liberals (those with low levels of free-market support) show relatively low perceived consensus compared to the 97% consensus. This “liberal consensus gap” exists despite the fact that liberals are predisposed to accept human influence on the climate. This means that contributing factors to the consensus gap are a lack of awareness of the level of scientific agreement (information deficit) and the public being misinformed about the consensus (misinformation surplus).

This carries implications for another ongoing debate in the science communication community between information deficit advocates, who believe the solution is getting more information to people, and cultural cognition advocates, who argue that climate attitudes are exclusively driven by cultural values. We think that this debate is a false dichotomy. Cultural filtering of information is a genuine phenomenon, but it is just one of many ways people process information about and orient themselves towards science and the environment (Nisbet and Markowitz 2014; Stevenson and others 2014; Xue and others 2014). Information (or, conversely, misinformation) and cultural values *both* shape climate attitudes, and science-based communication cannot afford to ignore either.

The claim that consensus messaging has not been effective implicitly assumes that the consensus has been broadcast broadly enough to have achieved ubiquitous awareness amongst

the general public. While it is true that past communication efforts have referenced the consensus, this assumption of awareness saturation is undermined by the “liberal consensus gap,” which is a result of both information deficit and misinformation surplus. Figure 3 illustrates how opponents of climate action have been manipulating perceived consensus for more than two decades through active campaigns to manufacture doubt. For example, in the early 1990s, a fossil fuel organization spent half a million dollars on a campaign to cast doubt on the consensus (Oreskes 2010). An analysis of conservative op-eds, a prominent source of climate misinformation, found that the most frequently repeated myth is “there is no consensus” (Elsasser and Dunlap 2012).

Over Two Decades Manufacturing Doubt about Scientific Consensus

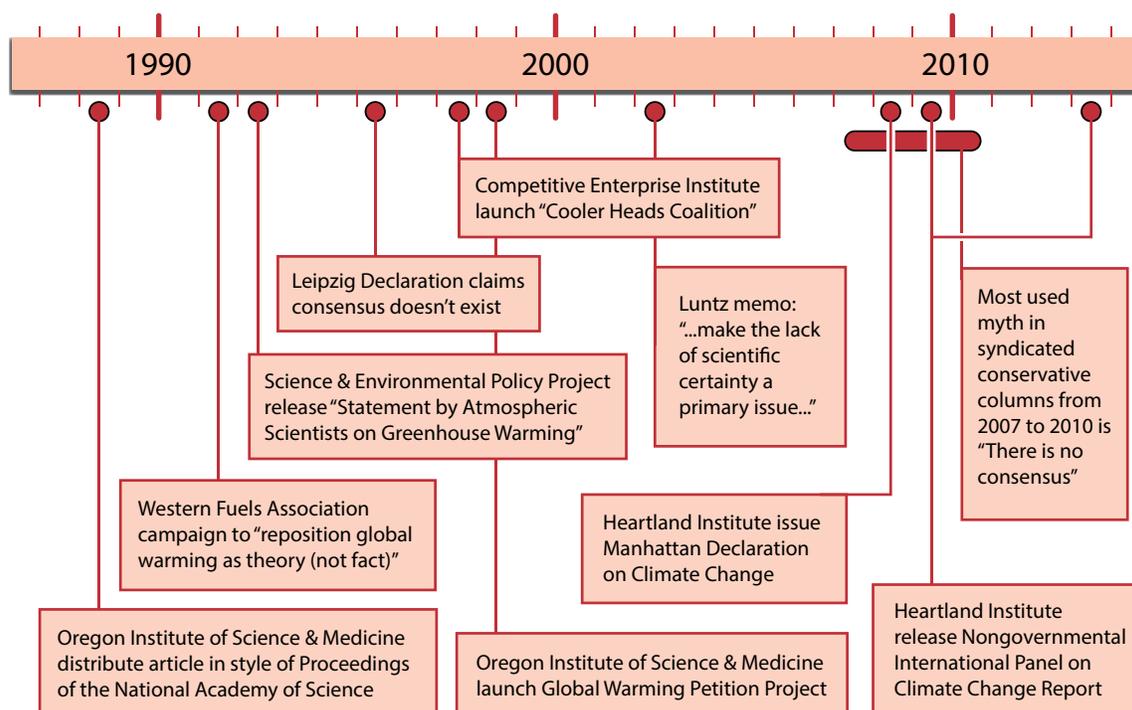


FIGURE 3. Timeline of sample campaigns to manufacture doubt about the scientific consensus from 1988 to 2013.

The deliberation behind the manufacturing of doubt is best articulated in a 2002 memo from a political strategist, Frank Luntz, who advised Republican politicians on opposing climate policies (Luntz 2002). Luntz suggested that the way to lower public support for climate policies was to cast doubt on the consensus. From fossil fuel self-interest to ideological opposition, confusing the public about consensus has been a key strategy in delaying climate policy.

Moreover, the myth that scientists remain divided on this issue has been reinforced by decades of misleading media portrayals. Slavish adherence to the journalistic norm of seeking to present “both sides” of a story has led (and continues to lead) the media to frame the issue as “debate” between two apparently equally valid sides (Boykoff and Boykoff 2004; Boykoff 2008; Boykoff and Mansfield 2008). The consensus position held by an over-

whelming majority of relevant experts was frequently “balanced” by equal airing of views held by a less qualified, academically isolated, and perpetually debunked fringe (Anderegg and others 2010; Shwed and Bearman 2010; Abraham and others 2014). This form of media coverage has been found to decrease perceived consensus as well as acceptance of human-caused global warming and policy support (Malka and others 2009).

Far from being a message that has been long-heard but ignored by the public, communicating the overwhelming scientific consensus on climate is an opportunity to bring the public’s views in line with the science and advance the debate to possible solutions. An example of successful consensus messaging is a popular comedy video (viewed over 4 million times on YouTube) that communicates the 97% consensus as well as explains how misleading media coverage has a negative influence on perceived consensus (Oliver 2014).

CONCLUSION

The scientific consensus on human-caused global warming has recently attracted an increasing amount of attention, particularly after the publicity surrounding the publication of a comprehensive analysis finding that 97.1% of relevant climate papers support the conclusion that humans are causing human-caused global warming (Cook and others 2013). This has led to some scientists questioning the value of communicating the scientific consensus. However, arguments against consensus messaging overlook the fact that laypeople use expert opinion as a heuristic to guide their beliefs about complicated scientific issues. Furthermore, perceived consensus—not actual consensus—is one of the strongest predictors of public support for climate action, making it a key “dragon of inaction”.

Scientists who discourage the mention of consensus fail to address a key issue which is particularly important given its status as a gateway belief about climate change: How do we close the consensus gap without communicating consensus? By muzzling themselves, scientists are surrendering the territory of perceived consensus for others to fill. This creates an opportunity for parties to fill the void and mislead the public, thereby maintaining the consensus gap and further delaying public support for climate action.

In summary, a growing body of evidence indicates the importance of scientific consensus as a gateway belief influencing attitudes about climate change. A number of surveys have found that the public possess low awareness of the level of agreement among climate scientists. This necessitates the communication of the 97% consensus to the public. Experimental studies have explored the efficacy of consensus messaging and have found that consensus messaging significantly increases perceived consensus, with the relative efficacy of different messaging types being examined.

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