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How does framing affect policy support for emissions mitigation? Testing the effects of ocean acidification and other carbon emissions frames

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ABSTRACT

Public support for carbon emissions mitigation is crucial to motivate action to address global issues like climate change and ocean acidification (OA). Yet in the public sphere, carbon emissions mitigation policies are typically discussed in the context of climate change and rarely in the context of OA or other global change outcomes. In this paper, we advance research on OA and climate change perceptions and communication, by (i) examining causal beliefs about ocean acidification, and (ii) measuring support for mitigation policies from individuals presented with one of five different policy frames (climate change, global warming, carbon pollution, air pollution, and ocean acidification). Knowledge about OA causes and consequences is more widespread than we anticipated, though still generally low. Somewhat surprisingly, an "air pollution" mitigation frame elicits the highest degree of policy support overall, while "carbon pollution" performs no better than "climate change" or "global warming." Framing effects are in part contingent on prior knowledge and attitudes, and mediated by concern. Perhaps due to a lack of OA awareness, the OA frame generates the least support overall, although it seems to close the gap in support associated with political orientation: the OA frame increases support among those (few) conservatives who report having heard of OA before the survey. These findings complement previous work on climate change communication and suggest the need for further research into OA as an effective way to engage conservatives in carbon emissions mitigation policy. Potentially even more promising is the air pollution framing.

1. Introduction

One explanation for the low level of political support for carbon emissions mitigation policy in the U.S. and elsewhere is that responses to terms such as global warming and climate change—which are used to frame such policies—are associated with political ideology (Schuldt et al., 2011; Villar and Krosnick, 2011; Whitmarsh, 2009). One can speculate that the increasing political divide has motivated the introduction of terms such as *carbon pollution*, as used by the White House in its 2015 press release, "President Obama to Announce Historic Carbon Pollution Standards for Power Plants." Such rhetorical shifts raise the question of whether it is possible to depoliticize carbon emissions mitigation policies by recasting them in this way.

Similarly, in his inaugural address in January 2013, Washington State Governor Jay Inslee used the term "climate change" at least four times. More recent speeches, such as his 2016 State of the State Address, have instead called for action to mitigate "carbon pollution" (see Analysis in Mossler, 2016). This change in framing has gone beyond speeches; for example, Inslee titled his 2014 executive order "Washington Carbon Pollution Reduction and Clean Energy Action," which paved the way for a proposed state carbon tax bill titled "The Carbon Pollution Accountability Act."

Inslee's rhetorical shift—which reflects similar shifts in policy circles across the U.S.—led us to ask whether this reframing is effective, and whether ocean acidification might be a more effective framing for the Washington State governor to espouse given the symbolic and economic importance of ocean acidification to this coastal state and its leadership on ocean acidification policy (Kelly et al., 2013).

After all, extensive research demonstrates the importance of framing and its ability to shape perceptions of an issue (e.g., Goffman, 1974; Lakoff and Johnson, 2003; Smith, 1987; Tewksbury, 2015). Framing involves the intentional or inadvertent crafting of a message to describe an issue, place responsibility, and/or suggest solutions (Entman, 1993; Iyengar, 1991, 1996; Moy et al., 2016). Theorizing about how framing works has identified two mechanisms of influence – accessibility and applicability. In the first, framing works because the message has made

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salient certain aspects of the issue; this increased salience or accessibility in turn makes it easier for individuals to consider those salient issues when making judgments (Moy et al., 2016). In other words, message framing works by priming individuals to respond in a particular way. The second mechanism of influence, applicability, relates to the mental associations people make between concepts, which can be influenced by how messages are framed. Ultimately, framing effects hinge on the communication recipient's existing mental schemas (Scheufele and Iyengar, 2012).

Even minor differences in wording can have a large effect on political and policy support (Simon and Jerit, 2007; Tversky and Kahneman, 1981). However, carbon pollution is a relatively novel, composite term. Given that the U.S. Environmental Protection Agency is regulating greenhouse gases under the Clean Air Act, and many people hold "air pollution" mental models of global warming (i.e., their causal beliefs equate air pollution and global warming, Reynolds et al., 2010), air pollution might be a more effective frame to drive emissions reductions.

If framing effects depend on causal beliefs, ocean acidification offers an intriguing potential frame, contrasting with air pollution, climate change and global warming. Although anthropogenic carbon dioxide emissions are the principal cause of ocean acidification (Doney et al., 2009; with terrestrial runoff being a minor contributor to worldwide ocean acidification, Feely et al., 2010, see Appendix A Section 6.1), people also misattribute ocean acidification to factors that do not make a difference. These include point source pollution from ships, such as from oil spills and discharge of waste products; disruption of ocean food chains from overfishing; increased seawater temperatures; naturally occurring carbon dioxide in the atmosphere being absorbed by the oceans; and normal cycles of change in ocean chemistry (Corner et al., 2014; Dropkin and Ludemann, 2015). Of these misattributions, pollution from ships appears in prior research to be the most common (Capstick et al., 2015 suppl info; Corner et al., 2014). This initial research (primarily in the U.K., Corner et al., 2014) has revealed common misperceptions of ocean acidification *consequences* as well, including consequences that scientists do not expect ocean acidification to have—for example, coastal erosion, sea-level rise, changes in the amount of sea ice, changes in atmospheric oxygen levels, acid rain, and changes in the temperature of the ocean—although several of these are direct consequences of anthropogenic CO_2 emissions through global warming. Direct, negative effects of ocean acidification on coral and shellfish have already been observed (Albright et al., 2016; Mabardy et al., 2015), of which at least some members of the public appear to be aware (see Appendix A Section 6.1, and Corner et al., 2014). Even under the most optimistic future emissions scenario (Representative Concentration Pathway 2.6, IPCC, 2014), coral reefs will suffer tremendously through the end of the century (Gattuso et al., 2015). OA will continue to affect tropical communities through further coral reef losses, but its impacts will also be felt closer to home: more than half of those in the U.S. West-coast shellfish industry report already feeling negative impacts of OA on their businesses and personal lives (Mabardy et al., 2015).

These considerations lead us to posit that the three frames discussed above—carbon pollution, air pollution, and ocean acidification—will bolster support for carbon emissions mitigation policies more than frames employing either climate change or global warming, with effects tempered by communication recipients' knowledge and attitudes, as found in prior research on framing (e.g., Price et al., 1997). In this study, we contribute to the growing body of climate-change framing studies (Scheufele and Iyengar, 2012), by examining equivalence framing for carbon emissions reduction to look at schema-dependent effects (Scheufele and Iyengar, 2012), that is, differences in support that should depend on the interactions between frames and people's mental models and attitudes.

1.1. Framing climate change

Climate change frames typically emphasize particular aspects of climate change, like causes or effects, in order to highlight an appealing outcome (e.g., support for mitigation policy). Governor Inslee's use of "carbon pollution" rather than "climate change" is one such example, highlighting a negative effect of the phenomenon ("pollution").

By appealing to existing mental models and attitudes, framing can shape an audience's perception of the problem, and thereby influence that audience's inclination to address it. For example, using "carbon pollution" as a frame takes advantage of air pollution as a phenomenon; "air pollution" carries a strong negative connotation and is often perceived as a major cause of environmental and public health problems (Bickerstaff and Walker, 2001; McDaniels et al., 1996; Pfister and Böhm, 2001). Air pollution is one of the most frequently mentioned causes of climate change in studies of climate change and global warming mental models (Bostrom et al., 2012, 1994). It is unclear if people distinguish between conventional air pollution (e.g., smog, including particulate matter, nitrogen oxides) and carbon pollution. However, to the extent that "carbon pollution" is a more influential way of presenting the information about the challenges of rising atmospheric CO_2—and to the extent CO_2 is a pollutant under the Clean Air Act—the new framing might help an old issue gain political traction.

In climate-change framing studies to date, some frames appear to increase support for emissions mitigation policies overall. For example, climate change framed as a public health issue can elicit more positive response and probable support for mitigation policies (Myers et al., 2012); people are more "hopeful" about climate change framed as a public health concern rather than an environmental problem.

Consistent with applicability models, closer examination of framing effects shows that such effects are often limited to a subsample associated with political ideology, party identification, or denial of anthropogenic climate change. In the United States, acknowledging that climate change is anthropogenic is associated with political orientation (Lee et al., 2015; McCright and Dunlap, 2011a), with those who acknowledge human causation more likely to be liberal and/or belong to the Democratic political party, while those who do not are more likely conservative and/or Republican (McCright and Dunlap, 2011a).

Studies that specifically examine these factors have found that some frames increase support only among Republicans or only among those who deny the existence of human-caused climate change (Bain et al., 2012; Hine et al., 2016). Some frames intended to increase policy support can even backfire (Hart and Nisbet, 2012; Myers et al., 2012). For example, when climate change is framed as a national security risk, it can incite anger and backlash toward mitigation policies amongst people who doubt or dismiss anthropogenic climate change—causing a "boomerang" effect in which framing actually decreases support for mitigation. In Republicans, framing climate change victims as socially distant (farmers abroad) created a boomerang effect and actually decreased support for climate change mitigation policy when compared to no frame (Hart and Nisbet, 2012). A similar study showed that behavioral intentions increase significantly among Republicans who viewed a video describing potential local climate change impacts, in contrast to Republicans who viewed a video describing potential global climate change impacts, whose behavioral intentions do not increase (Wiest et al., 2015). Democrats' behavioral intentions did not change after watching either video, which the authors attribute to a "ceiling effect," in which Democrats already have high behavioral intentions before watching the video and thus have little room to increase their intentions.

Many studies show that responses to the term "global warming" can differ from responses to "climate change" (Nerlich et al., 2010;