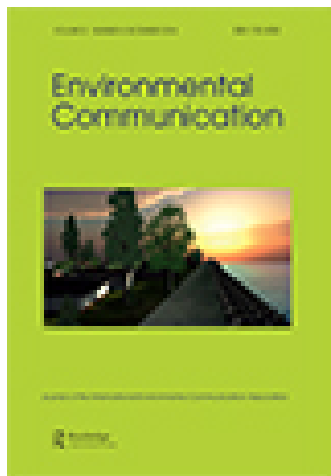


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Media Frames and Cognitive Accessibility: What Do “Global Warming” and “Climate Change” Evoke in Partisan Minds?

Jonathon P. Schuldt & Sungjong Roh

Decades of research demonstrate that how the public thinks about a given issue is affected by how it is framed by the media. Typically, studies of framing vary how an issue is portrayed (often, by altering the text of written communication) and compare subsequent beliefs, attitudes, or preferences—taking a framing effect as evidence that a media frame (or frame in communication) instantiated a particular audience frame (or frame in thought). Less work, however, has attempted to measure frames in thought directly, which may illuminate cognitive mechanisms that underlie framing effects. In this vein, we describe a Web experiment ($n = 400$) in which US political partisans reported the extent to which a “global warming” or “climate change” frame brought to mind various climate-related concepts. Although the media frequently employ them interchangeably, these frames evoked distinct patterns of cognitive accessibility across partisans: Whereas conservatives associated heat-related impacts (rising temperatures, melting ice) more strongly with “global warming” than with “climate change,” liberals associated these impacts equally with both phrases. Discussion focuses on implications for media framing of climate issues and framing theory more broadly.

Keywords: *framing effects; climate change; cognitive accessibility; media frames; motivated reasoning*

“Global warming” and “climate change” succinctly describe a complicated phenomenon, and in just a few decades they have become common descriptors.

—B. Palmer in *The Washington Post* (2012)

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Numerous studies in communication and related fields (including political science, psychology, and sociology) reveal that changes to the way an issue is framed—often, seemingly trivial ones—can powerfully affect how audiences perceive the issue. Many framing studies proceed as follows. Researchers identify two or more *frames*, which “select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, and/or treatment recommendation for the problem described” (Entman, 1993, p. 52). Members of some target audience are then exposed to one frame or another based on random assignment, before the outcome of interest—typically, a measure of policy preference (e.g., support or oppose)—is compared across treatments. When aggregate preference levels are found to differ across frames, a *framing effect* is said to have occurred (Druckman, 2001a; Nelson, Oxley, & Clawson, 1997).

This general characterization of frames and their effects obscures significant conceptual ambiguity regarding what constitutes a frame and how they exert their influence, a topic that has received a fair amount of attention from communication and public opinion scholars (Druckman, 2001a, 2010; Entman, 1993; Scheufele, 1999). In the present work, we seek to contribute to this ongoing discussion by attempting to directly measure the cognitive concepts evoked by two media frames that are commonly employed in environmental communication, namely “global warming” and “climate change,” and by doing so in a political context where climate issues are currently highly politicized (namely, the USA). This work also reiterates the value of distinguishing the related concepts of media frames, audience frames, and framing effects, with a special focus on illuminating audience frames—or “frames of thought”—that may affect subsequent judgments of political import (Chong & Druckman, 2007; Scheufele, 1999).

Frames and Their Conceptual Ambiguities

One place in which this ambiguity is apparent is in the two types of frames that scholars commonly examine, which Druckman (2001b) has distinguished as *equivalency* frames (more commonly studied in psychology and behavioral decision research) and *emphasis* frames (more commonly studied in communication and political science). Equivalency frames use different words but convey information that is logically equivalent (e.g., “90% fat-free” vs. “10% fat”; Teigen & Karevold, 2005), whereas emphasis frames use different words that selectively appeal to select knowledge structures stored in memory (e.g., stereotypes and other schemata) and thereby promote particular ways of interpreting an issue over others (e.g., immigration as a “humanitarian” vs. “national security” issue). Perhaps the best-known example of equivalency framing is the classic Asian disease problem studied by Tversky and Kahneman (1981), who found a dramatic shift toward riskier preferences when the logically equivalent outcomes of alternative disease-prevention programs were framed in terms of lives lost as opposed to lives saved. An example of emphasis framing comes from work by Iyengar (1990) on the framing of poverty in

the news as thematic (focused on macro-societal factors) versus episodic (focused on the plight of an individual), which revealed greater personal attributions of responsibility under the latter frame.

Further conceptual ambiguity lies in theoretical models of how frames operate. For instance, models of framing effects distinguish between media frames (or frames in communication) and audience frames (or frames in thought; Chong & Druckman, 2007; Scheufele, 1999). Unlike media frames, which are properties of a message that journalists are bound to employ in order to provide context and promote audience understanding of news, audience frames exist in the minds of message recipients, and are typically characterized as packages of stored knowledge, or schemata, that become temporarily accessible and help to organize experience and facilitate information processing (Entman, 1993; Fiske & Taylor, 1991; Goffman, 1974; Higgins, 1996). However, in most studies examining the influence of media frames on audience frames (see Scheufele, 1999, for a typology of framing studies), audience frames as they are commonly conceptualized—that is, as highly accessible cognitive structures that guide an individual's interpretation of information (Chong & Druckman, 2007)—are not measured directly. Instead, researchers typically measure a particular outcome variable of interest (often, some attitude, preference, or belief) and take any observed difference as evidence that the media frames did indeed instantiate distinct audience frames.

While inferring the instantiation of distinct audience frames in this manner is unlikely to prove controversial, measuring outcomes rather than the cognitive processes by which they are presumably mediated nevertheless poses a significant theoretical challenge—namely, a tendency to define the (unobserved) audience frame on the basis of the (observed) media frame. For instance, when gain versus loss framing leads to different preference outcomes (Tversky & Kahneman, 1981), we tend to speak about the effects of a gain versus loss “frame of mind” (e.g., Gunderman, 2009, p. 562). This tendency presumes that the method by which the independent variable was operationalized (gain vs. loss *language*) activates cognitions of a parallel nature (gain vs. loss *thoughts*), thereby obscuring the possibility that other accessible cognitions may account for, or mediate, the observed effect. That is, without directly measuring the audience's cognitive response to different media frames, we are left to speculate about which concepts and schemata are rendered accessible and whether they might vary across audience members as a function of relevant individual difference variables (e.g. political orientation, sex, income, etc.).

Although much of the experimental research on framing effects omits direct measures of cognitive accessibility, some work has attempted to directly capture the thoughts that media frames evoke among audiences. For instance, Price, Tewksbury, and Powers (1997) exposed undergraduates to different versions of a news article that contained the same core information about (fictional) state budget cuts to higher education but that framed the issue in terms of human interest, conflict, or consequence considerations, depending on condition. Immediately after reading the story, the researchers assessed cognitive accessibility by having the students complete a free-writing exercise, which was then coded for mentions of relevant thoughts.

Results showed that, relative to a control condition, the three experimental conditions tended to heighten the accessibility of frame-specific themes (e.g. tuition increases under the consequence frame) and suppress those made accessible by the control (core story) version (e.g. reduction of the state budget). Moreover, in a follow-up experiment, the researchers assessed the influence of these frames on students' support for a policy initiative to limit tuition increases and found effects that generally complemented the differences in cognitive accessibility observed in the earlier study (e.g. greater support for capping tuition increases in the consequences condition than in the control condition).

In related work, Valkenburg, Semetko, and De Vreese (1999) presented the same core news stories about crime in the Netherlands and the introduction of the euro currency to an audience of undergraduates at the University of Amsterdam. Depending on condition, the stories contained additional information that framed the issues in terms of different social themes (specifically, in terms of conflict, human interest, governmental responsibility, or economic consequences; an additional control condition contained no frame information). As in the study by Price and colleagues, participants then completed an open-ended thought-listing task, and their responses again tended to reflect the salient themes portrayed in the specific story versions they read (e.g. more mentions related to conflict in the conflict-frame condition). Thus, it appears that—at least in uncontested, or non-competitive, media environments (see Chong & Druckman, 2007, for a discussion of competitive framing)—the frames employed by the media in their coverage of various issues are likely to evoke a set of largely frame-consistent cognitions among the audience. This observation is consistent with decades of research in communication and psychology demonstrating the disproportionate influence of temporarily accessible or salient information on cognitive processing (e.g. Bargh, Chen, & Burrows, 1996; Higgins, Rholes, & Jones, 1977; McCombs & Shaw, 1972; Schwarz, 1999).

Although the present work similarly seeks to directly measure cognitive responses to different media frames, it differs from these previous efforts in important ways. First, instead of embedding frames within news articles as these and other studies have done (see also Iyengar, 1990), we solicit participants' responses to just the core media frame itself—"global warming" or "climate change"—stripped of any other contextual information that longer news articles provide. Thus, we make the assumption that our participants have been previously exposed to real-life news stories employing each of these frames, and rather than seeking to assess how embedding these frames in any *one* story affects which thoughts come to mind, we are more interested in the thoughts evoked by these media frames in general.¹ Second, rather than being primarily interested in testing for uniform effects of media frames on cognitive accessibility across audience members, we are primarily interested in testing whether these frames activate different cognitions as a function of individuals' frame-relevant values (namely, political orientation), for reasons we outline later. Third, instead of soliciting cognitive responses with open-ended thought-listing measures, we use closed-ended rating scales that allow us to target

specific cognitive associations of interest that are informed by previous work (see below). Finally, because the audience for news stories about global climate change is broad, we sought a sample of US adults that was more diverse than university undergraduates, with the hope that our findings would better generalize to how the US public at large thinks about these common media frames.

Media Frames and Global Climate Change

How is global climate change framed in the news media and everyday discourse and to what effect? Recent work in environmental communication reveals different approaches to this important question. Analogous to the approach taken by scholars studying the framing of other issues (e.g. crime in the Netherlands; Valkenburg et al., 1999), one approach considers how linking global climate change to broad sociocultural themes that matter to many members of the public, and to some audience segments in particular, might affect public support for climate mitigation policies. In this vein, Nisbet (2009) discusses how actors on different sides of the climate debate have framed the issue in ways that reinforce their preexisting ideologies and contribute to the partisan divide—dynamics that may be especially pronounced in the USA, where recent survey data find that while two-thirds of Americans agree that there is solid evidence that the “average temperature on earth has been getting warmer,” belief is substantially higher among liberal Democrats (91%) than among conservative Republicans (43%) (Pew Research Center for the People and the Press [Pew], 2012). For instance, whereas liberals might tend to employ a “scientific certainty,” “green jobs,” or “economic development” frame when communicating about climate issues, conservatives might employ a “scientific *uncertainty*” or (negative) “economic consequences” frame (Nisbet, 2010). In related work, Maibach, Nisbet, Baldwin, Akerlof, and Diao (2010) have explored how reframing global climate change as a public health issue may increase audience concern and promote greater climate engagement (see also Asplund, Hjerpe, & Wibeck, 2013; Billett, 2010).

A second approach, and our focus here, examines the effect of “global warming” versus “climate change” framing on how the public thinks about global climate change. As mentioned above, these phrases commonly appear in media coverage of climate issues, where—despite their different technical meanings²—they are sometimes treated as synonymous. For instance, take the following headline from a 2010 piece in *The New York Times* covering the results of newly released polling data: “Big Partisan Gap on Climate Change Is Widened by Tea Partiers” (Marshall, 2010). However, the actual survey questions, fielded by the Pew Research Center, made no mention of “climate change” and instead solicited opinions about “global warming,” as reflected in Pew’s press release on the findings: “Wide Partisan Divide Over *Global Warming*” (Pew Research Center for the People and the Press, 2010; emphasis added). Although the difference between these headlines may seem subtle, the fact that they employ different phrases may not be trivial from a framing perspective, as “global warming” and “climate change” may function in a manner similar to that of other emphasis frames (Druckman, 2001b), by activating different cognitions,

drawing the audience's attention to different aspects of the issue at hand, and ultimately affecting downstream policy-related preferences.

Suggesting that these phrases may indeed evoke different cognitions and affect politically meaningful judgments, a national survey experiment featuring US respondents revealed significantly lower levels of existence belief when the issue was framed in terms of "global warming" as opposed to "climate change" (Schuldt, Konrath, & Schwarz, 2011). Specifically, respondents were asked the following question (alternative wording in parentheses; formatting original):

You may have heard about the idea that the world's temperature may have been *going up (changing)* over the past 100 years, a phenomenon sometimes called "*global warming*" ("*climate change*"). What is your personal opinion regarding whether or not this has been happening? [Definitely *has not been* happening; Probably *has not been* happening; Unsure, but leaning toward it *has not been* happening; Not sure either way; Unsure, but leaning toward it *has been* happening; Probably *has been* happening; Definitely *has been* happening]

Importantly, political partisanship figured prominently in this framing effect: Whereas significantly fewer Republicans reported believing that the issue was real under the "global warming" than the "climate change" frame (44.0% vs. 60.2%), equal numbers of Democrats reported believing regardless of the frame employed (86.9% vs. 86.4%).³ Analogous findings were found for political orientation, with conservatives (but not liberals) reporting less belief in "global warming" than in "climate change."

Cognitive Responses to "Global Warming" versus "Climate Change"

Although past survey findings suggest that "global warming" and "climate change" may render different cognitive associations accessible in the minds of the public—and among Republicans and conservatives in particular—which associations, exactly, remain unknown, given that respondents' more immediate cognitive responses (i.e., *audience frames*) were not assessed. Nevertheless, previous work suggests some possibilities. In a nationally representative survey, Leiserowitz (2006) asked US respondents to report the images that came to mind when they thought about "global warming." Out of 24 image categories with distinct themes, the two most commonly associated images were related to melting polar ice and temperature increases, with 34% of the public mentioning a response that could be coded into one of these categories. Especially relevant to the present research, Whitmarsh (2009) asked residents in the south of England to report on the concepts that came to mind when they thought about either "global warming" or "climate change." Consistent with Leiserowitz (2006), strong temperature-related themes emerged when the respondents were asked about global warming (30.1% and 25.3% alluded to *temperature increase* and *melting icebergs/glaciers*, respectively), themes that were less prominent when respondents were instead asked about climate change (where 16.2% and 13.7% alluded to these themes). In addition, whereas respondents were more likely to mention anthropogenic causes when asked about global warming (e.g., 15.1% and 11.5% mentioned *fossil fuel burning* and *car exhaust*, respectively), these themes

emerged less often when respondents were instead asked about climate change (mentioned by just 6.5% in each case; see Lakoff, 2010, for a discussion of the natural connotations of “climate change”).

Different Cognitive Responses across US Political Partisans

While the results from Whitmarsh (2009) provide direct evidence that “global warming” and “climate change” may indeed engender distinct cognitive responses, it is unclear whether those data, which were collected in the UK, will generalize to the USA, where the climate issue has long been highly partisan. As mentioned above, US public opinion data reveal consistently lower existence beliefs and less concern about climate issues among Republicans and conservatives than among Democrats and liberals. As Krosnick, Holbrook, and Visser (2000) discuss, the roots of this political divide can be traced to the mid-1990s, beginning with a benchmark report by the Intergovernmental Panel on Climate Change (IPCC) indicating that human activities were likely responsible for the phenomenon and a subsequent campaign by the Clinton White House to build public support for the signing the Kyoto Protocol. In the years that followed, public relations battles have been fought between partisans on both sides of the debate in an effort to influence climate discourse and policy outcomes (McCright & Dunlap, 2000; Oreskes & Conway, 2010). This ideological divide has proven persistent even as climate science has become more certain (Oreskes, 2004), as illustrated by a recent analysis covering a decade of Gallup polling data (2001–2010) showing that liberals and Democrats reliably reported greater belief and concern about global climate change than did conservatives and Republicans (McCright & Dunlap, 2011).

In light of this ongoing partisan divide, Republicans and conservatives may be somewhat more likely to question the existence of global climate change when readily available information facilitates doing so, and the heightened accessibility of temperature increases or human causality may qualify. Taking temperature increases first, some heat-related images such as *melting icebergs/glaciers* may lower the public’s concern and reduce the likelihood of engaging in climate-mitigating action (e.g., lowering the thermostat in winter, carpooling) because they are psychologically distant (Gilbert, 2006; Trope & Liberman, 2010; Weber, 2006). Moreover, the heat-related concepts evoked by “global warming” may sometimes appear to contradict one’s personal experience with the weather (say, when unusually cold temperatures prevail) and thereby encourage existence doubts and less concern about the issue, consistent with a documented tendency to confuse weather with climate (Bostrom, Morgan, Fischhoff, & Read, 1994; Read, Bostrom, Morgan, Fischhoff, & Smuts, 1994; Weber & Stern, 2011). Such a pattern would be consistent with observations of conservative media’s use of the “global warming” frame to cast doubt on climate science during unusually cold weather events (e.g., Beck, 2011; Drudge, 2004) and with the tendency for conservative (but not liberal) think tanks in the USA to emphasize “global warming” over “climate change” in their communications (Schuldt et al., 2011). Second, Republicans may especially resist the suggestion that humans are

responsible for global climate change (McCright & Dunlap, 2000), and as a result, may report lower existence beliefs when anthropogenic associations such as *fossil fuel burning* are brought to mind. Thus, if the “global warming” frame were to heighten the accessibility of thoughts related to temperature increases and/or human causality among conservatives and Republicans in particular, it may have downstream consequences for a host of climate-related judgments, including less belief that the phenomenon really exists, lower levels of climate-related concern, and less support for climate mitigation policies, to name a few. In other words, such a pattern would suggest that effects of these different *media frames* (e.g., “global warming” vs. “climate change”) on politically meaningful outcome variables might not be direct, but instead mediated by the distinct *audience frames* (e.g., heat and/or anthropogenic associations) that these phrases evoke in the minds of the public.

The Present Work

Building on past research into the cognitive knowledge made accessible by “global warming” and “climate change” (Leiserowitz, 2006; Whitmarsh, 2009) and in the tradition of research that directly measures the audience’s immediate cognitive response to alternative media frames (Price et al., 1997; Valkenburg et al., 1999), the present work explores whether these two common climate frames activate distinct associations among audiences in the USA, where global climate change is highly politicized. In particular, we sought to address the following research questions (RQs):

RQ1: Do members of the U.S. public, in general, associate specific climate-related causes and consequences (i.e., heat-related impacts and human causes) more strongly with “global warming” than with “climate change”?

RQ2: Do U.S. conservatives and Republicans, in particular, associate specific climate-related causes and consequences (i.e., heat-related impacts and human causes) more strongly with “global warming” than with “climate change”?

Web Experiment

Participants

To explore whether “global warming” and “climate change” activate distinct cognitive associations among members of the US public, and conservatives/Republicans in particular, we recruited 400 US participants via Amazon.com’s Mechanical Turk crowdsourcing work site between June and August of 2012 to participate in a Web-based experiment in exchange for a nominal fee (\$0.25) (for discussion and validation of this data source, see Berinsky, Huber, & Lenz, 2012; Paolacci, Chandler, & Ipeirotis, 2010). As a part of a longer session ostensibly about recognition and memory ability, participants were asked to report on the extent to which they associated various concepts with “global warming” ($n = 196$) or “climate change” ($n = 204$) depending on their randomly experimental condition. Participants’ mean age was 29.8 years ($SD = 11.0$ years), 55% (i.e., 220) were male, 97.3% reported

holding US citizenship, and most (86.4%) reported at least some college/university education (42.1% held a college/university degree). On average, the sample leaned liberal ($M = 3.00$, $SD = 1.56$, on a scale from 1 = very liberal to 7 = very conservative) and the modal party identification (46.8%) was “Democrat.”⁴

Cognitive Accessibility Measures

We measured the accessibility of six different concepts related to the causes and consequences of global climate change—namely, *rising temperatures*, *melting polar ice*, *pollution*, *natural variation*, *immediate impacts*, and *delayed impacts*—which correspond to three of the dimensions previously explored by Whitmarsh (2009) (namely, temperature-related impacts, human vs. natural causation, and present vs. future impacts). Again, we were particularly interested in the first two of these dimensions—*temperature-related impacts* and *human vs. natural causation*—given that “global warming” was previously found to be more readily associated with temperature increases and human causes than was “climate change” (the present vs. future impact items were included for exploratory purposes).

Participants were asked, “When you think about the term ‘global warming’ [‘climate change’], to what extent does each of the following come to mind? (1 = Not at all to 7 = Very much)” (alternative wording in brackets). The six association ratings were vertically arrayed on the computer screen and presented in a random order for each participant. After the ratings, participants reported on demographic variables (e.g., age, gender, and educational attainment), including political orientation (1 = very liberal to 7 = very conservative), political affiliation (as Democrat, Republican, Independent, or Other/None of the above), and a single-item measure assessing general environmental concern, “Generally speaking, how concerned are you about the state of the natural environment? (1 = Not at all concerned to 7 = Very concerned).” On average, the questionnaire took approximately three to five minutes to complete.

Results

To examine whether the “global warming” and “climate change” frames evoke distinct cognitive associations among the public in general and/or among conservatives and Republicans in particular, we conducted a series of multiple regression analyses. In each, one of the six association items (e.g., *rising temperatures*) was regressed onto frame condition (climate change vs. global warming; coded -0.5 and $+0.5$, respectively), political ideology (1 = very liberal to 7 = very conservative; mean-centered), and their interaction term. Results revealed significant interactions between frame and political ideology only for the two temperature-related items, *rising temperatures* ($b = .22$, $t(396) = 3.48$, $p = .001$) and *melting polar ice* ($b = .22$, $t(396) = 2.82$, $p = .005$; Table 1). We then diagnosed the nature of these interactions using regression procedures outlined by Aiken and West (1991).

Table 1 OLS regression testing media frame and political ideology as predictors of six impact associations.

Predictors	Rising temperatures		Melting polar ice		Pollution		Natural variation		Immediate impacts		Delayed impacts	
	<i>b</i> (<i>SE</i>)	<i>T</i>	<i>b</i> (<i>SE</i>)	<i>T</i>	<i>b</i> (<i>SE</i>)	<i>t</i>	<i>b</i> (<i>SE</i>)	<i>t</i>	<i>b</i> (<i>SE</i>)	<i>t</i>	<i>b</i> (<i>SE</i>)	<i>t</i>
Media frame	.35 (.09)	3.60**	.16 (.12)	1.35	.04 (.14)	.30	.19 (.16)	1.18	-.17 (.16)	-1.02	.33 (.17)	1.96 [†]
Political ideology	-.14 (.03)	-4.25**	-.16 (.04)	-4.14**	-.24 (.05)	-5.31**	.22 (.05)	4.17**	-.14 (.05)	-2.7*	-.23 (.06)	-4.23**
Media frame × Political ideology	.22 (.06)	3.48**	.22 (.08)	2.82*	.10 (.09)	1.10	.11 (.11)	.10	.14 (.11)	1.35	.11 (.11)	.99
% explained <i>R</i> ²	10.5		6.9		6.5		4.6		2.7		5.7	

Note: Media frame was coded as: -0.5 = climate change; +0.5 = global warming.

[†]*p* < .10; **p* < .01; ***p* < .001.

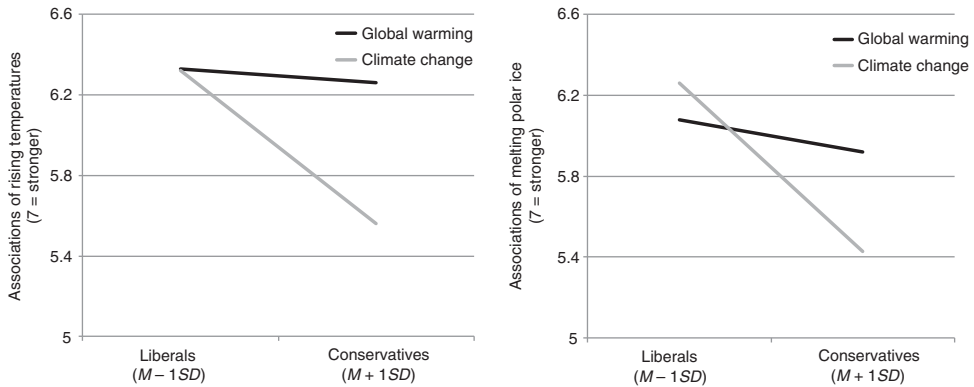


Figure 1. Graphs depicting the interaction of media frame and political ideology for associations of rising temperatures (left) and melting polar ice (right).

Taking *rising temperatures* first, these analyses revealed that whereas liberal participants (operationalized as $M - 1SD$ on political ideology) associated this impact equally with the global warming and climate change frames ($M_{\text{global warming}} = 6.33$ vs. $M_{\text{climate change}} = 6.32$; $b = .01$, $t < 1$, *ns*), conservative participants (operationalized as $M + 1SD$ on political ideology) associated this impact significantly more with the global warming frame ($M_{\text{global warming}} = 6.26$ vs. $M_{\text{climate change}} = 5.56$; $b = .70$, $t(396) = 5.00$, $p < .001$; Figure 1). Complementing this spotlight analysis, simple slopes analysis revealed that whereas global warming's associations of *rising temperatures* did not vary across partisans ($b = -.03$, *ns*), climate change's associations of *rising temperatures* decreased with increasing conservatism ($b = -.25$, $p < .001$). The analysis for *melting polar ice* revealed a highly similar pattern. Whereas liberal participants ($M - 1SD$) again associated this impact equally with the global warming and climate change frames ($M_{\text{global warming}} = 6.08$ vs. $M_{\text{climate change}} = 6.26$; $b = -.18$, $|t|(396) = 1.05$, *ns*), conservative participants ($M + 1SD$) associated this impact more strongly with the global warming frame ($M_{\text{global warming}} = 5.92$ vs. $M_{\text{climate change}} = 5.43$; $b = .49$, $t(396) = 2.95$, $p < .01$).

Regression results also revealed a marginally significant main effect of frame on associations of *delayed impacts*, with “global warming” evoking these thoughts more strongly than “climate change”; however, in contrast to *rising temperatures* and *melting polar ice*, these associations did not differ across partisans (Table 1). Although we did not expect this difference to emerge, this pattern may reflect a general tendency for the public to perceive the consequences of “global warming” as psychologically distant, not only spatially but temporally as well (Gilbert, 2006; Leiserowitz, 2006; Weber, 2006). Perhaps unsurprisingly, political ideology significantly predicted all six associations, such that increased conservatism negatively predicted associations of *rising temperatures*, *melting polar ice*, *pollution*, *immediate impacts*, and *delayed impacts*, but positively predicted associations of *natural variation*. This pattern echoes the familiar observation that conservatives in the

USA are less concerned about the phenomenon's consequences and more likely to attribute it to natural causes (McCright & Dunlap, 2011).

We also tested whether these associations were related to the other demographic variables in our data set (age, gender, environmental concern, and educational attainment). Overall, age positively predicted associations of *melting ice* ($b = .02$, $t(396) = 2.63$, $p < .01$), and females reported higher associations of *rising temperatures*, *melting polar ice*, and *immediate impacts* ($bs > .27$, $ts > 2.37$, $ps < .05$), and lower associations of *delayed impacts* ($b = -.38$, $|t|(396) = 2.21$, $p = .03$). Also unsurprisingly, environmental concern predicted heightened accessibility for nearly every item, except *natural variation* ($bs > .21$, $ts > 3.78$, $ps < .001$). Educational attainment did not significantly predict any of the six associations. Finally, among these demographic variables, only one significant interaction was observed: Whereas participants low in environmental concern ($M - 1SD$) tended to associate *pollution* more with "global warming" than with "climate change" ($M_{\text{global warming}} = 5.02$ vs. $M_{\text{climate change}} = 4.76$; $t(396) = 1.40$, $p = .16$), participants high in environmental concern ($M + 1SD$) associated *pollution* significantly more with "climate change" ($M_{\text{global warming}} = 5.96$ vs. $M_{\text{climate change}} = 6.34$; $t(396) = 2.05$, $p = .04$) ($b = .24$, $t(396) = 2.43$, $p = .02$, for the interaction).

Corresponding analyses featuring political party affiliation (Republican, Democrat, Independent, Other/None of the above) complemented the above regression results featuring political ideology. Speaking to RQ1, mean accessibility ratings for "global warming" were significantly higher than "climate change" for *rising temperatures* ($M_{\text{global warming}} = 6.29$ vs. $M_{\text{climate change}} = 5.94$; $t(398) = 3.48$, $p = .001$) and marginally higher for *delayed impacts* ($M_{\text{global warming}} = 4.90$ vs. $M_{\text{climate change}} = 4.56$; $t(398) = 1.93$, $p = .054$; Table 2). Speaking to RQ2, which focuses on the interaction effect of media frame and political orientation, we next tested whether these effects varied by political affiliation by including the frame by affiliation interaction term in the models. Post-hoc contrasts with Bonferroni corrections revealed only one significant effect: Republicans associated *rising temperatures* more strongly with the global warming frame than with the climate change frame ($M_{\text{global warming}} = 6.48$ vs. $M_{\text{climate change}} = 5.52$; 95% CI: 1.89 to .02, $p = .04$).

Discussion

Which cognitions become activated when an audience is exposed to a given media frame? This fundamental question has received surprisingly little direct attention in the framing literature, where scholars typically measure the influence of alternative media frames on more general outcome variables, such as political beliefs or policy preferences. By attempting to directly measure the audience's cognitive response—or frames of mind (Scheufele, 1999)—scholars may shed light on how alternative frames interact with audience characteristics in eliciting cognitive responses and gain insight into the psychological mechanisms that mediate known framing effects (Price et al., 1997).

Table 2 Mean association ratings by media frame and party identification.

Impact	Party identification									
	Overall		Republicans		Democrats		Independents		Others	
	CC	GW	CC	GW	CC	GW	CC	GW	CC	GW
Rising temperatures	5.94** (1.07)	6.29** (.97)	5.52* (1.08)	6.48* (.59)	6.16 (.85)	6.29 (1.07)	5.85 (1.33)	6.21 (.93)	5.64 (1.03)	6.35 (1.00)
Melting polar ice	5.84 (1.26)	6.01 (1.18)	5.39 (.99)	5.96 (.83)	6.08 (1.21)	6.10 (1.17)	5.67 (1.44)	5.87 (1.31)	5.71 (1.12)	6.12 (1.05)
Pollution	5.49 (1.50)	5.53 (1.38)	4.74 (1.71)	5.00 (1.71)	5.55 (1.44)	5.71 (1.25)	5.58 (1.49)	5.55 (1.36)	5.68 (1.44)	5.24 (1.52)
Natural variation	4.28 (1.74)	4.47 (1.60)	4.48 (1.65)	5.00 (1.73)	4.06 (1.70)	4.11 (1.53)	4.16 (1.74)	4.52 (1.65)	5.11 (1.81)	5.41 (.94)
Immediate impacts	4.22 (1.70)	4.05 (1.59)	3.48 (1.59)	4.35 (1.85)	4.42 (1.63)	4.16 (1.49)	4.16 (1.80)	3.76 (1.60)	4.21 (1.75)	4.24 (1.68)
Delayed impacts	4.56 [†] (1.80)	4.90 [†] (1.65)	4.00 (1.76)	4.22 (1.93)	4.85 (1.69)	5.06 (1.53)	4.55 (1.90)	4.85 (1.64)	4.07 (1.86)	5.18 (1.85)
<i>N</i>	204	196	23	23	98	89	55	67	28	17

Note: Standard deviations in parentheses.

CC = climate change; GW = global warming.

[†] $p < .10$; * $p < .05$; ** $p < .01$ (with Bonferroni correction).

In this vein, the present work sought to illuminate the cognitions that “global warming” and “climate change” evoke among political partisans in the USA. Although past research suggests that a global warming frame may activate stronger thoughts related to temperature increases (e.g., melting polar ice caps) and human causality (e.g., fossil fuel pollution) among the public at large (Whitmarsh, 2009), we tested whether these associations might be especially pronounced among conservatives and Republicans in the USA, who have long espoused greater uncertainty about the phenomenon’s existence and its human causes (McCright & Dunlap, 2000, 2011) and who have recently been shown to express less certainty about the existence of “global warming” than of “climate change” (Schuldt et al., 2011). Specifically, when we asked partisans to report the extent to which they associated various concepts with “global warming” or “climate change,” the responses of conservatives and Republicans (but not of liberals or Democrats) suggested greater accessibility of heat-related thoughts (i.e., *rising temperatures* and *melting polar ice*) in response to “global warming” in particular. We found no effect of wording on thoughts related to human causality. In addition, our findings revealed a marginally significant effect whereby “global warming” was more strongly associated with *delayed impacts* than was “climate change” in the sample overall. While scholars have pointed out that the distal construal of climate-related consequences may leave individuals unmotivated to engage in climate-mitigating actions (Gilbert, 2006; Weber, 2006; Weber & Stern, 2011), the present results hint that the “global warming” frame, in particular, might promote this unhelpful tendency. Thus, the current results extend the growing literature in environmental communication on the effects of various labels or frames for global climate change on public perceptions (e.g., Akerlof & Maibach, 2011; Jaskulska & Besela, 2013; Maibach et al., 2010; Schuldt et al., 2011) and highlight the importance of accounting for relevant individual differences (here, political orientation) in such analyses.

Beyond its specific relevance to the case of “global warming”/“climate change” framing, this work also highlights the importance and power of framing in environmental communication more broadly. As Lakoff (2010) has written, these frames are likely to affect how the public perceives the climate issue and to influence their environmental policy preferences, something that astute political strategists seem keenly aware of (e.g., Luntz, 2003). In this vein, future work in environmental communication may fruitfully explore how the individual’s frame of mind is shaped by the myriad other environment-related frames that are commonly employed in the media (e.g., global climate change as “climate crisis,” a threat to “biodiversity,” “the economy,” etc.) and that may similarly interact with the individual’s values and goals. More generally, the present work highlights an often-overlooked conceptual distinction between *framing effects* (which typically describe cases in which alternative media frames lead to different preferences among an audience) and *audience frames* (the *frames in thought* that presumably mediate framing effects). By more directly measuring the thoughts evoked by specific frames and messages (Price

et al., 1997; Shapiro, 1994), researchers may better understand the cognitive processes that give rise to the downstream effects that media frames exert on audiences.

We note that this study has some limitations. Our convenience sample of political partisans in the USA provided a useful testing ground for exploring whether cognitive responses to “global warming” versus “climate change” would differ across liberals and conservatives. However, the fact that this sample was not representative of the American public may limit the generalizability of the present findings for US public discourse on global climate change. On the other hand, we believe that the experimental (rather than descriptive) nature of the study mitigates this concern. Second, in contrast to previous work employing open-ended or free-response measures of cognitive associations (e.g., Leiserowitz, 2006; Price et al., 1997; Whitmarsh, 2009), we chose to employ closed-ended rating scale measures. While these rating scale measures offered us a number of advantages, notably allowing us to focus on a limited set of cognitive associations suggested by previous work, they carried disadvantages as well, such as possibly constraining spontaneous concept accessibility, failing to capture other (unsolicited) cognitive associations, and so on (Geer, 1991). Related to this, the more explicit nature of these rating scale measures may strike some as more demand-laden than open-ended measures. We would note, however, that it is unlikely that participants became aware of our research questions, which centered on interactions between frames and individual difference variables, as opposed to main effects.⁵ Third, our focus on the US political context may invite questions about the implications of these findings for other contexts. Although this work may generalize most readily to other English-speaking nations where climate beliefs have become politically divisive (e.g., the UK; e.g., Nerlich & Jaspal, 2012), it may nevertheless inform our understanding of how the public thinks about these phrases more broadly (including contexts in which climate beliefs are less politicized), given that English has emerged as the de facto international language of science (Ammon, 2001) and that common heat-related associations regarding global climate change (e.g. threatened polar bears and melting polar ice) may reduce the sense of urgency among the public to confront this challenging issue. We would also note that although the kind of framing examined here—which involves the use of different labels that reference a single issue—can be considered emphasis framing in the sense of selectively directing attention toward (and away from) certain subsets of issue-relevant information (Druckman, 2001a), such frames are sufficiently different from the kind that attempt to situate global climate change and its consequences within broader sociocultural contexts (e.g., as an “environmental” vs. “public health” issue; Maibach et al., 2010) that it may be served by somewhat distinct cognitive processes.⁶ Future theorizing and research should attempt to distinguish these types and illuminate their underlying mechanisms.

Finally, it is important to note that the ways that citizens think about global warming and climate change are not likely static, but rather, highly situated and determined by a complicated interplay of prevailing conditions, from everyday weather experiences (e.g. Joireman, Truelove, & Duell, 2010) to news coverage (e.g.,

of Al Gore's film *An Inconvenient Truth* and "Climategate"; Leiserowitz, Maibach, Roser-Renouf, Smith, & Dawson, 2012; Nolan, 2010) and the political climate in Washington, D.C. (Elsasser & Dunlap, 2012; Oreskes & Conway, 2010). Thus, the present findings should be understood within this shifting public opinion landscape, while explicitly recognizing that these cognitive associations may change over time and across contexts, just as public opinion and affective images associated with global warming have been known to do (Krosnick et al., 2000; McCright & Dunlap, 2011; Smith & Leiserowitz, 2012).

Overall, the present findings suggest that although they are often used interchangeably in the media and in public discourse about global climate change, "global warming" and "climate change" may be perceived quite differently by political groups that typically disagree about climate issues. Whereas the present work is a first attempt to measure the concepts that these frames evoke in partisan minds, future research may explore whether a similar pattern emerges among nationally representative samples, as well as the potential consequences of these different associations for citizens' reported beliefs, attitudes, and policy preferences surrounding climate issues.

Notes

1. A *Lexis-Nexis* search for these phrases among the headlines of seventeen major US newspapers representing diverse political perspectives (e.g., *The New York Times*, *The Wall Street Journal*) during the period from 2007 to 2012 (following the release of Al Gore's film *An Inconvenient Truth*) revealed that both phrases appear frequently in the media, with "global warming" returning over 500 instances and "climate change" returning over 700.
2. According to the US Environmental Protection Agency, "global warming" refers to the increase in global surface temperatures resulting from anthropogenic greenhouse gas emissions, whereas "climate change" refers to various protracted changes in climate patterns more broadly (Environmental Protection Agency [EPA], 2012).
3. Numbers represent the percentage endorsing a value ≥ 5 on the belief scale.
4. Political ideology was distributed as: "very liberal" (15.6%), "liberal" (31.0%), "basically independent, but leaning toward liberal" (19.5%), "independent" (16.3%), "basically independent, but leaning toward conservative" (7.8%), "conservative" (8.0%), "very conservative" (1.8%). Political party affiliation was distributed as: "Democrat" (46.8%), "Republican" (11.5%), "Independent" (30.5%), "Other/None of the above" (11.3%).
5. Indeed, when we asked participants before debriefing to guess what the study was "really about," none indicated any awareness of our research questions.
6. For example, compared to attempts at framing a given issue (e.g., gun ownership) in different sociocultural terms (as an "individual rights" vs. "public safety" issue), the type of framing examined here involves varying only a few words that are commonly treated as synonyms. As a result, we speculate that such framing may rely primarily on the activation of semantically related concepts stored in memory (e.g., "heat" in the case of "global warming"; Bargh et al., 1996; Collins & Loftus, 1975). Because the wording change is quite subtle, this framing may also invite less explicit awareness on the part of audiences and trigger less counter-argumentation, mental correction, and other types of controlled message processing (Sniderman & Theriault, 2004; Wilson & Brekke, 1994).

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