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"Don't Tell Me What to Do": Resistance to Climate Change Messages Suggesting Behavior Changes

Risa Palm
Georgia State University, risapalm@gsu.edu

Toby Bolsen
Georgia State University, tbolsen@gsu.edu

Justin Kingsland
Georgia State University, jkingsland2@gsu.edu

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Risa Palm
Urban Studies Institute
Georgia State University
risapalm@gsu.edu

Toby Bolsen
(*Corresponding author*)
Department of Political Science
Georgia State University
tbolsen@gsu.edu

Justin T. Kingsland
Department of Political Science
Georgia State University
Jkingsland2@student.gsu.edu

Abstract

This study evaluates the impact of exposure to messages that emphasize the need for changes in individual behavior or in public policy to address climate change attributed to a “climate scientist” or to an unnamed source. We implemented a large survey-experiment (N=1,915) online through Amazon’s Mechanical Turk (MTurk) platform that manipulated the presence of recommendations for voluntary behavioral changes or the adoption of new laws to mitigate climate change. We found that, regardless of the source of the information, recommendations for behavioral changes decreased individuals’ willingness to take personal actions to reduce greenhouse gases, decreased willingness to support pro-climate candidates, reduced belief in the accelerated speed of climate change, and decreased trust in climate scientists.

Key words: climate scientists, communication, climate change

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Introduction

Climate change arguably presents the most challenging collective action problem the world has ever faced. Rising global temperatures due to the increasing accumulation of greenhouse gases in the atmosphere will fundamentally reshape societies, threatening economies, health care systems, and geopolitical relations. It is projected that state-of-the-art behavioral interventions, such as providing targeted information to consumers about high-impact individual and household energy choices, could significantly reduce greenhouse gas emissions in the U.S. over time (Dietz et al. 2009; Capstick, Lorenzoni, Corner, and Whitmarsh 2014; Stern 2020); however, such reductions may be difficult to achieve in practice due to a lack of public (political) support for specific pro-environmental policies (Druckman 2015; Nielsen, van der Linden, and Stern 2020; van der Linden 2016). In this context, it is crucial to understand how best to promote high-impact individual and collective actions to mitigate the effects that will occur as a result of climate change. How effective are direct messages that recommend changes in personal behavior or the enactment of new laws to reduce emissions? Does the impact of such a message depend on the presence of an expert source linked to the recommendations?

A large body of research has accumulated which shows that exposure to strategic frames and persuasive messages can influence perceptions and willingness to support various actions to address climate change (Bolsen and Shapiro 2017; Druckman and McGrath 2019; Hart and Feldman 2016; van der Linden 2017); however, few studies have investigated the impact of exposure to messages that recommend specific changes in individual behaviors such as reducing beef consumption or cutting back on air travel as ways to reduce global carbon emissions (Nielson, Clayton et al. 2020), as well as collective policies such as increasing taxes on carbon emissions and increasing vehicle fuel efficiency requirements. Do people become more willing to

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change their behaviors or support specific pro-climate candidates and policies following exposure to framed messages emphasizing the need for such actions? When climate scientists engage in what may be viewed as "political advocacy" by recommending specific "solutions", does this have an impact on the degree to which the public trusts them to provide impartial and unbiased information about climate change? Do the effects of exposure to such messages depend on individual characteristics such as a person's party identification?

The present study examines the response to framed messages that advocate both changes in individual behavior including, for example, taking fewer plane flights and using less hot water, as well as collective actions such as retrofitting buildings or halting deforestation to address the impacts of climate change. Responses reported include willingness to engage in personal actions to reduce greenhouse gas emissions, stated preference to vote for a candidate who would enact pro-climate legislation, belief that human activity is the cause of accelerated global warming, and trust in climate scientists. To illuminate these relationships, we implemented a survey-experiment (N=1,915) online through Amazon's Mechanical Turk (MTurk) platform that manipulated: (1) the presence of recommendations for changes in public policy *or* individual behavior in order to reduce emissions of greenhouse gases; and, (2) the presence of a subtle source cue attributing these recommendations to climate scientists. The experiment thus dealt with two aspects of climate communication: the differences in the response to a message recommending collective policies or personal sacrifices as a way to mitigate climate change; and, (2) the introduction of a source manipulation that attributed the recommendation to a generic climate scientist. We find that presenting individuals with framed messages that advocate personal behavioral changes to combat climate change, with or without an expert source cue, *reduces* their expressed willingness to take action, *decreases* support for pro-climate candidates, *decreases* belief in the scientific

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consensus, and *lowers* trust in climate scientists. We address some of the implications of these findings for debates regarding how best to mobilize collective action to combat climate change as well as the role of climate scientists in policy advocacy.

Solution Framing and Climate Action

The concept of "climate action" refers both to individual behavioral changes to voluntarily reduce emissions or support for government actions to accomplish this goal (Lubell et al. 2007; Zahran et al. 2006). It has been estimated, for instance, that greenhouse gas emissions would be reduced considerably if consumers could be persuaded (collectively) to substitute meat and dairy with plant-based foods in their diet (Green et al. 2015; Poore and Nemecek 2018). Yet people often hold misperceptions about the personal actions that would be most effective at reducing climate pollution (Bord 1998; Bostrom et al. 1994; Kempton 1991; Sterman and Sweeny 2007; Whitmarsh 2009).

When individuals are exposed to communications that emphasize specific considerations about climate change, such as recommendations to engage in climate-friendly behaviors or support pro-climate policies, they may prioritize the highlighted consideration when forming their opinion, often shifting their opinion in the direction of the message; this is referred to as an *emphasis framing effect* (Druckman 2011). Prior research has found that exposure to messages that highlight descriptive social norms (Bolsen, 2013; Bolsen, Leeper, and Shapiro 2014; Goldberg et al. 2019; Mildenberger and Tingley 2019; van der Linden 2015), the benefits or costs of climate policies (Levine and Kline 2017; 2019), the benefits or costs of personal actions (Bolsen, Druckman, and Cook 2014), or the details of specific climate policy proposals (Buntaine and Prather 2018) can influence people's willingness to engage in or support collective actions aimed at reducing climate change.

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Despite robust empirical findings showing the direct impact of messages on changing both attitudes and behavior in the direction of the message (Chong and Druckman 2007), there are also several reasons why specific types of messages *might not be effective*. First, most people value freedom of choice, particularly in decisions they make in their everyday lives (Permuter et al 1980; Fujiwara et al. 2013). Several empirical studies have found that a behavior change as personal as a change in diet is met with particular resistance, even among those who ardently favor action to mitigate global climate change (Attari et al. 2011; DeBoer et al 2013). Several factors may come into this resistance but among them is the concept of psychological "reactance" which may be triggered when people perceive their freedom of choice is impinged upon by directives from others (Brehm 1966; Gifford et al. 2011; Gifford 2011; Ma et al. 2019; Nisbet, Cooper, and Garrett 2015).

Second, rather than take personal responsibility for an issue as large as climate change, many people would prefer an "upstream" solution that would not impinge on their personal behavior; even many of those who believe that climate mitigation is urgent would prefer that the producers rather than the consumers of carbon be regulated or taxed (Campbell and Sedikides 1999; Hardisty et al. 2019). The results of these empirical studies suggest that at least some respondents are more likely to favor more distant policy solutions that do not have a direct impact on their personal behavior.

Third, addressing large scale collective action problems may require generating support for policies that have been politicized on ideological grounds because they involve the regulation of free markets or potential restrictions on personal freedoms. Surveys have shown that Americans are divided over support for public policy to mitigate climate change, with liberal Democrats as opposed to conservative Republicans more likely to support tougher fuel efficiency

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127 standards and various tax incentives even if this means greater costs to themselves or their
128 families (Nisbet et al, 2015; Pew Research Center 2018). Campbell and Kay (2014) have
129 suggested that in order to protect their values and cultural worldviews, conservatives might not
130 only oppose specific climate change mitigation strategies but also deny that climate change itself
131 is a problem: in other words, when confronted with solutions to climate change that would pose
132 regulations, supporters of free-market solutions will respond by denying that climate change
133 exists, not due to their perception of the "inherent seriousness" of the threat but because they
134 oppose on ideological grounds the solutions that are generally proposed to address it.

135 Fourth, there are questions about the efficacy of voluntary adoption of individual-level
136 behavior changes when the earth is confronted with a problem as overwhelming as global climate
137 change. Even when people believe that climate change presents a dire threat and they
138 acknowledge that behavior change by a large part of the world's population would help, they may
139 believe changing their personal behavior is futile (McGrath N.d.:16): that "individual voluntary
140 behaviors in and of themselves to have no bearing on the macro political problem of climate
141 change, which requires global coordination, not personal commitments" (see also, Bubeck et al.
142 2012; Hornsey et al. 2016; Kellstedt, Zahran, and Vedlitz 2008).

143 Based on this literature, we pose the following research question: *Do messages that*
144 *recommend personal behavior change or collective policies to combat climate change affect*
145 *individuals': (i) willingness to take personal steps or support collective actions to address climate*
146 *change; (ii) support for political candidates with a pro-climate agenda; and, (iii) belief in human-*
147 *caused climate change?* (**Research Question #1**)

148 **Message Source Effects**

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A long and robust history of empirical research on communication and environmental risk perceptions makes clear that the messages are more impactful when they emanate from credible and trustworthy sources (Brewer and Ley 2013; Druckman 2001; Liu and Priest 2009; Lupia 2013; Benegal and Scruggs 2018; Bolsen et al. 2019; Van Boven et al. 2018). The question this research poses is whether attribution to an unnamed climate scientist makes the message more or less credible and trustworthy, or, alternatively, if such attribution doesn't affect the impact of the message.

Linking recommendations for individual and collective action on climate change to expert scientists might influence positive response because of the high level of overall trust that Americans report for the scientific community compared with other institutions (Krause et al. 2019; Mullin 2017). In this scenario, trust in the scientific community should translate to trust in climate scientists when they discuss issues in their area of expertise including climate change.

Alternatively, however, empirical studies have shown that this general trust in science or in scientists is not universal within the United States. Instead, numerous surveys have found an association between conservative political ideology and a loss of trust both in science itself as well as in scientists (Hamilton, Hartter and Saito 2015; Krause et al. 2019; Leiserowitz et al. 2012; McCright et al. 2013; Safford et al. 2019). This distrust is exacerbated when scientists themselves engage in public policy debates (Brulle 2018; Milkoreit et al. 2015; Motta 2018). The tendency of political polarization around scientifically-based warnings has been documented most recently with respect to the Covid-19 pandemic (Ballew et al. 2020; Ellis 2020; Krause et al. 2019; Pennycook et al. 2020; Van Bavel et al. 2020).

In a recent study, we compared the impact of climate scientists with party leaders and military leaders, and found that climate scientists had relatively little positive impact on the

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perceived threat of climate change when the message was linked with a mild suggestion to "promote energy efficiency and renewable energy technologies" (Bolsen et al. 2019). We found that when information about the national security or environmental effects of climate change was attributed to climate scientists, this linkage often *weakened* the impact of the message for Republicans and Independents. In the current study, we focused on the combination of specific packages of recommendations attributed either to a climate scientist or with no attribution to elucidate the influence of message type and message source.

Based on this literature, we pose the following research question: *When a message that recommends specific individual or collective actions to combat climate change is attributed to an unnamed "climate scientist", does this attribution have an effect on the message's impact or on the degree to which there is general trust in climate scientists to provide unbiased and impartial information?* (**RQ #2**)

Methods

We administered a survey over the period of September 23 – October 1, 2019 using Amazon's Mechanical Turk to recruit 1,915 unique respondents.[1] Following a brief introduction,

[1] MTurk is a widely used online crowdsourcing platform, producing a convenience sample that differs from the general population, but not in ways that impede making generalizable causal inferences (Levay, Freese, and Druckman 2016; Clifford, Jewell, and Waggoner 2015). Further, the results have been found to be comparable to identical studies fielded on general population samples (Mullinix, Leeper, Druckman, and Freese 2015). Sample demographics are included in Appendix table A-1. We restricted the survey to individuals who had completed a minimum of 200 previous tasks on MTurk with a minimum approval rate of 95%.

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187 respondents opting to participate were randomly assigned to one of six experimental conditions
188 (see Table 1). These included: (1) a simple sentence stating that "climate change is a threat to
189 both the environment and the national security of the United States" (*No Source Baseline*); (2)
190 the same sentence attributed to "climate scientists" (*Climate Scientists Source*); (3) the no-source
191 baseline sentence with an added statement that "it is recommended that we as individuals take
192 fewer plane flights, drive less, eat less beef, use less hot water and adjust the thermostat" (*No*
193 *Source + Individual Actions*); (4) the baseline sentence with individual behavioral
194 recommendations attributed to "climate scientists" (*Climate Scientists + Individual Actions*); (5)
195 the no-source baseline sentence with the statement that "it is recommended that we as a nation
196 adopt new laws that: limit the amount of carbon pollution in the air, stop deforestation, require
197 business and industry to switch from coal to sustainable energy, increase vehicle fuel efficiency,
198 and retrofit all public buildings to make them maximally energy efficient" (*No Source + Policy*
199 *Actions*), and (6) the baseline sentence along with the same policy recommendations attributed to
200 a "climate scientist" (*Climate Scientists + Policy Actions*). The experimental design was
201 constructed to vary two dimensions: the extent to which the statement was accompanied by
202 recommendations concerning personal behavior or policy changes, and whether or not the
203 statement was attributed to a climate scientist or no source.
204
205 [*Insert Table 1 here*]

206 *Dependent Variables*

207 We measured how exposure to the experimental treatments affected respondent beliefs on
208 four key outcome measures. After respondents had read the headline or short paragraph, they
209 were asked: "how willing are you to take steps in your own life that would reduce greenhouse gas
210 emissions as a way to fight climate change?" on a 7-point response scale (1=*strongly unwilling*;

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7=*strongly willing*). The second question was, "how willing are you to vote for candidates who favor greater regulation of carbon emissions by business and industry, and higher taxes on carbon emitters?" on a 7-point response scale (1=*strongly disagree*; 7= *strongly agree*). Third, respondents were asked the extent to which they agreed or disagreed with the statement, "climate change is occurring faster now because of human activity:" on a 7-point response scale (1= *strongly disagree*; 7= *strongly agree*). Finally, they were asked "how much would you say that you trust climate scientists to provide accurate and impartial information?" (1=strongly distrust; 7=strongly trust). Since so much of the previous survey research has found robust effects of political party identification with their response to climate information, we also analyzed the impacts of political partisanship.

Results

To test our research questions, we estimated a series of OLS regression models. In each model we omit the *No Source Baseline* condition as our reference group and regress the dependent variable on the condition indicators. For each dependent variable, we first report the full main effects model using all respondents in the sample. Following this, we present a series of subset models restricting the analysis to 1) Republicans, 2) Independents, and 3) Democrats in the sample. In all models, cell entries contain OLS coefficients representing the difference in means between the treatment condition and the *No Source Baseline* condition. Standard errors are presented in parentheses below, and two-tailed *p*-values are reported alongside the coefficient estimates.[2]

Personal action

[2] Additional analyses, including the results of a balance test and sample demographics are available in the Appendix. A comprehensive test of source effects is presented in the Appendix.

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The first effect that we analyzed was willingness to take personal action as indicated by response to the question: "How willing are you to take steps in your own life that would reduce greenhouse gas emissions as a way to fight climate change? Changes might include driving conventional cars alone less, conserving energy in your home, or changing your diet." As shown in Table 2, when "no source" was linked with suggestions for making behavioral changes (*NS Individual Action*), the effect was to *reduce* willingness to take action ($b = -0.31, p=0.01$); in other words, the difference in the mean score of those exposed to this treatment as compared with the baseline group was one-third of a point on the seven-point scale. None of the other conditions elicted a statistically significant effect at conventional levels in the full model. Further, in our analyses of partisan groups, no estimates reach statistical signifiancce at $p<0.05$.

[*Insert Table 2 here*]

Preference for political candidates that support climate mitigation

We next analyzed the responses to the question: "How willing are you to vote for candidates who favor greater regulation of carbon emissions by business and industry, and higher taxes on carbon emitters?" Note that this question does not ask for changes in personal behavior and is a classic "upstream" delegation of responsibility. Shown in Table 3, when the treatment was linked with individual behavioral change and came either from no source (*NS Individual Action*) or an unnamed climate scientist (*CS Individual Action*), the response was negative: the respondents were significantly less likely (*NS Individual Action, b = -0.42, p = 0.003; CS Individual Action, b = -0.51, p = 0.00*) than the *No Source Baseline* group to respond that they would vote for a candidate that supports climate mitigation. There were similar negative effects

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for both the general climate scientists source (*b = -0.26, p = 0.06*) and the no source policy action conditions *(NS Policy Action* (*b = -0.26, p = 0.07*.)

Across the party groups, only the Independents showed treatment effects across a broader range of conditions: when individual action or policy changes were suggested either by no source or by a climate scientist, Independents stated that they were significantly *less* likely to vote for candidates supporting climate legislation than their co-partisans in the baseline. For Independents, the only condition that did not elicit a statistically significant response was the addition of a climate scientist source (*CS Source*) to the baseline statement.

[*Insert Table 3 here*]

Accelerated anthropogenic climate change

The treatments did not specifically address the issue of the accelerating pace of climate change due to human activity but the responses to this question did vary in different message formats (Table 4). Overall, when asked "To what extent do you disagree or agree that 'climate change is occurring faster now because of human activity' ", respondents were less likely to attest that the climate is changing faster because of human activity when this message was linked with changes in personal behavior either attributed to no source (*NS Individual Action, b = -0.34, p = 0.01*) or to a climate scientist (*CS Individual Action, b = -0.38, p = 0.00*). When linked with policy recommendations (*NS Policy Action* and *CS Policy Action*) or no recommendations at all (*CS Source*), there was no impact on the response.

Across partisan groups, none of the treatments had a significant impact on responses for Democrats or Republicans. However, among Independents, the treatment condition did affect response: when the message was linked with climate scientists and either mentioned individual (*b*

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276 = *-0.71, p < 0.01*) or policy changes (*b = -0.64, p < 0.01*), Independents were significantly less
277 likely to respond that climate change is accelerating as a result of human action.

278 [*Insert Table 4 here*]

279 *Trust Climate Scientists to provide accurate information*

280 Our final set of analyses examine the effects of the treatments on answers to "how much
281 would you say that you trust climate scientists to provide accurate and impartial information?"
282 Overall, this message linked with suggestions for changes in individual behavior reduced trust in
283 climate scientists both when no source (*b = -0.34, p = 0.01*) was mentioned or when a climate
284 scientist (*b = -0.37, p < 0.01*) was mentioned. The policy recommendations had no effect
285 overall on response. Among partisans, Republicans were less likely to state that they trust
286 climate scientists when the message was linked with suggestions for change in personal behavior
287 (*b = -0.58, p = 0.04*), and both Republicans (*b = -0.62, p = 0.02*) and Independents (*b = -0.59, p*
288 *= 0.02*) were less likely to trust climate scientists when climate scientists recommended changes
289 in personal behavior. Among Democrats, those exposed to policy recommendations
290 accompanied by a climate scientist source had higher scores for trust in climate scientist (*b =*
291 *0.23, p = 0.04*), while there was no impact from the remaining conditions.

292

293 [*Insert Table 5 here*]

294 **Discussion**

295 This study evaluates the impact of messages suggesting the need for changes in
296 individual behavior or public policy attributed to no source or to an unnamed climate scientist.
297 We found that when messages advocate "solutions" to combat climate change that would require
298 major changes in individual behavior, the general response was less willingness to support pro-

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mitigation candidates, a reduced belief in human-induced climate change, and in the case of this message delivered by "no source", less willingness to take personal actions to reduce emissions. In addition, messages recommending individual behavior changes as a way to address climate change, with or without the subtle source attribution linking the recommendation to a climate scientist, reduced trust in climate scientists to provide accurate and impartial information. Messages that imply the need for individual sacrifices in living style that will be required to reduce emissions are thus translated into a negative response to the entire message, including an increased skepticism about climate science and trust in climate scientists. Messages about policies that would affect others, such as taxes on industry and business or on carbon emitters, are more palatable and do not result in such a negative response.

Response to the messages was strongly influenced by the political identification of the respondents. In general, support for various actions and pro-climate beliefs was stronger among Democrats than among Republicans in the no-source baseline condition. Further, Republicans and Independents tended to respond more negatively in certain conditions if the message was attributed to a climate scientist. This finding links back to the increasingly large set of findings that have demonstrated conservative skepticism about a variety of scientific messages, but the fact that the Independents reacted so negatively to these messages in our study warrants further study. Our small sample size only permits conjecture about the ways in which Independents are responding, but the finding warrants study with a larger and more representative sample.

Given the nature of our sample, we are cautious about the generalizability of our findings, and we encourage future work on representative samples to probe additional factors that may condition the impact of a wider range of individual behaviors and policy recommendations targeting climate mitigation efforts. Future research should identify the specific actions or

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policies that will be palatable to particular groups of listeners so that the entire process does not backfire. We acknowledge that respondents may have been reacting negatively to portions of the message seeking individual action (e.g., changes in diet): future research should unpack the reactions to specific behavioral suggestions in order to tailor effective messages for diverse populations (Nielsen et al., 2020). Respondents might also not connect recommended behavioral changes to actual reductions in global concentrations of carbon dioxide, and the framing of this connection needs to be explored (van der Linden 2016). In addition, future work needs to extend our understanding of source effects, particularly those with ascribed scientific expertise.

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Appendix

(*Insert Appendix Table A-1 through Table A-3 here*)

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509 **Table 1: Experimental Design and Treatments**

Condition	Treatment
No Source Frame (*Baseline*) (*N*= 319)	Climate change is a threat to both the environment and the national security of the United States.
No Source + Individual Action (*N*= 319)	Climate change is a threat to both the environment and the national security of the United States. It is recommended that we as individuals: • take fewer plane flights • drive less • eat less beef • use less hot water • adjust the thermostat
No Source + Policy Action (*N*= 317)	Climate change is a threat to both the environment and the national security of the United States. It is recommended that we as a nation adopt new laws that: • limit the amount of carbon pollution in the air • stop deforestation • require business and industry shift from coal to sustainable energy • increase vehicle fuel efficiency • retrofit all public buildings to make them maximally energy efficient
Climate Scientist (*N*= 319)	Climate scientists say that climate change is a threat to both the environment and the national security of the United States.
Climate Scientist + Individual Action (*N*= 319)	Climate scientists say that climate change is a threat to both the environment and the national security of the United States. They recommend that we as individuals: • take fewer plane flights • drive less • eat less beef • use less hot water • adjust the thermostat
Climate Scientist + Policy Action (*N*= 319)	Climate scientists say that climate change is a threat to both the environment and the national security of the United States. They recommend that we as a nation adopt new laws that: • limit the amount of carbon pollution in the air • stop deforestation • require business and industry shift from coal to sustainable energy • increase vehicle fuel efficiency • retrofit all public buildings to make them maximally energy efficient

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Table 2: Personal Action - Main Effects

	(1) **All**		(2) **Rep**		(3) **Ind**		(4) **Dem**	
	Coef.	*p-val*	*Coef.*	*p-val*	*Coef.*	*p-val*	*Coef.*	*p-val*
NS Individual Action	-0.31*	0.013	-0.51	0.059	-0.41	0.078	0.05	0.684
	(0.12)		(0.27)		(0.23)		(0.13)	
NS Policy Action	-0.11	0.362	-0.11	0.685	-0.16	0.505	-0.09	0.491
	(0.12)		(0.28)		(0.24)		(0.13)	
CS Source	-0.14	0.254	-0.40	0.148	0.03	0.902	-0.08	0.548
	(0.12)		(0.28)		(0.23)		(0.13)	
CS Individual Action	-0.23	0.066	-0.40	0.137	-0.23	0.331	-0.04	0.739
	(0.12)		(0.27)		(0.24)		(0.13)	
CS Policy Action	-0.13	0.299	-0.12	0.681	-0.46	0.053	0.07	0.597
	(0.12)		(0.28)		(0.24)		(0.13)	
Constant (No Source)	5.58**	0.000	4.96**	0.000	5.47**	0.000	5.99**	0.000
	(0.09)		(0.20)		(0.17)		(0.09)	
N	1906		505		551		850	
AIC	7071.0		2020.0		2074.4		2583.7	
BIC	7104.4		2045.3		2100.3		2612.2	

Note: Cell entries are OLS coefficients with standard errors in parentheses below. Two-tailed p-values are presented in the adjacent column. Coefficients represent the estimated difference in means between the treatment condition and the No Source Baseline condition.

** p<0.05, ** p<0.01*

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Table 3: Vote for Candidates - Main Effects

	(1) **All**		(2) **Rep**		(3) **Ind**		(4) **Dem**	
	Coef.	*p-val*	*Coef.*	*p-val*	*Coef.*	*p-val*	*Coef.*	*p-val*
NS Individual Action	-0.42**	0.003	-0.51*	0.077	-0.53*	0.041	-0.05	0.695
	(0.14)		(0.29)		(0.26)		(0.14)	
NS Policy Action	-0.26	0.070	0.02	0.944	-0.65*	0.015	-0.20	0.142
	(0.14)		(0.29)		(0.27)		(0.13)	
CS Source	-0.26	0.067	-0.27	0.360	-0.42	0.108	-0.11	0.396
	(0.14)		(0.29)		(0.26)		(0.13)	
CS Individual Action	-0.51**	0.000	-0.47	0.099	-0.94**	0.001	-0.13	0.324
	(0.14)		(0.28)		(0.27)		(0.14)	
CS Policy Action	-0.18	0.222	-0.20	0.493	-0.76**	0.004	0.19	0.150
	(0.14)		(0.30)		(0.27)		(0.13)	
Constant (No Source)	5.54**	0.000	4.33**	0.000	5.39**	0.000	6.29***	0.000
	(0.10)		(0.21)		(0.19)		(0.09)	
N	1911		507		552		852	
AIC	7705.7		2081.2		2215.4		2656.7	
BIC	7739.0		2106.6		2241.3		2685.2	

Note: Cell entries are OLS coefficients with standard errors in parentheses below. Two-tailed p-values are presented in the adjacent column. Coefficients represent the estimated difference in means between the treatment condition and the No Source Baseline condition.

** p<0.05, ** p<0.01*

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Table 4: Climate Change is Occurring Faster - Main Effects

	(1) **All**		(2) **Rep**		(3) **Ind**		(4) **Dem**	
	Coef.	*p-val*	*Coef.*	*p-val*	*Coef.*	*p-val*	*Coef.*	*p-val*
NS Individual Action	-0.34*	0.011	-0.53	0.072	-0.35	0.146	-0.01	0.915
	(0.13)		(0.29)		(0.24)		(0.12)	
NS Policy Action	-0.12	0.355	0.13	0.670	-0.41	0.099	-0.11	0.338
	(0.13)		(0.30)		(0.25)		(0.11)	
CS Source	-0.19	0.155	-0.39	0.193	-0.03	0.889	-0.15	0.190
	(0.13)		(0.30)		(0.24)		(0.12)	
CS Individual Action	-0.38**	0.005	-0.40	0.170	-0.71**	0.005	-0.03	0.768
	(0.13)		(0.29)		(0.25)		(0.12)	
CS Policy Action	-0.19	0.162	-0.27	0.378	-0.64**	0.009	0.13	0.277
	(0.13)		(0.30)		(0.25)		(0.12)	
Constant (No Source)	5.76**	0.000	4.65***	0.000	5.71**	0.000	6.40**	0.000
	(0.09)		(0.21)		(0.18)		(0.08)	
N	1912		507		552		853	
AIC	7452.7		2104.9		2131.2		2407.0	
BIC	7486.0		2130.2		2157.1		2435.4	

Note: Cell entries are OLS coefficients with standard errors in parentheses below. Two-tailed p-values are presented in the adjacent column. Coefficients represent the estimated difference in means between the treatment condition and the No Source Baseline condition.

** p<0.05, ** p<0.01*

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539 **Table 5: Trust Climate Scientists - Main Effects**

	(1) **All**		(2) **Rep**		(3) **Ind**		(4) **Dem**	
	Coef.	*p-val*	*Coef.*	*p-val*	*Coef.*	*p-val*	*Coef.*	*p-val*
NS Individual Action	-0.34*	0.011	-0.58*	0.043	-0.36	0.143	0.03	0.771
	(0.14)		(0.29)		(0.25)		(0.12)	
NS Policy Action	-0.15	0.276	-0.10	0.737	-0.47	0.066	-0.00	0.990
	(0.14)		(0.30)		(0.26)		(0.11)	
CS Source	-0.07	0.586	-0.17	0.561	-0.06	0.806	0.02	0.880
	(0.14)		(0.29)		(0.25)		(0.12)	
CS Individual Action	-0.37**	0.006	-0.62**	0.029	-0.59*	0.022	0.05	0.681
	(0.14)		(0.28)		(0.26)		(0.12)	
CS Policy Action	-0.03	0.826	-0.07	0.818	-0.43	0.088	0.23*	0.042
	(0.14)		(0.30)		(0.25)		(0.11)	
Constant (No Source)	5.53**	0.000	4.54***	0.000	5.31**	0.000	6.21**	0.000
	(0.10)		(0.21)		(0.18)		(0.08)	
N	1909		506		551		852	
AIC	7476.3		2080.4		2160.5		2395.4	
BIC	7509.6		2105.8		2186.4		2423.9	

540 Note: Cell entries are OLS coefficients with standard errors in parentheses below. Two-tailed p-values are presented
541 in the adjacent column. Coefficients represent the estimated difference in means between the treatment condition
542 and the No Source Baseline condition.
543 ** p<0.05, ** p<0.01*
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Variable	Value	N	(%)
Age	18 - 24	199	(10.4%)
	25 - 34	697	(36.5%)
	35 - 44	488	(25.5%)
	45 - 54	284	(14.9%)
	55 - 64	171	(8.9%)
	65 - 74	68	(3.6%)
	75 or older	5	(0.2%)
Female	Male	681	(35.9%)
	Female	1,217	(64.1%)
Race	White	1,409	(73.7%)
	African American	195	(10.2%)
	Asian American	136	(7.1%)
	Hispanic	103	(5.4%)
	Mixed race or Other	69	(3.6%)
Education	Less than high school	14	(0.7%)
	High school graduate	179	(9.4%)
	Some college	428	(22.4%)
	2-year degree	240	(12.6%)
	4-year degree	741	(38.8%)
	Professional degree	275	(14.4%)
	Doctorate	35	(1.8%)
Income	Less than $15,000	142	(7.4%)
	$15,000 - $24,999	190	(9.9%)
	$25,000 - $34,999	219	(11.5%)
	$35,000 - $49,999	301	(15.7%)
	$50,000 - $74,999	420	(22.0%)
	$75,000 - $99,999	292	(15.3%)
	$100,000 - $149,999	259	(13.5%)
	$150,000 - $199,999	51	(2.7%)
	More than $200,000	38	(2.0%)
Political party	Republican	507	(26.5%)
	Independent	552	(28.9%)
	Democrat	853	(44.6%)
Ideology	Conservative	557	(29.1%)
	Moderate	503	(26.3%)
	Liberal	852	(44.6%)

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550 **Appendix Table A-1: Descriptive Statistics**

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	(1) No Source	(2) NS Individual Action	(3) NS Policy Action	(4) CS Source	(5) CS Individual Action	(6) CS Policy Action
Female	0.08	-0.07	-0.15	-0.09	0.16	0.08
	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)	(0.13)
Minority	-0.13	0.07	0.06	0.13	-0.10	-0.05
	(0.15)	(0.14)	(0.14)	(0.14)	(0.15)	(0.14)
Republican	-0.01	-0.01	0.05	-0.10	0.14	-0.07
	(0.17)	(0.16)	(0.17)	(0.17)	(0.17)	(0.17)
Democrat	0.10	-0.21	0.11	-0.07	0.06	0.01
	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)
Age	-0.02	0.04	-0.07	0.04	0.04	-0.03
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Education	-0.04	-0.02	0.05	0.03	-0.04	0.02
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Income	0.01	-0.02	-0.03	0.04	0.04	-0.04
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Constant	-1.50**	-1.47**	-1.38**	-1.96**	-1.93**	-1.44**
	(0.31)	(0.30)	(0.31)	(0.31)	(0.31)	(0.31)
N	1898	1898	1898	1898	1898	1898

Note: Cell entries are logit coefficients with standard errors in parentheses below.
** p<0.05, ** p<0.01*

Appendix Table A-2: – Balance Test

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583 **Appendix – Test of Climate Scientists Source Effects**
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	NS vs CS Source		NS Ind vs CS Ind		NS Pol vs CS Pol	
	Diff.	*p-value*	*Diff.*	*p-value*	*Diff.*	*p-value*
Trust Climate Scientists	0.07	0.557	0.03	0.858	-0.12	0.39
	(0.125)		(0.144)		(0.137)	
Vote for Candidates	0.26	0.053	0.08	0.572	-0.09	0.558
	(0.136)		(0.15)		(0.145)	
Personal Action	0.14	0.233	-0.08	0.535	0.02	0.9
	(0.117)		(0.129)		(0.122)	
Climate Change	0.19	0.137	0.03	0.804	0.06	0.64
Occurring Faster	(0.128)		(0.139)		(0.136)	

585 *Note:* Cell entries are coefficient estimates with standard errors in parentheses below.

586 **Appendix Table A3: Climate Scientist Source Effect**

587 An additional set of analyses examine whether, and to what degree, there is evidence of source
588 effects, that is, the difference between a message attributed to a climate scientist as opposed to no
589 identified source. We perform a series of t-tests between the "No Source" and "Climate Scientist
590 Source" while holding constant the message content. If the climate scientist as a source of
591 information were having a separate and meaningful effect, we would expect systematic
592 significant differences in the means across the dependent variables. The results indicate that in
593 all but one test there is no statistically significant difference between the "No Source" and
594 "Climate Scientist." This finding corroborates and extends the conclusions from our prior work
595 (Bolsen, Palm, and Kingsland 2019), in that there is no impact of climate scientists as a message
596 source independent of the message's content, but also extends this finding to show no impact of
597 climate scientists as an information source across a variety of potential mitigation measures.
598

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