

Is There Any Hope? How Climate Change News Imagery and Text Influence Audience Emotions and Support for Climate Mitigation Policies

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Using a national sample, this study experimentally tests the effects of news visuals and texts that emphasize either the causes and impacts of climate change or actions that can be taken to address climate change. We test the effects of variations in text and imagery on discrete emotions (i.e., hope, fear, and anger) and, indirectly, on support for climate mitigation policies. Political ideology is examined as a moderator. The findings indicate that news images and texts that focus on climate-oriented actions can increase hope and, in the case of texts, decrease fear and anger, and these effects generally hold across the ideological spectrum. In turn, the influence of emotions on policy support depends on ideology: Hope and fear increase support for climate policies for all ideological groups but particularly conservatives, whereas anger polarizes the opinions of liberals and conservatives. Implications for climate change communication that appeals to emotions are discussed.

KEY WORDS: Climate change communication; emotions; imagery; policy support; political ideology

1. INTRODUCTION

Scientists widely agree that climate change is real, human-caused, and requires a dramatic reduction of greenhouse gas emissions in order to minimize dangerous ecological and societal impacts.⁽¹⁾ In 2016, the World Economic Forum identified a failure of climate change mitigation and adaptation as the global risk with the greatest damage potential.⁽²⁾ Although a majority of Americans express at least moderate support for government policies to mitigate climate change, such as regulating carbon emissions and funding renewables,⁽³⁾ Americans' concern for climate change and the political priority they grant it are relatively low.^(4,5) There also are wide

ideological gaps in public attitudes toward emissions-reduction policies, particularly those involving new regulations—which liberals tend to support and conservatives are more likely to oppose.⁽⁶⁾ Public support for regulation will be a key factor in motivating elected officials to act more decisively to reduce the risk of climate change.⁽⁷⁾

Americans' relatively low political prioritization of and concern about climate change may stem, in part, from their lack of emotional involvement with the issue. In particular, hope, which prior research has shown is positively related to climate policy support and activism,^(8,9) is often thought to be in short supply among Americans when it comes to climate change.⁽¹⁰⁾ News stories about climate change tend to emphasize dramatic, threatening consequences, while sending a muddled message about possible actions that can mitigate its effects.^(11–14) Given that media are the public's primary sources of information about climate change,^(15,16) such coverage may engender a feeling of hopelessness and, in turn, undermine engagement with the issue.⁽⁸⁾ At the same

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time, even while news coverage of climate change emphasizes dramatic impacts, it often does so in a way that distances the public from the problem and its solutions, for example by focusing on nonhuman nature and remote geographies.⁽¹⁷⁾ This may impede the arousal of negative emotions that are productive for public engagement.^(18,19)

Can communicating about a risk—in this case, climate change—in terms of its potential solutions, rather than its impacts or causes, differentially affect citizens' emotions and support for policies to mitigate that risk? In this study, we integrate literature from risk communication, political science, and media effects to inform an online survey experiment with a national sample that tests the influence of news visuals and texts that emphasize either the causes and impacts of climate change or actions that can be taken to address climate change. We test both the main and interactive effects of variations in text and imagery on the discrete emotions of hope, fear, and anger, and, indirectly, on support for climate mitigation policies. Recognizing the stark ideological divides in public opinion about climate change,⁽²⁰⁾ we also build on theories of motivated reasoning and affective intelligence to examine political ideology as a moderator of these effects. Of particular interest is whether certain imagery and textual variations and, in turn, the emotional responses induced by these treatments, may help ameliorate the persistent and growing ideological polarization on the issue.

Despite our increasingly multimodal media environment, we know very little about how images augment and interact with news texts about risk issues to influence key outcomes such as emotions and policy support.⁽²¹⁾ By addressing this research gap, the present study provides a more complete understanding of how media coverage of climate change may affect audiences. Moreover, knowledge of how text, imagery, and ideology interact in their influence on emotions and policy support can help inform communication strategies that aim to effectively engage citizens from across the ideological spectrum with controversial risks like climate change, while also contributing to our theoretical understanding of media effects and the antecedents of public opinion in the context of risk-related issues. Ultimately, we find that action-oriented imagery and text can help increase hope, whereas impacts-oriented information is more evocative of fear and anger. Further, we find that emotional reactions to media content drive public opinion about climate policies but that the implications of this effect for ideological polarization

depend on the emotion: media-induced hope and especially fear can help reconcile opinion gulfs between liberals and conservatives, whereas anger is polarizing.

1.1. The Influence of News Text and Imagery on Emotions

Emotions are psychological responses of varying strength and duration that are evoked in response to an external stimulus.⁽²²⁾ Fear, anger, and hope are discrete emotions, in that they have “unique appraisal patterns, motivational functions, and behavioral associations.”^(22, p. 290) However, all three represent reactions to an external threat, a commonality that makes them particularly relevant to study in the context of a risk like climate change. Lazarus,^(23,24) in his comprehensive theory of discrete emotions, defines emotions in terms of their “core relational theme.” For anger, this is “a demeaning offense against me and mine”; for fear, “confronting an immediate, concrete, and overwhelming physical danger”; and for hope, “fearing the worst but yearning for better and believing the wished-for improvement is possible.”^(24, p. 16)

Changes in message content, including news stories, can induce discrete emotions.^(25–29) News stories influence audiences' emotions by altering their interpretations of an issue or event.^(27,30) News visuals are considered particularly potent for engaging audience emotions,^(31,32) in part because visuals are processed quickly and intuitively, thereby facilitating memory.^(31,33) Also, visuals help capture and direct attention and, as such, provide a salient entry point to a news story.^(34,35) Moreover, individuals see images as highly credible and often take them as veridical representations of reality,^(31,36) which may promote an emotional connection with an image's subject.

Studies show that visual imagery in news stories can evoke negative emotions, including fear and anger, above and beyond any effect of the text.^(21,29,37) These studies mostly have been conducted in the context of war and conflict. In particular, images that depict danger, such as an image of terrorism victims, evoke fear, whereas images that depict an injustice and especially those that identify a perpetrator responsible for the suffering elicit anger.⁽³⁰⁾ To our knowledge, the effects of news visuals on hope have not previously been studied experimentally, which is consistent with the dearth of research on discrete positive emotions overall.⁽²²⁾

1.2. The Effects of Climate Change Visuals and Texts on Emotions

What types of climate change news visuals and texts are likely to influence individuals' emotions? Past studies point to key content dimensions along which emotions may shift—namely, based on the extent to which news messages portray the causes, impacts, or mitigative actions associated with climate change.^(18,19,38) Because messages that stress climate change's causes and/or impacts often do so by portraying a clear threat—either in terms of a danger, injustice, or both—they are apt to elicit fear and anger while minimizing hope. In contrast, messages that focus on actions that can address the danger or injustice posed by climate change offer the promise of a desired outcome and are thereby likely to evoke hope while reducing fear and anger.

Scholars have used Q-sort methods to explore how individuals orient to climate change imagery.^(19,38) In these studies, participants were asked to rank climate images on dimensions of salience and efficacy. Across studies, images of climate impacts, particularly aerial views of floods, were ranked highest in terms of salience—that is, the belief that climate change is important. Smokestack images, which connote climate pollution, also promoted salience. These same images, however, were ranked lowest when it came to self-efficacy, or individuals' sense that they can do something about climate change. Rather, images of actions that can be taken to mitigate climate change—especially images of energy futures such as solar panels and, to a lesser extent, of lifestyle choices such as political protest—were seen as most empowering. Although these studies did not explicitly measure discrete emotional responses, such responses are implicit in the data; when asked to reflect on the results, participants noted that impact imagery made them feel powerless, overwhelmed, and scared.⁽³⁸⁾ Reactions to smokestack images were characterized by feelings of disgust and distress levelled at industry and government, while participants associated action-oriented images with positive feelings and the possibility for personal change. In a more direct exploration of affective responses, Leviston *et al.*⁽¹⁸⁾ interviewed Australians in a series of workshops and asked them to categorize their emotional reactions to various climate images. They found that images of natural disasters and extreme weather (e.g., flooding), as well as climate pollution (e.g., smokestacks), evoked negative emotions like fear and anger, whereas images of

climate solutions (e.g., solar panels) aroused positive emotions (also see Ref. 39).

Although informative, the aforementioned research relies on small, nongeneralizable samples and captures emotional responses through interviews with participants; it does not necessarily tell us what *effects* variations in visual climate change communication will have on audience emotions, or whether these emotions can, in turn, activate support for climate mitigation policy. Thus, the current study builds on this past research to experimentally test the effects of four types of climate images found to elicit the strongest and most consistent reactions from participants: they were associated with either a sense of helplessness, fear, and anger (i.e., aerial flood view, smokestacks) or a sense of empowerment and hope (solar panels, political protest). We hypothesize that relative to a news story with no image, a news story that includes an image of either flooding or polluting smokestacks will increase fear and anger but decrease hope, whereas a news story that includes an image of climate-focused actions (i.e., solar panels or political protest) will decrease fear and anger but increase hope (*Hypothesis 1*).

Several studies have examined how textual information about climate-related impacts and actions influence emotions. One experimental study found that news stories that discussed actions to address the negative consequences of climate change increased hope and lessened fear, relative to a story that only discussed the negative consequences.⁽⁸⁾ Another experiment found that a message that emphasized the possibility of individual action to improve the climate increased hope.⁽⁴⁰⁾ Survey research has further demonstrated that stories about climate impacts elicit higher fear and anger ratings than stories about climate solutions.⁽³⁹⁾ Thus, we expect that relative to a news text that only discusses the impacts of climate change, a news text that discusses either impacts along with actions to address climate change or actions alone will decrease fear and anger but increase hope (*Hypothesis 2*).

1.3. The Interaction between Text and Images

Recently, scholars have stressed the importance of analyzing the effects of visuals in interaction with news texts rather than in isolation,^(21,41,42) which is an additional aim of the present study. Past research suggests that presenting media messages via both text and pictures improves learning and memory,^(33,43,44) particularly when the image and text

have congruent or reinforcing meanings.^(45,46) Congruent messages benefit from the elevated salience, richness, and memorability of visuals as well as the logical structure of the text.⁽⁴²⁾ In other words, the image and text work together, producing a greater effect on audiences than either alone. However, visual and textual information in climate change news stories tend to pull in different narrative directions.⁽⁴⁷⁾ Less is known about how audiences respond when the image and text are incongruent.⁽⁴²⁾ On one hand, the image may overwhelm the accompanying text,^(32,48) given individuals' superior recall for visuals over text.⁽³³⁾ On the other hand, the image may help attract attention to the text,⁽⁴⁴⁾ but the syntactical structure of the text will exert the prevailing influence.^(21,48) Most prior research examining the multimodal influence of images and text has analyzed effects on information recall⁽⁴³⁾ or, occasionally, issue perceptions,⁽⁴⁸⁾ and very few studies have manipulated both textual and image content simultaneously. However, one recent study⁽²¹⁾ examined the effects of varying both image and textual news content on emotional reactions, finding that images but not text influenced emotions, with no interaction between text and imagery. In other words, the influence of image content occurred regardless of the congruence or incongruence of the text.

Given the mixed empirical findings, our hypothesis is more tentative in this area; however, we expect an interaction between imagery and text, such that the predicted effects of the news text on fear, anger, and hope will be weakened in the presence of contradictory imagery (e.g., a news story about impacts with action imagery) and strengthened in the presence of reinforcing imagery (e.g., a news story about impacts with impact imagery) (*Hypothesis 3*).

1.4. The Moderating Role of Ideology

U.S. public opinion about climate change is divided along ideological lines, with liberals and—to a lesser extent—moderates more concerned about climate change and supportive of policies to address it than conservatives.^(6,20) In turn, liberals and conservatives often exhibit divergent responses to information about climate change.⁽⁴⁹⁾ This results from motivated reasoning, whereby people with strong ideological commitments actively counter-argue and/or defensively avoid information that contradicts their beliefs while readily accepting supportive information.⁽⁵⁰⁾ Research also has shown that

individuals' emotional reactions to a news article vary according to their political ideology.⁽⁵¹⁾ Although most research on motivated reasoning concerns responses to textual information, prior studies indicate that how individuals attend to, interpret, and react to images also is contingent on their existing predispositions.⁽⁵²⁾ Gadarian⁽⁵³⁾ found that images lose their potency in a polarized political climate and particularly when the image itself is attached to a particular political party's policies. In such cases, an image will be emotionally evocative or persuasive only among those who share an identity with the party associated with the image. Thus, to the extent that climate change is considered a liberal issue, related images may be dismissed by conservatives—although this moderating effect may be minimized somewhat when the image is presented by a nonpartisan news source rather than for political purposes.⁽⁵³⁾

Accordingly, we hypothesize interactions between the text manipulation and ideology (*Hypothesis 4*) and between the imagery manipulation and ideology (*Hypothesis 5*) such that the respective treatment effects on emotions will be weaker among conservatives relative to liberals and moderates. This is because both liberals and moderates are more accepting of climate change and thus likely to be more open to information about climate change than conservatives. However, given that images are generally considered more emotionally arousing than text⁽³¹⁾ and, even when potentially polarizing, retain their influence regardless of individuals' political orientations as long as the images are not sponsored by a political party,⁽⁵³⁾ we expect that the interaction will be weaker for imagery than for text.

1.5. The Effect of Emotions on Policy Support

Emotional reactions to news content are important because of their potential effects on public opinion.^(26,30) For example, in their affective intelligence theory, Marcus *et al.*⁽⁵⁴⁾ argue that citizens' emotional systems play a critical role in shaping their judgments and behavior during election campaigns. The surveillance system, which is associated with fear and anxiety, stimulates attention, learning, and information seeking, and can inspire a reconsideration of partisan loyalties. In contrast, the disposition system, which is related to hope and enthusiasm, encourages citizens' interest and involvement in the campaign but also their reliance on partisanship when

voting.³ Similarly, risk communication research finds that when forming judgments about risks such as climate change, people rely on an “affect heuristic,” a processing shortcut via which individuals make decisions based on how they feel about an issue.⁽⁶⁰⁾

In the specific context of climate change, emotions play an important role in shaping risk perceptions and policy support.^(9,61,62) Negative emotions, in particular, may help stimulate deeper information processing and thus make people more attentive to risks and to the policies that can be used to address them.⁽²⁸⁾ Fear and anger are related to greater support for policies designed to mitigate climate change.^(9,62,63) Among positive emotions, hope is strongly associated with support for climate mitigation policies.⁽⁹⁾ In turn, we expect that hope, anger, and fear will be positively related to support for emissions-reduction policies that offer a means to resolve the threat of climate change (*Hypothesis 6*).

Political ideology, however, is likely to moderate the effects of emotions on climate policy support. Drawing from affective intelligence theory, MacKuen, Wolak, Keele, and Marcus⁽⁵⁷⁾ argue that discrete emotional reactions to information about a proposed policy influence partisans’ desire for political compromise. In an experimental study, they found that fear, because it reduces reliance on habits and facilitates open-mindedness, encourages people to adopt conciliatory views; whereas anger, because it signals the desire to confront an adversary, results in more entrenched opinions. They found that hope increases individuals’ willingness to compromise, but only when considering a policy that is counter to their political predispositions. If the policy is consistent with their attitudes, hope limits their openness to compromise.

Some evidence exists for political orientation as a moderator of emotional effects on policy in the context of climate change. For example, studies have found that fear,⁽⁶³⁾ as well as the positive emotion of compassion,⁽⁶⁴⁾ can encourage opinion moderation among conservatives and break through partisan divides on climate change. Anger, on the other hand, tends to reinforce existing opinions.⁽⁶²⁾ Follow-

ing from this prior research, we hypothesize an interaction between emotions and ideology in predicting policy support (*Hypothesis 7*). We expect that anger will reinforce ideologues’ predispositions toward climate policy, leading to greater support among liberals but less support among conservatives. In contrast, fear and hope should encourage moderation among conservatives, and thus be positively related to policy support for this group. Hope and fear also are likely to increase support among liberals, but this relationship may not be as strong as for conservatives, given that liberals already are predisposed to support climate policies.

Finally, we hypothesize indirect effects from the imagery and text manipulations to policy support via the discrete emotions of fear, anger, and hope;^(26,30) however, given the expected interactions between imagery and ideology, and text and ideology, respectively, in predicting emotions and, in turn, between emotions and ideology in predicting policy support, the nature of these indirect effects should be conditional on ideology (*Hypothesis 8*). See Table I for a summary of the study’s hypotheses.

2. METHOD

An online experiment was fielded in May 2015. The study utilized a 5 (*type of imagery*: flood, smokestacks, solar panels, political march, or no image) \times 3 (*text*: impacts only, actions only, or both impacts and actions) between-subjects factorial design. The experimental news stimulus was embedded within an online survey designed and hosted on the Qualtrics platform.

2.1. Sample

A sample of 1,575 adults was recruited from a national paid opt-in online survey panel through Qualtrics Panels. Qualtrics selects potential study participants from traditional, actively managed market research panels, recruited via email sign-up, web banners, social media, and invitation-only methods. Quotas were used to ensure age, gender, race, and ethnicity distributions that approximated census estimates. The sample was 49% female, 72% white, and 13% Hispanic, with a mean age of 45.6 ($SD = 14.5$).

2.2. Procedure and Stimuli

After consenting to participate and answering demographic questions, participants were randomly

³Affective intelligence theory identifies enthusiasm as a central emotion of the disposition system. In studies based on affective intelligence theory, enthusiasm is measured inconsistently; however, “hope” is almost invariably included as an indicator and, in fact, is included more often than “enthusiasm” itself.^(25,54–59) Thus, it could be argued that the findings from these studies represent the effects of hope as much as, if not more so than, the effects of enthusiasm.

Table I. Summary of Predicted Effects

Hypothesis	Predictor	Outcome Variable			
		Hope	Fear	Anger	Policy Support
H1	Imagery ^a				
	Flood	–	+	+	n/a
	Smokestacks	–	+	+	n/a
	March	+	–	–	n/a
	Solar	+	–	–	n/a
H2	Text ^b				
	Actions Only	+	–	–	n/a
	Actions + Impacts	+	–	–	n/a
H3	Text × Imagery	Predicted text effects on emotions should be stronger when image is congruent, weaker when image is incongruent			n/a
H4	Text × Ideology	Predicted text effects on emotions should be weaker among conservatives than among liberals and moderates			n/a
H5	Imagery × Ideology	Predicted imagery effects on emotions should be weaker among conservatives than among liberals and moderates			n/a
H6	Emotions				
	Hope	n/a	n/a	n/a	+
	Fear	n/a	n/a	n/a	+
	Anger	n/a	n/a	n/a	+
H7	Emotions × Ideology				
	Hope × Ideology	n/a	n/a	n/a	+ among all groups, but strongest among conservatives
	Fear × Ideology	n/a	n/a	n/a	+ among all groups, but strongest among conservatives
	Anger × Ideology	n/a	n/a	n/a	+ among liberals, – among conservatives
H8	Conditional Indirect Effects	Indirect effects of the imagery and text manipulations on policy support are predicted via fear, anger, and hope, and these effects will be conditional on ideology			

Note. – indicates a negative predicted effect. + indicates a positive predicted effect.

^aThe direction of the imagery effects are predicted compared to the No Image condition.

^bThe direction of the text effects are predicted compared to the Impacts Only condition.

assigned to see one of 15 versions of a news article about climate change (i.e., three text conditions crossed with five image conditions; $n = 105$ per cell). The news text discussed U.S.-based impacts and

actions in the context of the 2014 National Climate Assessment.⁽⁶⁵⁾ The text and headline of the article were manipulated to emphasize either (1) the impacts of climate change for weather, the economy,

public health, and agriculture (Headline: “National Climate Assessment Offers Stark Warnings”); (2) possible actions to address climate change, including regulating power plant emissions and investing in renewable energy sources (Headline: “National Climate Assessment Offers Possibilities for Action”); or (3) both impacts and actions (Headline: “National Climate Assessment Offers Stark Warnings, Possibilities for Action”). The articles were attributed to *The Associated Press* and formatted to resemble an online news article. All information in the articles was factually accurate and adapted from previously published news reports. The impacts-only and actions-only articles were each approximately 190 words; the article that combined information about both impacts and actions was necessarily longer (377 words).

The imagery condition was manipulated by embedding one of four color photographs in the news article: (1) an aerial view of flood damage in Colorado, (2) smokestacks at a Pennsylvania generating station, (3) workers installing solar panels on the roof of a California home, or (4) citizens demonstrating in New York City during the 2014 People’s Climate March. The images were domestically focused to increase a sense of local relevance and reduce distancing effects by making causes, impacts, and actions more relatable (see Ref. 19). Each included a descriptive caption that specified the date and location of the image. A fifth of respondents saw only the article text, with no accompanying image.⁴

⁴Two questions at the end of the survey gauged, respectively, whether participants (1) remembered and interpreted the article text appropriately and (2) recalled the image they were shown. Both questions were multiple choice and included an unsure option. The first question asked whether the article discussed the impacts of climate change, proposed actions to address climate change, or both. On average, 59% of participants answered this question correctly based on the text condition to which they were assigned (to account for the possibility that participants may have been factoring the image they saw into their answer, participants also were coded as “correct” if they answered “both” and saw an impacts article and actions image or vice versa). The second question asked whether the image that appeared in the article depicted workers installing solar roof panels, flood damage in Colorado, demonstrators during the People’s Climate March, smokestacks at a generating station, or if the article didn’t include an image. On average, 78% of participants correctly recalled the image. To correct for people who did not accurately recall the stimulus, we reran the analysis two ways: (1) dropping respondents who did not answer both questions correctly ($N = 831$) and (2) dropping respondents who answered both questions incorrectly ($N = 162$). In both cases, the pattern of results was largely

unchanged from the analyses reported in the main text. Specific differences are available from the authors by request.

Participants were instructed to read the article carefully and told that questions about the article would follow. After reading the article, participants completed a survey that measured their emotional reactions to the story and climate policy support, among other variables.

Randomization to condition was successful on key demographic variables, including age, education, income, gender, race, and ethnicity.

2.3. Measures

2.3.1. Emotions

Participants indicated how much they had felt each of several emotions while reading the news story, on a scale from 1 “not at all” to 7 “very.” Following past research,⁽⁶⁶⁾ our measure of *hope* averaged responses for “hopeful,” “optimistic,” and “inspired” (Cronbach’s $\alpha = 0.83$; $M = 4.08$, $SD = 1.49$). Our measure of *fear* averaged responses for “fearful,” “anxious,” and “overwhelmed” ($\alpha = 0.88$; $M = 3.97$, $SD = 1.63$). *Anger* was measured with a single item, “angry” ($M = 3.90$, $SD = 1.79$).

2.3.2. Support for Climate Mitigation Policies

Participants indicated their level of support for six policies that have been proposed to address climate change: (1) regulating carbon dioxide and other greenhouse gases as pollutants, (2) regulating greenhouse gas emissions from power plants, (3) requiring power companies to produce at least 20% of their electricity from wind, solar, or other renewable energy sources, (4) increasing government investment in renewable energy industries like wind and solar, (5) providing tax rebates for people who purchase energy-efficient vehicles or solar panels, and (6) signing an international treaty that requires the United States to cut its emissions of carbon dioxide by the year 2050. Participants responded from 1 “strongly oppose” to 7 “strongly support,” with 4 “neither support nor oppose” as the midpoint. Responses to all six items were averaged together to create a scale ($\alpha = 0.93$; $M = 5.59$, $SD = 1.36$).

unchanged from the analyses reported in the main text. Specific differences are available from the authors by request.

2.3.3. Political Ideology

Participants placed themselves on a seven-point scale ranging from 1 “very liberal” to 7 “very conservative” ($M = 3.99, SD = 1.56$). Ideology was not treated as a continuous variable because the interactions between the message treatments and ideology were nonlinear. Thus, political ideology was recoded into a categorical variable, distinguishing between liberals (1–3 on original scale; $n = 481, 30.5\%$), moderates (4 on original scale, $n = 609, 38.7\%$), and conservatives (5–7 on original scale, $n = 485, 30.8\%$).

2.3.4. Control Variables

Because the relationship between emotions and policy support could be subject to spuriousness, analyses predicting policy support controlled for age, gender, race, ethnicity, income, and education. Education was measured on a 10-point ordinal scale, where 1 = “grade 8 or lower,” 2 = “some high school, no diploma,” 3 = “high school diploma or equivalent,” 4 = “technical or vocational school after high school,” 5 = “some college, no degree,” 6 = associate degree or 2-year college degree,” 7 = “Bachelor’s degree,” 8 = “Master’s degree,” 9 = “Professional degree (MD, DDS, LLB, JD, etc.),” and 10 = “Doctorate degree (PhD, etc.)” ($Mdn =$ “some college;” $M = 5.61, SD = 1.75$). Income was measured on a nine-point ordinal scale, with each level representing an income range of \$19,999, anchored by 1 = “less

than \$20,000” and 9 = “\$160,000 or higher” ($Mdn =$ \$40,000 – \$59,999; $M = 3.33, SD = 1.98$).

The analyses also controlled for ecological beliefs, which are an important predictor of climate change attitudes.⁽⁶⁷⁾ Ecological beliefs were measured using a seven-item subset⁽⁶⁸⁾ of the New Environmental Paradigm (NEP) Scale.⁽⁶⁴⁾ Participants indicated their level of agreement with the following statements: (1) “The balance of nature is very delicate and easily upset by human activities,” (2) “Ecological, rather than economic, factors must guide our use of natural resources,” (3) “We attach too much importance to economic measures of the well-being of our society,” (4) “We are approaching the limit of the number of people the earth can support,” (5) “When humans interfere with nature, it often produces disastrous consequences,” (6) “Humans must live in harmony with nature in order to survive,” and (7) “There are limits to growth beyond which our industrialized society cannot expand.” Response options ranged from 1 “strongly disagree” to 7 “strongly agree,” with 4 “neither agree nor disagree” as the midpoint. Responses were averaged to form a scale ($\alpha = 0.84; M = 5.20, SD = 1.06$).

3. RESULTS

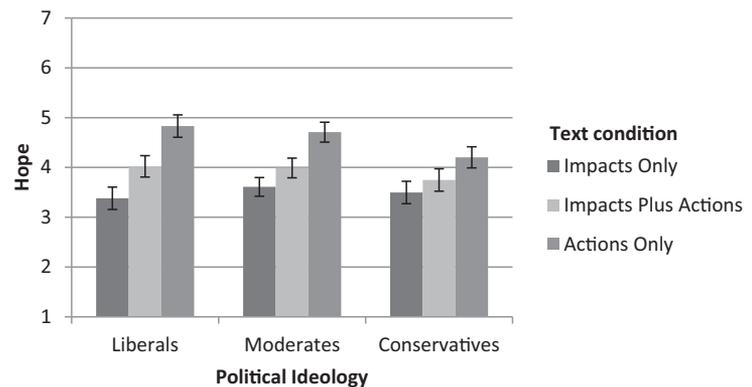
We first test tested the main and interactive effects of the imagery manipulation, text manipulation, and ideology on hope, fear, and anger, respectively, using a three-way analysis of variance (ANOVA).

Table II. Adjusted Marginal Means for Emotion Variables Across Image and Text Conditions

Text Condition	Imagery Condition					Total
	No Image	Flood	Smokestacks	March	Solar	
Hope						
Impacts Only	3.47 (0.14)	3.42 (0.14)	3.53 (0.14)	3.54 (0.14)	3.78 (0.14)	3.55 (0.06)
Impacts + Actions	4.01 (0.14)	3.90 (0.14)	4.02 (0.14)	4.03 (0.14)	4.15 (0.14)	4.02 (0.06)
Actions Only	4.65 (0.14)	4.46 (0.14)	4.75 (0.14)	4.55(0.14)	4.92 (0.14)	4.66 (0.06)
Total	4.04 (0.08)	3.93 (0.08)	4.10 (0.08)	4.04(0.08)	4.28 (0.08)	4.08 (0.04)
Fear						
Impacts Only	4.60 (0.15)	4.36 (0.15)	4.47 (0.15)	4.39 (0.15)	4.31 (0.15)	4.42 (0.07)
Impacts + Actions	4.04 (0.15)	4.39 (0.15)	4.12 (0.15)	4.01 (0.15)	4.15 (0.15)	4.14 (0.07)
Actions Only	3.50 (0.15)	3.48 (0.15)	3.37 (0.15)	3.00 (0.15)	3.18 (0.15)	3.31 (0.07)
Total	4.05 (0.09)	4.08 (0.09)	3.88 (0.09)	3.80 (0.09)	3.88 (0.09)	3.96 (0.04)
Anger						
Impacts Only	4.39 (0.17)	4.51 (0.17)	4.38 (0.17)	4.17 (0.17)	4.04 (0.17)	4.30 (0.08)
Impacts + Actions	4.09 (0.17)	4.39 (0.17)	4.26 (0.17)	4.01 (0.17)	4.18 (0.17)	4.19 (0.08)
Actions Only	3.23 (0.17)	3.52 (0.17)	3.25 (0.17)	3.01 (0.17)	2.99 (0.17)	3.20 (0.08)
Total	3.90 (0.10)	4.14 (0.10)	3.96 (0.10)	3.73 (0.10)	3.74 (0.10)	3.89 (0.04)

Note. Standard errors in parentheses.

Fig. 1. Mean levels of hope across text conditions and ideological groups with 95% CIs.



The ANOVA results for hope showed significant main effects of the imagery treatment ($F(4, 1526) = 2.59, p < 0.05, \eta^2 = 0.007$), text treatment ($F(2, 1526) = 79.84, p < 0.001, \eta^2 = 0.09$), and ideology ($F(2, 1525) = 4.43, p < 0.05, \eta^2 = 0.006$). Table II displays the cell means across the imagery and text conditions. For the main effect of imagery, planned contrasts comparing mean levels of hope in each image condition to the no-image condition indicated that only the solar image was significantly different from no image ($t(1526) = 2.1, p < 0.05$). *Post hoc* tests of the estimated marginal means using the Šidák correction also showed significant differences between the solar and flood conditions ($t(1525) = 3.1, p < 0.05$). For the main effect of the text treatment, planned contrasts indicated that hope was significantly higher in the actions-only condition ($t(1526) = 12.5, p < 0.001$) and in the impacts plus actions condition ($t(1526) = 5.3, p < 0.001$) relative to the impacts-only condition. This effect, however, was moderated by ideology ($F(4, 1526) = 3.42, p < 0.01, \eta^2 = 0.009$; see Fig. 1). As predicted, the simple effect of the text treatment among conservatives was smaller ($F(2, 1526) = 10.3, p < 0.001, \eta^2 = 0.01$) than it was for liberals ($F(2, 1526) = 44.0, p < 0.001, \eta^2 = 0.05$) and moderates ($F(2, 1526) = 32.5, p < 0.001, \eta^2 = 0.04$). Among conservatives, the difference between the actions-only and impacts-only conditions was significant ($t(1526) = 4.5, p < 0.001$) but not the difference between the impacts-only and impacts plus actions conditions. For liberals and moderates, both pairwise differences were significant (liberals: actions only vs. impacts only, $t(1526) = 9.4, p < 0.001$, impacts plus actions vs. impacts only, $t(1526) = 4.7, p < 0.001$; moderates: actions only vs. impacts only, $t(1526) = 8.0, p < 0.001$, impacts plus actions vs. impacts only, $t(1526) = 2.9, p < 0.05$). No other interactions were significant.

Turning to fear, the ANOVA results showed a nonsignificant main effect of the imagery treatment ($F(4, 1525) = 1.78, p = 0.13$); however, the main effects of the text treatment ($F(2, 1525) = 74.23, p < 0.001, \eta^2 = 0.09$) and ideology ($F(2, 1525) = 45.80, p < 0.001, \eta^2 = 0.06$) were significant. For the main effect of the text treatment, planned contrasts indicated that fear was significantly lower in the actions-only condition ($t(1525) = 11.4; p < 0.001$) and in the impacts plus actions condition ($t(1525) = 2.9; p < 0.01$) relative to the impacts-only condition. Text and ideology interacted ($F(4, 1525) = 3.26, p < 0.05, \eta^2 = 0.008$; see Fig. 2), such that the simple effect of the text treatment for liberals was larger ($F(2, 1525) = 44.1, p < 0.001, \eta^2 = 0.05$) than for moderates ($F(2, 1525) = 16.9, p < 0.001, \eta^2 = 0.02$) and conservatives ($F(2, 1525) = 16.7, p < 0.001, \eta^2 = 0.02$). For all three groups, the difference between the impacts-only and actions-only conditions was significant (liberals: $t(1525) = 8.6, p < 0.001$; moderates: $t(1525) = 5.5, p < 0.001$; conservatives: $t(1525) = 5.7, p < 0.001$), whereas the difference between the impacts-only and impacts plus actions conditions was not significant. No other interactions were significant.

The ANOVA results for anger revealed significant main effects of the imagery treatment ($F(4, 1525) = 3.10, p < 0.05, \eta^2 = 0.008$), text treatment ($F(2, 1525) = 64.08, p < 0.001, \eta^2 = 0.08$), and ideology ($F(2, 1525) = 15.55, p < 0.001, \eta^2 = 0.02$). For the main effect of imagery, none of the planned contrasts between the image and no-image conditions were significant. However, *post hoc* tests using the Šidák correction showed differences between the flood and both the solar ($t(1525) = 2.9; p < 0.05$) and march conditions ($t(1525) = 3.0; p < 0.05$). For the main effect of the text treatment, planned contrasts indicated that anger was significantly lower in the

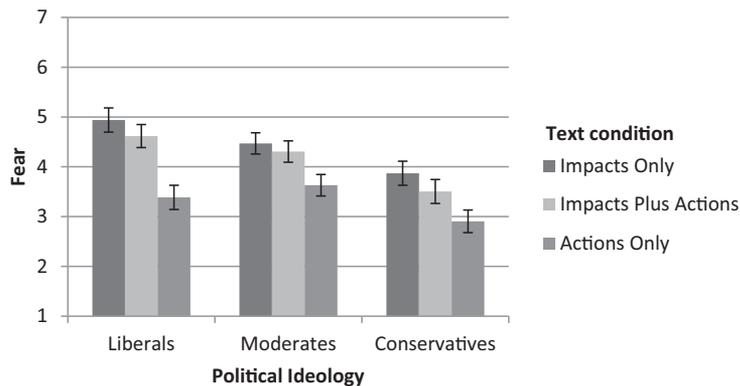


Fig. 2. Mean levels of fear across text conditions and ideological groups with 95% CIs.

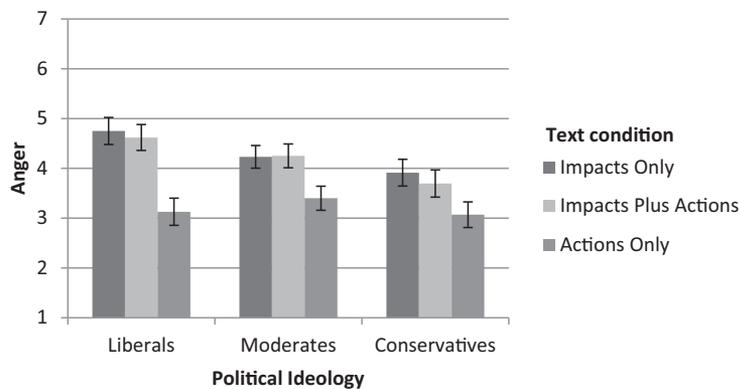


Fig. 3. Mean levels of anger across text conditions and ideological groups with 95% CIs.

actions-only condition than in the impacts-only condition ($t(1525) = 10.3; p < 0.001$); the difference between the impacts plus actions and the impacts-only conditions was not significant. As with fear, the interaction between text and ideology was significant ($F(4, 1525) = 3.89, p < 0.01, \eta^2 = 0.01$; see Fig. 3), such that the simple effect of the text treatment among liberals was larger ($F(2, 1525) = 42.9, p < 0.001, \eta^2 = 0.05$) than it was for moderates ($F(2, 1525) = 15.9, p < 0.001, \eta^2 = 0.02$) and conservatives ($F(2, 1525) = 10.7, p < 0.001, \eta^2 = 0.01$). For all three groups, the difference between the impacts-only and actions-only conditions was significant (liberals: $t(1525) = 8.3, p < 0.001$; moderates: $t(1525) = 4.9, p < 0.001$; conservatives: $t(1525) = 4.4, p < 0.001$), whereas the difference between the impacts-only and impacts plus actions conditions was not significant. No other interactions were significant.

Based on these results, H1 received only limited support; H2 was supported (with the exception of the nonsignificant difference between actions plus impacts and impacts only for anger), H3 was not supported, H4 was partially supported, and H5 was not supported (see Table I). Also, although not hypothesized, we examined the direct treatment effects on

policy support; neither the main nor interactive effects were significant.

Next, to test the direct effects of emotions on policy support and the indirect effects of the imagery and text manipulations on policy support via emotions, both conditional on ideology, we used the SPSS PROCESS macro.⁽⁶⁹⁾ PROCESS provides OLS regression coefficients as well as bootstrapped confidence intervals for the indirect effects. As a test of mediation, bootstrap methods, which do not assume normality, are considered superior to alternatives such as the Sobel test or causal steps approach.⁽⁶⁹⁾ The bootstrap analysis was conducted with 10,000 iterations and bias-corrected estimates. Because the ANOVAs revealed a significant interaction between the text treatment and political ideology on emotions, we accounted for this interaction in our model, along with the proposed interactions between emotions (mean-centered) and ideology on policy support. Because there were no interactions involving the imagery treatment, we did not model any additional interaction terms. The indirect effects of the text treatment were tested using PROCESS Model 76; the indirect effects of the imagery treatment, which did not include interactions with ideology,

Table III. OLS Regression Results Predicting Emotions and Policy Support

	Hope B (SE)	Fear B (SE)	Anger B (SE)	Policy Support B (SE)
Conceptual Variables				
Imagery Treatment ^a				
Flood	-0.06 (0.11)	0.06 (0.11)	0.25 (0.13)	0.08 (0.07)
Smokestacks	0.06 (0.11)	-0.09 (0.11)	0.05 (0.13)	0.0002 (0.07)
March	0.04 (0.11)	-0.16 (0.11)	-0.11 (0.13)	0.05 (0.07)
Solar	0.24 (0.11)*	-0.16 (0.11)	-0.16 (0.13)	0.06 (0.07)
Text Treatment ^b				
Impacts + Actions	0.31 (0.16)*	-0.29 (0.17)	-0.17 (0.20)	-0.05 (0.13)
Actions Only	0.71 (0.17)***	-0.96 (0.16)***	-0.85 (0.20)***	0.21 (0.14)
Political Ideology ^c				
Liberals	-0.39 (0.16)*	0.69 (0.16)***	0.61 (0.18)**	0.59 (0.11)***
Moderates	-0.05 (0.15)	0.30 (0.16)	0.17 (0.18)	0.28 (0.11)*
Text × Ideology Interactions				
Impacts/Actions × Liberal	0.44 (0.22)*	-0.04 (0.21)	0.04 (0.25)	0.13 (0.15)
Impacts/Actions × Moderate	0.07 (0.21)	0.11 (0.22)	0.16 (0.25)	0.002 (0.15)
Actions Only × Liberal	0.79 (0.22)***	-0.67 (0.23)**	-0.83 (0.27)**	-0.19 (0.18)
Actions Only × Moderate	0.41 (0.21)	0.18 (0.21)	0.04 (0.25)	-0.17 (0.18)
Emotions (mean-centered)				
Hope	-	-	-	0.20 (0.04)***
Fear	-	-	-	0.35 (0.05)***
Anger	-	-	-	-0.08 (0.04)*
Emotion × Ideology Interactions				
Hope × Liberal	-	-	-	-0.15 (0.04)**
Hope × Moderate	-	-	-	-0.09 (0.05)
Fear × Liberal	-	-	-	-0.35 (0.06)***
Fear × Moderate	-	-	-	-0.27 (0.06)***
Anger × Liberal	-	-	-	0.13 (0.05)**
Anger × Moderate	-	-	-	0.14 (0.05)**
Control Variables				
Age	0.006 (0.002)*	-0.001 (0.003)	0.006 (0.003)*	-0.007 (0.002)***
Gender (male)	0.13 (0.07)	-0.20 (0.07)**	-0.10 (0.09)	-0.05 (0.05)
Race (white)	-0.24 (0.08)**	-0.12 (0.08)	0.04 (0.10)	-0.13 (0.05)*
Ethnicity (Hispanic)	0.27 (0.11)*	.37 (0.11)***	0.26 (0.12)*	-0.02 (0.07)
Education	-0.04 (0.02)	-0.01 (0.02)	0.002 (0.02)	0.01 (0.01)
Income	0.007 (0.02)	.03 (0.02)	0.03 (0.02)	-0.01 (0.01)
Ecological Beliefs	0.27 (0.04)***	0.57 (0.03)***	0.42 (0.05)***	0.62 (0.03)***
Constant	2.20 (0.29)***	1.37 (0.28)***	1.47 (0.35)***	2.37 (0.21)***
R ²	0.16	0.28	0.17	0.57

Note. Unstandardized regression coefficients and Huber-White standard errors are reported. *N* = 1,568.

^aNo image is the reference category.

^bImpacts only is the reference category.

^cConservative ideology is the reference category.

****p* < 0.001; ***p* < 0.01; **p* < 0.05.

were tested using PROCESS Model 16, with the interactions between text and ideology entered as covariates. The no-imagery and impacts-only text conditions served as the respective reference categories in the analyses.⁵

⁵In the regression model predicting policy support, we detected some mild nonlinearity and heteroscedasticity. We experimented with several different approaches to minimize these violations (i.e., transformations of the dependent variable, deletion of

Table III reports the OLS regression results predicting the emotion mediators (hope, fear, and anger) from the treatment conditions and control variables, and predicting policy support from the

multivariate outliers, robust standard errors). In no case did these data modifications meaningfully change the results; thus, it seems that our results are robust to violations of regression assumptions. Still, Huber-White standard errors, which do not assume homoscedasticity, are reported for all regression models.

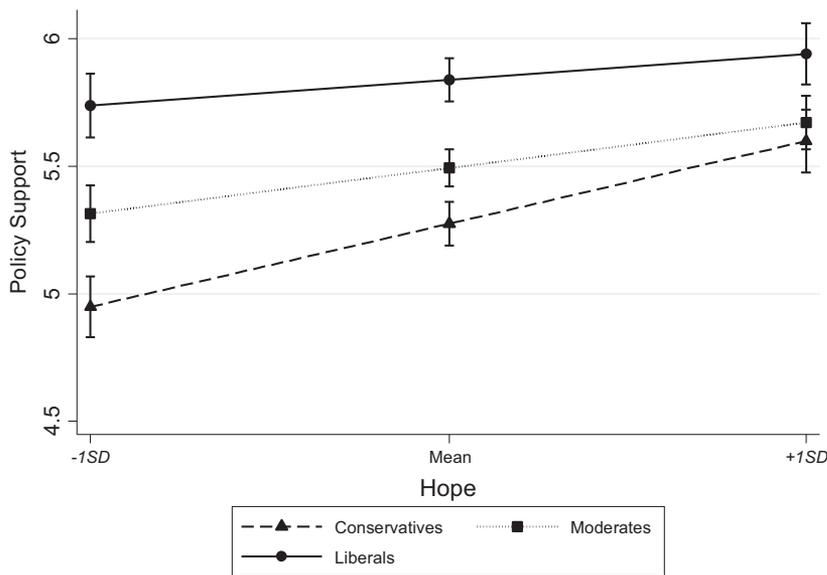


Fig. 4. Predicted values of policy support as a function of hope and ideology with 95% CIs.

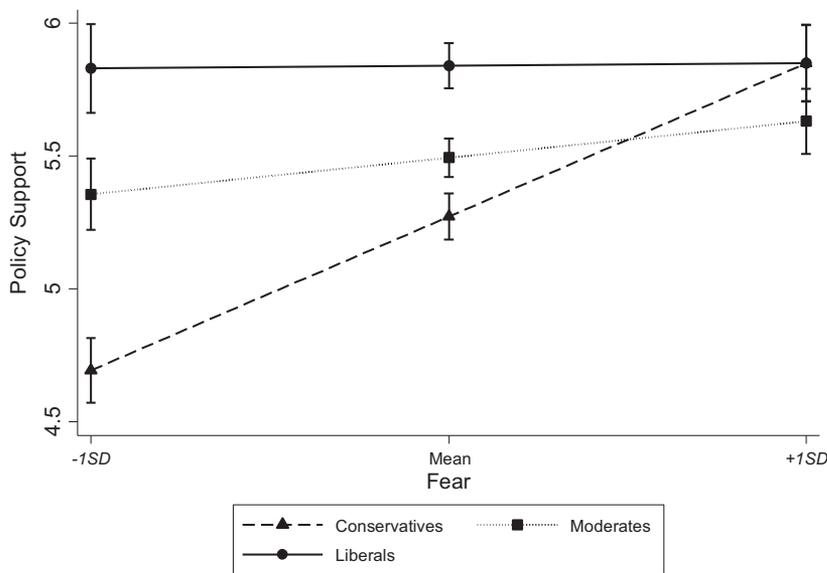


Fig. 5. Predicted values of policy support as a function of fear and ideology with 95% CIs.

treatment conditions, mediators, and control variables. The regression results predicting each of the emotions (columns 1–3) are consistent with the ANOVA results discussed previously, and thus are not elaborated further in the text. Looking to the impact of emotions on policy support (column 4), hope and fear are both positively related to support for climate mitigation policies, whereas anger is negatively related. The results for hope and fear are consistent with H6; the results for anger are not. However, as predicted by H7, there are significant interactions between the emotion variables and ideology. Using PROCESS, we probed the interactions to determine

the direct effect of each emotion on policy support for each ideological group. Hope is positively related to policy support among moderates ($B = 0.12, SE = 0.03, p < 0.001$) and especially conservatives ($B = 0.20, SE = 0.03, p < 0.001$); this relationship is not quite significant for liberals ($B = 0.06, SE = 0.03, p = 0.06$) (see Fig. 4). The positive association between fear and policy support is significant for conservatives ($B = .35, SE = 0.03, p < 0.001$) and moderates ($B = 0.08, SE = 0.03, p < 0.05$) but not for liberals ($B = 0.006, SE = 0.04, p = 0.88$) (see Fig. 5). The relationship between anger and policy support is negative and significant for conservatives ($B = -0.08,$

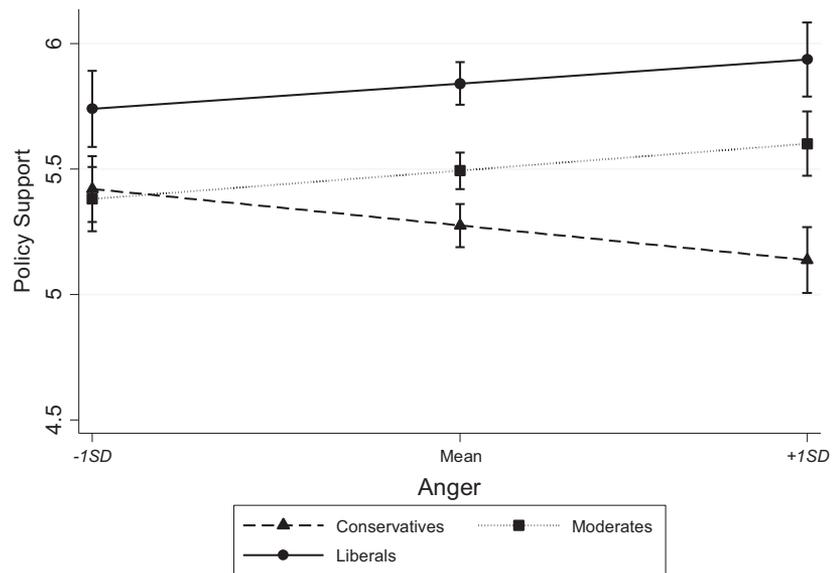


Fig. 6. Predicted values of policy support as a function of anger and ideology with 95% CIs.

Table IV. Conditional Indirect Effects of Text Conditions on Policy Support via Emotional Mediators across Levels of Political Ideology

Mediator	Political Ideology	Impacts Plus Actions Condition ^a		Actions-Only Condition ^a	
		Indirect Effect (Boot SE)	Boot 95% CI	Indirect Effect (Boot SE)	Boot 95% CI
Hope	Liberal	0.04 (0.02)	0.009, 0.090	0.09 (0.04)	0.016, 0.167
	Moderate	0.04 (0.02)	0.015, 0.096	0.13 (0.04)	0.070, 0.216
	Conservative	0.06 (0.03)	0.005, 0.143	0.15 (0.04)	0.074, 0.246
Fear	Liberal	-0.002 (0.01)	-0.031, 0.019	-0.01 (0.06)	-0.124, 0.099
	Moderate	-0.01 (0.01)	-0.053, 0.003	-0.07 (0.03)	-0.140, -0.015
	Conservative	-0.10 (0.06)	-0.230, .014	-0.34 (0.08)	-0.512, -0.208
Anger	Liberal	-0.007 (0.01)	-0.036, 0.008	-0.09 (0.04)	-0.181, -0.004
	Moderate	-0.0005 (0.01)	-0.024, 0.019	-0.05 (0.03)	-0.110, 0.0008
	Conservative	0.01 (0.02)	-0.011, 0.071	0.07 (0.04)	0.003, 0.164

Note. Bootstrapped standard errors and confidence intervals were computed using 10,000 bootstrap samples. Bold text is used to denote significant effects, $p < 0.05$.

^aRelative to the impacts-only condition.

$SE = 0.03, p < 0.01$), whereas it is positive and significant for moderates ($B = 0.06, SE = 0.03, p < 0.05$) and positive but nonsignificant for liberals ($B = 0.05, SE = 0.03, p = 0.12$) (see Fig. 6). These patterns are generally consistent with H7, such that the positive relationships between fear and hope, respectively, and policy support are largest among conservatives, whereby anger has a divergent relationship with policy support among liberals (positive) and conservatives (negative).

Turning to the conditional indirect effects of the imagery conditions on policy support via the emotion mediators, the solar condition had small but significant indirect effects, via hope, on policy support for

liberals ($B = 0.01, SE = 0.01, LCI = 0.001, UCI = 0.039$), moderates ($B = 0.03, SE = 0.01, LCI = 0.003, UCI = 0.064$), and conservatives ($B = 0.05, SE = 0.02, LCI = 0.006, UCI = 0.104$). Thus, exposure to the solar image, as compared to no image, indirectly increased policy support through its effect on hope for all ideological groups. None of the other imagery conditions exerted significant indirect effects on policy support through emotions for any ideological group.

Table IV reports the bootstrapped indirect effects of the text conditions on policy support via hope, fear, and anger across ideological groups. Among liberals, moderates, and conservatives, both

the impacts plus actions and the actions-only conditions had significant, positive indirect effects on policy support via hope. The actions-only condition significantly decreased policy support via fear for moderates and especially conservatives; this effect was not significant for liberals. The actions-only condition also indirectly decreased policy support via anger for liberals and moderates, although this effect was significant only for liberals; in contrast, the indirect effect through anger for conservatives was positive and significant. There were no other significant indirect effects of the text manipulation. Thus, H8 was only partially supported.

4. DISCUSSION

The results of the present experimental study suggest that including climate imagery in news stories has a limited effect on emotions. Only the solar image significantly increased hope relative to no image. When compared to no image, no other effects of the image manipulation on hope, fear, or anger were significant. It is unclear why the images did not have a more powerful effect on emotions, as predicted. It may be that any effects of the images were overwhelmed by the article text⁽⁴⁸⁾ and, in particular, by the article headlines, which participants may have read before processing the image.⁽⁷⁰⁾ Still, it is notable that the flood and smokestack imagery, which prior studies have found to be especially salience inducing,⁽³⁸⁾ had no emotional effects here. This may be because, as suggested by previous research,⁽²⁹⁾ the presence of text dampens negative emotional reactions to disaster imagery through its emphasis on reasoning and logic. In any case, the results suggest that visuals do not uniformly evoke emotions and that certain images in certain contexts may lack emotional resonance (also see Ref. 41). Importantly, the solar image—which was the one image to significantly affect emotions by boosting hope—offers the clearest option for individual action in response to climate change; this contrasts with political protest—the other action image we studied—whose success relies on others' participation and on the responsiveness of government. Of the images used in this study, images of solar panels are least likely to appear in news coverage of climate change.⁽¹⁷⁾ The image's relative novelty in the media landscape, along with its focus on individual action, may have contributed to its unique effects. Ultimately, however, we cannot confirm the precise mechanism underlying the solar

image's effect on hope, and this remains an important question for future studies.

In contrast to the imagery manipulation, the text manipulation had consistent, significant effects on emotions. Specifically, the inclusion of information about actions in a news story—both alone and in combination with information about impacts—increased hope, while decreasing fear, relative to a story that only discussed climate impacts. When a news story discussed actions alone, this also decreased anger relative to a story that only discussed impacts; when information about impacts and actions was combined, the effect on anger was no different than when only including impacts. These results align with prior research that has found that including information about actions and their likely effectiveness, or efficacy, can increase hope^(8,25) and decrease fear.⁽⁸⁾ Notably, the textual effects observed in the present study, while weakest for conservatives, remained significant regardless of political ideology. Moreover, the imagery effects were uniform across ideological groups. As Gadarian⁽⁵³⁾ found, images often retain their potency across the political divide as long as they are not sponsored by a partisan group. Overall, these findings suggest that the efficacy cues embedded in action-oriented texts and images help to minimize motivated reasoning and could be a promising strategy for reaching those who tend to be more dismissive toward climate change.

Contrary to expectations, the text and imagery manipulations did not interact in their effects on emotions. This diverges from previous research that found that congruency between visual and textual information enhances message effects;^(45,46) however, it is consistent with one recent study that found that the effects of news images and texts were not conditional on one another.⁽⁴²⁾ Given these discrepant findings, this remains an important area for future research.

Some of the most interesting results from the study concern the relationships between emotions and support for climate mitigation policies. Here, we found interactions consistent with MacKuen *et al.*'s⁽⁵⁷⁾ argument that fear motivates compromise among political ideologues, thereby encouraging opinion moderation, whereas anger is likely to discourage compromise and instead reinforce existing views. According to MacKuen *et al.*, hope will inspire political compromise only when ideologues are confronted with policies that are counter to their political predispositions. When applying MacKuen *et al.*'s theory to public opinion about environmental risk policy, our results showed that fear indeed

encouraged conservatives, who are predisposed to oppose climate mitigation policies, to increase their support for such policies, although fear had no effect on liberals. In contrast, anger appeared to reinforce existing predispositions by decreasing policy support among conservatives while increasing support among liberals (although the latter trend was not significant, likely due to ceiling effects). Finally, hope was positively associated with policy support among all ideological groups, although this effect was significant only for conservatives and moderates. This suggests that conservatives, when feeling hopeful, are willing to moderate their opinions by increasing their support for policies that they otherwise may be reticent to accept. Liberals, when feeling hopeful, do not moderate their opinions toward an ideologically consistent set of policies, but rather exhibit a trend of stronger support. Overall, high levels of anger produced the greatest polarization in public opinion between liberals and conservatives, whereas fear resulted in the least. These results suggest that emotions play a nuanced role in driving public opinion on divisive risk mitigation policies and that messages that evoke fear, and to a lesser extent hope, may offer the most promising routes to decreasing ideological polarization in public support for such policies.

Given the relationships between the experimental manipulations and emotions and, in turn, between emotions and policy support, we also found evidence for indirect effects of the news treatments on policy support via hope, fear, and anger. The solar panel image, as well as news texts that emphasized actions alone or both impacts and actions, indirectly increased policy support via hope across ideological groups. News texts that discussed actions alone decreased policy support, via fear, among moderates and conservatives. Through the mediator of anger, news texts that discussed actions alone indirectly decreased policy support among liberals while increasing policy support among conservatives.

Taken together, these results continue to support an important role for hope—which is enhanced in response to news stories that emphasize actions to address climate change—as a motivator of public engagement with climate change. Past research has linked message-induced hope to climate activism;⁽⁸⁾ this study extends this relationship to policy attitudes. The results also suggest that there is a risk inherent in emphasizing climate solutions: Although doing so increases hope, it also reduces fear, which we find is an important booster of policy support, particularly among conservatives. While some warn

that fear can be counterproductive for public engagement with climate change,^(9,19,71) this study suggests that fear is not only important for climate policy support but also encourages opinion moderation among political ideologues, especially conservatives. Thus, fear appeals—at least when balanced with information about actions and their efficacy—should be reconsidered as a climate communication strategy (see Ref. 28). In particular, it is important for future research to consider how action-oriented information about climate change can be presented in such a way as to increase hope but not reduce fear. Combining impacts and actions information, rather than focusing on actions exclusively, may be one approach.^(11,12) In fact, the actions plus impacts text condition did not have any significant negative indirect effects via fear, only positive effects through hope. Also, images may be a more straightforward way to indirectly boost policy support, since they did not affect fear—although the imagery effects overall were small.

While the results from this study have important theoretical and practical implications, there are limitations that should be kept in mind. Most significantly, a single image was used to represent each image type; it is possible that the particular images selected as well as characteristics unique to the selected images—such as their vividness or colors—influenced the pattern of effects. Thus, generalizing beyond the effects of the specific images tested here should be done cautiously. Ideally, future studies will attempt to replicate and build on these results using a more diverse set of images. Also, political protest was not mentioned explicitly in the news story as a potential action to address climate change; this may have made this particular image less relevant to readers than the other images, which were more directly connected to information presented in the news text. The image captions—which were included to increase the ecological validity of the news articles—may have attenuated the emotional effects of the imagery, although Pfau *et al.*⁽²⁹⁾ found that a news image with a brief caption was more emotionally evocative than an image with full news text; thus, if anything, the story text is more likely than the captions to have weakened the emotional impacts of the images. Still, testing imagery effects, independent of the captions, remains an important direction for future research. In addition, it is important to note that the captions indicated a particular location; examining place as a moderator of the effects seen here represents another useful research avenue.

Several limitations involve our emotions measures. First, anger was measured with a single item rather than a multi-item scale, which may have reduced reliability and made it more difficult to detect effects on anger. Second, by not measuring positive emotions beyond hope, it is unclear whether the effects for hope are attributable to hope specifically or to positive affect more broadly; this is an important question for future research. Third, emotions were measured via self-report, rather than direct physiological measures, and with respect to the news article in general. It is thus difficult to know what specifically about the text or image content triggered certain emotions and how this may vary across treatments and/or individual predispositions, as well as whether different emotional referents affect policy support differently. For example, liberals' anger may have been triggered by the perceived injustice of climate change, whereas conservatives' anger may have been driven by reactance to the message.⁽⁷²⁾ In addition, we don't know the order in which participants processed the text and imagery in the stories and how the order of information processing affected the results; eye-tracking could be used in future research to capture this, as could experimentally manipulating the order or positioning of information. Relatedly, the findings may be different with video-based stories, where the order of information processing is determined by the producer. Finally, we should note that the effect sizes observed in this study were small to moderate. In future research, it will be important to study the effects of repeated exposure to climate change messages, as well as test how the effects observed here either may intensify or subside over time. It also is important to consider the present results alongside other studies that analyze influences on different perceptual, attitudinal, or behavioral outcomes.⁽⁷³⁾

In conclusion, this study's results hold promise for engaging the public more broadly around the risk of climate change. Public support for climate mitigation policies places critical pressure on elected officials and may help push the needle toward effective implementation of new regulations and incentives to stimulate clean energy development and reduce fossil fuel use. The results suggest that text and imagery that emphasize actions that can be taken to address climate change inspire hope, which, in turn, increases climate policy support across the ideological spectrum. Given that news stories often do not discuss the actions that can be taken to minimize the negative impacts of climate change and, in particular, often ne-

glect individual behaviors,⁽¹¹⁾ and news imagery typically focuses on threatening landscapes and distancing visuals rather than climate solutions,⁽¹⁷⁾ we hope that these results can help journalists better understand how their reporting and editorial choices may influence public involvement with climate change, while also informing more effective risk communication practice.

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