THE UNIVERSITY OF OKLAHOMA GRADUATE COLLEGE

LOCAL CLIMATE CHANGE MESSAGES IN OKLAHOMA

A THESIS

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

Degree of

MASTER OF ARTS

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Norman, Oklahoma

2025

LOCAL CLIMATE CHANGE MESSAGES IN OKLAHOMA

A THESIS APPROVED FOR THE
GAYLORD COLLEGE OF JOURNALISM AND MASS COMMUNICATION

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ACKNOWLEDGEMENTS

When I began working toward a master's degree, I did not fully understand what research meant, and I had no idea how much I would enjoy it. To Dr. Zhang, Dr. Park, and Dr. Yoon – thank you for inspiring me, for guiding me through so many exciting research experiences, and for believing in me when I did not yet have the confidence to believe in myself.

I am also thankful for my mentors at the South Central Climate Adaptation Science Center. You all have shown me the type of work I want to pursue both as a professional and as a researcher. Thank you also to the Honors College, for laying a foundation I did not fully appreciate until I began this master's program.

To my roommates, thank you for being here through this whole journey. Thank you for letting me bounce ideas off you constantly. Thank you for being the support system I needed to do hard things and reach for my goals all through college. Thank you for the laughter and tears and for showing me the kind of person I am working to become.

Thank you to my entire Gaylord family – all the PhD students who have mentored me and welcomed my questions; my cohort of 4+1s and other master's students who inspire me with their own goals and aspirations; Leslie, who helps so many of us students find a clear path; and all the wonderful professors who constantly remind me why I love to learn.

And, of course, to my actual family - thank you for instilling in me curiosity and a strong work ethic. Thank you for always being there for me and for supporting my academic endeavors in so many ways.

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ABSTRACT

The uneven recognition of climate change poses a challenge for those seeking to address related impacts. Framing theory provides a lens to understand what storylines and narratives help audiences recognize climate change challenges. In this experiment, climate change messages representing local or distant frames about policy or natural disaster topics are presented to Oklahoma audiences. Values, beliefs, and town size are examined to understand how individual characteristics impact message framing effects. Findings show that local message frames result in a slight increase in risk perception, but climate change engagement and concern are not significantly impacted by the frame used. Interaction effects between frames and attitudes are minimal. Differences in climate change perceptions are higher among Oklahomans residing in metropolitan areas than those in and small towns. Findings point to a need for more holistic approaches to effectively communicate climate change challenges.

Keywords: *climate change communication, message frames, local climate impacts, risk perception, rural communities*

INTRODUCTION

As climate change impacts worsen, public engagement with this issue remains lacking (Carmichael & Brulle, 2017). Since personal involvement with an issue can contribute to perceived levels of threat and individual willingness to act, messages emphasizing local climate change impacts are a logical outreach strategy to raise awareness and concern. Local action and community-based initiatives have been proposed as solutions to increase understanding of and involvement in climate change issues (Bond, 2010). However, climate change communication studies on the effectiveness of locally framed messages yield mixed results (Shwom et al., 2008; Spence & Pidgeon, 2010; Scannell & Gifford, 2013).

Climate change is linked to negative impacts such as natural disasters, sea level rise, agricultural challenges, and strains on energy and water systems (IPCC, 2022). These impacts are felt differently across geographic locations, and they affect individuals differently based on the cultural aspects of these specific places (Spence & Pidgeon, 2010). As such, effective climate change messaging must account for a deeper understanding of these variations. For example, different values appeals for environmental action have been shown to have differing effects on individuals based on liberal or conservative political ideologies (Hurst & Stern, 2020). Previous research shows how emotions and identities can interact to shape climate perceptions among specific audiences (Caretta et al., 2022). Local message frames provide an opportunity to appeal to identity and sense of place (Scannell & Gifford, 2013), but ongoing research is needed to understand how these messaging strategies shape risk perceptions within a given context (Mildenberger et al., 2024).

Framing theory is frequently applied in climate change research to understand how messages define a problem and establish a storyline about climate change issues (Nisbet, 2009). A message frame can interact with an individual's prior knowledge to affect interpretations, recall of information, decision making, and evaluations (D'Angelo, 2002). Messages highlighting the efficacy of climate change action may increase emotions of hope and fear (Feldman & Hart, 2016), and communicating pro-environmental behaviors through frames tied to personal identity may increase support for sustainability (Sapiains et al., 2016).

Additionally, perceived distance can affect how individuals mentally construe an issue. Construal level theory explains how more concrete processing of an object or issue occurs when people perceive psychological proximity to it (Trope & Liberman, 2010). This provides support for the idea that local frames of climate change impacts may increase risk perceptions among those who are otherwise disengaged with the issue. Survey data shows that those with proximity to physical climate change vulnerabilities may have increased climate change risk perceptions (Brody et al., 2008). Climate communicators need more insight into how messages highlighting the local impacts of climate change may increase individual perceptions of climate change risk.

In Oklahoma, climate change impacts are already felt in the form of greater weather extremes such as winter storms, droughts, and floods (Frankson et al., 2022). However, public engagement with pro-environmental information tends to be lower among political conservatives (Hurst & Stern, 2020), which make up the largest percentage of Oklahomans (Pew Research Center, 2014). Further, as a state with a significant rural population and strong dependence on natural resource extraction, characteristics such strong place identity and environmental values are likely to affect local engagement with climate change messages (Hamilton et al., 2014;

Caretta et al., 2022). These social factors may further influence levels of climate change risk perception among Oklahomans.

To better understand how locally framed climate change impacts interact with audience-specific social factors, this study applies a 2x2 experiment within the context of Oklahoma. Climate change risk perceptions, engagement and concern will be measured among participants presented with local or distant message frames focusing on disaster or policy topics. Additional values measures and demographic factors will be used to examine interaction effects between social contexts and message frames. This will provide greater insight into how specific climate change message strategies can elicit stronger climate change risk perceptions and issue engagement among audiences in the generally rural, conservative context of Oklahoma. Results will help public information officials and climate educators more effectively communicate increased climate risks, strengthening the foundation for efforts to encourage stewardship, highlight the urgency of climate action, and build support climate-aware policies and initiatives.

LITERATURE REVIEW

Climate Change Communication

Addressing the issue of climate change requires cooperation from a wide array of actors, such as scientists, policymakers, business leaders, and citizens, making climate change communication is an area of increasing importance (Lamb & Lane, 2016). This field encompasses communication about the science behind climatic patterns, physical security, ecological impacts, humanitarian and social implications, and proposed policy and economic solutions, among others. As the climate changes, communication efforts are critical for helping people and societal structures adapt to the resulting challenges (Evans et al., 2018). To address this range of issues, climate change communicators must account for cognitive, emotional, and social dimensions of the issue (Lamb & Lane, 2016). The resulting media messages influence the ways society perceives the problems and solutions of climate change (Smith et al., 2016).

While the negative effects of climate change cause increasing concern among scientists, the problem is one characterized by political polarization and continued inaction from policymakers and the public (McCright et al., 2016). Researchers, journalists, politicians and advocates alike face challenges when identifying effective messaging strategies for audiences with varied levels of engagement and concern for climate change issues (Leiserowitz et al., 2021). Since climate change impacts are not felt equally across geographical areas or social circumstances (IPCC, 2022), messages about climate change must account for the needs and perspectives of specific audiences. As such, communication scholarship offers a range of methods and theoretical approaches that contribute to the effectiveness of climate and sustainability programs (Smith et al., 2016).

Framing Theory

Framing is one approach to understand how audiences engage with an issue such as climate change through the different types of information presented. The way a message is framed determines which parts of a given topic are highlighted as important. Frames "select some aspects of a perceived reality and make them more salient in a communicating text", allowing communicators to define problems, identify causes, and suggest moral judgements or solutions (Entman, 1993, p. 52). Message frames help people understand information about complex issues through the language, metaphors, or visuals associated with the message (Nisbet, 2009). The study of framing examines the types of frames used, the contexts where they are found, the ways frames interact with individual's prior knowledge and beliefs to affect message interpretations, and the impacts for broader societal conversations (D'Angelo, 2002).

Framing has been approached from diverse research backgrounds including social psychology, communication, and political science. Communication frames provide especially useful insights to understand the influence and power of a message (Entman, 1993). Frames in communication focus on the storyline used to present information, while frames in thought describe the cognitions individuals use to understand the information. When frames in communication influence frames in thought, this is described as a framing effect (Druckman, 2001). The study of framing effects examines how message portrayal may influence opinions (Chong & Druckman, 2007).

Two common communication frames include equivalency frames and emphasis frames. Equivalency frames present the same issue information from varying perspectives, while emphasis frames highlight the specific aspects of an issue individuals should consider when forming an opinion (Druckman, 2001). Emphasis frames are especially important to highlight the

storyline of an issue, as they communicate "why an issue might be a problem, who or what might be responsible for it and what should be done" (Nisbet, 2009, p. 15). For example, Hurst and Stern (2020) found emphasizing varying moral foundations in climate change message frames could appeal to individuals of different political ideologies. Similarly, O'Neill (2013) explored how visual frames influence audience efficacy perceptions relating to climate change problems based on the emphasis of contested solutions and distant impacts. The study of framing effects allows communicators to understand how different message approaches shape issue perceptions.

Construal Level Theory

Construal level theory (CLT) provides additional insight into how and why certain message frames may be effective. This theory explains how individuals form perceptions based on their psychological distance from an object. People are likely to rely on concrete cognitions, a low-level construal, when they perceive an object as psychologically close. By contrast, people are more likely to rely on abstract mental processing when psychological distance increases. Objects can be perceived as distal because of distance in time, spatial or geographic distance, uncertainty, or social distance (Trope & Liberman, 2010).

Abstract and concrete processing can affect how individuals interpret different situations. Lermer et al. (2016) conducted a study to examine how concrete versus abstract construal priming activities would affect risk assessments, finding that people with a concrete mindset make higher and more accurate risk estimates among both laypeople and professional risk managers. In climate change research using CLT, Jones et al., (2017) found that reducing psychological distance increases engagement with climate change issues among Australian residents. In another study looking specifically at the spatial distance component of CLT, greater psychological distance correlated with greater reliance on abstract climate beliefs such as

skepticism. Reduced spatial distance correlated with more concrete perceptions of climate change, increasing self-reported fear and risk perceptions (Brügger et al., 2016). Communicators should consider how abstract and concrete processing based on spatial distance can help explain responses to climate change information.

Framing Climate Change

Journalists, policymakers, and technical experts alike use framing to tailor climate messages to specific audiences (Nisbet, 2009). Different climate change frames contribute to how audiences engage with the issue (Li & Su, 2018). Framing may emphasize specific values, conflicts, or sources of information, creating opportunities to make climate change messages accessible across politically polarized divides (Nisbet, 2009). As such, message frames are frequently considered in climate change studies focused on behavioral intentions, policy support, and attitudes toward climate issues (Homar & Cvelbar, 2021). Climate change framing research examines topics such as how different news outlets frame the issue (Boykoff & Boykoff, 2007), how activist organizations use framing to build support for climate action (Vu et al., 2021), or how different frames influence pro-environmental behavioral intentions (Sapiains et al., 2016).

In a meta-analysis of climate change framing experiments, Li and Su (2018) found environmental, economic, and moral frames have a higher impact on audience's behavioral intentions and support for climate policy than public health frames or geographic identity frames. Homar and Cvelbar (2021) analyzed studies testing gain and loss frames, which are messages that emphasize either the gains of climate change solutions or the losses if actions are not taken. They found relatively low message frame impacts on behavioral outcomes, though loss frames are more effective for behavior and intention outcomes, and gain frames have greater influence on attitudes. If direct behavioral outcomes of climate change message frames are limited, as

these studies found, exploring attitudinal outcomes of climate change frames such as risk perception may be most insightful for communicators.

In study testing how message frames affect support for watershed conservation, researchers found personal characteristics were an important determinant of how participants reacted to different values message frames and whether they supported conservation behavior (Marquina et al., 2022). This aligns with past framing literature that emphasizes how message frames interact with audiences' pre-existing knowledge and beliefs about an issue, further highlighting the importance of considering audience characteristics (D'Angelo, 2002).

Local and Distant Climate Change Frames

Many Americans do not feel personally involved in climate change problems. The most recent surveys from the ongoing "Climate Change in the American Mind" project reported only 28% of Americans say they are "very worried" about global warming. Under half (48%) of Americans recognize that people in the United States are currently impacted by climate change, posing a barrier to public support for climate action (Leiserowitz et al., 2024). As supported by CLT, when climate change is thought of as distant, individuals have lower concrete perceptions of fear and risk (Brügger et al., 2016). Local message frames provide an opportunity to decrease psychological distance from climate change issues.

Several studies explore the outcomes of messages focused on local versus geographically distant impacts of climate change, a logical approach to emphasize personal relevance of climate change threats. However, Spence and Pidgeon (2010) found that distance has little effect on fear and information processing when they tested climate change messages presented with gain or

loss frames near participants' hometowns or in a distant country. The distant frames, however, increase perceived severity of climate change.

In another study, researchers found that posters emphasizing the local impacts of climate change increase message engagement compared with those emphasizing global impacts. Individual place attachment was shown to further predict climate change message engagement (Scannell & Gifford, 2013). In a U.S. survey study, proximity to physical climate change impacts like sea level rise increased individuals' risk perceptions. Social group identification, demographic factors, and values were also shown to predict risk perception (Brody et al., 2008). Another study on local versus national news coverage of climate change in Louisiana found that messages from trusted local media that covered local climate change impacts rather than national impacts increased willingness to engage in climate change action, overcoming polarized political divides on the debate for climate action (Andrews et al., 2023).

Research on the effectiveness of local climate change messages has mixed results, showing a need to further explore the impacts locally framed climate change messages. As supported by construal level theory, reducing psychological distance through local message frames may increase concrete risk perceptions of climate related issues (Brügger et al., 2016). Further, since different climate change frames and message approaches resonate with audiences based on personal characteristics and values, locally framed messages should be examined in specific contexts (Brody et al., 2008; Hurst & Stern, 2020; Marquina et al., 2022). Just as climate change messages from local news sources covering local stories can be viewed more positively among Republicans, locality frames may be especially useful for reaching these audiences (Andrews et al., 2023). Additionally, the view of climate change as a distant issue has been identified as a barrier to climate change engagement among those from rural conservative

communities (Caretta et al., 2022). Even with mixed results in past local and distant framing research, examination of situational factors in Oklahoma points to the potential effectiveness and importance of locality frames for increasing risk perceptions, issue engagement, and climate change concern in this context.

H1a: Oklahomans presented with local message frames have higher climate change risk perceptions than those who view distant frames.

H1b: Oklahomans presented with local message frames have higher climate change engagement than those who view distant frames.

H1c: Oklahomans presented with local message frames have higher climate change concern than those who view distant frames.

Climate Change Message Topics

The mass media is a common source of science information for public audiences, especially when it comes to climate change (Whitmarsh, 2009). Media coverage is a significant predictor of public concern for climate change, as it often reflects other factors influencing climate change perceptions, such as elite cues and social movement activity (Carmichael & Brulle, 2017). Over the decades, news sources have presented a wide variety of information about climate change, including scientific reports, impacts, policymaking debates, economic threats, and developing technologies (O'Neill et al., 2015). The media also serves as an indicator of the severity or legitimacy of climate change information (Brevini & Lewis, 2018). Studies that examine how climate change issues are commonly framed find specific emphasis on distance frames within climate change news coverage (O'Neill et al., 2013). Further, political efficacy

messages within the news media are shown to impact audience attitudes toward climate change (Feldman & Hart, 2021).

Climate policy is one of the most common topics of climate change news coverage. Before conducting their experiment of local news source effects, Andrews et al. (2023) performed a content analysis of climate change news articles, finding that media coverage of politics, legislation, and budget received the largest share of coverage. Additionally, Carmichael and Brulle (2017) found that when Congress increases activity related to climate change, media coverage and overall public concern for the increases. Localizing messages about policy may further enhance these effects. Messages emphasizing the importance of policy addressing local Oklahoma climate change problems such as water shortages are expected to increase risk perception of climate change among Oklahomans compared to messages emphasizing climate mitigation policies in other states.

The increased severity of climate change-induced natural disasters is another important topic for climate change risk. Proximity to physical vulnerabilities of climate change may increase risk perception (Brody et al., 2008). Messages frames that emphasize local natural disasters help bridge this gap. Challenges such as sea level rise were used in past studies of the effects of locality framing (Scannell & Gifford, 2013; Spence & Pidgeon, 2010). Messages emphasizing local Oklahoma climate disasters such as heat waves are expected to increase risk perceptions of climate change among Oklahomans compared to messages emphasizing similar climate disasters in other states.

However, people can be reluctant to link natural disaster impacts to climate change (Saleh Safi et al., 2012). In their study on communicating the threat of sea level rise, Mildenberger et al. (2024) found that maps of sea level rise did not increase climate change risk

perceptions, while maps of increased traffic and commute-times due to sea level rise did increase climate change risk perceptions. Descriptions of climate disasters may have less of an influence on risk perceptions than messages relating to specific infrastructure or policy outcomes. By describing concrete reactions to climate impacts, reports of policies targeting climate change issues are expected to reduce psychological distance of climate change issues more than reports of disasters linked to climate change.

H2a: Oklahomans presented with messages about policies responding to climate change have higher climate change risk perceptions than those presented with messages about climate change disaster.

H2b: Oklahomans presented with messages about policies responding to climate change have higher climate change engagement than those presented with messages about climate change disaster.

H2c: Oklahomans presented with messages about policies responding to climate change have higher climate change concern than those presented with messages about climate change disaster.

Community and Individual Characteristics

Communicators need to understand how specific contexts for climate change outreach contribute to the effectiveness of different messages (Mildenberger et al., 2024). Vulnerability to climate change impacts varies across locations, and individuals' perceived vulnerability does not always align with actual risk (Brody et al., 2008; Saleh Safi et al., 2012). Studies on rural communities find that climate change may be perceived as a distant threat (Caretta et al., 2022). However, climate change impacts strongly affect agricultural and other natural resource-

dependent industries (Dunlap, 2010). Rural communities are likely to be more directly dependent on natural resources than urban areas, increasing vulnerability to climate change impacts (Hamilton et al., 2014). Researchers studying climate change perceptions among rural communities have highlighted the importance of increasing awareness of impacts on local areas (Caretta et al., 2022).

Oklahoma is fourteenth in the nation for percentage of rural populations, with thirty-four percent (34%) of its population residing in rural areas (UHF, n.d.; WPR, n.d.). Further, the state's economy is largely dependent on natural resource extraction through the oil and gas industry (IBIS World, n.d.). Communities with rural characteristics and strong reliance on natural resources are likely to have a strong sense of place attachment, further increasing the relevance local climate change messages (Caretta et al., 2022). Threats to place may be perceived as threats to belonging, self-esteem, self-efficacy, and social ties (Fresque-Baxter et al., 2012). In previous studies of rural communities, individuals with greater social attachment to the place they live were shown to be more involved in community improvements, including environmental ones (Takahashi & Selfa, 2015). Measurement scales of sense of place examine identity, attachment, and dependence on place (Jorgensen & Stedman, 2001).

H3a: Higher place attachment is positively correlated with climate change risk perception among Oklahomans.

H3b: Higher place attachment is positively correlated with climate change engagement among Oklahomans.

H3c: Higher place attachment is positively correlated with climate change concern among Oklahomans.

Over past decades, climate change has been presented to Americans very differently by Republican and Democratic leaders, resulting in high political polarization of the issue (Nisbet, 2009). Pro-environmental attitudes are commonly associated with a more liberal political ideology, and climate change message frames are likely to be interpreted differently by political liberals and political conservatives, as differing values appeals can be perceived differently across political ideologies (Hurst & Stern, 2020). Political ideology may change how individuals respond to the moral values commonly emphasized in pro-environmental discourse (Feinberg & Willer, 2013). Thus, the effectiveness of locality framing should also be examined among individuals with varying political ideologies.

H4a: More conservative political orientation is negatively correlated with climate change risk perception among Oklahomans.

H4b: More conservative political orientation is negatively correlated with climate change engagement among Oklahomans.

H4c: More conservative political orientation is negatively correlated with climate change concern among Oklahomans.

An individual's environmental values are also considered, as greater personal connection to the natural world is likely to relate to climate change awareness. Biospheric values are those related to an individual's views on the importance of the natural world and have been shown to predict pro-environmental behaviors (Van Der Werff et al., 2013). If stronger biospheric values are associated with concern for the environment, these values may similarly predict concern for local climate change risks.

H5a: Stronger biospheric values are positively correlated with climate change risk perception among Oklahomans.

H5b: Stronger biospheric values are positively correlated with climate change engagement among Oklahomans.

H5c: Stronger biospheric values are positively correlated with climate change concern among Oklahomans.

Demographic factors will also be considered to provide context for common trends in responses to climate change messaging. Location of residence will be used examine how those living in rural versus urban communities respond to locally framed messages, with the U.S. Census Bureau defining rural communities as those with less than 5,000 residents and less than 2,000 housing units (HRSA, 2024).

Since message frames interact with preexisting values and beliefs, interaction effects between message presentation and individual social factors are expected (D'Angelo, 2002). Place attachment can be a predictor of pro-environmental behaviors, so messages emphasizing local effects are expected to be especially strong among those with high place attachment (Takahashi & Selfa, 2015). Scannell and Gifford (2013) found place attachment to predict climate change engagement among audiences in British Columbia, so examining this in the context of Oklahoma will provide further insights into how place attachment may impact the effectiveness of locality frames.

H6a: Oklahomans with high place attachment who view local message frames have higher climate change risk perceptions than those presented with distant frames, or those with low place attachment presented with local or distant frames.

H6b: Oklahomans with high place attachment who view local message frames have higher climate change engagement than those presented with distant frames, or those with low place attachment presented with local or distant frames.

H6c: Oklahomans with high place attachment who view local message frames have higher climate change concern than those presented with distant frames, or those with low place attachment presented with local or distant frames.

Environmental attitudes can similarly predict pro-environmental behaviors (Takahashi & Selfa, 2015). Further, messages that appeal to identity and underlying values can increase engagement with climate change messages (Sapiains et al., 2016; Hurst & Stern, 2020). In a study on the values that predict environmentally related attitudes, biospheric values were defined as those reflecting concern for the natural environment (Steg et al., 2012). As such, higher biospheric values are likely to increase concern for climate change regardless of the message frame used.

H7a: Local frames elicit higher climate change risk perceptions from Oklahomans with lower biospheric values, but locality framing has a smaller impact on Oklahomans with high biospheric values.

H7b: Local frames elicit higher climate change engagement from Oklahomans with lower biospheric values, but locality framing has a smaller impact on Oklahomans with high biospheric values.

H7c: Local frames elicit higher climate change concern from Oklahomans with lower biospheric values, but locality framing has a smaller impact on Oklahomans with high biospheric values.

Further, since political liberals tend to have stronger pro-environmental attitudes than political conservatives (Hurst & Stern, 2020), localizing climate change may have more apparent effects among conservative audiences (Andrews et al., 2023). Similar outcomes are expected for the effectiveness of locally framed messages among political conservatives as among those with lower biospheric values.

H8a: Local frames elicit higher climate change risk perceptions from conservative Oklahomans than distant frames, but locality framing has a smaller impact on liberal Oklahomans.

H8b: Local frames elicit higher climate change engagement from conservative Oklahomans than distant frames, but locality framing has a smaller impact on liberal Oklahomans.

H8c: Local frames elicit higher climate change concern from conservative Oklahomans than distant frames, but locality framing has a smaller impact on liberal Oklahomans.

Finally, policy messages and disaster messages may resonate with audiences differently depending on their individual characteristics, which will be further explored through the following research questions.

RQ1: How do policy and disaster frames interact with Oklahomans' place attachment, political orientation, and biospheric values to influence climate change risk perception, engagement, and concern?

RQ2: How do policy and disaster frames interact with Oklahomans' demographic characteristics to influence climate change risk perception, concern, and engagement?

METHODS

Design

This study uses a 2 (distance frame: local vs. distant) x 2 (topic frame: policy vs. disaster) between-subject factorial experiment with one control group, allowing for additional examination of interaction effects between the localized and topical message frame conditions (Wimmer & Dominick, 2014). Climate change messages are presented in the form of mock Facebook news posts covering climate-related natural disasters or climate mitigation policies. These topics were chosen because they are common climate change messages encountered in everyday news, making them relevant examples of climate change communication (Andrews et al., 2023). Mock Facebook posts are used because over half of U.S. adults get at least some of their news from social media, with Facebook being one of the top social media sites U.S. adults regularly turn to for news information (St. Aubin & Liedke, 2024). The username of the mock Facebook posts was redacted to remove any influence of source perceptions while ensuring the posts appeared realistic. All experimental testing and procedures were carried out through Qualtrics, an online survey tool.

The University of Oklahoma's Institutional Review Board approved protocols for all phases of this study, listed as IRB#18002. Participants in the pilot study, pretest, and final experiment were informed of the risks of online data collection and minimal benefits of the study. The questionnaire was presented as a study about how Oklahomans respond to social media news messages. Following the questionnaire, participants were taken to a debriefing page that explained the true purpose of the study and the fictitious nature of the news posts to remove any lasting manipulation effects (Wimmer & Dominick, 2014). All responses were kept confidential. No identifying data was collected in the pilot study or pretest. An optional

compensation raffle was offered as incentive to participants in the experiment, and contact information was collected through a separate Qualtrics link to maintain the confidentiality of all participants.

Stimuli Development

A pilot study was conducted to design the experimental stimuli messages. It presented questions about perceived distance of various locations and topical relevance of different climate impacts to a sample of $n = 22$ Oklahomans. Based on pilot study results, distance was manipulated by naming a specific state in the news story. The local condition mentioned Oklahoma, and the distant condition mentioned Georgia. The topical manipulations selected based on pilot responses include heatwave and drought for the disaster topics and a water sustainability plan and a climate adaptation plan for the policy topics. Two manipulations for each topic condition were selected to control for any confounding effects due to personal associations with specific events.

The topic and distance manipulations were assessed in a pretest. Experimental stimuli were presented in a between-subjects design to a sample of $n = 54$ Oklahomans. Pretest results showed manipulations were successful. An independent-samples *t*-test comparing the mean scores of the distance manipulation found a significant difference between the local and distant manipulations ($t\ (39) = -4.856$, $p < .001$) such that participants in the distant conditions agreed more strongly with the statement "this story is about something far away from me" ($M = 3.65$, $SD = 0.97$) than the participants in the local conditions ($M = 2.05$, $SD = 0.97$). An independent-samples *t*-test comparing the mean scores of the topic manipulation found a significant difference between the disaster and policy manipulations ($t\ (39) = 5.84$, $p < .001$) such that participants in the policy topic conditions agreed more strongly with the statement "this story is about a

government policy" (M = 3.55, SD = 0.83) than the participants in the disaster topic conditions (M = 2.10, SD = 0.77).

Participants and Procedures

For the final experiment, Oklahomans were invited to participate in the online Qualtrics survey with the chance to win a $30 gift card through an optional raffle. The target sample for the experiment was n = 210 participants to account for balance between effects size and power, with a medium effect size of f = 0.25 and high power 1- β = 0.95 at 95% confidence level. A purposive sampling technique was used to recruit participants in small towns who currently reside in Oklahoma and have done so for at least ten years. The length of residency requirement was set to ensure participants have adequate context of local conditions to respond to the experimental stimuli. Participants were recruited through various online platforms and contacts, including Facebook, Instagram, LinkedIn, Nextdoor, Reddit, email, and text. Recruitment posters were shared in public community spaces in 14 towns across the state, and in-person recruitment was also conducted at community events in three locations. Data was collected over a one-month period resulting in a final sample of n = 218 completed responses.

The survey began with an informed consent and four screening questions. Participants were required to be at least 18 years old, to currently live in Oklahoma, to have lived in Oklahoma for at least ten years, and they could not take the survey if they were part of the pilot study or pretest. After answering three questions about general news habits, each participant was randomly assigned to one of nine conditions. One control group did not see a mock Facebook news post. Participants in the control group answered questions about climate change risk perception, engagement, and concern. The remaining participants saw a mock Facebook post in one of the four manipulation conditions: local policy, local disaster, distant policy, or distant

disaster. With two possible Facebook posts for each condition, there were a total of eight manipulation groups, included in Appendix A. After reading their assigned post, the manipulation condition participants answered questions about message risk perception, climate change risk perception, message engagement, climate change engagement, and climate change concern. Participants in all nine conditions also answered questions about place attachment, political ideology, environmental values. Location of residency was recorded with questions about town classification, town name, and zip code to examine differences between urban and rural participants. Additional demographic information was collected based on variables examined in past research on climate change risk perceptions, including age gender, education level, and annual income level (Brody et al., 2008).

Location of residency was self-reported by participants based on a provided definition from the U.S. Census Bureau. Participants include those from rural communities with fewer than 5,000 residents (n = 85), micropolitan communities with urban centers of at least 10,000 people (n = 76), and metropolitan communities with urban centers of at least 50,000 people (n = 55). The majority of participants are female (n = 154), followed by male (n = 51), non-binary or other gender (n = 10), and those who prefer not to say (n = 3). The majority of participants have a college education or higher (n = 139). Roughly half the participants (n = 105) reported earning more than the median Oklahoma income of $62,138 (U.S. Census Bureau, n.d.). The average age of participants is 40 years (M = 40.49, SD = 15.417). Complete demographic information collected from participants is included in Table 1.

Table 1

Participant Demographics

Demographics	Categories	N (%)
Town Size (self-reported)	1. Metropolitan (urban center of at least 50,000 people)	55 (25.5)
	2. Micropolitan (urban center of at least 10,000 people)	76 (35.2)
	3. Rural (fewer than 5,000 residents)	85 (39.4)
Gender	1. Male	51 (23.4)
	2. Female	154 (70.6)
	3. Non-binary/other gender	10 (4.6)
	4. Prefer not to say	3 (1.4)
Highest Completed Education	1. Some high school	3 (1.4)
	2. High school or equivalent	8 (3.7)
	3. Some college	56 (25.7)
	4. Technical training	12 (5.5)
	5. College degree	94 (43.1)
	6. Postgraduate degree	40 (20.6)
Annual Salary	1. Less than $15,000	25 (11.5)
	2. $15,000 to less than $30,000	14 (6.4)
	3. $30,000 to less than $50,000	40 (18.3)
	4. $50,000 to less than $75,000	37 (17.0)
	5. $75,000 to less than $100,000	31 (14.2)
	6. $100,000 to less than $150,000	34 (15.6)
	7. $150,000 or above	37 (17.0)

Note. $N = 218$. Participants were on average 40.49 years old ($SD = 15.42$).

Measures

The dependent variables measured included risk perception, engagement, and climate change concern. Message risk perception was assessed using a four-item risk perception scale with instructions to participants to consider the climate change issue covered in the news post (Zhang & Borden, 2024). General climate change risk perception was measured using a three-item scale including questions about worry, issue severity, and likelihood of impacts (Chu & Yang, 2020). Message engagement was measured with a six-item scale consisting of a fear

dimension and a danger dimension with instructions to participants to consider the news post they viewed (Xue et al., 2016). A five-item climate change engagement scale was used to measure general issue engagement (Gifford & Comeau, 2011). After data collection, this scale was reduced to four items to achieve an acceptable Cronbach's alpha. Finally, concern for climate change impacts was measured (Gifford & Comeau, 2011). All responses were recorded on five-point Likert-style scales. Dependent variable measures and reliability scores are found in Table 2.

Table 2

Dependent Variables Measures and Scales

Source	Scale Items	*M*, *SD*, & Reliability
Risk Perception (Zhang & Borden, 2024)	Thinking about the climate change issue covered in the news post, please rate your agreement or disagreement with the following statements on a scale of 1 to 5. 1. The issue covered is very severe. 2. The issue covered is very serious. 3. I am certain the issue covered threatens me personally. 4. I am certain the issue covered affects my community directly.	*M*=3.41, *SD*=.96, Cronbach's α=.892
Climate Change Risk Perception (Chu & Yang, 2020)	Thinking about the topic covered in the news post, please rate your responses to the following questions on a scale of 1 to 5. 1. How worried are you about climate change? 2. How serious are the impacts of climate change? 3. How likely are climate change impacts to happen?	*M*=3.62, *SD*=1.19, Cronbach's α=.910
Message Engagement (Xue et al., 2016) *Manipulation Condition Only*	Thinking about the news post you saw, please rate your agreement or disagreement with the following statements on a scale of 1 to 5. *Danger Dimension* 1. This post is important and valuable. 2. This post motivates me to take action.	 *Danger* *M*=2.30, *SD*=.81, Cronbach's α=.821

	3. This post motivates me to seek out more information. *Fear Dimension* 4. This post is manipulative. 5. This post is exaggerated. 6. This post encourages denial.	*Fear* *M*=3.22, *SD*=.93, Cronbach's α=.861
Climate Change Engagement (Gifford & Comeau, 2011)	Thinking about the topic covered in the news post, please rate your agreement or disagreement with each statement on a scale of 1 to 5. 1. I talk to my friends about environmental solutions. 2. I want to know more about what to do to stop climate change. 3. I feel guilty that I am not doing more to stop climate change. 4. News reports on environmental issues make me feel helpless.	*M*=3.14, *SD*=.92, Cronbach's α=.771
Climate Change Concern (Gifford & Comeau, 2011)	How concerned are you about climate change impacts on a scale of 1 to 5?	*M*=3.54, *SD*=1.34

Audience beliefs, values, and characteristics were also recorded. Place attachment was measured on a 12-item Sense of Place scale adapted from Jorgensen and Stedman (2001), which identifies sense of place based on four questions across three areas, including place identify, attachment, and dependence. Political ideology is measured on a one-item scale ranging from 1 (extremely liberal) to 7 (extremely conservative), which provides a more in-depth understanding of ideology than political party affiliation (Feinberg & Willer, 2013). Finally, environmental values are measured with a 4-item biospheric values orientation scale asking participants how important different environmental values are to their guiding principles (Van Der Werff, et al., 2013). Measurement scales and reliability scores for the values and belief measures are found in Table 3.

Table 3

Values Measures and Scales

Source	Scale Items	*M*, *SD*, & Reliability
Place Attachment (Jorgensen & Stedman, 2001)	Rate your agreement or disagreement with the following statements on a scale of 1 to 5. *Place Identity* 1. Everything about Oklahoma is a reflection of me. 2. Oklahoma says a lot about who I am. 3. I feel that I can really be myself in Oklahoma. 4. Oklahoma reflects the type of person I am. *Place Attachment* 1. I feel relaxed when I am in Oklahoma 2. I feel happiest when I am in Oklahoma 3. Oklahoma is my favorite place to be 4. I really miss Oklahoma when I'm away from it for too long. *Place Dependence* 1. Oklahoma is the best place for me to do the things that I enjoy the most. 2. For doing the things that I enjoy most, no other place can compare to Oklahoma. 3. Oklahoma is a good place to do the things I most like to do. 4. As far as I am concerned, there is no better place to be than Oklahoma.	*M*=2.83, *SD*=1.00, Cronbach's α=.955
Political Orientation (Feinberg & Willer, 2013)	Rate your political ideology on a scale from 1 (extremely liberal) to 7 (extremely conservative).	*M*=3.93, *SD*=1.67
Biospheric Values (Van Der Werff et al., 2013)	Rate the importance of each value your life where 1 is completely opposed to your values and 5 is extremely important to your values. 1. Respecting the earth – harmony with other species 2. Unity with nature – fitting into nature 3. Protecting the environment – preserving nature 4. Preventing pollution – protecting natural resources	*M*= 4.27, *SD*=.66, Cronbach's α=.885

RESULTS

Manipulation Checks

As in the pretest, the topic and distant manipulations were significant. Participants in the policy condition agreed more strongly ($M = 3.43$, $SD = 1.00$) than participants in the disaster condition ($M = 2.23$, $SD = 0.98$) with the statement "this post is mostly about a government policy" (t (193) = 8.45, $p < .001$). Participants in the local condition agreed more strongly ($M = 3.63$, $SD = 0.98$) than participants in the distant condition ($M = 2.84$, $SD = 1.06$) with the statement "this post is about something close to me" (t (193) = 5.47, $p < .001$). Additional independent-samples t-tests were conducted to rule out any differences in perceptions between the two messages participants could view for the distant disaster, local disaster, distant policy, and local policy framing conditions. No significant differences were found in the manipulation check questions or dependent variable measures between the two message stimuli options within each framing condition.

Hypothesis Testing

A hierarchal multiple linear regression was conducted to test the differences in risk perception, engagement, and concern between participants in the local and distant framing conditions and those in the policy and disaster framing conditions, controlling for demographic factors and the other covariates. For risk perceptions, the demographic factors of age, gender, education level, and income level included in step one did not explain a significant amount of variance. Adding town size variables improved the model in step two, accounting for a significant portion of variance (F (7, 176) = 2.57, $p = .015$, $R^2 = .093$, $\triangle R = .004$). Adding the covariates of place attachment, biospheric values, and political ideology improved the model in step three, accounting for a significant portion of variance (F (10, 173) = 10.28, $p < .001$, $R^2 =$

.373, $\triangle R$ = .004). In step four, the distance frame and disaster frame independent variables further improved the model (F (12, 171) = 9.53, p < .001, R^2 = .401, $\triangle R$ = .028). Results indicate that those in the local frame condition had higher risk perceptions than those in the distant frame condition (β = -.123, p = .043), but the effects of the policy and disaster frame conditions did not reach a significance (β = .119, p = .051). For general climate change risk perception, a significant regression model was found (F (12, 171) = 9.53, p < .001, R^2 = .508, $\triangle R$ = .002), but the effects of the independent variables of distance frames (β = -.019, p = .723) and topic frames (β = .044, p = .425) were not significant. H1a was partially supported, but H2a was not supported. These results are shown in Tables 4 and 5.

Table 4

Hierarchal Multiple Linear Regression for Risk Perception

Variable	Step 1	Step 2	Step 3	Step 4
	β	β	β	β
Age	-.134	-.097	-.055	-.056
Gender [a]	-.012	-.012	-.057	-.042
Education [b]	.089	.098	.015	.003
Income [c]	-.151	-.162*	-.060	-.035
Metropolitan	---	.166	.417	.463
Micropolitan	---	.374	.489	.541
Rural	---	.431	.596	.640*
Place Attachment	---	---	-.101	-.084
Biospheric Values	---	---	.369***	.359***
Political Ideology	---	---	-.265***	-.295***
Distance Frame [d]	---	---	---	-.123*
Topic Frame [e]	---	---	---	.119

Note. N = 195. R^2 = .048 at Step 1, R^2 = .093* at Step 2, R^2 = .373*** at Step 3, and R^2 = .401* at Step 4.

[a] (Male=0, Not male = 1) [b] (No college = 0, College or higher = 1), [c] (Annual salary <75k = 0, Annual salary 75k+ = 1), [d] (Local = 0, Distant = 1), [e] (Policy = 0, Disaster= 1)

*p ≤ .05. **p ≤ .01. ***p ≤ .001.

Table 5

Hierarchal Multiple Linear Regression for Climate Change Risk Perception

Variable	Step 1	Step 2	Step 3	Step 4
	β	β	β	β
Age	-.236**	-.208*	-.146*	-.148*
Gender [a]	-.074	-.078	.040	.044
Education [b]	.078	.085	-.021	-.026
Income [c]	-.110	-.115	.021	.030
Metropolitan	---	.021	.298	.303
Micropolitan	---	.205	.316	.322
Rural	---	.218	.387	.390
Place Attachment	---	---	-.082	-.076
Biospheric Values	---	---	.373***	.372***
Political Ideology	---	---	-.407***	-.415***
Distance Frame [d]	---	---	---	-.019
Topic Frame [e]	---	---	---	.044

Note. $N = 195$. $R^2 = .083$** at Step 1, $R^2 = .112$ at Step 2, $R^2 = .506$*** at Step 3, and $R^2 = .508$ at Step 4.

[a] (Male=0, Not male = 1) [b] (No college = 0, College or higher = 1), [c] (Annual salary <75k = 0, Annual salary 75k+ = 1), [d] (Local = 0, Distant = 1), [e] (Policy = 0, Disaster= 1)

*p ≤ .05. **p ≤ .01. ***p ≤ .001.

For message engagement, significant regression models were also found. A significant regression model was found for the danger dimension of message engagement (F (12, 171) = 7.23, $p < .001$, $R^2 = .337$, $\triangle R = .017$), but the effects of the independent variables of distance

frames (β = -.102, p = .109) and topic frames (β = .084, p = .190) were not significant. A significant regression model was found for the fear dimension of message engagement (F (12, 171) = 3.02, p < .001, R^2 = .175, $\triangle R$ = .001), but the effects of the independent variables of distance frames (β = -.033, p = .638) and topic frames (β = .007, p = .920) were not significant. For climate change engagement, a significant regression model was found (F (12, 171) = 10.84, p < .001, R^2 = .432, $\triangle R$ = .005), but the effects of the independent variables of distance frames (β = -.014, p = .809) and topic frames (β = .074, p = .214) were not significant. Therefore, H1b and H2b were not supported. For climate change concern, a significant regression model was also found (F (12, 171) = 14.67, p < .001, R^2 = .507, $\triangle R$ = .002), but the effects of the independent variables of distance frames (β = -.037, p = .503) and topic frames (β = .032, p = .557) were not significant. Therefore, H1c and H2c were not supported. These results are shown in Tables 6, 7, 8, and 9.

Table 6

Hierarchal Multiple Linear Regression for Message Engagement Danger Dimension

Variable	Step 1	Step 2	Step 3	Step 4
	β	β	β	β
Age	-.060	-.040	-.041	-.041
Gender [a]	.104	.091	.061	.073
Education [b]	.099	.099	.044	.036
Income [c]	-.179*	-.199*	-.129	-.112
Metropolitan	---	.483	.593*	.633*
Micropolitan	---	.547	.532	.577
Rural	---	.658	.695*	.734*
Place Attachment	---	---	.138	.150*
Biospheric Values	---	---	.420***	.412***
Political Ideology	---	---	-.227**	-.250**

Distance Frame [d]	---	---	---	-.102
Topic Frame [e]	---	---	---	.084

Note. $N = 195$. $R^2 = .055$* at Step 1, $R^2 = .079$ at Step 2, $R^2 = .320$*** at Step 3, and $R^2 = .337$ at Step 4.

[a] (Male=0, Not male = 1) [b] (No college = 0, College or higher = 1), [c] (Annual salary <75k = 0, Annual salary 75k+ = 1), [d] (Local = 0, Distant = 1), [e] (Policy = 0, Disaster= 1)

*p ≤ .05. **p ≤ .01. ***p ≤ .001.

Table 7

Hierarchal Multiple Linear Regression for Message Engagement Fear Dimension

Variable	Step 1	Step 2	Step 3	Step 4
	β	β	β	β
Age	.173*	.172*	.142	.144
Gender [a]	-.147*	-.153*	-.147*	-.144*
Education [b]	.026	.011	.060	.060
Income [c]	.065	.053	-.013	-.011
Metropolitan	---	.700*	.607	.622
Micropolitan	---	.734*	.716*	.733*
Rural	---	.684	.641	.656
Place Attachment	---	---	-.016	-.015
Biospheric Values	---	---	-.134	-.137
Political Ideology	---	---	.237**	.232*
Distance Frame [d]	---	---	---	-.033
Topic Frame [e]	---	---	---	.007

Note. $N = 195$. $R^2 = .068$* at Step 1, $R^2 = .096$ at Step 2, $R^2 = .174$*** at Step 3, and $R^2 = .175$ at Step 4.

[a] (Male=0, Not male = 1) [b] (No college = 0, College or higher = 1), [c] (Annual salary <75k = 0, Annual salary 75k+ = 1), [d] (Local = 0, Distant = 1), [e] (Policy = 0, Disaster= 1)

*p ≤ .05. **p ≤ .01. ***p ≤ .001.

Table 8

Hierarchal Multiple Linear Regression for Climate Change Engagement

Variable	Step 1	Step 2	Step 3	Step 4
	β	β	β	β
Age	-.254**	-.229**	-.210**	-.213**
Gender [a]	.070	.062	.024	.028
Education [b]	.116	.118	.043	.034
Income [c]	-.113	-.132	-.037	-.023
Metropolitan	---	.453	.634*	.633*
Micropolitan	---	.575	.609*	.609*
Rural	---	.663	.754*	.751*
Place Attachment	---	---	.060	.070
Biospheric Values	---	---	.442***	.441***
Political Ideology	---	---	-.289***	-.300***
Distance Frame [d]	---	---	---	-.014
Topic Frame [e]	---	---	---	.074

Note. $N = 195$. $R^2 = .092$** at Step 1, $R^2 = .121$ at Step 2, $R^2 = .427$*** at Step 3, and $R^2 = .432$ at Step 4.

[a] (Male=0, Not male = 1) [b] (No college = 0, College or higher = 1), [c] (Annual salary <75k = 0, Annual salary 75k+ = 1), [d] (Local = 0, Distant = 1), [e] (Policy = 0, Disaster= 1)

*p ≤ .05. **p ≤ .01. ***p ≤ .001.

Table 9

Hierarchal Multiple Linear Regression for Climate Change Concern

Variable	Step 1	Step 2	Step 3	Step 4
	β	β	β	β
Age	-.244**	-.213**	-.167**	-.167**
Gender [a]	.079	.085	.045	.049
Education [b]	.079	.087	-.011	-.014
Income [c]	-.100	-.104	.021	.028

Metropolitan	---	.009	.259	.273
Micropolitan	---	.218	.302	.318
Rural	---	.220	.364	.378
Place Attachment	---	---	-.026	-.021
Biospheric Values	---	---	.423***	.421***
Political Ideology	---	---	-.367***	-.384***
Distance Frame [d]	---	---	---	.032
Topic Frame [e]	---	---	---	-.037

Note. $N = 195$. $R^2 = .085$** at Step 1, $R^2 = .120$ at Step 2, $R^2 = .505$*** at Step 3, and $R^2 = .507$ at Step 4.

[a] (Male=0, Not male = 1) [b] (No college = 0, College or higher = 1), [c] (Annual salary <75k = 0, Annual salary 75k+ = 1), [d] (Local = 0, Distant = 1), [e] (Policy = 0, Disaster= 1)

*p ≤ .05. **p ≤ .01. ***p ≤ .001.

A series of simple linear regressions were conducted to examine the relationship between place attachment, political ideology, and biospheric values with the dependent variables of risk perception, engagement, and concern, as outlined in H3, H4, and H5. Results are shown in Table 10. A significant regression model was found for place attachment predicting risk perception (F (1, 216) = 22.14, $p < .001$, $R^2 = .093$), indicating that higher place attachment is associated with lower risk perception ($\beta = -.305$, $p < .001$). A significant regression model was found for place attachment predicting climate change risk perception (F (1, 216) = 34.01, $p<.001$, $R^2 = .136$), indicating that higher place attachment is associated with lower climate change risk perception ($\beta = -.369$, $p < .001$). A significant regression model was found for place attachment predicting the fear component of message engagement (F (1, 193) = 6.36, $p = .012$, $R^2 = .032$), indicating that higher place attachment is associated with higher message fear ($\beta = .179$, $p = .012$). A significant regression model was found for place attachment predicting climate change engagement (F (1,

216) = 7.35, p = .007, R^2 = .033), indicating that higher place attachment is associated with lower climate change engagement (β = -.181, p = .007). A significant regression model was found for place attachment predicting climate change concern (F (1, 216) = 23.01, p < .001, R^2 = .096), indicating that higher place attachment is associated with lower climate change concern (β = -.310, p < .001). No significant model was found for place attachment and the danger component of message engagement (F (1, 193) = .65, p = .421, R^2 = .003). These findings do not support H3.

A significant regression model was found for political ideology predicting risk perception (F (1, 201) = 58.17, p < .001, R^2 = .224), indicating that a more conservative political ideology is associated with lower risk perception (β = -.474, p < .001). A significant regression model was found for political ideology predicting climate change risk perception (F (1, 201) = 109.54, p < .001, R^2 = .353), indicating that a more conservative political ideology is associated with lower climate change risk perception (β = -.594, p < .001). A significant regression model was found for political ideology predicting the danger component of message engagement (F (1, 182) = 19.880, p < .001, R^2 = .098), indicating that a more conservative political ideology is associated with lower message danger (β = -.314, p < .001). A significant regression model was found for political ideology predicting the fear component of message engagement (F (1, 182) = 17.19, p < .001, R^2 = .086), indicating that a more conservative political ideology is associated with higher message fear (β = .294, p < .001). A significant regression model was found for political ideology predicting climate change engagement (F (1, 201) = 48.54, p < .001, R^2 = .195), indicating that a more conservative political ideology is associated with lower climate change engagement (β = -.441, p < .001). A significant regression model was found for political ideology predicting climate change concern (F (1, 201) = 91.62, p < .001, R^2 = .313), indicating

that a more conservative political ideology is associated with lower climate change concern (β = -.560, $p < .001$). Therefore, H4 is supported. Additionally, a significant regression model was found for political ideology and place attachment (F (1, 201) = 76.47, $p < .001$, $R^2 = .276$), indicating that a more conservative political ideology is associated with higher place attachment (β = -.525, $p < .001$).

H5 is also supported. A significant regression model was found for biospheric values predicting risk perception (F (1, 216) = 60.26, $p < .001$, $R^2 = .218$), indicating that higher biospheric values are associated with higher risk perception (β = .467, $p < .001$). A significant regression model was found for biospheric values predicting climate change risk perception (F (1, 216) = 77.02, $p < .001$, $R^2 = .263$), indicating that higher biospheric values are associated with higher climate change risk perception (β = .513, $p < .001$). A significant regression model was found for biospheric values predicting the danger component of message engagement (F (1, 193) = 77.10, $p < .001$, $R^2 = .222$), indicating that higher biospheric values are associated with higher message danger (β = .471, $p < .001$). A significant regression model was found for biospheric values predicting the fear component of message engagement (F (1, 193) = 9.61, p = .002, $R^2 = .047$), indicating that higher biospheric values are associated with lower message fear (r = -.218, p = .002). A significant regression model was found for biospheric values predicting climate change engagement (F (1, 216) = 77.83, $p < .001$, $R^2 = .265$), indicating that higher biospheric values are associated with higher climate change engagement (β = .515, $p < .001$). A significant regression model was found for biospheric values predicting climate change engagement (F (1, 216) = 93.68, $p < .001$, $R^2 = .303$), indicating that higher biospheric values are associated with higher climate change concern (β = .550, $p < .001$).

Table 10

Regression Coefficients of Risk Perception, Climate Change Risk Perception, Climate Change Concern, and Climate Change Engagement

Variables	Place Attachment			Political Ideology			Biospheric Values		
	B	β	*SE*	*B*	β	*SE*	*B*	β	*SE*
1. Risk Perception	-.29	-.31***	.06	-.27	.47***	.04	.67	.47***	.09
2. Climate Change Risk Perception	-.43	-.37***	.07	-.42	-.59***	.04	.91	.51***	.10
3. Climate Change Engagement	-.17	-.18**	.06	-.24	-.44***	.04	.72	.52***	.08
4. Climate Change Concern	-.41	-.31***	.09	-.45	-.56***	.05	1.11	.55***	.12

Note. N = 218 for Place Attachment. N = 203 for Political Ideology. N = 218 for Biospheric Values.

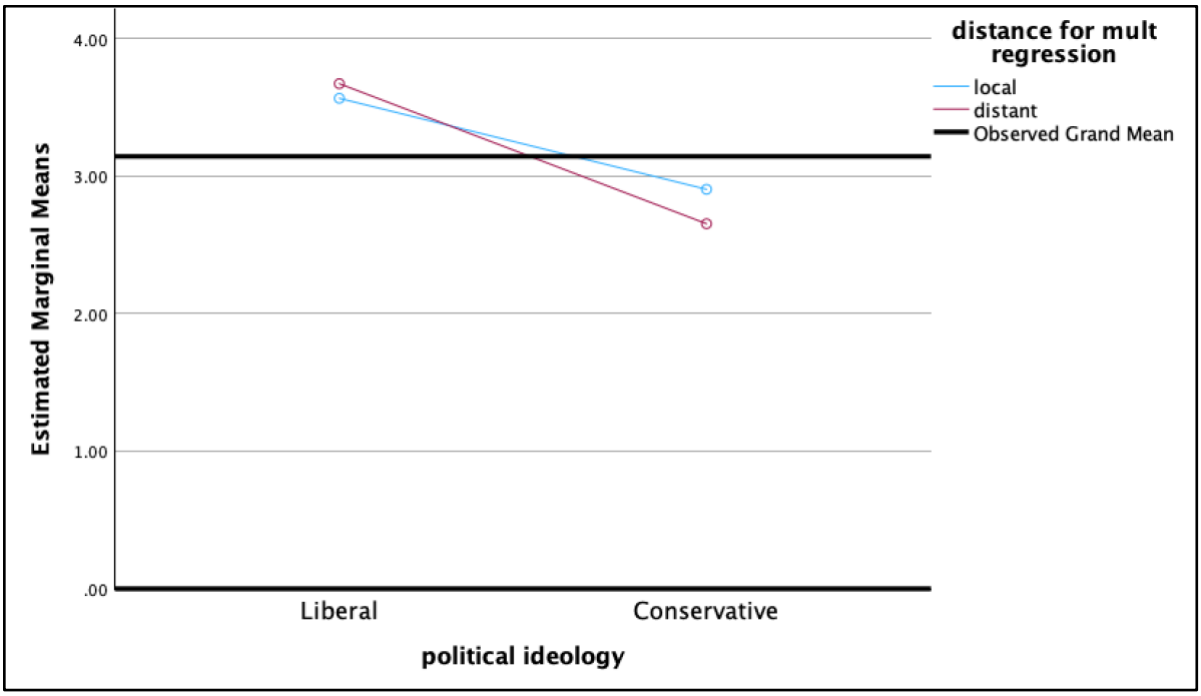
*p ≤ .05. **p ≤ .01. ***p ≤ .001.

Moderation analyses using Hayes PROCESS Model 1 were conducted to test the interaction effects examined in H6, H7, and H8. Place attachment is not a significant moderator with the distance frame for risk perception (B = -.090, t (191) = -.739, p = .461, ΔR^2 = .003, 95% CI [-0.33, 0.15]), climate change risk perception (B = -.257, t (191) = -1.661, p = .098, ΔR^2 = .012, 95% CI [-0.56, 0.05]), the danger dimension of message engagement (B = -.138, t (191) = -1.061, p = .290, ΔR^2 = .006, 95% CI [-0.40, 0.12]), the fear dimension of message engagement (B = .020, t (191) = -.181, p = .857, ΔR^2 = .000, 95% CI [-0.20, 0.24]), climate change engagement (B = -.231, t (191) = -1.800, p = .073, ΔR^2 = .016, 95% CI [-0.48, 0.02]), nor climate change concern (B = -.339, t (191) = -1.883, p = .061, ΔR^2 = .017, 95% CI [-0.69, 0.02]). Therefore, H6 is not supported. Biospheric values are not a significant moderator with the distance frame for risk perception (B = -.037, t (191) = -.211, p = .833, ΔR^2 = .000, 95% CI [-0.39, 0.31]), climate change risk perception (B = -.054, t (191) = -.242, p = .809, ΔR^2 = .000, 95% CI [-0.49, 0.38]), the danger dimension of message engagement (B = -.155, t (191) = -.851, p = .396, ΔR^2 = .003,

95% CI [-0.51, 0.20]), the fear dimension of message engagement (*B* = .252, *t* (191) = 1.44, *p* = .151, ΔR^2 = .010, 95% CI [-0.09, 0.60]), climate change engagement (*B* = -.035, *t* (191) = -.201, *p* = .841, ΔR^2 = .000, 95% CI [-0.38, 0.31]), nor climate change concern (*B* = -.187, *t* (191) = -768, *p* = .450, ΔR^2 = .002, 95% CI [-0.67, 0.30]). Therefore, H7 is not supported. Political ideology is not a significant moderator with the distance frame for risk perception (*B* = -.060, *t* (180) = -.818, *p* = .415, ΔR^2 = .003, 95% CI [-0.20, 0.08]), climate change risk perception (*B* = -.111, *t* (180) = -1.277, *p* = .203, ΔR^2 = .006, 95% CI [-0.28, 0.06]), the danger dimension of message engagement (*B* = -.044, *t* (180) = -.546, *p* = .586, ΔR^2 = .002, 95% CI [-0.20, 0.11]), the fear dimension of message engagement (*B* = -.096, *t* (180) = -1.356, *p* = .177, ΔR^2 = .009, 95% CI [-0.24, 0.04]), nor climate change concern (*B* = -.147, *t* (180) = -1.477, *p* = .141, ΔR^2 = .008, 95% CI [-0.34, 0.04]). H8a and H8c are not supported. The interaction between political ideology and distance frame reached significance for climate change engagement (*B* = -.149, *t* (180) = -1.985, *p* = .049, ΔR^2 = .017, 95% CI [-0.30, -0.0009]), and the relationship is shown in Figure 1. This suggests that political ideology moderates the effects of distance frame condition on climate change engagement such that those who are more politically conservative have higher climate change engagement when presented with a local frame, while those with more liberal views have higher climate change engagement when presented with distant frames. Therefore, H8b receives some support.

Figure 1

Interaction Effect Between Political Ideology and Distance Frame for Climate Change Engagement



Note. Political ideology is a significant moderator for distance framing effects on climate change engagement (B = -.149, t (180) = -1.985, p = .049, ΔR^2 = .017, 95% CI [-0.30, -0.0009]).

Research Questions

Additional moderation analyses were conducted to examine the interaction effects between topic frames and the different values and demographic variables measured using Hayes PROCESS Model 1. In response to RQ1, no significant moderation interactions were found between the topic frame used and personal values for risk perceptions, climate change engagement, nor climate change concern. In response to RQ2, no significant moderation interactions were found with the topic frame used and demographic characteristics for risk perceptions, climate change engagement, nor climate change concern.

Town Size and Climate Change Perceptions

Additional analyses were conducted to examine differences in climate change perceptions, engagement, and concern based on the size of town where participants live. Results are shown in Tables 11 and 12. A one-way ANOVA was conducted to examine the differences in risk perception between those in rural (towns 5,000 or fewer residents), micropolitan (towns at least 10,000 residents), and metropolitan (towns with at least 50,000 residents). There was no significant difference in engagement between groups for the danger dimension of message engagement (F (2, 190) = 1.08, p = .343), the fear dimension of message engagement (F (2, 190) = 1.29, p = .278), nor climate change engagement (F (2, 213) = 2.14, p = .080). Risk perceptions between groups are significant (F (2, 213) = 5.35, p = .005, η^2 = .048). A Tukey's post hoc test showed significant differences between risk perceptions of metropolitan and micropolitan residents and metropolitan and rural residents, but not between micropolitan and rural residents ($M_{difference}$ = .070, p = .884). Participants in metropolitan communities have slightly higher risk perceptions of the events described in the messages (M = 3.76, SD = .946) than micropolitan (M = 3.33, SD = .980) residents ($M_{difference}$ = .438, p = .024) and rural (M = 3.26, SD = .900) residents ($M_{difference}$ = .508, p = .006).

Climate change risk perceptions between groups are also significant (F (2, 213) = 4.44, p = .013, η^2 = .040). A Tukey's post hoc test showed significant differences between climate change risk perceptions of metropolitan and micropolitan residents and metropolitan and rural residents, but between micropolitan and rural residents ($M_{difference}$ = .017, p = .995). Participants in metropolitan communities perceive greater climate change risks (M = 4.02, SD = 1.03) than micropolitan (M = 3.48, SD = 1.22) residents ($M_{difference}$ = .536, p = .028) and rural (M = 3.47, SD = 1.21) residents ($M_{difference}$ = .553, p = .019). Climate change concern between groups is

significantly different (F (2, 213) = 5.35, p = .005, η^2 = .048). A Tukey's post hoc test showed significant differences in climate change concern between metropolitan and micropolitan residents and metropolitan and rural residents, but not between micropolitan and rural residents ($M_{difference}$ = -.009, p = .999). Participants in metropolitan communities have higher climate change concern (M = 4.03, SD = 1.23) than micropolitan (M = 3.36, SD = 1.36) residents ($M_{difference}$ = .681, p = .011) and rural (M = 3.36, SD = 1.34) residents ($M_{difference}$ = .672, p = .010).

Table 11

Means, Standard Deviations, One-Way Analyses of Variance, and Effect Size for Risk Perception, Climate Change Risk Perception, Climate Change Engagement, and Climate Change Concern Across Town Sizes

Measure	Metropolitan		Micropolitan		Rural		F (2, 213)	η^2
	M	*SD*	*M*	*SD*	*M*	*SD*		
1. Risk Perception	3.76	.95	3.33	.98	3.23	.90	5.35**	.048
2. Climate Change Risk Perception	4.02	1.03	3.48	1.22	3.47	1.21	4.44*	.040
3. Climate Change Engagement	3.35	.86	3.13	1.01	3.00	.86	2.56	.023
4. Climate Change Concern	4.04	1.23	3.36	1.36	3.36	1.34	5.35**	.048

Note. See Table 12 for Tukey's post-hoc tests.

*p ≤ .05. **p ≤ .01. ***p ≤ .001.

Table 12

Tukey's Post-Hoc Tests for Risk Perception, Climate Change Risk Perception, and Climate Change Concern Across Town Sizes

Dependent Variable	I	J	Mean Difference (I-J)
Risk Perception	Metropolitan	Micropolitan	.438*
		Rural	.508**
	Rural	Micropolitan	-.070
		Metropolitan	-.508**
Climate Change Risk Perception	Metropolitan	Micropolitan	.536*
		Rural	.553*
	Rural	Micropolitan	-.017
		Metropolitan	-.553*
Climate Change Concern	Metropolitan	Micropolitan	.681*
		Rural	.672**
	Rural	Micropolitan	.009
		Metropolitan	-.672**

*p ≤ .05. **p ≤ .01. ***p ≤ .001.

Based on these results, additional analyses were conducted to examine if the impact of distance message frames varied between metropolitan participants and small town participants, classified as those from micropolitan and rural communities. A moderation test was conducted using Hayes PROCESS Model 1 to examine if a participants' town size acts as a moderator for distance frame condition on risk perceptions and concern. No significant interaction effects were found town size and distance frame condition for risk perception (B = .179, t (191) = .604, p = .547, ΔR^2 = .002, 95% CI [-0.41, 0.77]), climate change risk perception (B = .355, t (191) = .912, p = .363, ΔR^2 = .004, 95% CI [-0.41, 1.12]), climate change engagement (B = -.082, t (191) = -.267, p = .790, ΔR^2 = .000, 95% CI [-0.69, 0.53]), nor climate change concern (B = .215, t (191) = .486, p = .628, ΔR^2 = .001, 95% CI [-0.66, 1.09]).

To further explore differences between metropolitan and small town residents, independent-samples t-tests were conducted to determine if place attachment, biospheric values,

and political ideology vary significantly by place of residence. No significant differences in place attachment were found (t (83.89) = -1.90, p = .061). Significant differences in biospheric values were found (t (120.84) = 2.72, p = .008) such that small town residents have slightly lower biospheric values (M = 4.21, SD = .695) than metropolitan participants (M = 4.45, SD = .531). Significant differences in political ideology were also found (t (71.15) = -2.97, p = .004) such that small town residents have a more conservative political ideology (M = 4.12, SD = 1.604) than metropolitan participants (M = 3.28, SD = 1.740).

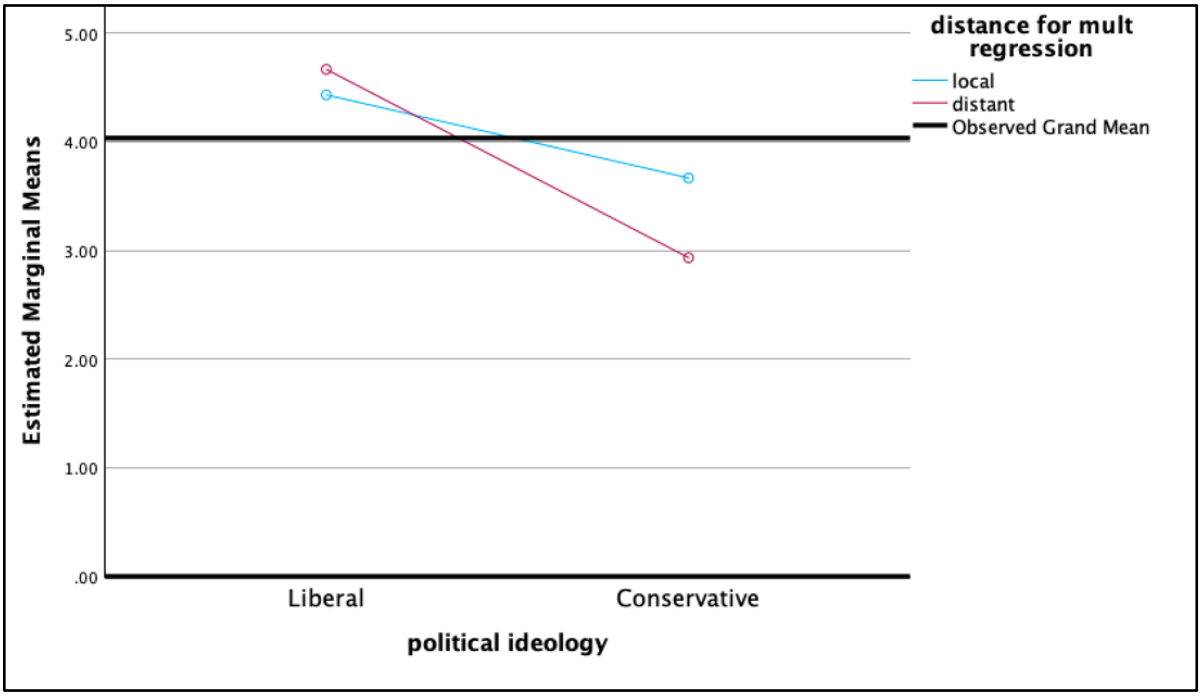
Finally, moderation analyses were carried out to examine if biospheric values and political ideology interact with distance frame conditions to affect risk perceptions, engagement, and concern for metropolitan residents and small town residents, respectively. Moderation tests using Hayes PROCESS Model 1 showed that among metropolitan participants, biospheric values are not a significant moderator with distance frame for risk perceptions (B = .429, t (44) = .87, p = .387, ΔR^2 = .014, 95% CI [-0.56, 1.42]), climate change risk perception (B = .567, t (44) = 1.10, p = .278, ΔR^2 = .019, 95% CI [-0.47, 1.61]), climate change engagement (B = .396, t (44) = .997, p = .324, ΔR^2 = .017, 95% CI [-0.40, 1.20]), nor climate change concern (B = .683, t (44) = 1.16, p = .252, ΔR^2 = .019, 95% CI [-0.50, 1.87]). Among metropolitan participants, political ideology is not a significant moderator with distance frame for risk perception (B = -.082, t (40) = -.603, p = .550, ΔR^2 = .006, 95% CI [-0.36, 0.19]), climate change engagement (B = -.195, t (40) = -1.62, p = .114, ΔR^2 = .049, 95% CI [-0.44, 0.05]), nor for climate change concern (B = -.263, t (40) = -1.471, p = .149, ΔR^2 = .033, 95% CI [-0.62, 0.10]).

However, the interaction between political ideology and distance is significant for climate change risk perception, (B = -.339, t (40) = -2.56, p = .014, ΔR^2 = .084, 95% CI [-0.61, -0.07]), suggesting that among metropolitan participants, political ideology moderates the effect of the

distance frame condition on climate change risk perception. A more conservative political ideology is associated with lower climate change risk perceptions when participants are exposed to the distant message frame, which can be seen in Figure 2. Alone, local or distant message frames did not significantly affect climate change risk perceptions, but among those with a more conservative political ideology, local messages elicited higher climate change risk perception than distant messages, while distant messages elicited higher climate change risk perceptions among more liberal participants.

Figure 2

Interaction Effect Between Political Ideology and Distance Frame for Climate Change Risk Perception Among Metropolitan Participants



Note. Political ideology is a significant moderator for distance framing effects on climate change risk perception among metropolitan participants only (B = -.339, t (40) = -2.56, p = .014, ΔR^2 = .084, 95% CI [-0.61, -0.07]).

Among small town residents, including those in micropolitan and rural locations, biospheric values are not a significant moderator with distance frame for risk perception (B = -.047, t (140) = -.240, p = .4811, ΔR^2 = .000, 95% CI [-0.43, 0.34]), climate change risk perception (B = -.074, t (140) = -.289, p = .773, ΔR^2 = .000, 95% CI [-0.58, 0.43]), climate change engagement (B = -.132, t (140) = -.821, p = .413, ΔR^2 = .003, 95% CI [-0.45, 0.19]), nor climate change concern (B = -.238, t (140) = -.847, p = .398, ΔR^2 = .004, 95% CI [-0.79, 0.32]). Similarly, political ideology is not a significant moderator with distance frame for risk perception (B = -.076, t (134) = -.832, p = .407, ΔR^2 = .004, 95% CI [-0.25, 0.10]), climate change risk perception (B = -.064, t (134) = -.577, p = .565, ΔR^2 = .002, 95% CI [-0.28, 0.16]), climate change engagement (B = -.072, t (134) = -.920, p = .360, ΔR^2 = .005, 95% CI [-0.23, 0.08]), nor climate change (B = -.134, t (134) = -1.077, p = .284, ΔR^2 = .006, 95% CI [-.038, 0.11]).

DISCUSSION

This study examines how different climate change messaging approaches affect how individuals engage with related risks and issues. As climate change worsens, negative effects are evident in all types of environments. While impacts such as sea level rise are often sensationalized in the news, changes in annual temperature averages, precipitation patterns, and the increased frequency of extreme events may be less noticeable. When people do not recognize these changes in their day to day lives, climate change communication efforts are especially important to help people understand increasing risks. In this study, climate change message frames relating to local and distant impacts as well as policy and disaster topics were tested among Oklahoma participants. Since message frames can shape an individual's understanding of an issue (Nisbet, 2009) and reducing psychological distance can make an issue seem more concrete (Trope & Liberman, 2010), local message frames were expected to increase risk perceptions, message engagement, and climate change concern. However, in most instances, the type of message viewed had very little effect on overall views of climate change issues.

Hypothesis one specifically examines the effects of local frames. Messages emphasizing climate disasters or policies taking place locally in Oklahoma result in a small increase in risk perceptions of the direct the challenges described in the message. However, general climate change risk perceptions, engagement, and concern are not significantly affected by the location mentioned. This suggests that emphasizing concrete risks and personal relevance may reduce perceived distance to overcome climate change communication barriers. It also points to the limited effects of a single message. In past locality framing studies, some research shows that emphasizing regional climate impacts did not affect support for related policies (Shwom et al., 2008). Even when a message helps people recognize risk, this may not translate to overall

concern for climate change as a broad concept. The small main effect of locality framing on risk perception points to the need for future consideration of increasing personal relevance in communication efforts. It also calls for recognition that a single message cannot fully overcome the barriers to public understanding of climate change threats.

The topic frame was also manipulated in the message stimuli. Messages discussing climate related policies and climate change induced natural disasters did not alter participants' risk perceptions, engagement, or concern. While longitudinal survey research shows shifts in widespread audience attitudes based on news coverage of policy and disaster events (Carmichael & Brulle, 2017), these findings provide additional support for the argument that a single message is not likely to alter an individual's viewpoint. The two research questions further explored if specific audience demographic factors or values would influence the effectiveness of different topic frames, but neither policy nor disaster topics stood out as significantly more impactful when controlling for different audience characteristics.

Place attachment, political ideology and biospheric values are significant predictors of climate change risk perception, engagement, and concern. As climate change messages have long been framed along party lines, lower levels of climate change risk perception, engagement, and concern are often characteristic of political conservatives, which was supported in the findings of this study (Nisbet, 2009). In places like Oklahoma where the population is predominately conservative, those seeking to enhance climate change adaptation initiatives or mitigate related risks should consider what shared goals may better engage these audiences with pro-environmental efforts. Appreciation for nature and protection of community health can be shared values even when direct discussions of climate change become contentious (Letourneau et al., 2024). Additionally, when messages come from trusted local sources or others with shared

political perspectives, conservatives may be more willing to engage directly with climate change topics (Andrews et al. 2023; Goldberg et al., 2020).

Similarly, hypothesis five is supported since biospheric values are associated with higher climate change risk perceptions, engagement, and concern. Biospheric values directly relate to a person's understanding of and connection with the natural environment (Van der Werf et al., 2013). The challenges connected to climate change may be seen as a direct threat to the lifestyle or sense of self of those with high biospheric values. Additionally, pro-environmental choices are often influenced by biospheric values (Steg et al., 2014). Targeting audiences with high biospheric values in climate change messaging strategies may result in greater engagement since these individuals are likely to already have some level of concern.

Place attachment encompasses a person's relationship to their community, the built environment, and place-based behaviors and beliefs in addition to their natural surroundings (Jorgensen & Stedman, 2006). Contrary to hypothesis three, place attachment predicted lower climate change risk perception, engagement, and concern. This relationship is opposite to that observed in past research, where place attachment was a positive predictor of climate change engagement (Scannell & Gifford, 2013) and community attachment was a positive predictor of pro-environmental behaviors (Takahashi & Selfa, 2015). However, in a conservative state like Oklahoma, identifying with the most widely shared political viewpoint may contribute to higher place attachment. This aligns with the significant relationship observed between higher place attachment and conservative political ideology, and it helps explain why place attachment in Oklahoma negatively predicts climate change risk perceptions, engagement, and concern.

Even in regions where strong place attachment is associated with lower climate change concern, place-based analysis can provide important insights into which messaging strategies

may best connect audiences with climate change problems and solutions. Understanding the information barriers and misconceptions relating to climate change is an important first step for effective climate change engagement (Caretta et al., 2022). In Oklahoma, long-term residents are very familiar with droughts, heatwaves, and floods because the region is known for experiencing extreme weather events and variable precipitation patterns (OCS, n.d.). This provides one explanation for the overall limited climate change risk perception, engagement, and concern among Oklahomans. When individuals regularly experience weather extremes, it is more difficult to recognize increases in the frequency and severity of these events. This effect has been observed in past research examining how those living in flood plain areas view climate change vulnerability, finding that perceived risk is often lower than actual vulnerability (Brody et al. 2008). Place is an important context for climate communicators to consider, especially when it is a barrier to climate change engagement and concern.

Framing theory also explores how different messages interact with audience's preexisting attitudes and beliefs (D'Angelo, 2002). Political ideology, biospheric values, and place attachment were used to further examine how local and distant message frames resonate within specific audience contexts. The patterns between values and message frame effects were minimal. Despite strong relationships between participant values and climate change risk perceptions, engagement, and concern, only one interaction effect was found between participant values and the outcomes of local and distant message frames was observed across the full sample. Participants with a more conservative political ideology reported higher climate change engagement when presented with a locally framed message than they did when presented with a distantly framed message. For those with more liberal political leanings, distance frames resulted

in slightly higher in engagement, with both distance and local framing resulting in overall higher engagement among liberals than among conservatives.

This is not surprising, as those with a more conservative political ideologies are likely to be more skeptical of climate change information. Past research also shows a stronger local media effect among Republicans compared to non-Republicans (Andrews et al., 2023). This insight can help climate change communicators identify potential opportunities to engage with hesitant audiences. However, political ideology did not moderate the ability of local frames to increase risk perceptions or concern differently between political conservatives and political liberals. While utilizing local frames may be one approach to connect with conservative audiences, this cannot be seen as a prescriptive communication framework. Similarly, local frames did not have differing effects among those with higher or lower place attachment or biospheric values, so no clear communication strategies were distinguished based on these audience values.

In this sample, town size was identified as another barrier to understanding climate change risks. Those in micropolitan and rural communities had lower risk perceptions and concern for climate change issues and impacts than participants living in metropolitan areas, pointing to a disconnect in actual and perceived risk. Small communities are often the most vulnerable to negative impacts, and they are likely to need additional climate adaptation support (Hamilton et al., 2014). Small town participants reported lower biospheric values and more conservative political ideology, both of which are associated with lower climate change risk perceptions, engagement, and concern. None of the message frames tested in this study were more impactful among small town participants. While an interaction between political ideology and distance frame effectiveness was observed among metropolitan participants for climate

change risk perceptions, there were no additional insights into how to effectively engage small town residents with these messages.

Reaching vulnerable small town populations poses unique challenges for climate change communicators. Educational materials and messaging related to local climate change impacts can be an important first step for raising awareness of climate change risks and impacts (Brody et al., 2008). However, access to adaptation resources is often a strong limiting factor for engagement. Increasing climate change information among small town residents may do little to address lived experiences, livelihood concerns, or norms of socially acceptable topics (Caretta et al., 2022). Socioeconomic and attitudinal factors may be better at explaining climate change views than knowledge of impacts (Brody et al., 2008). Climate change risk perceptions can be higher among those with the ability to adapt and respond to these threats, including those with higher status, education, and income (Saleh Safi et al., 2012). Professionals working to address climate change issues should be especially concerned about vulnerable populations who may be less likely to recognize climate change risk due to perceived constraints. More research is needed to identify strategies for connecting with rural populations to address climate change vulnerabilities and expand adaptation resources.

Theoretical implications

Climate change communication research seeks to identify when and why different messaging strategies are likely to be effective (Li & Su, 2018; Homar & Cvelbar, 2021; Hurst & Stern, 2020). Framing theory provides an important lens for exploring this topic, as it seeks to describe the power of a communicating text (Entman, 1993). This helps communicators understand how messages create narratives and impact audience engagement with abstract problems such as climate change (Nisbet, 2009). Very few significant framing effects were

observed for the climate change message frames tested in this study. This points to a potential limitation of message framing. It is unreasonable to expect a single message to fully address the barriers to Oklahomans' understanding of climate change risks. A message may prompt an individual to spend more time thinking about climate change than they would in their everyday life, but this is unlikely to shift their overall perceptions of the issue. However, looking for deeper explanations for why certain message frames are relevant across specific contexts remains important (Li & Su, 2018). Framing strategies can provide a foundation for establishing more holistic climate change communication efforts that go beyond a single message.

Construal level theory also informed this study's exploration of psychological distance and climate change risk perceptions (Brügger et al., 2016; Lermer et al., 2016). The spatial component of psychological distance has direct relation to perceived personal relevance, as the view that climate change is only happening elsewhere and affecting distant people is a commonly identified barrier to climate action or concern (Caretta et al., 2022). In this study, messages relating to decreased spatial distance increased participants' risk perceptions of concrete climate change impacts, but more abstract perceptions of this issue such as climate change concern and cognitive engagement were not affected. The other components of construal level, including temporal distance, uncertainty, and social relevance, should be examined to more fully understand the implications of this theory for climate change communication (Trope & Liberman, 2010). Psychological processes such as mental construal point to which message frames may be useful for addressing climate concerns.

Practical Implications

Climate change communicators should look to insights from framing theory and construal level theory to understand when and why different messaging may be effective.

Emphasizing local impacts provides an opportunity to enhance understanding of climate risks, and efforts to engage political conservates may be strengthened by focusing on local relevance. When climate change problems are linked to local challenges, this may help hesitant audiences find a personal connect to the information. However, the limited message framing effects found here should caution communicators against relying too heavily on a single message to bridge overall gaps in understanding of climate change issues.

Instead, relational approaches to climate change communication can focus on identifying and meeting local information needs through efforts such as educational outreach or community workshop facilitation (Bamzai-Dodson et al., 2021; Archie et al., 2014). The insights gained from climate change framing studies help communicators identify strategies for long-term and solution-oriented engagement initiatives. Especially in places with more conservative or rural populations, communicators should work to understand how factors such as physical location, environmental values, or resource limitations shape climate change engagement. Communication can be an important enabler or barrier for helping communities address direct environmental needs (Gerlak et al., 2023). This points to the importance of ongoing research and exploration of communication theories to inform the efforts of climate change advocates, educators, and communicators alike.

Limitations

Online data collection was used to reach participants in both rural and urban areas, but bot responses were an ongoing issue. Qualtrics reCAPTCHA scores were used to detect potential bots, and additional suspicious responses were deleted in the data cleaning process. Future research should utilize added safety features to further ensure quality responses (Griffin et al., 2022). Question design also limited response collection, as the difficulty of the sliding scale

feature on a mobile device may explain the 15 missing responses to the political ideology question. User ease should be more carefully considered in questionnaire design.

The lack of racial and ethnic data leaves a notable hole in this study's ability to examine how demographic factors influence climate change risk perceptions. This is an especially important factor to consider in future research since racial minorities often face higher social and health vulnerabilities due to negative climate impacts (Akerlof et al., 2015). Analysis of town size data could also be expanded since this study only looked at self-reported town size. In future analysis, zip code responses and self-reported town size categorization should be compared to understand how participants' subjective view of their hometowns differs from formal categorization and how this may relate to the perceptions they report. Additionally, the dependent variables used in this study measured cognitions of climate change, so further insights could be gained through measures of behavioral intention. Lastly, while these findings are discussed in the context of Oklahoma, responses are not generalizable within Oklahoma or beyond due to the nonprobability sampling technique used for this experimental design.

Future Research

This study examined interactions between values and climate change message frames, and findings point areas where ongoing analysis and data collection could provide deeper insights. Mediating relationships between risk perceptions and climate change engagement or concern should be tested. Since small main effects for local frames and interaction effects with political ideology were identified in this study, future research should also seek to identify how climate change communicators can best utilize local frames to enhance personal relevance among conservative audiences. Potential moderators can be explored with additional data collection, as factors such as social vulnerability, availability of adaptation resources, or message

source may also influence the effectiveness of locally framed messages. Researchers should continue to look for opportunities to overcome climate change communication barriers among small town audiences and other vulnerable populations.

While experimental testing of climate change messages is one method for identifying effective climate change communication strategies, the future areas of inquiry identified here can be further examined through additional approaches. Longitudinal surveys provide more generalizable insights into the beliefs and climate change perceptions represented within the state of Oklahoma (Jenkins-Smith et al., 2017). This data can be used to help communicators identify key differences between climate perceptions in rural and urban areas. Further, while this experimental study explored the relationships between values and perceptions of environmental issues, a qualitative approach may provide deeper insights into specific information barriers to climate change communication, engagement, and risk perceptions in a given location (Caretta et al., 2022). With improved insights from qualitative data, researchers can identify additional contexts or message frames to be tested in future experiments.

CONCLUSION

This study examines the effects of different climate change message frames relating to issue distance and impact topic. The framing effects observed are minimal, pointing to a need for holistic communication strategies that go beyond emphasizing a single message. The lack of interaction effects between message frames and specific audience values further points to the need for climate communicators to engage with audiences, as this will allow them to better understand contextual needs when designing climate change messaging strategies. Identifying the information needs of vulnerable populations, such as those in small town communities, is especially important when risk perceptions and actual vulnerability differ. As indicated by construal level theory, highlighting local impacts can be an important first step to increase risk perception. However, this is unlikely to increase overall engagement and concern for climate change issues through a standalone message or a one size fits all message strategy. Future research should explore how message framing can be applied to additional engagement components and broader climate change communication strategies.

APPENDIX A

Distant Disaster

[redacted] Yesterday at 9:45am ·

Communities in Georgia faced ten straight days with high temperatures over 100 degrees Fahrenheit. Heat health and safety are an ongoing concern as climate change increases heat wave events in Georgia.

57 21 Comments 10 Shares

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[redacted] Write a comment...

[redacted] Yesterday at 9:45am ·

A major drought is currently affecting 76% of Georgia. Lake levels, agriculture, and wildlife face negative impacts as climate change increases the severity of droughts and water shortages in Georgia.

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[redacted] Write a comment...

Distant Policy

[redacted] Yesterday at 9:45am ·

Georgia policymakers will update the state's comprehensive water plan to increase sustainable access to water. The plan addresses urgent needs as climate change raises the severity of droughts and water shortages in Georgia.

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[redacted] Write a comment...

[redacted] Yesterday at 9:45am ·

Policymakers in Georgia discussed proposals on Tuesday for a climate action plan, a measure many other states have taken to address climate change threats.

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Local Disaster

[redacted] Yesterday at 9:45am ·

Communities in Oklahoma faced ten straight days with high temperatures over 100 degrees Fahrenheit. Heat health and safety are an ongoing concern as climate change increases heat wave events in Oklahoma.

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[redacted] Write a comment...

[redacted] Yesterday at 9:45am ·

A major drought is currently affecting 76% of Oklahoma. Lake levels, agriculture, and wildlife face negative impacts as climate change increases the severity of droughts and water shortages in Oklahoma.

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Local Policy

[redacted] Yesterday at 9:45am ·

Oklahoma policymakers will update the state's comprehensive water plan to increase sustainable access to water. The plan addresses urgent needs as climate change raises the severity of droughts and water shortages in Oklahoma.

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[redacted] Yesterday at 9:45am ·

Policymakers in Oklahoma discussed proposals on Tuesday for a climate action plan, a measure many other states have taken to address climate change threats.

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