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Code red for humanity or time for broad collective action? Exploring the role of positive and negative messaging in (de)motivating climate action

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Despite decades of warning from climate scientists, the international community has largely failed at reining in planet-warming greenhouse gas (GHG) emissions. In this context, scientific assessments of climate change—like those periodic reviews provided by the Intergovernmental Panel on Climate Change (IPCC)—are repeatedly faced with the challenge of communicating the rapidly closing window for securing a livable future on Earth. Yet, it remains unclear whether sounding “code red for humanity” fosters climate action or climate paralysis. The ongoing debate among climate change communication scholars about the (in)effectiveness of fear-based messaging sheds light on three intertwined and often overlooked aspects of emotional appeals in communication: the content of the message frame, the emotional arousal it induces, and the values and dispositions of the audiences receiving the message. While previous work has addressed questions related to one or two of these aspects, this study examines the role of positive and negative messaging in (de)motivating climate action, with particular attention to how messages, emotions and audiences interact in the process of communication. Leveraging data drawn from a sample of environmental group supporters in Canada ($N = 308$), we first identify and describe four unique audiences within supporters of Canada’s environmental movement that vary in their levels of engagement and radicalism. We then examine how negative and positive messaging influence emotional arousal and climate action across audience segments. We find that negative messages about climate change (e.g., sounding “code red for humanity”) can be less mobilizing than positive messaging, even when the message is directed toward relatively engaged audiences and followed by the opportunity to take a specific, actionable and effective action. These findings help shed light on the potential limits of fear-based messaging in the context of a global public health pandemic while further highlighting the importance of communicating in ways that inspire people through hopeful and optimistic messages.

KEYWORDS

climate change, communication, emotions, audience segmentation, message framing, climate action

Introduction

Fear appeals, or communications that emphasize the dire consequences or threat of climate change, are often the default strategy when attempting to communicate with and engage the public on climate change (Nisbet, 2009; Moser, 2010; Hart and Feldman, 2014). With each successive report authored by the UN's Intergovernmental Panel on Climate Change (IPCC), which evaluates the state of scientific knowledge on the topic, such messages are now common, as the scientific community feels compelled to highlight the rapidly closing window for securing a livable future in the face of continually rising global greenhouse gas (GHG) emissions. Indeed, after sounding a "code red for humanity" in its report released in August 2021, the IPCC further went on to describe "an atlas of human suffering and a damning indictment of failed climate leadership" (IPCC, 2021, 2022). While such negative emotional messaging is common in both research and practice, relatively little emphasis has been given to efficacy-relevant information in IPCC reports and climate change communication more generally. Perhaps owing to the IPCC's claim to policy neutrality, research has found that threat information occurred nearly twice more frequently than efficacy-relevant information in the Summary for Policymakers (SPM) of the IPCC Fifth Assessment Report (Poortvliet et al., 2020). Extending well beyond the IPCC, this tendency to emphasize the consequences of inaction characterizes much of climate change communication, from economic assessments (Stern, 2007), media coverage (e.g., *Time's* 2017 "The Uninhabitable Earth") to popular culture, including films and documentaries (e.g., *The Day After Tomorrow* [2004], *An Inconvenient Truth* [2006], *Years of Living Dangerously* [2014], and *Don't look up* [2021]). Although alarmist and fear-inducing narratives have long been used to describe climate change (Ereaut and Segnit, 2006), this framing of the climate change problem took a qualitatively new form in 2019, with "climate emergency" emerging as a new global phenomenon (McHugh et al., 2021). Declared Word of the Year by the Oxford Dictionary in 2019, the phrase "climate emergency" was more than 100 times more common in September 2019 than it had been the previous year (Oxford Dictionaries 2019).

As the "climate emergency" frame gains momentum, negative and fear-based appeals continue to be debated within the climate change communication field (Ettinger, 2021), with several studies suggesting that fear-based messages can be effective (e.g., Meijnders et al., 2001; van Zomeren et al., 2010; Hartmann et al., 2014; Michelson and DeMora, 2021) and others suggesting the opposite (e.g., O'Neill and Nicholson-Cole, 2009; Feinberg and Willer, 2011; Chen, 2016). This ongoing debate sheds light on three important and intertwined aspects of emotional appeals in communication: the message's content, the emotional arousal it induces, and the values and dispositions of the audiences receiving the message. However, most prior research has addressed questions related to one

or two of these aspects, while overlooking the multiple and complex ways that all three are intertwined. This could help explain the mixed results commonly found in the literature on fear appeals, which has left several important questions unanswered. What is more effective (and when and how): scaring the public into climate action, or inspiring them to take action through optimistic and hopeful messages? Are negative emotional appeals leading to maladaptive fear and paralysis? Are optimistic and hopeful messages increasing complacency? What is the role of emotional responses in shaping the impact of negative and positive messaging on climate action? How do audiences with varying environmental values, worldviews and levels of engagement react toward communications that induce negative and positive emotions?

To address these questions, we examine the direct and indirect influence of negative and positive messaging on climate action across diverse supporters of Canada's environmental movement. Drawing on a two-wave panel survey of Canadian environmentalist NGO members ($N = 308$) conducted in 2019 and 2021, we apply Latent Class Modeling to create a novel segmentation of environmental activists in Canada. Using a survey experiment embedded in the second wave of this panel, we then examine how negative and positive messaging influence emotional arousal and climate action across audience segments. Overall, our results suggest that negative messages about climate change (e.g., sounding "code red for humanity") can be less mobilizing than positive messaging, even when the message is directed toward relatively engaged audiences and followed by the opportunity to take a concrete, doable and effective action. These findings help shed light on the potential limits of fear-based messaging in the context of a global public health pandemic, while further highlighting the importance of communicating in ways that inspire people through hopeful and optimistic messages.

The rest of the paper proceeds as follows. First, we briefly review the literature on the role of negative and positive messaging in (de)motivating climate action. We then examine the multiple ways that positive and negative messaging, emotions and audiences are intertwined and consider how these relationships help explain the mixed findings identified in the literature. After outlining our research design, we present the results of our audience segmentation and survey experiment. We conclude with a discussion of the implications of our findings and propose new avenues for further research.

Positive and negative messaging in climate change communication

While the consequences of climate change are admittedly frightening and distressing for many, it is unclear whether sounding "code red for humanity" will foster action or paralysis.

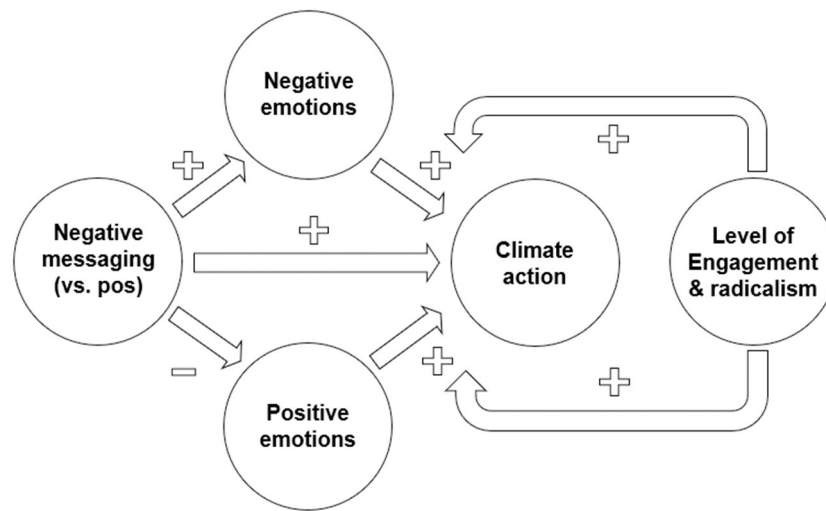


FIGURE 1

Conceptual model testing the effect of negative vs. positive messaging on climate action. Model tests the effectiveness of negative (vs. positive) messaging on climate action (H1), though negative and positive emotional arousal (H2, H3, and H4) moderated by the level of engagement and radicalism of the audiences (H5).

Despite years of debate among scholars in the climate change communication field, there is no clear scientific consensus on whether fear-evoking communications are beneficial or detrimental for motivating action on climate change. This stands in contrast to research and theory exploring the conditions of fear appeal effectiveness in other fields (Janis and Feshbach, 1953; Janis and Terwilliger, 1962), which generally conclude that fear appeals can be effective, insofar as they also provide recipients with specific, actionable and effective steps to reduce the risk of a given threat (Witte and Allen, 2000). While fear appeals have been widely studied in risk communication, fewer studies have examined these questions in the context of climate change (Reser and Bradley, 2017; Brosch, 2021).

Among the studies investigating the role of fear appeals in climate change communication, several have pointed to the positive effect of fear-based messages. Meijnders et al. (2001) found that eliciting fear about the risk of greenhouse gas emissions resulted in more favorable attitudes toward energy conservation, while van Zomeren et al. (2010) found that exposure to fear appeals about the impacts of climate change led to heightened environmental action intentions (signing petitions). Hartmann et al. (2014) found that high threat messages increased subjective fear and led to greater behavioral intentions (voting and green electricity purchasing). Moreover, this study found that fear predicted behavioral intentions and mediated the relationship between threat information and intentions.

Other studies, on the other hand, have found that messages and visuals emphasizing catastrophic and dire consequences of climate change can result in more skepticism and feelings

of helplessness, leading to “apocalypse fatigue” and ultimately causing people to disengage from climate change (O’Neill and Nicholson-Cole, 2009; Feinberg and Willer, 2011; Hart and Nisbet, 2012; Chen, 2016). Through semi-structured interviews and focus groups, O’Neill and Nicholson-Cole (2009) found that fearful and shocking representations of climate change were associated with enhanced perceptions of climate change as a distant issue in both time and space. Using a survey experiment, Feinberg and Willer (2011) found that exposure to a dire message about the impacts of climate change increased skepticism in participants with just world beliefs (i.e., those who believe that people get what they deserve in life).

Building on previous work on fear appeals in risk communication (Witte and Allen, 2000), a few studies have examined the interaction between fear and efficacy in the context of climate change (van Zomeren et al., 2010; Chen, 2016; Scharks, 2016; Nabi et al., 2018). Some find support for the threat-with-efficacy structure (Nabi et al., 2018), while others suggest that efficacy information is more important than threatening information in predicting attitudes and intentions (van Zomeren et al., 2010; Chen, 2016). Given the potentially negative effect of fear-based messaging, and considering the importance of efficacy perceptions in predicting constructive responses to climate change (Jugert et al., 2016; Bostrom et al., 2018), scholars have more recently begun to investigate the effect of positive-only appeals in climate change communication, producing similarly mixed findings. While some studies find that hope appeals, or messages designed to evoke hope, are effective for encouraging climate change engagement (e.g., Chadwick, 2015), other studies find that optimistic messages increase

complacency and reduce motivations to act on climate change (Hornsey and Fielding, 2016). Although not explicitly appealing to fearful or hopeful emotions, two recent experimental studies compared the effectiveness of positive and negative messaging on real observable behaviors, again producing mixed results. In a series of three experimental studies testing the effectiveness of positively and negatively framed emails about the impact of clean energy policies, Levine and Kline (2019) found that respondents who received the positively framed email were more likely to sign the online petition or join the partner organization than those who received the negatively framed message. In another series of five experimental studies, Michelson and DeMora (2021) found that a negatively framed email sent by a local environmental advocacy organization in Washington was more likely to motivate supporters to sign an online petition relative to a positively framed email, an effect that remained consistent across the five experiments.

Messages, emotions and audiences

One possible explanation for the mixed findings identified above is that the effect of positive and negative messaging may be mediated by specific message-induced emotions, which are not accounted for in many of the studies examining the effectiveness of persuasive appeals. While message-induced emotions—particularly hope, fear and worry—have been found to play a mediating role in framing effects (Nabi et al., 2018), many studies examining the effectiveness of fear appeals did not seek, find, nor report evidence that their messages were effective in actually evoking the intended emotional response (Reser and Bradley, 2017). Importantly, measures of message-induced emotional arousal were included in most experimental studies yielding positive effects of fear appeals, either alone (Meijnders et al., 2001; van Zomeren et al., 2010; Skurka et al., 2018) or in a threat-efficacy structure (Hartmann et al., 2014; Nabi et al., 2018), whereas such measures were lacking in many studies reporting negative effects (e.g., Feinberg and Willer, 2011; Hart and Nisbet, 2012; Chen, 2016).

While emotions play a central role in the conceptualization and operationalization of persuasive appeals in climate change communication, it should be noted that message-induced emotions differ from other pre-existing (i.e., message-unrelated) emotions about climate change. On the one hand, several studies have highlighted the constructive role of negative emotions in social movements in general (Jasper, 2011; Castells, 2015) and climate change more specifically (Smith and Leiserowitz, 2014; Ojala et al., 2021). In their narrative review of the research on emotions and climate action, Ojala et al. (2021) find that negative emotions like worry, eco-anxiety and environmental grief generally led to adaptative responses in the context of climate change. On the other hand, these results are mainly correlational and do not imply that negative message-induced emotions will

have effects similar to emotions experienced outside the context of communication. For example, negative emotions arising from personal experience with the consequences of climate change might have greater motivational power than negative emotions induced through communication. Along these lines, Demski et al. (2016) find that direct experience with flooding increase negative emotions, which in turn increase behavioral intentions to mitigate and adapt to climate change.

Another possible reason for these contradictory results is that studies differ substantially in terms of sample composition. In particular, many studies pointing to the effectiveness of fear appeals either included a much larger percentage of female participants (e.g., Meijnders et al., 2001; van Zomeren et al., 2010) or sought to deepen engagement with individuals who were already engaged with climate change (e.g., Michelson and DeMora, 2021). This is important, as regulatory fit theory (Kurman and Hui, 2011) and the late effectiveness hypothesis (Cho and Salmon, 2006) suggest that fear appeals should be more effective for women than men, and for late-stage rather than early-stage individuals (i.e., those who have already enacted change). According to the late effectiveness hypothesis, more engaged audiences should process fear through their high self-efficacy—and thus have a greater capacity to act out of fear (or other negative emotions). This suggests that targeting specific emotional reactions to motivate climate action is unlikely to produce consistent and predictable effects in individuals with varying levels of engagement with climate change.

To the extent that values, ideologies and worldviews have repeatedly been found to moderate how information about climate change is received, responded to, and acted upon (Lord et al., 1979; Kuhn and Lao, 1996; Kahan, 2012), it is likely that different segments of the population will react differently to emotion-based appeals. This is why scholars have emphasized the importance of knowing one's audience and tailoring communication to meet different audiences' emotional and informational dispositions and needs (Chapman et al., 2017; Markowitz and Guckian, 2018; Scheufele, 2018; Boykoff, 2019). An increasingly common approach used to identify specific audiences is audience segmentation, which aims to identify subgroups that share similar characteristics in terms of values, motivations, beliefs and behaviors within a population (Hine et al., 2014, 2017). While use of audience segmentation in the context of climate change is growing (e.g., Maibach et al., 2011; Hine et al., 2016; Metag and Schäfer, 2018), we know relatively less about the diversity within environmentally engaged citizens. Yet, research suggests that the environmental movement is far from homogeneous, and that environmentalists diverge not only in their levels of engagement with climate change, but also—and perhaps most importantly—in terms of views about nature, technology, economic growth and social change (Bernstein and Szuster, 2018, 2019; Brulle and Norgaard, 2019; Tindall et al., 2022). While some authors argue that the environmental movement can be best understood as divided

into two groups—those engaged in conventional advocacy, considered as “reformists,” and those supporting a more contentious climate-justice perspective, considered “radicals” (e.g., Hadden, 2015; Brulle and Norgaard, 2019)—several others have suggested that the classical division between “reformists” and “radicals” might be further subdivided and refined (e.g., Perron et al., 2001; Bernstein and Szuster, 2018, 2019). Overall, the literature suggests that the effectiveness of emotional appeals for climate action may depend not only on the level of engagement with climate change (Cho and Salmon, 2006), but also on pre-existing values, ideologies and worldviews (Kuhn and Lao, 1996; Lord et al., 1979; Kahan, 2012), and that these predispositions are likely to vary, even among environmentally engaged citizens (Brulle and Norgaard, 2019; Bernstein and Szuster, 2018, 2019; Tindall et al., 2022).

In sum, existing research suggests that negative messaging should be most effective under certain conditions. First, negative messaging should be most effective when the message induces the intended negative emotional arousal among the receiver, and when the mediating role of emotions is taken into account. Second, negative messaging should be most effective when the threatening information is followed by concrete, effective and attainable steps to reduce the threat of a given risk. Finally, negative messages should be most effective with audiences in later-stages of environmental engagement (e.g., environmental activists) and with more radical values and beliefs about climate change (e.g., radical activists).

Hypotheses and conceptual model

Building on this literature, we leverage data drawn from a sample of active supporters of environmental non-governmental organizations (ENGOS) to test five hypotheses (Figure 1). First, to the extent that previous research conducted on similarly engaged (e.g., Michelson and DeMora, 2021) and less engaged (e.g., Levine and Kline, 2019) samples lend credence to the late effectiveness hypothesis, we expect that negative messaging will lead to greater climate action than positive messaging among our sample of active ENGO supporters.

H1: Exposure to negative messaging (relative to positive messaging) increases the likelihood of taking climate action.

The literature is quite clear that negative frames should evoke greater negative and less positive emotions than positive frames, and vice-versa (Spence and Pidgeon, 2010; Lecheler et al., 2015; Nabi et al., 2018). As such, we hypothesize that:

H2: Exposure to negative messaging generates more negative and less positive emotions than exposure to positive messaging.

To the extent that fear was found to mediate the positive relationship between threatening information and behavioral intentions (Hartmann et al., 2014), and that higher levels of hope reduced mitigation motivations (Hornsey and Fielding, 2016), we further expect that:

H3: Negative (positive) emotional arousal is positively (negatively) associated with climate action.

H4: Negative messaging has a positive indirect effect on climate action by way of increased negative emotions and decreased positive emotions.

Finally, in light of the late effectiveness hypothesis and research on the role values, ideologies and worldviews play in moderating how individuals’ respond to climate change information, we further hypothesize that the relationship between emotional arousal and climate action will be more positive for audiences in later-stages of environmental engagement and with more radical values and beliefs about climate change.

H5: The relationship between emotional arousal and climate action will be moderated by the level of engagement and radicalism of the audience receiving the message.

Data and methods

To examine the direct and indirect influence of negative (vs. positive) messaging on climate action across audience segments, we analyze data drawn from a two-wave panel survey administered online to members and supporters of Canadian environmental organizations in 2019 and 2021. A total of eight environmental organizations (i.e., Greenpeace, David Suzuki Foundation, Conservation Council of New Brunswick, Ecology Action Centre, Canadian Parks and Wilderness Society, Nature Canada, West Coast Environmental Law and Canadian Environmental Law Association) participated in both waves of the study. These organizations provided a list of their email contacts including a full spectrum of environmental group supporters, from newsletter subscribers to active donors. The first wave of data was collected online between April 25th and July 18th, 2019 ($n = 2,651$). A professional firm was hired to administer an online survey and develop unique web links that were provided to the participating environmental organizations, who then sent out a standardized invitation to their lists. The response rate for this portion of the field work was 9%. Based on the information provided by environmental organizations regarding the demographic make-up of their lists, we estimate that the sample is representative of the population of ENGO supporters in terms of age and gender. Of those who completed the first survey, 1,163 were invited to participate in the second wave of the research (i.e., excluding those who had unsubscribed

TABLE 1 Selection of segmentation criteria.

<i>Attitude toward solutions (which statement best describes your attitude regarding solutions to environmental problems in our society?)</i>
<ul style="list-style-type: none"> • Environmental problems can be solved within our present political-economic system if enough people change their lifestyle/environmental problems can be solved only if significant changes are made in our present political-economic system/environmental problems can be solved only if our present political-economic system is replaced by a radically different system
<i>Economic growth (how much do you agree or disagree with the following statements)</i>
<ul style="list-style-type: none"> • Economic growth is necessary to finance environmental protection • We need to set strict limits on production, consumption and economic growth • Economic growth is the best indicator of prosperity • A “good life” without economic growth is impossible • Technology can solve all environmental problems associated with economic growth
<i>New environmental paradigm (how much do you agree or disagree with the following)</i>
<ul style="list-style-type: none"> • The balance of nature is very delicate and easily upset
<i>Behaviors (have you ever...)</i>
<ul style="list-style-type: none"> • Taken part in a protest or public march regarding environmental protection and/or environmental issues • Voted for a political candidate primarily because of their progressive stance on the environment
Total: 9 variables

since 2019) and 29% completed the second survey ($n = 335$). This second wave was administered online between November 12th and December 31st, 2021. Retention for the second wave of the survey differed slightly by gender [$\chi^2(1) = 7.78, p < 0.05$] such that males were slightly more likely to complete the two waves of the survey (15%) than females (11%). Older generations (i.e., Gen Xers and above) were also slightly more likely (13%) than younger cohorts (8%) to complete both surveys [$\chi^2(1) = 7.22, p < 0.05$]. No substantial differences in terms of education, income, or partisanship were detected between the initial sample and those who completed the second wave. To ensure data quality, we checked for any discordances between self-reported birth year in 2019 and 2021 and excluded 27 respondents from the analysis due to inconsistent responses ($N = 308$).

Audience segmentation

To segment the data into relatively homogenous subgroups, we followed the approach of Maibach et al. (2011) and conducted a Latent Class Analysis using Latent Gold 5.1. Based on several selection criteria (e.g., R^2 , bivariate residuals, improvement in model fit statistics), the following nine variables

TABLE 2 Summary of model fit statistics.

Model	BIC(LL)	NPAR	BLRT p	BF
3 classes	37,083	86		<15
4 classes	36,910	115	0.040	>15
5 classes	36,975	144	0.016	-

BIC, Bayesian information criterion; NPAR, number of parameters; LL, log-likelihood; BLRT, bootstrapped likelihood ratio test; BF, Bayes factor.

were used to create the segmentation on the initial sample (Table 1).

These variables were used to submit three, four and five segment solutions to the analysis. To guard against local maximum solutions when conducting LCA, we ran the estimation algorithm several times with different parameter start values (Maibach et al., 2011). To further ensure the validity and stability of our findings, we conducted the analyses using 5,000 random sets of start values and replicated each solution ten times. All three models (3-, 4-, and 5-segments) replicated exactly.

Several measures can be used to identify the number of classes and choose the model that best fits the data (Table 2). Generally, the best fitting model is indicated by the model with the lowest value of the Bayesian information criterion (BIC) generated among the set of models (Nylund-Gibson and Choi, 2018), pointing in our case to the selection of the 4-class model. Additionally, we performed bootstrapped likelihood ratio tests to assess whether moving from 3- to 4- and 5-segments significantly improved model fit. P -values for both the 4- and 5- segments were significant at $p < 0.001$. We thus calculated the Bayes factor (BF) to further compare the 4- and 5-class solutions. A BF greater than 10 provides strong evidence for the model with fewer classes (Wasserman, 2000), indicating that the 4-class model provided the best model fit. The 4-class model was hence used to segment the data into distinct audiences. This model was used to replicate the audience segmentation on the 2021 data.

Survey experiment

A survey experiment was embedded in the second wave of data collected in 2021. Respondents were randomly assigned to either a control group or to one of two treatment conditions as outlined in Table 3. The negative and positive messaging treatments were presented alongside visuals aimed at strengthening the experimental treatment (see Supplementary material for exact visuals and wording).

Participants in the negative and positive messaging conditions were then asked to rate how they felt while reading the paragraph using a battery of 10 emotions on a scale ranging from 0 (not at all) to 5 (extremely). Results of an exploratory

TABLE 3 Summary of experimental treatments.

		<i>Question wording</i>
<i>Experimental treatments</i>	Control	(1) No message
	Negative messaging (aimed at inducing negative emotions)	(2) This last summer, the United Nations Intergovernmental Panel on climate change issued its latest report, sounding a “code red for humanity”. Wildfires and deadly heatwaves, as we saw this last summer, are just examples of how serious climate change is in Canada. As the UN chief said: “greenhouse-gas emissions from fossil fuels burning and deforestations are choking our planet and putting billions of people at immediate risk.”
	Positive messaging (aimed at inducing positive emotions)	(3) The COVID-19 pandemic has shown how strong society is when we all work together. As the latest round of global climate talks will take place from 31 October to 12 November 2021 in Glasgow, United Kingdom, thousands of people will gather to advance climate action. Now is the time to take bold collective action to reduce emissions, build resilience and reduce the impacts of climate change.

factor analysis pointed to three emotional dimensions. The first factor, worry, emerged as a separate dimension with only one item. The second, which we labeled “other negative emotions” comprised anger, sadness, upset, and fear. These items all loaded on the same dimension with high reliability (Cronbach’s alpha > 0.81). Finally, hope and optimism loaded on the same factor (Cronbach’s alpha > 0.89) which we labeled as hope. Skepticism, helplessness and empowerment were excluded because of high cross-loadings. Because we did not measure message-induced emotions for the control group, and given that we are interested in the mediating role of emotions in framing effects, we base our analysis on negative and positive messaging only.

We employed two separate measures of climate action: activism intention, and observable activism. Activism intention was measured using the self-reported intention to contact one’s Member of Parliament (MP). Specifically, respondents were asked “would you take a minute to email your federal Member of Parliament demanding a green and just recovery from COVID-19? By answering yes, you will be directed to a letter we have prepared. If you would like us to send the letter on your behalf, please enter your information below the letter.” Responses were coded 0 (no) and 1 (yes). The second measure of observed climate activism¹ was coded as 1 if the respondent provided their contact information and sent the letter to their MP, and 0 otherwise. Data collected in the first wave of the survey (2019) suggests that contacting one’s MP is perceived as particularly effective among ENGO supporters. In the first wave of the survey, respondents were asked how effective they believed different actions to be in terms of bringing about changes to help protect the environment, on a scale ranging from 1 (not at all effective) to 5 (very effective). The question involved

a randomized list of 13 different actions, including protests and marches, acts of civil disobedience, petitions, voting, lobbying elected officials, consumer boycotts and buycotts, advocating for stronger laws and policies for environmental protection, working collaboratively with government, working collaboratively with business, working collaboratively with Indigenous communities, public education campaigns, litigation through the courts and establishing teams of local volunteers to raise funds or deliver on-the-ground projects. Advocating for stronger laws and policies for environmental protection was considered the second most effective action, with 80% of respondents ranking it as moderately or very effective, just behind working collaboratively with Indigenous communities (81%). Lobbying elected officials came 6th, with 63% of respondents finding it moderately or very effective. Overall, 87% of respondents said they would like to contact their MP and 54% actually sent the letter. Of those who showed activism intention, 68% sent the letter and 32% left the action page without actually sending the letter.

To test the effect of negative and positive messaging on emotions and climate action across different levels of audience engagement and radicalism, we used Hayes’ PROCESS (Hayes, 2022) modeling software (Model 4 and 14) with 5,000 bootstrapped resamples and 95% confidence intervals. Continuous variables were centered at their means prior to all analyses.

Results

We begin with results from the audience segmentation. Drawing on the first wave of the survey, our analysis identified four unique audiences within our sample of respondents who support Canada’s environmental movement. These environmental group supporters varied in their levels of engagement and radicalism: the active radicals (26%), the active reformers (43%), the moderate reformers (25%) and the passive pragmatists (6%).

¹ Action pages may be assessed using the following links: <https://act.newmode.net/action/ecoanalytics/tell-federal-government-we-need-green-and-just-recovery-covid-19> (in English) and <https://act.newmode.net/action/ecoanalytics/dites-au-gouvernement-f%C3%A9d%C3%A9ral-nous-avons-besoin-dune-relance-verte-et-juste> (in French).

The active radicals represented about a quarter (26%) of the sample of environmental group supporters in Canada. Individuals in this segment were very engaged with climate change. A large majority (81%) said they had at some point taken part in a protest or public march regarding environmental issues and nearly all of them (96%) said they had at some point voted for a political candidate primarily because of their progressive stance on the environment. Of all groups, they were the most likely to think that environmental problems can be solved only if radical changes are made to the present political-economic system (54%). Most strongly disagreed with the economic growth paradigm: 94% strongly disagreed that economic growth is the best indicator of prosperity and 71% strongly agreed that we need to set strict limits on production, consumption and economic growth.

A plurality of environmental group supporters in the sample fell into the Active reformers category (about 2 in 5). Individuals in this group were engaged in climate change but were more active in traditional rather than radical forms of participation. Nearly all (92%) had at some point voted for a political candidate because of their progressive stance on the environment, while 60% had taken part in a protest or public march regarding environmental issues. The active reformers differed from their radical counterparts in that they were less likely to think that environmental problems can be solved only if radical changes are made to the present political-economic system (29%). Instead, most of the active reformers expressed a view that to protect the environment, significant changes should be made within the present system (64%). Although less strongly than their radical counterparts, most individuals in this group were willing to question the economic growth paradigm. For instance, when asked if strict limits were needed on production, consumption and economic growth, the active reformers were somewhat split between those who strongly agreed (32%), those who agreed somewhat (47%) and those who neither agreed nor disagreed (15%).

Meanwhile, the moderate reformers (about 25% of the sample) were less active and more ambivalent in their views. A majority (71%) had voted for a political candidate because of their stance on the environment and about one third (31%) reported having participated in a protest or public march. Similar to the active reformers, most of the moderate reformers endorsed the institutional view of solving environmental problems (63%). However, they were considerably more ambivalent than the active reformers when it came to agreeing or disagreeing with the economic growth paradigm. On questions related to economic growth, moderate reformers were more likely than any other group to say that they neither agreed nor disagreed (e.g., 42% of them said they neither agreed nor disagreed that economic growth is the best indicator of prosperity).

Finally, the passive pragmatists (about 6% of the sample) were the least active of all groups, with 17% of them having

taken part in a protest or public march and 39% having at some point voted for a political candidate primarily because of their stance on the environment. Of all groups, passive pragmatists were the most likely to believe that environmental problems can be solved within the present political-economic system if enough people change their lifestyle (36%). Yet, almost half of the passive pragmatists believed that significant institutional changes should be made to solve environmental problems (46%). Individuals in this category tended to agree with the economic growth paradigm. Most of them either agreed (44%) or strongly agreed (28%) that economic growth is the best indicator of prosperity and about half either disagreed (28%) or strongly disagreed (27%) that we need to set strict limits on economic growth.

Replicating the segmentation using the 2021 data revealed slight changes in the distribution of audiences. Compared to the initial segmentation, the 2021 distribution revealed an increase in the proportion of active radicals (from 26% to 34%), a decrease in the proportion of moderate reformers (from 25% to 17%) and about the same proportion of active reformers (43% to 44%) and passive pragmatists (6% and 5% respectively). The 2021 distribution was used to test the moderated mediation model, as presented below.

Next, we tested whether negative (vs. positive) messaging had a direct or indirect effect on activism intention (i.e., would you take a minute to email your federal Member of Parliament) and observed activism (i.e., send a letter to their Member of Parliament). To test our first four hypotheses, we begin by examining a simple mediation model (PROCESS model 4). Results showed no direct nor indirect effect on activism intention (results not shown here). However, while respondents were equally likely to say that they would contact their MP regardless of the condition to which they were assigned, results showed that those who received the negatively framed message were significantly less likely to *actually* send the letter to their MP (Model 4 of Table 4). Contrary to our first hypothesis, negative messaging significantly *decreased* the likelihood of taking climate action (b [unstandardized] = -0.621 , $p < 0.05$). Overall, 59% of those who were assigned to the positive treatment sent the letter, while 46% did the same in the negative treatment condition. Holding worry, hope and other negative emotions constant, and converting the negative messaging coefficient in Model 4 of Table 4 from log-odds to odds, we find that the negative messaging condition decreased the odds of sending the letter by 54%. In line with our second hypothesis, negative messaging generated more worry (b [unstandardized] = 0.412 , $p < 0.05$) and less hope (b [unstandardized] = -0.415 , $p < 0.01$) than positive messaging. However, our treatment had no effect on the index of other negative emotions (fear, upset, anger and sadness). We further examined the impact of our experimental treatment on fear, upset, anger and sadness separately and found that our treatment significantly increased fear, though it had no impact on upset, anger and sadness (see Supplementary Table S2). Our results did not support the

TABLE 4 Summary of direct and indirect effect of negative and positive messaging on observed activism (PROCESS model 4).

	Model 1 DV: worry	Model 2 DV: neg. emotions	Model 3 DV: hope	Model 4 DV: observed activism
Constant	-0.200*	-0.111	0.198*	0.442*
Neg. messaging	0.412**	0.110	-0.415**	-0.621*
Worry				0.156
Neg. emotions				-0.171
Hope				0.226

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

TABLE 5 Summary of direct and indirect effect of negative and positive messaging on observed activism (PROCESS model 14).

	Model 1 DV: worry	Model 2 DV: hope	Model 3 DV: observed activism
Constant	-0.207*	0.206*	0.217
Neg. messaging	0.416*	-0.415**	-0.620*
Worry			-0.171
Hope			0.0543
Active rad			0.806*
Worry X act			0.823*
Hope X act			0.427

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

simple mediation hypotheses (H3 and H4), as indicated by the non-significant coefficients of worry and hope in Model 4 below.

Finally, we expected that the relationship between emotional arousal and climate action would be moderated by the level of engagement and radicalism of the audience receiving the message. We used PROCESS model 14 to test this moderated mediation hypothesis, with the negative (vs. positive) message as predictor (X), audience segments as moderator (W), worry and hope as mediators (M1 and M2) and observed climate activism as the outcome variable (Y). A model was tested for each of the four audiences (full results included in the [Supplementary material](#)). However, given that active radicals were the only segment to process emotional arousal distinctively, we compare the results for active radicals and less engaged groups, using the dummy variable “active radicals” (coded 1 if the respondent is an active radical and 0 otherwise).

Consistent with our fifth hypothesis, the interaction between worry and the most engaged and radical segment was positive and significant (b [unstandardized] = 0.8230, $p < 0.05$, Model 4 of [Table 5](#)). The difference between conditional indirect effects was also significant, as indicated by the index of moderated mediation (b [index] = 0.3421, bootSE = 0.1863, 95% BootCIS [0.0486, 0.6553]). Overall, the negative messaging condition had a negative direct effect on observed activism among the sample as a whole, decreasing the odds of sending the letter by about

54%, and a positive indirect effect through worry among active radicals only, increasing the odds of sending the letter by 31% among this more engaged and radical audience segment. However, we found no moderated mediation between hope and the level of audience engagement and radicalism (b [index] = 0.1768, bootSE = 0.1853, 95% BootCIS [-0.6152, 0.1072]).

Discussion and conclusion

Our analysis identified four unique audiences within our sample of active environmental group supporters in Canada, with varying levels of engagement and radicalism: the active radicals (26% in 2019; 34% in 2021), the active reformers (43% in 2019; 44% in 2021), the moderate reformers (25% in 2019; 17% in 2021) and the passive pragmatists (6% in 2019; 5% in 2021). Overall, these results are broadly consistent with previous research exploring the heterogeneity of views within the environmental movement ([Bernstein and Szuster, 2018, 2019](#); [Brulle and Norgaard, 2019](#); [Tindall et al., 2022](#)). Our findings differ from past research suggesting that the environmental movement might be understood as divided between only two groups (i.e., “reformists” and “radicals”; e.g., [Brulle and Norgaard, 2019](#)), though they are in line with previous studies suggesting that pro-environmental worldviews vary along a more complex range of views (e.g., [Bernstein and Szuster, 2018, 2019](#)).

Our survey experiment showed that negative messaging can be less mobilizing than positive messaging, even when the message is directed toward relatively engaged audiences and followed by the opportunity to take a specific, actionable and effective action. To be sure, this is at odds with previous work in risk communication suggesting that fear appeals can be effective insofar as they also provide recipients with the opportunity to take a clear, concrete and doable action ([Witte and Allen, 2000](#)). However, it is consistent with the idea that negative messaging effectiveness may vary across time and contexts. As [Patterson et al. \(2021\)](#) recently pointed out, repeated, consistently negative messages may lead to public fatigue over time. While the literature has yet to investigate the effects of overlapping emergency frames (such as climate change and

COVID-19), an alternative hypothesis that might help explain our findings is that the cascade of crises the world has faced in the last 2 years might have contributed to generating “apocalypse fatigue” (Patterson et al., 2021). To the extent that the use of the “climate emergency” frame has increased substantively since 2019 (McHugh et al., 2021), and that even recently published studies tend to draw on data collected in 2019 or before (e.g., Michelson and DeMora, 2021), the contrast between our results and those found previously may suggest that alarmist and fear-inducing messages might be effective in the short-term, but might become less so as the context changes. Conversely, optimistic messages may become relatively more effective as “apocalypse fatigue” sets in, especially in the context of a global public health pandemic. The extent to which such contextual factors shape responses to positive and negative framing is thus an important topic for future research. Our findings did not support our hypotheses regarding the simple mediating role of emotions. This is at odds with previous research pointing to the mediating role of emotions in framing effects (Hornsey and Fielding, 2016; Nabi et al., 2018). However, previous efforts differ from our study in terms of research design and outcome variables. Contrary to Nabi et al. (2018), who explored the mediating role of fear and hope in a threat-efficacy, emotion sequencing structure (i.e., exploring the effect of threat-induced fear on subsequent emotional responses to a loss- and gain-framed efficacy message), our negative message did not include any efficacy component, nor did our positive message include any threatening information. In testing the value of emotional sequencing, Nabi et al.’s (2018) model included two separate measures of fear: the first in response to a threatening vs. non-threatening message, and the second in response to a gain- vs. loss-framed efficacy message. Whereas their research design helped better understand how emotions can be intensified and climate action enhanced through emotional sequencing, our study offered a relatively more conservative test of the mediating role of emotions in framing effects. Overall, emotions were not found to mediate framing effects at the aggregate level. However, we do find some support for our moderated mediation hypothesis. The relationship between emotional arousal and climate action was moderated by the level of engagement and radicalism of the audience receiving the message, such that worry was positively associated with observed climate activism among active radicals, but not among less engaged/radical groups. This is in line with previous research suggesting that more engaged audiences will process fear or other negative emotions through high self-efficacy and thus be able to act out of (rather than avoid) these emotions (Cho and Salmon, 2006).

Theoretically, this study contributes to the literature on effective climate change communication by demonstrating that negative messaging can be less mobilizing than positive messaging, even when meeting the conditions under which the literature suggests that fear appeals ought to be most effective. Although we included measures of message-induced emotions,

drew on a sample of already engaged audiences, and offered the opportunity to act in a concrete and effective way, the negative message was less mobilizing than the positive one. These results highlight the need to revisit existing theories in climate change communication in light of the potential “apocalypse fatigue” that may result from the repeated use of overlapping emergency frames. To the extent that severe climate change impacts are still unevenly spread geographically, such sounding of the alarm may resonate less with many who have not yet experienced serious impacts from climate change personally. Furthermore, in identifying audience segments that vary in their levels of engagement and radicalism and testing a moderated mediation model that incorporates both mediation and moderation effects, this analysis further sheds light on the complex ways in which message frames and emotions interact with the audiences’ preexisting values and dispositions. In so doing, we show that the relationship between emotions and climate action differs across audiences varying in their level of engagement and radicalism, hence highlighting the importance of taking audiences into account when developing persuasive appeals in the context of climate change communications. Methodologically, this study extends previous research by allowing for a comparison of persuasion effects on both self-reported intention to act, and on observed climate activism. Finally, these results have suggestive implications for environmental organizations seeking to engage and communicate with their supporters, as well as climate change communicators more generally.

However, our analysis is limited in a number of respects. First, our findings are based on a relatively small sample of environmental group supporters, and taken at a particular moment in time (in the shadow of a global public health pandemic). We thus had to rely on a small number of observations, especially when testing our moderated mediation hypothesis (i.e., including the four audience segments used in the analysis). While we have no way of knowing exactly how representative our sample is given the lack of true demographic data on Canada’s environmental movement, we are confident that our random probability sample of eight of Canada’s largest environmental groups provides a reasonably good representation of this population. Our sample is in fact similar to that used in other published research of Canadian environmental group supporters (e.g., Tindall and Piggot, 2015), notably in terms of the greater proportion of older and female respondents. Moreover, to the extent that our experimental design establishes internally valid results, ultimately, the generalizability of our findings is a point we must leave for future research.

Future research might examine how message frames, emotions and audiences interact in the process of climate change communication using larger samples of respondents, including both environmentally engaged citizens and the general public. The heightened prominence of online environments provides researchers and practitioners with new opportunities to connect

with audiences that are less motivated and attentive to the issue of climate change. For instance, climate change communication researchers may consider running online field experiments on Facebook to test the impact of negative and positive messaging on several measures of engagement among the general public (for an example, see [Orazi and Johnston, 2020](#)).

Second, although our study moves beyond previous work by offering an audience-focused approach to studying emotions in climate change communication, our manipulation was limited to a single message, and was followed by a limited number of post-treatment questions, making it difficult to know what specifically about each treatment triggered certain emotional and behavioral reactions. For example, in addition to reducing hope and increasing worry, “code red messaging” may have lowered efficacy beliefs about the action page itself. Having no post-treatment action-efficacy measures, we are unable to test for this possibility in the current research. Future studies would benefit from testing the potential interaction between messaging and emotions, on the one hand, and efficacy beliefs across a range of different types of climate action, on the other.

Third, our results may have been affected by the fact that the positive message explicitly primed efficacy (i.e., now is the time to take broad collective action), while the negative message did not. This imbalance could have increased efficacy perceptions in the positive treatment relative to the negative one, in turn affecting its relative effectiveness in motivating climate action. However, previous research has pointed to potentially more complex and less intuitive relationships between exposure to threatening/efficacy information and perceptions of efficacy. In fact, some studies have found that exposure to highly threatening information increased perceptions of efficacy (relative to a moderate threat) and suggested that the positive link between threat and efficacy occurred as a result of “motivated control” — a coping mechanism leading people to adjust their efficacy beliefs in order to match their perception of the threat ([Hornsey et al., 2015](#)). Other research has found that under exposure to threatening information, providing coping information actually lowered efficacy perceptions (i.e., perceived efficacy was higher in the threat only group) ([Hartmann et al., 2014](#)). Having no post-treatment measure of efficacy perceptions, we have no way of knowing exactly how each treatment affected efficacy beliefs.

To be sure, these results should not be interpreted as implying that negative messages can never be an effective communication strategy, nor that optimistic messages will always be more effective than negative messaging. Although many studies have shown that negative messaging increased pro-environmental intentions even in the absence of an efficacy statement (e.g., [van Zomeren et al., 2010](#); [Hartmann et al., 2014](#); [Michelson and DeMora, 2021](#)), we cannot rule out the possibility that the negative treatment would have been more effective had it also included an efficacy statement (e.g., “the problem is so dire that we must urgently speak up and push governments to act”). Furthermore, different optimistic messages may tap

into different components of efficacy (i.e., internal, external and response efficacy), affecting perceptions of efficacy and climate action differently. Future research could test a wider array of climate change messages, while manipulating both the valence of the message (i.e., positive vs. negative) and the type of efficacy information (i.e., internal, external and response efficacy).

While our moderated mediation model accounted for the simultaneous effects of different emotions (i.e., worry and hope), much remains to be understood about how and under what conditions a different mix of emotions evoked in climate change communication can promote climate action. To the extent that emotional experiences are part of a complex interconnected system involving a wide range of emotions and cognitive appraisals that cannot be easily disentangled ([Chapman et al., 2017](#)), future studies should treat emotions as part of a more integrated learning system and investigate their potentially broader and longer-term impacts on behaviors. For instance, building on the results of this study, future analyses might go further and use longitudinal data to examine the interindividual and contextual conditions under which different emotion-laden messages should be most effective. While our results provide suggestive evidence of potential “apocalypse fatigue,” more research is needed to examine the (un)sustainability of emergency messages and threat-induced emotions about climate change over time, especially as they compete and overlap with other emergency frames or arguments.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Comité d'éthique de la recherche en arts et humanité (CERAH). The patients/participants provided their written informed consent to participate in this study.

Author contributions

MM-M and EL developed the study concept, collected the data, wrote and edited the article. MM-M performed the data analysis and produced the data and figures. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fcomm.2022.968335/full#supplementary-material>

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