



Positive emotions and climate change

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Counteracting the worst effects of human-induced climate change is one of the most daunting challenges of our time. There has been an increased recognition of the important role that human emotions, in particular positive affect, play in shaping people's climate change-relevant decision-making and collective action. Here, we briefly review the rapidly expanding body of empirical research on positive emotions and climate change, focusing on two distinct yet closely intertwined ways in which positive emotions come into play: as antecedents and as consequences of climate change-relevant engagement. Our review reveals that positive emotions are positively linked to and can promote productive engagement with climate change but also that there is no 'one size fits all' approach to incorporating emotion into engagement and communication efforts.

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Introduction

Climate change is one of the biggest challenges humanity faces this century [1], a global-scale social dilemma which requires unprecedented levels of cooperation and coordination. The challenge stems in part from the nature of the problem: it is an abstract, complex, multifaceted collective action problem that cannot be solved by any one actor, involves deep uncertainty, and unfolds over a long time horizon—a 'perfect storm' for a species (us) which has a tendency towards 'myopic,' narrowly self-interested behavior [2,3,4]. Experts in judgment and decision-making have suggested that one way to overcome the psychological challenges posed by climate change is to more intentionally and actively involve people's

affective⁴ responses to the challenge, as there is increasing evidence that affective engagement may increase attention and responsiveness, and provide a powerful source of motivation to take action [2,5–9].

Positive emotions, in particular, have been shown to have beneficial effects on motivation, perseverance, and prosocial behavior [10,11,12]. Fredrickson's broaden-and-build theory of positive emotions [13] offers one explanation for these socially beneficial effects of positive emotions, suggesting that they can help to equip people with the cognitive resources necessary to engage in prosocial action, a point echoed in subsequent research [12,14].

Recently, researchers have begun to examine the role of positive emotions in the domain of climate change. This increased attention is critically important, given both the dire need for widespread collective action to confront climate change and the role that positive emotions likely can play in helping to promote and sustain such efforts [2,15].

Here, we review recent work in this area, focusing on two intertwined yet distinct approaches to the study of positive emotions and climate change that have emerged: positive emotions as antecedents to climate change engagement and positive emotions as consequences of such engagement. Although this distinction is necessarily artificial, we believe it both reflects the current state of research in this area as well as provides a useful framework within which to better understand how (positive) emotion and climate change engagement intersect. Moreover, both approaches provide important insight into the role of positive emotion in supporting productive engagement with climate change, in part because there may be the potential for powerful 'upward spirals' [13] to emerge as positive emotions and productive engagement (e.g. mitigative action) feed in to one another in an iterative fashion, both at the individual level and collectively. That is, as people start to engage in productive climate change actions, they may experience more positive emotion(s),

⁴ Scholars in this domain use the terms 'affect' and 'emotion' somewhat interchangeably to refer to a suite of overlapping but theoretically distinct concepts related to relatively rapid, automatic, evaluative responses to stimuli (actual or anticipated) in an individual's environment (e.g. information about climate change). These include global states of arousal and/or evaluation (e.g. 'positive affect', feelings of 'goodness' or 'badness') as well as more discrete affective states (e.g. emotions like pride or hope), both experienced and anticipated [76,77]. Following the diverse literature on affective responses and reactions in the context of climate change, we include both conceptualizations— affect and emotion—in our review.

which in turn may promote further engagement; in this way, positive emotions both as antecedent to and consequence of productive engagement with climate change may work to reinforce such action across time. Moreover, this cycle may also involve both directly *experienced* emotions (e.g. as a result of previous, positive action) as well as *anticipatory* emotions [16**]. Figure 1 provides a structural depiction of the conceptual relationships between positive emotions as antecedents versus consequences of climate change-relevant engagement outlined in our review.

Positive emotions as antecedents

A considerable body of literature exploring the relationship between positive emotions and ameliorative behaviors has investigated how emotions engender pro-environmental attitudes and behaviors. This section reviews the body of recent experimental literature that treats positive emotions as independent variables, as well as their mediating and moderating influence on climate change related outcomes.

Types of affect-based interventions

Research has documented the impact of various positively valenced interventions to induce pro-environmental behaviors, including through the use of affective imagery, campaigns and narratives. For instance, Baden [17] explored the impact of emotional narratives, and found that solution-focused stories were more likely to motivate pro-environmental intentions compared to catastrophic stories. Related findings have been reported utilizing positively valenced images: Carlson *et al.* [18] found that positive images of climate change solutions

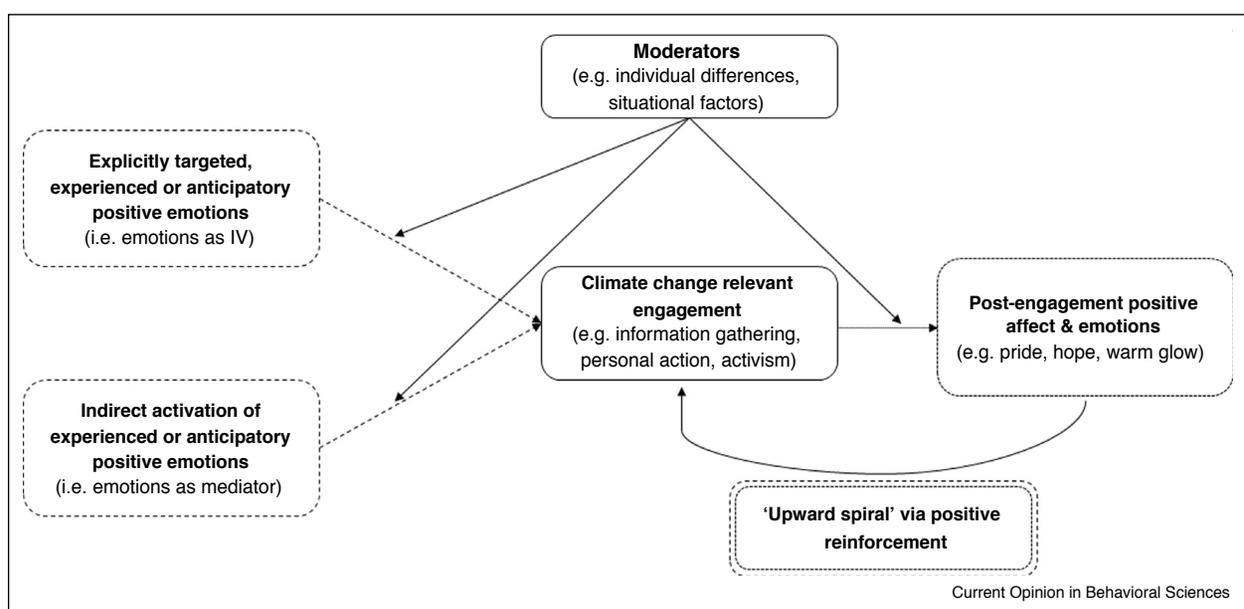
were more likely to capture observers' attention compared to negatively valenced images, suggesting that positive images may be a more engaging way to motivate sustainable action. Other inductions have involved embedding emotional appeals in climate change campaigns, which indicate that positive emotions increase willingness to act pro-environmentally [19].

While the vast majority of research in this area has utilized surveys or experiments that constrain responses, field experiments testing a real choice environment are lacking. One recent exception tested interventions using anticipated positive emotions and social norms to encourage pro-environmental donations [20*]. Results showed that people were more likely to donate money obtained from recycled bottles to a climate change charity after being exposed to a positive emotional message.

The role of positive emotion across pro-environmental contexts

The role of positive emotion as an antecedent to pro-environmental action has been documented across a diverse array of sustainable contexts. Several recent studies have focused on the relationship between positive emotions and sustainable transport and leisure activities. For example, a study on transportation mode selection showed that positive feelings associated with active modes of transport (e.g. walking) positively influenced preferences for these modes compared to other motivational variables [21]. Positive emotion has also been found to predict how reliable people find informational sources concerning sustainable transportation [22]. In the domain of leisure,

Figure 1



Conceptual relationships between positive emotions as antecedents versus consequences of climate change relevant engagement. Note: Dashed lines denote positive emotions as antecedents. Dotted lines denote positive emotions as consequences.

studies have shown that positive affect improved perceptions of loyalty towards green hotels [23] and increased visitors' intentions to perform environmentally responsible behaviors in an urban park [24].

Moreover, in the context of consumer decision-making, research has demonstrated that positive emotions play an important role in guiding green-product choice [25,26]. For example, one study demonstrated that environmental advertising that engendered feelings of positive moral and social emotions improved consumer attitudes towards a green product, the brand advertised, and purchase intent [25].

The role of discrete positive emotions

An emerging body of research has considered the role of specific, discrete emotions in driving climate change-relevant behaviors. This work has investigated a range of positive emotions, including optimism [27], gratitude [28], and anticipated pride [16**]. Schneider *et al.* [16**], for instance, directly compared anticipated pride and guilt in an intervention context and found that eliciting anticipated pride led to higher pro-environmental motivation compared to guilt.

'Warm glow', the feel-good sense one gains from acting prosocially or sustainably, has received particular attention in recent years⁵. Studies have shown that warm glow has a positive influence on pro-environmental intentions [29], such as the intention to reduce meat consumption via curtailment [30]. In line with these findings, Jia and van der Linden [31*] found evidence that the anticipated warm glow from helping the planet predicted a range of self-reported conservation behaviors over a four-week period, consistent with prior research [32].

Other interventions have targeted humor as an antecedent to pro-environmental behavior. A number of scholars have argued that humor has the potential to spark engagement on climate change issues [33,34*,35,36]. For instance, through an experimental study of sarcastic humor in *The Onion*, Anderson and Becker [37] found that the levity of communications increased belief in climate change among individuals who did not previously believe climate change was a serious issue.

A related body of research has explored feelings of hopefulness as an antecedent of climate change engagement [38,39]. This work suggests that hope can motivate collective action on climate change [40], and positively influence

support for environmental policies across the political spectrum [41]. Some research has investigated the role of hope as a mediating variable [42,43]. For example, Chu and Yang [44] reported that increased psychological distance leads to a greater experience of hope, with downstream effects on climate change mitigative actions.

Yet other experimental research finds mixed evidence around the influence of hope and optimism [45,46*]. As Chapman *et al.* [47] argue, these mixed findings underscore the problems associated with treating discrete emotions as simple tools to increase pro-environmental action. Like other emotional appeals, the impact of interventions designed to induce feelings of hope may vary depending on the intervention strategy, the situational context, and audience socio-demographic characteristics.

Moderating relationships

Another body of evidence has examined the moderating conditions under which positive emotion acts as an antecedent to pro-environmental behaviors, which confirm that findings can be impacted by individual differences and situational factors. For instance, Odou and Schill [48] showed that the effect of positive anticipated emotions on intentions to engage in mitigation behaviors was stronger in individuals who were already pro-environmentally engaged. Similarly, findings have shown that when people feel emotionally 'moved,' collective action intentions increase; however, this effect only held for those with existing collective efficacy beliefs [49]. Similarly, Spielmann [50] demonstrated that the importance consumers place on their own morality moderates the impact of positive emotions on green purchase intent.

Mediating relationships

Other research has treated positive emotion as a mediating variable. For example, Rowe *et al.* [51] explored the potential for recalled pride and guilt to influence anticipated positive emotions, and further, sustainable purchase intentions. Findings revealed that anticipated pride mediated the impact of recalled pride on sustainable purchase intentions. Other circumstances that have been linked to increases in positive affect and subsequent pro-environmental outcomes include visiting an urban park [24], perceiving a company to be socially responsible [52], sharing personal stories of climate change [53*], being exposed to documentary story-telling [54], and developing closer connections with nature [11**].

Null or negative effects of positive emotions

Notably, attempts to induce positive emotion to motivate climate change action is not consistent across all contexts. While the majority of published literature demonstrates beneficial effects of positive emotions as antecedents of pro-environmental behavior, other studies reported null findings [55], or stronger effects of negative emotions in comparative studies [56–60]. For example, one study

⁵ Warm glow has been treated as both, affect and discrete emotion in the extant literature. In a classic paper, for example, Andreoni [78] speaks of warm glow in the quite literal sense of the word, that is, a desire for a 'warm glow' that drives prosocial behavior, which seems more in line with the concept of generalized positive affect rather than a discrete emotion. Other scholars fall either in line with this view of warm glow as an affective response [29], refer to it as an emotion [30], or express ways in which warm glow can be both, that is, positive affect when anticipated, and an emotion when experienced due to a certain behavior [79].

found that communications that emphasized the positive consequences of climate protection elicited feelings of hope, but subsequently lowered people's willingness to sacrifice for climate change, compared with more negative framing [61]. Wang *et al.* [62] reported some interesting mixed results, suggesting that while positive anticipated emotions have a beneficial effect on energy saving intentions, they have a negative effect on actual saving behavior. These findings are a powerful reminder that pro-environmental behavioral intentions cannot always be considered as a proxy measure for actual behavior, and underscore the level of complexity of competing influences on affective responses.

Positive emotions as consequences

While a wealth of research has explored the ways in which positive emotions impact the likelihood that people perform pro-environmental behaviors, other work has investigated whether pro-environmental behaviors induce positive emotional responses. This work has demonstrated that climate change engagement positively impacts personal well-being [63,64], life satisfaction [65,66], a more positive self-image [67••], and a sense of 'warm glow' [68].

The degree to which pro-environmental behaviors increase positive emotions may depend on the specific characteristics of the behavior. For example, Schmitt *et al.* [66] demonstrated that the relationship between pro-environmental behaviors and subjective well-being was stronger for behaviors with higher direct costs in time, money and effort. Supporting this finding, one study showed that it is not the behaviors themselves that influence subjective well-being, but the perception that those behaviors have positively impacted the environment [69].

In the domain of consumer decision-making, studies have demonstrated that buying green products can elicit positive emotions in consumers, which subsequently increases purchase intention. For example, results from a UK sample showed that consumers felt more positive when consuming foods that they knew contained sustainable ingredients [70]. Moreover, Gutierrez *et al.* [71] argued that engagement with eco-labeling messages elicits positive emotions, which then leads to purchase of an eco-product.

Some work in the past few years has investigated the mechanisms underlying how climate change-relevant engagement influences positive emotion. Taken together, this work suggests that lifestyle changes associated with pro-environmental behaviors may provide a means of enhancing emotional well-being, particularly for individuals who are driven to behave sustainably, and find such actions to be inherently meaningful [63], moral [67••,72] or intrinsically rewarding [15]. Additionally, this work suggests that the positive feelings that stem from mitigative actions could serve as a key component in engendering positive-reinforcement and an 'upward spiral' [13] of green

action and positive emotional responses. Hartmann *et al.* [29], for instance, suggest that warm glow can not only drive but also reinforce pro-environmental behavior; that is, warm glow that is experienced due to pro-environmental engagement can strengthen future intentions to act pro-environmentally.

Conclusion and directions for future research

Our review of the recent theoretical and empirical research on positive emotions and climate change engagement reveals a number of important insights and considerations for researchers, issue advocates and communicators.

Perhaps most fundamental is the conclusion that (positive) emotions should not and cannot be treated as mere 'levers' or 'tools' of behavior change (echoing the point made by Chapman *et al.* [47]); although the evidence base suggests that positive affect and certain discrete emotions are often positively associated with productive climate change engagement, this is not always the case nor does it necessarily follow that 'more positive emotion' equates to 'more engagement' in a straightforward, predictable manner.

Second, there is no reason to expect that a 'one size fits all' approach to considering (and attempting to leverage) positive emotions in the context of climate change will or can emerge. The evidence base strongly points to the important role that moderating factors, both internal and external to the individual, play in shaping the effects of positive emotions on climate change engagement (as well as the positive emotions that people may or may not experience in response to such engagement). The role that positive emotions play in this domain critically depends on the exact circumstances, variables, and research/practice questions of interest. This highlights the importance of careful, situationally sensitive analysis and assessment rather than reliance on broad assumptions about what positive emotions 'do' in this context.

Third, although there is a plethora of research on positive emotions and small-scale, short-term individual pro-environmental actions, work on larger-scale and longer-term behavior (e.g. investment decisions in green energy) is sorely missing from the literature. This is an important gap to be filled for at least two reasons. First, such forms of engagement and action are highly consequential from a climate mitigation and adaptation perspective [73], much more so than many of the outcome variables used in extant research. Second, the role that positive emotions play in shaping such behaviors may be significantly different relative to their role in promoting easier, shorter-term forms of climate change action.

Fourth, there is a broader need for more behavioral work that uses measures of actual behavior and moves away from reliance on measures of attitudes and intentions, which may also reveal false or misleading relationships to

positive emotion (e.g. because intentions can more easily be aspirational relative to actual behavior). One way to overcome some of these limitations is for researchers to forge relationships with non-profits, community groups, utility providers, and municipal governments to conduct real-world field studies which examine actual changes in climate-relevant behavior [74]. Relatedly, as our review shows, there has been a strong reliance on self-reports for the assessment of emotional response, both as antecedents as well as consequences. Although self-reports are a simple and flexible measurement method, it may be advisable to complement them with non-self-report techniques, such as physiological measurements, to arrive at a more complete and reliable picture of emotional experience in this context [75].

Similarly, we strongly urge an expanded use of diverse, representative and meaningful, targeted samples (e.g. new homeowners) in future research. A striking shortcoming of the current research is that it almost exclusively tests effects in western industrialized nations. To tackle a global issue such as climate change, it will be critical to understand the relationships between emotions and behaviors across the globe. Relatedly, the field would greatly benefit from longitudinal research designs, as almost all extant work relies on cross-sectional samples providing only momentary snapshots. This is especially important given the need for sustained engagement over time to confront the climate crisis.

Finally, our review suggests that positive emotions are indeed linked in multiple, complex ways to people's engagement with climate change, largely in a productive manner (i.e. positive emotions tend to promote and result from productive issue engagement). The potential for positive emotions and productive engagement to promote one another in reinforcing 'upward spirals' should not be overlooked and begs for further examination. Indeed, although much has been learned over the past few years regarding the relationship between positive emotions and climate change engagement, there is clearly much more to be explored in the years ahead.

Conflict of interest statement

Nothing declared.

CRedit authorship contribution statement

Claudia R Schneider: Conceptualization, Methodology, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization, Supervision, Project administration. **Lisa Zaval:** Conceptualization, Writing - review & editing. **Ezra M Markowitz:** Conceptualization, Writing - review & editing.

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