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Climate change and daily wellbeing: The role of environmental, governmental, and commute-related stressors

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ABSTRACT

While the effect of climate change on the environment, economy, and chronic health is increasingly evident, its impact on everyday wellbeing remains relatively less understood. This study investigated how environmental, governmental, and commute-related stressors relate to everyday wellbeing. We hypothesized that the presence of these daily stressors would be linked to experiences of higher negative affect. To capture individuals' daily experiences in an ecologically valid manner, experience sampling methodology was adopted. Over the course of a day, participants were randomly prompted once within every hour (a total of 10 prompts) to report their negative affect and encounters with specified daily stressors. The environmental, governmental, and commute-related stressors were linked to higher negative affect. Environmental stressors were uniquely associated with worse daily wellbeing after accounting for health stressors. Environmental stressors also interacted with other governmental stressors. Particularly, the experience of both environmental and governmental stressors was cumulatively associated with significantly higher negative affect, compared to either one of these stressors being absent. These findings highlight the connection between environmental stressors with governmental and health stressors and the daily toll these stressors can have on individuals' everyday wellbeing. This work emphasizes the importance of addressing complex stressors relevant to climate change vulnerabilities.

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KEYWORDS Daily stress; climate change; climatic stressors; non-climatic stressors; experience sampling methodology

Anthropogenic climate change threatens social and ecological communities across the world through rising average temperatures, increased frequency of extreme weather, and rising sea levels (Intergovernmental Panel on Climate Change (IPCC), 2022). Recent work has shown that climate change can also

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influence psychological wellbeing as evidenced by higher psychological distress and anxiety, thereby impacting mental health globally (Cunsolo & Ellis, 2018; Hickman et al., 2021; Ogunbode et al., 2022). Direct exposure to climate crises experienced by communities affected by floods, drought, or extreme weather can bring chronic health crises, including anxiety, depression, and suicide (Carleton, 2017; Ellis & Albrecht, 2017; Paranjothy et al., 2011). Connections have also been made between climate change and its indirect impact on societal, environmental, and financial contributors to mental health (Ramadan & Ataallah, 2021). At the same time, looming concerns about the extinction of species, unpredictable weather patterns, and a sense of doom have also influenced wellbeing (Cunsolo & Ellis, 2018).

For the most part, climate change has been examined more as a chronic stressor (Hsiang et al., 2017; Jacobsen et al., 2022; Räsänen et al., 2016; Rocque et al., 2021). While the effect of climate change on the environment, economy, and chronic health is increasingly evident (Hsiang et al., 2017; Jacobsen et al., 2022), its impact on everyday wellbeing remains relatively less understood. It is possible that incremental and persistent experiences of negative emotions due to climate change may explain the multiple adverse mental health outcomes in both the short and long term (Clayton & Ogunbode, 2023; Ogunbode et al., 2022). Indeed, an examination of 10,000 young individuals (16–25 years old) found that about half reported climate change disrupted their everyday life and functioning and that they had daily negative cognitions specific to climate change (e.g., trouble focusing, sleeping, and enjoying; Hickman et al., 2021). However, there is very little understanding of the kinds of everyday climate change stressors experienced and how they may specifically be linked to daily wellbeing. This gap in the literature was the motivation for the current research study. Although limited research has directly considered climate change as a daily stressor (Galway & Field, 2023; Author et al. year; Cianconi et al., 2023), a rich body of literature has shown that daily stressors generally have short and long-term impacts on *daily wellbeing* (i.e., socioemotional health in everyday life; Almeida, 2005; Almeida et al., 2023; Charles et al., 2013; Kaur et al., 2025; Lohani et al., 2022). In past research, *negative affect*, which is a composite of negative emotional states (Watson et al., 1988), has been utilized as a common index of daily wellbeing as used in classic daily stressor theoretical framework (e.g., Almeida, 2005; Almeida et al., 2023).

Stressors are disruptive events that can elevate stress levels and worsen health and social vulnerability (Almeida, 2005; Fussel & Klein, 2006; Tschakert, 2007). For example, everyday stressors (such as work deadlines or arguments) have been widely documented as disruptive and linked to experiences of negative affect (Almeida, 2005). The current research examined how some stressors relevant in the context of climate change may be linked to everyday wellbeing. Specifically, we focused on two kinds of stressors—climatic stressors and non-climatic stressors. *Climatic stressor*s are those that are directly

caused by the environment, including extreme weather conditions and air, water, and land pollution. In addition to such climate-caused stressors that are more directly linked to climate change, other daily stressors may impact wellbeing that have also been recognized. Such stressors, called *non-climatic stressors*, are relevant to climate change but are not necessarily caused by it (Fussel & Klein, 2006). Synonymous terms such as "multiple exposures" (Belliveau et al., 2006) or "other stressors" (Tschakert, 2007), and "non-climate influences" (Clarke et al., 2018) have also been used to describe non-climatic stressors. Another framework that closely aligns with the idea of multiple stressors is the *Complex Sectoral Interaction* (Clarke et al., 2018), which suggests that climate-related systems (e.g., water, land, and ecosystems) and non-climate related systems (e.g., government, transportation, and health) are individually influenced by climate change and that these systems also influence each other (e.g., government policies inform climate change adaptation and vulnerabilities). The main implication that can be made by this literature is that climate-related systems (corresponding with climatic stressors) and non-climate systems (leading to non-climatic stressors) interact with each other and thus need to be studied together to gain insights into climate change risks and adaptation. In line with this framework, a systematic review suggested that climatic and non-climatic stressors contribute to health vulnerabilities (Räsänen et al., 2016). Furthermore, governmental stressors and health stressors were found to be additional stressors that are relevant to climate change and are linked to wellbeing and vulnerability (Räsänen et al., 2016).

Our primary daily stressor of interest was experiences of environmental stressors because of their empirical connection to climate change, as reviewed below. Several *environmental stressors* may impact everyday life, such as extreme weather conditions and air, water, and land pollution, to name a few. A common environmental stressor is extreme temperature, which has been found to impact performance (Pilcher et al., 2002) and productivity (Graff Zivin & Neidell, 2014). Uncomfortable temperatures can also limit time spent outdoors that could otherwise be helpful to relax and enjoy (Graff Zivin & Neidell, 2014), thereby negatively impacting everyday wellbeing. Other frequently studied environmental stressors are pollution, including air, water, and land pollution, which have a significant impact on health. In particular, poor air quality is known to impact health, including cardiovascular and respiratory illnesses as well as wellbeing (Haines et al., 2019; Jacobsen et al., 2022; Liu et al., 2016). Greenhouse gas emissions and anthropogenic climate change have reliably influenced health and wellbeing (e.g., Ebi et al., 2017; Mitchell et al., 2016). Although scarce in terms of everyday influence, the above work provides a tangential connection between environmental stressors and daily wellbeing. Further research is needed to better understand this link between environmental stressors and daily

wellbeing. In particular, we were interested in environmental stressors, such as pollution and waste (Bakadia et al., 2021; Guski et al., 2001; Horowitz & Stefanko, 1989; Shmool et al., 2014; Vogel et al., 2020) that are noticeable in daily life by individuals and are perceived as stressors by the responder. Indeed, air pollution and waste dumps have been perceived as environmental stressors to community members and are known to affect their health (Shmool et al., 2014; Vogel et al., 2020).

In the current study, we considered three non-climatic stressors (governmental, commuting, and health factors) and examined their interactions with climatic (environmental) stressors and their links to daily wellbeing. *Governmental stressors*, such as learning about governmental actions and policies in the news that may adversely impact the community, are non-climatic stressors that can influence daily wellbeing. This is because the government plays a pivotal role in individual wellbeing, in addressing climate change, and enacting regulatory policies, the effectiveness of which may also contribute to the resulting wellbeing (McConnell & 't Hart, 2019; Obradovich et al., 2018; Wu, 2021). For instance, poor governmental monitoring can worsen environmental protection efforts (Smith et al., 2003), which can leave communities vulnerable and distressed. In fact, governmental regulation has been identified as having a key role in promoting climate-resilient systems (Haines et al., 2019). Furthermore, effective governmental policies are closely linked to public wellbeing (Flavin, 2019; Flavin et al., 2014), but a lack thereof can have devastating impacts (Wu, 2021). For example, individuals have found governments' inaction to be a major contributor of distress (McConnell & 't Hart, 2019; Ngwakwe, 2024; Wu, 2021). These studies suggest that governmental stressors are non-climatic stressors that may negatively impact everyday wellbeing. In line with the idea of complex, multiple stressors (Belliveau et al., 2006; Clarke et al., 2018), we were interested in the interaction between environmental and governmental stressors and links to wellbeing.

Another non-climatic factor is the *commuting stressor*, which includes travelling short (e.g., to work) or long distances (e.g., different states or countries) that can heavily impact everyday wellbeing (Clarke et al., 2018). In fact, the World Health Organization (WHO) considers transportation a stressor that influences health (World Health Organization, 2011, 2022). Transporting, and in particular commuting, can lead to adverse experiences of stress, fatigue, mood, and wellbeing (Evans & Wener, 2006; Gimenez-Nadal & Molina, 2019; Jimenez-Vaca et al., 2020; Stone & Schneider, 2016; Wiese et al., 2020). Given that commuting is known to negatively impact wellbeing (Evans & Wener, 2006; Gimenez-Nadal & Molina, 2019; Jimenez-Vaca et al., 2020; Stone & Schneider, 2016; Wiese et al., 2020), we wanted to examine it as a non-climatic (or other stressor) because forms of transportation can heavily increase greenhouse gas emissions and anthropogenic climate change. It is possible that environmental and commuting stressors may interact to inform

daily wellbeing, and we wanted to explicitly examine this potential multiple stressor relationship. In addition to the above stressors, we were interested in including *health stressors* (e.g., getting sick and needing care) as they have a direct association with negative affect and wellbeing (Cunsolo & Ellis, 2018; IPCC, Pörtner et al., 2022; Räsänen et al., 2016); thus, we were interested in examining the unique role of the environmental stressors and links with daily wellbeing after accounting for health stressors.

The current study

Although limited and mostly tangential, the above literature suggests a connection between climatic and non-climatic stressors, and more research is needed to better appreciate this link. We refer to these climatic and non-climatic stressors as *climate change-relevant* because they may provide an understanding of complex, multiple stressors that may contribute to daily wellbeing in the climate change context (Clarke et al., 2018; Fussel & Klein, 2006; Räsänen et al., 2016; Tschakert, 2007). In addition to the scarcity of research on climate change-relevant stressors, most existing work has been retrospective and cross-sectional in nature, which can be distorted by memory recall biases. The Ecological Momentary Assessment (EMA) approach can address issues with retrospective reporting and improve ecological validity (Liao et al., 2016; Reichert et al., 2020; Shiffman et al., 2008; Timm et al., 2024; Trull & Ebner-Priemer, 2013). It has also been successfully utilized in daily stressor literature (Almeida et al., 2023). EMA can be quite useful in collecting people's experiences of climate change in their own naturalistic settings (for a review see, Lohani & Blodgett, 2025), increasing the personal relevance and generalization of the findings. In addition, EMA is helpful in reducing memory biases in responding by placing assessments close to events as they happen for a more accurate recall of information. Furthermore, frequent assessments are found to reduce social desirability and capture variability in responses made by the same person over time, which can provide rich insights about an individual's dynamic experiences and actions in real-world settings (ElHaffar et al., 2020; Reichert et al., 2020; Trull & Ebner-Priemer, 2013). Another advantage of EMA methodology is relevance in catching contextual information (e.g., kind of stressors experienced very recently) and the psychological experiences associated with it (e.g., sadness or stress). Such contextual information is generally not available via traditional self-report approaches and can be tremendously useful in gaining a reliable understanding of psychological processes specific to climate stress (Lohani & Blodgett, 2025). This motivated us to adopt the EMA methodology to capture the average hourly experience of relevant daily stressors and wellbeing in an ecologically valid manner.

Based on previous findings with daily stressors (e.g., Cunsolo & Ellis, 2018; IPCC; 2022; Charles et al., 2013), our primary hypothesis was that the presence of environmental and non-climatic daily stressors (including governmental, commuting, and health) would be associated with experiences of higher negative affect (i.e., hypothesis 1). Furthermore, we examined an additional hypothesis which predicted that environmental stressors may interact with governmental stressors and be associated with worse negative affect (hypothesis 2; Clarke et al., 2018; Flavin, 2019; Haines et al., 2019; McConnell & 't Hart, 2019; Ngwakwe, 2024; Räsänen et al., 2016; Wu, 2021). Similarly, we expected that environmental stressors may interact with commuting stressors and would be linked to worse negative affect (i.e., hypothesis 3; Evans & Wener, 2006; Gimenez-Nadal & Molina, 2019; Jimenez-Vaca et al., 2020; Stone & Schneider, 2016; Wiese et al., 2020). We planned to particularly examine how environmental stressors may be linked to negative affect, even after accounting for health stressors (i.e., hypothesis 4; Räsänen et al., 2016). Therefore, to test these hypotheses, interactions between environmental and all examined non-climatic daily stressors were planned.

Method

Participants

304 students from the University of Utah participated in the study in exchange for course credit. If participants opted not to report negative affect, their data were not included, as that was the outcome being examined in this work. Out of 304 participants, 17 (or .056%) did not report any negative affect questions over the course of the day, which led to 287 participants' data available for data analysis in this study. We used a rough estimate of effect sizes to generate sample estimates. A power analysis for linear mixed-effects models using the RStudio software and the package "sjstats" (Lüdecke & Lüdecke, 2019) revealed that to achieve 80% power for detecting a small to moderate effect size (.35 to .33) at a significance level of .05, a sample size of 258 to 290 would be needed. Our study's sample size of 287 ($M = 22.15$, $SD = 5.98$ was sufficiently powered to test our research questions. Additional details in Table 1.

Table 1. Descriptive information on the sample

Variable	Age in years	Total Negative Affect
Mean	22.15	5.69
SD	5.98	6.09
Median	20	4
Min	18	0
Max	59	32
Range	41	32
Skew	2.79	1.59
Kurtosis	9.14	2.46

Based on self-reported gender, participants were primarily women (89.55% women, 9.06% men, .35% genderqueer, 1.05% other). Of the 287 participants, 2.43% were American Indian/Alaskan, 11.50% were Asian, 0.35% were Native Hawaiian, 2.09% were African American, 79.79% were Caucasian, and 2.439% were Pacific Islanders. Being in a commuter school, these students who did not live on campus were primarily commuting from the greater Salt Lake City area.

Materials

Stressors

To learn about the average hourly experience of specific stressors, participants were asked whether (Yes/No) they had encountered any of the listed daily stressors, including environmental, governmental, commuting, and health (adapted for this study, similar to previous daily stressor work; Almeida, 2005). Specifically, the question wording asking about daily stressors was similar to the methodology proposed in initial daily stressor work (Almeida, 2005); however, for the purpose of learning about climate-relevant stressors, in past published research have adapted additional stressors (Lohani et al., 2022), which included environmental, governmental, commuting, and health stressors. These pre-existing list of daily stressors were also utilized in the current study. A few examples of the stressor category were presented to help the participant understand what the stressors meant. See Table 2 for each stressor-related definition and examples.

Negative affect

We adopted the approach of assessing negative emotions using a modified differential emotion scale (Watson et al., 1988) because it has been exhaustively used in affective science to assess negative affect, which is indicative of daily wellbeing. On a 5-point Likert scale from *not at all* (0) to *a great deal* (4), participants indicated the extent to which they felt any of the following eight

Table 2. Information on the different stressors studied with examples presented to participants during each EMA event

Stressor	Definition	Example presented
Environmental stressors	Environmental pollutants (in air and water or land) or events (such as extreme temperatures) that cause stress to the individual responder.	"environmental waste (e.g., air and water) and garbage"
Governmental stressors	Actions, statements, or policies put forth by the government that cause stress.	"in the news or politics"
Commuting stressors	Unpleasant and stressful experiences while travelling to short or long distances using public or personal transportation	"traffic, delays, and aggressive or distracted drivers"
Health stressors	Stress caused by health concerns that need one's attention.	"getting sick, medication, and urgent care"

negative emotions: sadness, irritable, bored, anger, lonely, helpless, hopeless, and useless (Watson et al., 1988). A sum of all these ratings was used to calculate the total negative affect participants reported at each event. This was utilized as the outcome variable for the study where a higher score implied higher negative affect. The standardized Cronbach's alpha for total negative affect was .89 (95% CI [.88, .89]) and Guttman's lambda six was .90. Both of these commonly utilized reliability measures suggested that total negative affect had good reliability.

Procedure

The study was approved by the Institutional Review Board at the University of Utah. Accordingly, participants used the online consent procedure to provide their voluntary informed consent to participate in this study. This study took place over the course of four semesters between Fall 2020 and Spring 2022. In order to receive the daily EMAs necessary to participate in the study, participants registered their phone numbers securely with the web-based application SurveySignal (Hofmann & Patel, 2015). Data were only collected on weekdays (as weekends could be quite different than weekdays in terms of commuting and experience of daily stressors generally). Throughout the study day, using a semi-random beep design, participants were sampled 10 times randomly once within each hour via a text message link sent to their phones from the SurveySignal platform between 10 AM and 8 PM. The same set of questions and examples were presented each time. Participants were asked to indicate their experiences since completing the previous EMA event. If participants had missed an EMA or it was the first one of the day, they were asked to report based on their experience during the past hour only. A reminder text was sent if participants did not open the link within 15 minutes. Furthermore, a minimum of 15 minutes was set to ensure that some time has passed between two consecutive EMA assessments. At each EMA event, participants reported whether they experienced any of the climate change stressors and negative affect.

Data analysis plan

A generalized linear mixed effects model was conducted to test how negative affect can be predicted by environmental stressors, health stressors, commuting stressors, government stressors, and time. Given that the data were skewed and had a non-normal distribution, a Poisson distribution was modeled as it led to a better fit. All stressors were grand-mean centered before being included as a predictor. Experience sampling observations (Level 1) were nested within individuals (Level 2). Time (i.e., up to 10 EMA assessments over the course of the day) was included as a continuous covariate in the

model to account for the nested nature of these data. The model included participants as a random variable and also a random slope for time to be able to measure the relationship between stressors and negative affect across EMA assessments. After making sure that data for the outcome variable was reported to be able to explain the effects of predictors on it, all available data were included in the analysis without imputation or exclusion. No imputations were done because there isn't enough understanding of these constructs in the literature to replace missing data accurately. We had enough number of participants to be able to tolerate missing data and detect meaningful effects.

Because the interest was also in examining how environmental stressors may interact with other relevant stressors, two-way interaction terms between environmental stressors and each stressor were also included in the model. These led to the inclusion of three interactions: between environmental X governmental, environmental X health, and environmental X commuting stressors. Alpha was set at .05. We planned to conduct contrasts to examine how the presence and absence of stressors (separate as a main effect and combined as a 2-way interaction) would predict the wellbeing outcome. Tukey's method for multiple comparisons was used to make corrections for any follow-up comparisons. Analyses were conducted using RStudio using *lme4, ggplot2*, *psych*, and *emmeans* packages. For effect sizes, Cohen's d is reported using the *emmeans* package, which is defined by the paired differences divided by the generalized linear mixed model's population standard deviation (Lenth, 2024).

Results

Table 1 presents the descriptive information for total negative affect and Figure 1 presents its distribution in the form of a histogram. The negative affect-related percentage of total variance associated with the grouping variable (i.e., Intraclass Correlation 1) was .69 and Intraclass Correlation 2 (Reliability of group differences or ICC2) was .95. These suggested sufficient variance at the within-person level to conduct multi-level models.

Compliance

Table 3 shows the total number of times climate change-relevant stressors were reported across all participants and EMA prompts. Overall, there were 2366 responses (out of a possible 2870) across participants over the 10 EMA prompts, which is an 82.44% compliance rate. Across each of the 10 EMA prompts, the average participants' response rate was 236.60 (out of 287 people). Based on the approved protocol, participants were free to skip answering any of the questions asked. In addition, the participants were

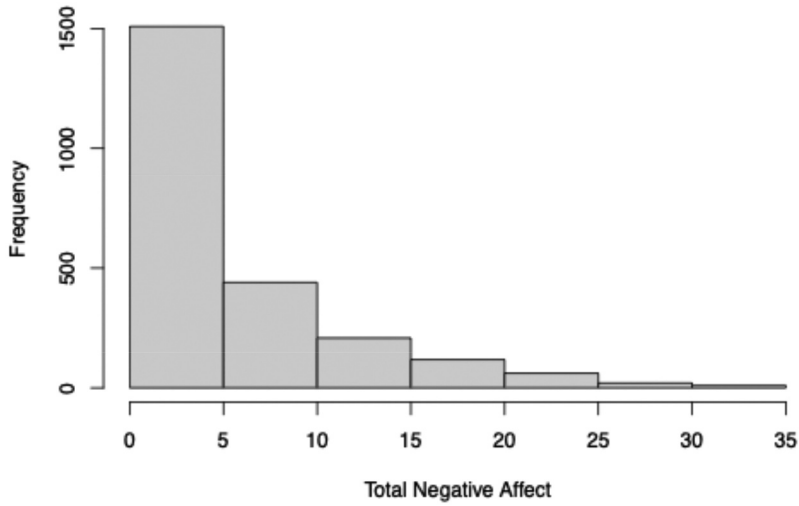

Figure 1. A histogram of the outcome variable, total negative affect.

Table 3. The total answered EMA prompts across all subjects was 2366. The average number of EMA prompts answered per person = 8.64/group, per id,

		Stressor experienced	
	Average number of times reported	Yes	No
Commuting	2.16 (SD = 1.66)	333	2033
Environmental	1.89 (SD = 1.80)	119	2247
Governmental	1.90 (SD = 1.71)	116	2250
Health	2.99 (SD = 2.70)	320	2046

informed not to respond to EMA prompts when it was not safe or appropriate (e.g., while driving or attending a class). We do not have information on the reasons for noncompliance. Participants reported 3.13 (SD = 4.42) climate-relevant stressors, with more information across each stressor presented in Table 3.

Model predicting negative affect

Table 4 presents correlations between the variables of interest (based on Pearson correlation). The generalized linear-mixed effects model tested how total negative affect was predicted by experiences of environmental, governmental, commuting, and health-related stressors. Time was added as a covariate. The results are presented in Table 5.

Main effects

Results found a main effect (i.e., an independent effect of the predictor) of daily stressors on negative affect, such that the presence of stressors was

Table 4. Correlations between total negative affect and four stressors were examined in the study (environmental, governmental, health, and commuting). The values below the diagonal line (made of 1s) are between-person correlations, while those above the diagonal are within-person correlations

Variable	Negative affect	Environment stressor	Governmental stressor	Health stressor	Commuting stressor
Negative affect	1	0.06**	0.07**	0.07**	0.07***
Environmental	0.20***	1	0.22***	0.11***	0.13***
Governmental	0.25***	0.57***	1	0.09***	0.09**
Health	0.14*	0.35***	0.26***	1	0.06**
Commuting	0.06	0.40***	0.32***	0.21***	1

* is $p < .05$; ** is $p < .01$; *** is $p < .001$.

linked to higher negative affect. As presented in Table 5, the main effect of commuting stressors was significant, Incident rate ratio (*IRR*) = 1.12, $SE = .04$, $p = .001$, 95% CI [1.05, 1.20]. *IRR* represents the estimated rate of negative affect for a one-unit change in the predictor(s) of interest when other variables are held constant. IRR is estimated by calculating the model coefficient for the effect. Figure 2 shows that the presence of commuting stressors was associated with higher negative affect than their absence. Also, the main

Table 5. Results from the model that included both climatic (environmental) and non-climatic (governmental, commuting, and health) stressors as predictors and total negative affect as the outcome variable

	Total NA				
Predictors	Incidence Rate Ratios	std. Error	CI	Statistic	p
(Intercept)	4.38	0.30	3.84–5.00	21.92	**< 0.001**
Health stressors	1.09	0.04	1.02–1.18	2.40	**0.016**
Environmental stressors	1.12	0.07	0.99–1.26	1.76	0.079
Governmental stressors	1.04	0.06	0.93–1.15	0.66	0.506
Commuting stressors	1.12	0.04	1.05–1.20	3.31	**0.001**
Time	0.97	0.01	0.95–0.98	−4.37	**< 0.001**
Environmental × Health stressors	0.77	0.09	0.62–0.96	−2.32	**0.020**
Environmental × Governmental stressors	1.43	0.17	1.13–1.80	3.01	**0.003**
Environmental × Commuting stressor	0.92	0.10	0.75–1.13	−0.77	0.444
Random Effects					
σ^2	0.13				
$\tau_{00\ Participant}$	1.05				
$\tau_{11\ Participant.Time}$	0.01				
$\rho_{01\ Participant}$	−0.41				
ICC	0.88				
Marginal R^2 /Conditional R^2	0.014/0.881				

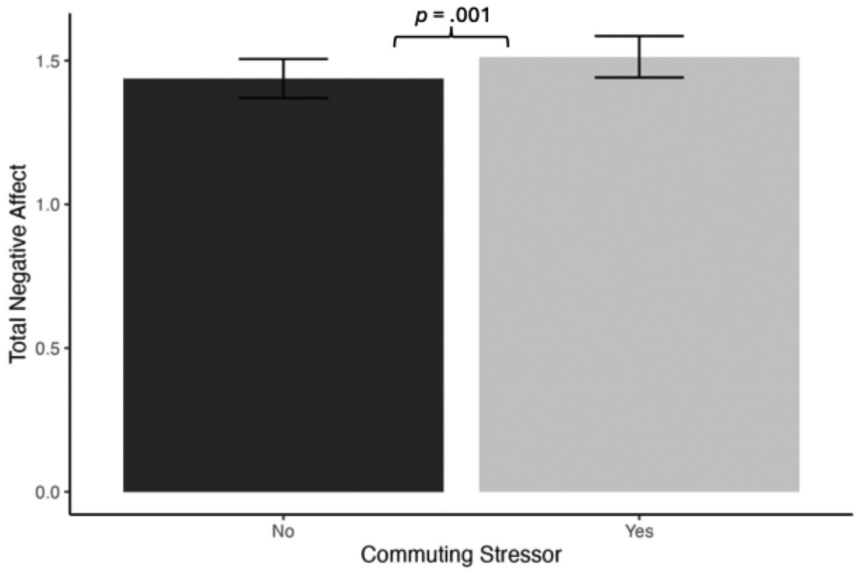

Figure 2. The main effect of commuting stressors on negative affect was significant, but the interaction with environmental stressors was insignificant.

effect of health stressor was significant, *IRR* = 1.09, *SE* = .04, *p* = .016, 95% CI [1.02, 1.18]. The other predictors were insignificant at the main effect level, including the environment stressors (*IRR* = 1.12, *SE* = .07, *p* = .08, 95% CI [.99, 1.26]) or government stressors (*IRR* = 1.04, *SE* = .06, *p* = .51, 95% CI [.93, 1.15]). The main effect of covariate time (*IRR* = .97, *SE* = .01, *p* < .001, 95% CI [.95, .98]) was significant. At the same time, some interaction terms were significant, which implies that those combinations of predictors should be used to explain the outcome variable. Next, we present each interaction and planned comparisons.

Interaction effects

The model (presented in Table 5) showed that the interaction between environmental and governmental stressors was significant (*IRR* = 1.43, *SE* = .17, *p* = .003, 95% CI [1.13, 1.80]). Planned follow-up comparisons revealed that in moments when participants experienced both environmental and governmental stressors, they reported significantly higher negative affect than when neither of the stressors was experienced, *z* = 3.90, *p* = .001, 95% CI [−.50, −.16], *d* = .33. See Figure 3 for links between negative affect and presence (and absence) of environmental and governmental stressors. As shown in Figure 3, the presence of both environmental and governmental stressors also had significantly higher negative affect than environmental stressors only, *z* = 3.62, *p* = .002, 95% CI [−60., −.18], *d* = .39. Furthermore, the experience of environmental and governmental stressors also predicted

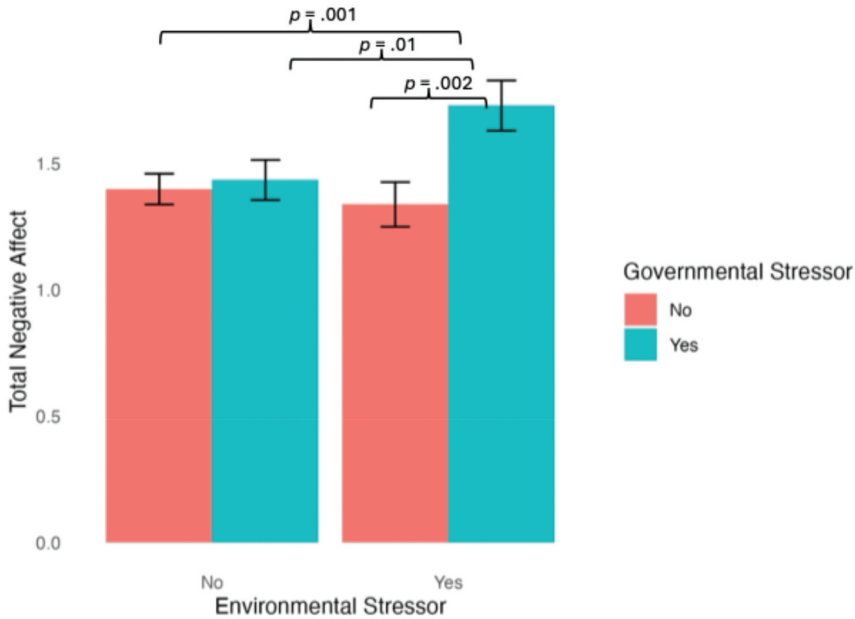

Figure 3. Experienced negative affect as a function of environmental and governmental stressors.

significantly higher negative affect than experiencing governmental stressors only, z = 3.09, $p = .01$, 95% CI [−.48, −.11], $d = .29$.

There was also a significant interaction between environmental and health-related stressors (*IRR* = 1.12, *SE* = .04, $p = .02$, 95% CI [1.50, 1.20]; See Table 5. Planned follow-up analysis suggested that the experience of environmental only stressors was associated with higher negative affect than the health only stressor, z = 3.39, $p = .004$, 95% CI [−.39, −.10], $d = .25$. This pattern can be seen in Figure 4 that shows the interaction effect of environmental and health stressors. Notably, no other planned contrasts were significant. Finally, there was not a significant interaction between environment and commuting stressors (*IRR* = .92, *SE* = .10, $p = .44$, 95% CI [.75, 1.13]).

Random effects

Table 5 presents the random effects that show substantial variability across participants ($\tau_{00} = 1.05$) as well as a small random slope variability ($\tau_{11} = .01$).

Discussion

In a 2022 survey of U.S. adults, 29% of respondents were either disengaged, doubtful, or dismissive of global warming (Leiserowitz et al., 2023). Although likely related to many factors, including the sociopolitical history of climate change in the U.S (e.g., McCright & Dunlap, 2011), an unalarmed

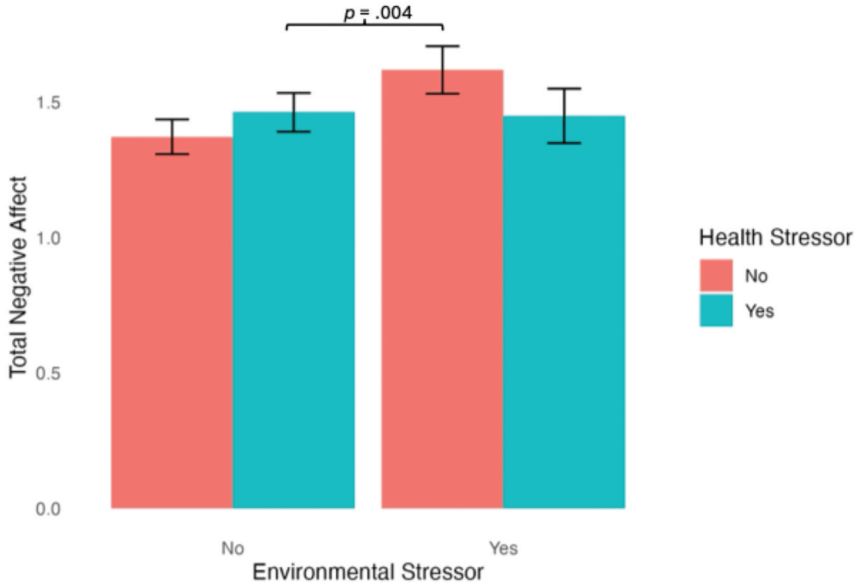

Figure 4. Experienced negative affect as a function of environmental and health stressors.

attitude seen across the American public can likely be at least in part attributed to the common perception of climate change as abstract, or a distant problem, far removed from daily life in space and time (e.g., Spence & Pidgeon, 2010; Spence et al., 2011). Our study counters this idea by showing that climate change-relevant stressors are experienced as daily stressors and are related to everyday wellbeing. In order to empirically investigate how climate change-relevant stressors may be linked to everyday wellbeing, this study adopted a more naturalistic approach to measure everyday experiences of environmental, governmental, and traveling or commuting stressors and their links to affect using an EMA approach. Overall, we found that climate change-relevant stressors have a cumulative connection to everyday wellbeing, extending the Complex Sectoral Interaction framework (Clarke et al., 2018) that recommends interdependence between climate-related and non-climate related systems. These findings resonate with previous calls for action (Haines et al., 2019) and imply that climate change cannot be treated as a tentative concern for the future because it is relevant to daily wellbeing.

Despite being infrequent in daily life, environmental stressors were significantly linked to worse negative affect. These findings complement a previous cross-sectional survey-based study that has found climate change issues can adversely affect daily life (Hickman et al., 2021). Even separate from everyday health issues, environmental stressors were uniquely associated with worse daily wellbeing. Thus, not only do environmental stressors impact

long-term health (Jacobsen et al., 2022; Räsänen et al., 2016; Rocque et al., 2021), but the current findings suggest that they also have a significant connection with everyday wellbeing. Environmental stressors are not only independently linked to negative affect but also interacted with other non-climate related stressors cumulatively to predict lower wellbeing (Clarke et al., 2018; Räsänen et al., 2016). In particular, the experience of both environmental (climate-related) and governmental (non-climate related) stressors was associated with worse negative affect. These findings align with previous work (Hickman et al., 2021) that found that young people felt betrayed by their government and found their governments' climate change response inadequate. Among those who were engaged with climate change, it has been recently rated as one of the biggest and most worrisome stressors (Weierstall-Pust et al., 2022). These findings highlight the complex and entangled nature of connections that environmental, governmental, and related stressors can have with everyday wellbeing.

These findings support previous work that has found that transportation influences negative experiences (Stone & Schneider, 2016) and wellbeing in general (Gimenez-Nadal & Molina, 2019). Importantly, commuting (and transport in general) exposes individuals to extreme weather, poor air quality, and pollution (WHO 2022), thereby reflecting the role of anthropogenic-specific stressors. It is possible that during travel, participants are exposed to the adverse climate change-relevant impacts of transportation, which may explain links with deleterious experiences reported in prior research. One possible solution that has been proposed is the adoption of shared rides that can help meet the sustainability efforts of cities and possibly promote better affect (Roca-Puigros et al., 2023). In fact, transportation has been recognized as an important target for sustainability efforts and ways of improving health, such as reducing air pollutants and road traffic (2011, 2022).

Limitations

The findings should be interpreted with the following limitations in mind. First, not all non-climatic stressors (e.g., governmental or commuting-related daily stressors) may be relevant to climate change at all times. In the current study, we did not specifically ask participants if their experienced stressors were climate change-related or not. This is because there are relevant climate stressors that may not necessarily be caused by climate, but may contribute to the cumulative stress in the context of climate change (Clarke et al., 2018; Räsänen et al., 2016). For instance, within commuting stressors, some may be more exposed to air pollution produced by vehicles (an environmental stressor), thereby leading to an interaction between commuting and environmental stressor. However, there may be other stressors unrelated to climate change (e.g., aggressive driving, which is not an environmental

stressor). Therefore, in future work, more specific information about each stressor experienced by the responder would be helpful. Future research should collect additional information to discern the specific nature of the stressors. On a related note, we recognize that there is subjectivity in what individuals consider daily stressors for themselves, and to counteract this concern, additional training in different types of stressors and whether they are climate change-relevant would help clarify this concern in future work.

Second, while this study provided knowledge about the stressor-wellbeing link over the course of a day, learning about day-to-day changes would also provide an appreciation of the dynamic links between climate change stressors and affective experiences. Third, the current study only speaks to the links between climate change-relevant stressors and adverse affective experiences and cannot imply causation. Fourth, the sample of this study was specific to university students, who were 90% female, which raises questions of generalizability. For instance, on average, females are known to have a stronger emotional reaction to climate change challenges (Pearse, 2017). Future work is needed to generalize these findings with a larger, diverse sample that is more representative of the general population.

Future directions

Individual differences of participants, such as their personal understanding of climate change issues and their engagement in sustainable behaviors, would be helpful to know in order to better contextualize the relationship between these stressors and associated affective experiences. Additionally, this study emphasizes the importance of addressing climate change challenges. Further work is needed to consider how to mitigate experiences of unpleasant climate change stressors (Brosch, 2021; Brosch & Sauter, 2023; Lohani et al., 2025a, 2025b; Obradovich & Minor, 2022). At the same time, previous work has found that experiences of negative affect can be the driving force of climate change-related judgments and behaviors. For instance, negative experiences of climate change may promote environment-friendly perceptions (Van der Linden, 2015) and behaviors (Ogunbode et al., 2022). In fact, a recent meta-analysis found that negative affect was one of the most important motivators for behaviors to adapt to climate change (Brosch, 2021; van Valkengoed & Steg, 2019). Follow-up work should examine how the experience of climate change stressors may motivate pro-environmental behavior. For example, when individuals may report experiencing negative affect, they could also be provided with opportunities to promote pro-environmental behavior change (such as, volunteering and advocacy efforts in the local community; Lohani et al., 2025, in press). In addition to receiving such action-oriented messages, they could also receive information on how to best manage their health and wellbeing in the context of climate change

(e.g., connecting with pro-environmental groups to gain social support and counseling).

Furthermore, future studies can incorporate existing measures of cognition and emotion with EMA assessments to gain a nuanced understanding of psychological experiences and responses to environmental stressors in daily life (Lohani & Blodgett, 2025; Lohani et al., 2025). For example, adopting an innovative approach, researchers have combined knowledge gained from EMA assessments, location tracking, and functional neuroimaging to understand the impact of environmental factors (Tost et al., 2019). Similarly, other researchers have investigated how temperature changes can influence the relationship between physical activity measured by an accelerometer and psychological experiences gathered via EMA to incorporate environmental factors, such as temperature and air quality, that participants are exposed to in their daily life (Bundo et al., 2023; Timm et al., 2023). In future work, such existing methodologies can also be combined to create applied interventions as well. For instance, air and temperature sensors can relay information in real-time to trigger preventive measures to help individuals manage the psychological and physical impacts of extreme conditions due to climate change. Extending current work (Cooper et al., 2025; Williams et al., 2024), future interventions can also be designed to provide support to those who are most vulnerable to climate change (e.g., older adults or children, their caretakers, and historically marginalized groups).

Conclusion

Taken together, the current study highlights the relationship between daily wellbeing and everyday climatic and non-climatic stressors. Specifically, we found that environmental, governmental, and commuting stressors are connected to experiences of everyday wellbeing in real-world settings. Furthermore, environmental and governmental stressors can interact with each other to be associated with worse daily wellbeing. This work supports past research that has talked about other non-climatic stressors (such as governmental and commuting) that can potentially interact with climate change challenges to impact daily wellbeing (Clarke et al., 2018; Räsänen et al., 2016). Contrary to some dismissals of climate change issues, this work implies that multiple climate change-relevant stressors are present in everyday life and are related to the experience of negative affect. Other recent research has found that historically marginalized individuals are most impacted by climate change stressors and yet remain least protected (Lohani et al., 2025); thus, future work is needed to examine multiple stressors in marginalized individuals. Further governmental and community initiatives are needed to raise awareness about the daily effects of climate change-

relevant stressors and promote support for those who are most vulnerable (Lohani et al., 2025, in press).

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Availability of data and materials

Data will be made available on request.

Consent for publication

All authors provide their consent to publish this paper

Ethics approval and consent to participate

The study was approved by the Institutional Review Board at the University of Utah. Accordingly, the informed consent procedure was adopted. All participants provided their informed consent to participate in this study voluntarily.

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