



Widening the moral circle: perceived responsibility and guilt as mediators of moral expansiveness and pro-environmental behavior

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Abstract

Previous research has shown that moral constructs, such as personal norms, play a significant role in shaping individuals' pro-environmental engagement. However, the specific influence of moral expansiveness on such behaviors has received limited attention in the existing literature. This study aims to investigate the relationship between moral expansiveness and pro-environmental engagement within the Turkish context, which is particularly vulnerable to the impacts of climate change. It specifically examines the mediating roles of perceived environmental responsibility and environmental guilt to better understand the mechanisms underlying this association. In total, 244 undergraduate students (167 women, 76 men, 1 did not state; $M_{age} = 21.95$, $SD_{age} = 2.58$) participated in the current study in exchange for course credit. Findings indicated that moral expansiveness indirectly predicted pro-environmental behaviors through both perceived environmental responsibility and environmental guilt, although its direct effect was not significant. Perceived environmental responsibility and environmental guilt both significantly predicted pro-environmental behaviors. Additionally, individuals with more left-leaning political views reported higher levels of pro-environmental behavior. This study highlights how broader moral concern can support sustainability, while contributing to the inclusion of non-Western contexts in environmental psychology.

Keywords Pro-environmental behaviors · Guilt · Environmental responsibility · Moral expansiveness · Moral circle

There is an increasing concern regarding the potential dangers posed by the human-induced climate crisis and ecological degradation. These shifts jeopardize the well-being of all living beings, encompassing both human and non-human species. The Intergovernmental Panel on Climate Change

(IPCC, 2023) report indicated that ongoing ecological damage is predominantly attributed to the rise in industrial activities and unsustainable habits adopted by individuals. Beyond ecological imbalance, climate change poses serious threats to human health and well-being (e.g., Berry et al., 2010). Given these detrimental impacts, promoting pro-environmental behavior is arguably one of humanity's most crucial objectives. Identifying the factors that motivate individuals to act, as well as the barriers that hinder such actions, is essential. Behavioral science has identified several facilitators, including personality traits (Gibbon & Douglas, 2021; Rothermich et al., 2021), emotions (Shi-pley & van Riper, 2022), values (Lindenberg & Steg, 2007), identities (Fritzsche et al., 2018; Kırıl-Uçar et al., 2023), and social norms (Farrow et al., 2017).

This study introduces a moral perspective to enhance these efforts in understanding pro-environmental behavior. Specifically, we aim to examine the mediating roles of perceived environmental responsibility and environmental guilt to uncover the mechanisms through which moral expansiveness relates to pro-environmental behaviors in the

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Turkish context. By doing so, we provide a deeper theoretical understanding of this relationship to inform strategies for fostering sustainable action (see Fig. 1 for the hypothesized path model).

The association between moral expansiveness and pro-environmental behaviors

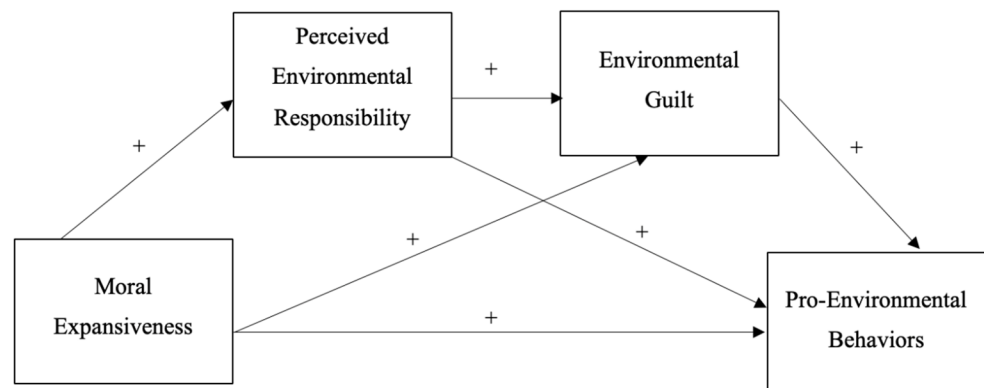
Among the predictors of pro-environmental behavior, framing environmental issues as moral concerns is vital. Prior work has highlighted the influential role of moral norms (de Groot et al., 2021), which demonstrated that personal moral norms are often the strongest determinant of engagement compared to descriptive or injunctive norms (Coşkun et al., 2024; Helferich et al., 2023). While the popularity of environmental morality is increasing (van der Werff, 2023), there is limited research on moral expansiveness, the degree to which individuals extend moral concern beyond close kin to include distant others, animals, and plants (Crimston et al. 2018a; McFarland et al. 2012). Historically, moral circles have widened over time, as seen in the advancement of rights for marginalized groups and increasing opposition to animal testing. Bratanova et al. (2012) found that a wider moral circle is positively associated with energy saving and supporting environmental taxes. Further research reveals that integrating non-human entities into one's moral circle increases environmental concern (Crimston et al. 2018b) and prosociality toward nature (Caviola et al., 2019; Ghasemi & Kyle, 2021). Individuals with wider moral circles are predisposed toward universalistic values, making them more likely to sacrifice for nature (Crimston & Hornsey, 2018) and identify with all of humanity (McFarland et al., 2012). Thus, extending the moral circle to the environment may be key to fostering beneficial behaviors for the environment (Anthis & Paez, 2021).

The mediating role of perceived environmental responsibility and environmental guilt

To understand how moral expansiveness translates into pro-environmental action, we look toward the sequential roles of responsibility and guilt. In his Norm Activation Model, Schwartz (1977) suggested that altruistic actions require recognizing a problem, feeling responsible for it (ascription of responsibility), and endorsing moral norms. If individuals do not perceive a moral problem, they will not feel accountable. In terms of ecological conservation, feeling personally responsible for environmental degradation makes individuals more obliged to exhibit sustainable lifestyles (Wang et al., 2022).

According to Cognitive Appraisal Theory (Lazarus, 1991), the evaluation of a situation initiates emotional processes. In this study, we propose that perceived responsibility serves as a cognitive appraisal that precedes the moral emotion of guilt based on this theoretical approach. Guilt arises following the realization of a violation of moral standards (Tangney et al., 2007) and typically entails the perception that one is accountable for the consequences. Prior research supports this directionality, indicating that perceptions of responsibility can lead to feelings of guilt for both environmental behavior (e.g., Culiberg et al., 2023; Erlandsson et al., 2016; Harth et al., 2013) and other prosocial behaviors (e.g., Čehajić-Clancy et al., 2011). Thus, while guilt is associated with pro-environmental intentions (Culiberg et al., 2023; Onwezen et al., 2013), it is the cognitive acknowledgment of responsibility that provides the necessary internal attribution for this emotion to emerge. Building on this framework, we propose that moral expansiveness predicts pro-environmental behavior through the sequential mediation of perceived environmental responsibility and environmental guilt.

Fig. 1 The hypothesized model



The current study

Previous studies highlighted the influential role of moral variables (e.g., moral norms) on individuals' pro-environmental engagement. However, prior literature has overlooked the specific role of moral expansiveness on pro-environmental engagement. To the best of our knowledge, no previous research has examined the connections between moral expansiveness, environmental guilt, perceived environmental responsibility, and pro-environmental engagement. Instead of merely showing how moral concern can extend beyond social relationships to include environmental entities, identifying the factors that potentially mediate this connection may contribute to the development of more effective interventions for promoting sustainable behavior.

Furthermore, according to the IPCC (2022), nearly half of the world's population, particularly in the Global South, is vulnerable to climate change. However, 83.76% of samples in environmental psychology are drawn from Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies (Tam & Milfont, 2020). Cultural factors significantly shape human-environment interactions (Adger et al., 2013; Milfont, 2012), with relationships between values and engagement being stronger in countries with high Human Development Index scores (Milfont & Markowitz, 2016) and individualistic societies (Tam & Chan, 2017). Individuals' pro-environmental decision-making is inevitably bounded by their socio-cultural values (Wang et al., 2023).

Türkiye is highly vulnerable to climate impacts like water scarcity and disasters (IPCC, 2022), yet research remains limited. Interestingly, Turkish samples often exhibit ecological anger and grief linked to blaming the Global North for environmental issues (Voşki et al., 2023). This unique sense of responsibility attribution makes exploring the internal mechanisms of moral expansiveness particularly interesting in this non-Western context. The present study examines whether moral expansiveness predicts pro-environmental behavior through the sequential mediation of perceived environmental responsibility and environmental guilt in a Turkish sample (see Fig. 1 for the proposed model).

Method

Participants and procedure

Data collection involved participation of 244 students (167 women, 76 men, 1 preferred not to state; $M_{\text{age}} = 21.95$, $SD_{\text{age}} = 2.58$) at a Turkish state university who voluntarily took part in the study in exchange for course credit. Participants were recruited through a convenience sampling strategy. Data were collected through an online survey administered

via Qualtrics. Prior to accessing the questionnaire, participants were presented with an informed consent form outlining the purpose of the study, eligibility criteria, the voluntary nature of participation, and their right to withdraw at any time. Only those who provided consent were permitted to proceed. The participants completed the survey online and took 12 min on average to complete. To ensure data quality, responses were screened for missing data. No personally identifiable information was obtained during the data collection process, and all responses were recorded anonymously. Prior to the commencement of the study, ethical approval was obtained from the Human Subjects Ethics Committee of Middle East Technical University.

Measures

Moral Expansiveness Scale Moral Expansiveness Scale (Cronbach's $\alpha = 0.86$), adapted to Turkish by Kirkland et al. (2022) was employed to evaluate the extent of participants' moral circle, reflecting the variety of entities they regard as deserving moral regard (Crimston et al., 2016). In this measure, participants assess the moral significance of 30 various entities, including family members/friends, in-group members, out-group members, the environment by assigning them to one of four predefined categories. In this scale, entities that warrant the greatest moral concern and personal accountability are placed in the *inner circle*, while those for whom participants maintain ethical concern but experience a diminished sense of responsibility are categorized in the *outer circle*. Participants feel the lowest level of moral consideration for entities they assign to the *fringes of moral concern* and do not perceive any moral responsibility for them. *Outside the moral boundary* is used for entities for which moral treatment or feeling personal responsibility is considered nonsensical and exaggerated. In the current study, participants' responses for each entity were coded as: (4) "the inner circle of moral concern", (3) "the outer circle of moral concern", (2) "the fringes of moral concern" and (1) "outside the moral boundary". Participants' overall moral expansiveness was assessed by calculating a mean score across all entities. Higher scores reflect a broader moral circle, indicating that a greater number of entities are viewed as deserving moral concern and ethical regard.

Environmental Guilt Participants' perceived guilt for individuals' performance on environmental conservation was measured with two items ("I am regretful about humans' lack of performance on environmental protection", "I feel guilty for how little humans have done to improve the quality of the environment"; $r = .28$, $p < .001$) (1 = *completely disagree*, 7 = *completely agree*) following Tam (2019). This

value of $r = .28$ falls within the optimal range of 0.15 to 0.50 for average inter-item correlations (Clark & Watson, 1995, 2019). This indicates that while the items are not conceptually redundant, they demonstrate adequate internal consistency for a parsimonious two-item measure. The mean of 2 items was taken such that higher scores indicated higher levels of environmental guilt. The original items were translated into Turkish by two bilingual researchers using a forward-backward translation approach. Initially, each researcher independently translated the items into Turkish, after which another bilingual researcher back translated them into English. Any differences between the versions were discussed and refined collaboratively to ensure that the Turkish items accurately captured the meaning and nuance of the original statements. The original items along with their Turkish translations may be found in Table 2 of the Appendix.

Perceived Environmental Responsibility Participants' level of perceived responsibility for environmental protection was assessed with 7 items (e.g., "I think I have responsibility in protecting the environment") (1 = completely disagree, 7 = completely agree, Cronbach's $\alpha = 0.78$) (Paço & Gouveia Rodrigues, 2016). The average of seven items was calculated, with higher scores reflecting greater perceived responsibility toward the environment. Once again, the items were translated to Turkish for the purposes of this study and the items may be found in Table 3 of the Appendix. The same translation procedure described above was followed to ensure conceptual consistency between the English and Turkish versions. In addition, a confirmatory factor analysis (CFA) was also performed to examine whether the Turkish form of the Perceived Environmental Responsibility Scale was adequately represented by a single underlying factor. The analysis showed that the proposed one-factor model fit the data well, $\chi^2(N=244, df=13)=28.50$, $\chi^2/$

$df=2.19$, $p = .008$, CFI = 0.97, TLI = 0.95, RMSEA = 0.07, 90% CI [0.04, 0.11], SRMR = 0.04. Standardized factor loadings ranged from 0.33 to 0.75, all $ps < 0.001$.

Pro-Environmental Behaviors Pro-environmental behaviors (Candar, 2022) were measured with 8 items with a 5-point Likert scale (1 = very untrue of me, 5 = very true of me). An example item is "I buy environmentally friendly products and services" and the mean of 8 items were taken such that higher scores indicated greater engagement in pro-environmental behaviors with Cronbach's $\alpha = 0.82$.

Demographic Information Form Participants reported their gender and age and completed single-item measures of religiosity ("To what extent does your religious belief influence your daily life?"), political orientation (1 = Left, 10 = Right), and conservatism ("To what extent do you consider yourself conservative?").

Results

Preliminary analyses

Before testing our hypothesized model, we conducted several preliminary analyses, including descriptive statistics, bivariate correlations, and independent samples *t*-tests. No outliers were detected, and skewness and kurtosis levels between -2 and $+2$ indicated no substantial deviations from normality in the study variables (Hair et al., 2019). We also evaluated multicollinearity using variance inflation factors (VIFs) and all values were below 1.5, as commonly accepted thresholds (Gordon, 2015), indicating that multicollinearity was not a concern. Table 1 displays the means, standard deviations, and bivariate correlations among the variables.

Table 1 Descriptive statistics and bivariate correlations between study's variables

	1	2	3	4	5	6	7
1. Pro-Environmental Behaviors	—						
2. Moral Expansiveness	0.25***	—					
3. Environmental Guilt	0.40***	0.33***	—				
4. Perceived Environmental Responsibility	0.39***	0.27***	0.52***	—			
5. Political Orientation (1 = Left, 10 = Right)	-0.13*	0.01	-0.00	0.05	—		
6. Religiosity	0.06	0.14*	0.11	0.20**	0.50***	—	
7. Conservatism	-0.04	0.11	0.08	0.15*	0.61***	0.77***	—
Mean	3.06	2.72	4.89	5.35	3.82	1.52	1.46
Standard Deviation	0.67	0.41	1.17	0.84	1.95	0.32	0.27
Skewness	-0.46	0.06	-0.52	-0.44	0.69	0.65	0.92
Kurtosis	0.30	-0.04	-0.04	-0.28	0.29	-0.91	-0.37

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Main findings

A mediation analysis using the PROCESS macro for SPSS (Model 6; Hayes, 2013) was conducted to investigate the mediating roles of perceived environmental responsibility and environmental guilt in the relationship between moral expansiveness and pro-environmental behaviors. Given the statistically significant relationship between political orientation and the dependent variable (i.e., pro-environmental behaviors), political orientation was included in the model as a covariate.

Our findings demonstrated that moral expansiveness significantly and positively predicted perceived environmental responsibility ($\beta=0.26, p<.001$), which in turn predicted environmental guilt ($\beta=0.46, p<.001$). Environmental guilt predicted pro-environmental behaviors ($\beta=0.24, p<.001$). Perceived environmental responsibility was also found as a significant predictor of pro-environmental behaviors ($\beta=0.25, p<.001$).

The results indicated that our covariate, political orientation, negatively predicted pro-environmental behaviors ($\beta=-0.14, p=.02$), suggesting that individuals towards the left of the political spectrum generally exhibited higher levels of pro-environmental behaviors.

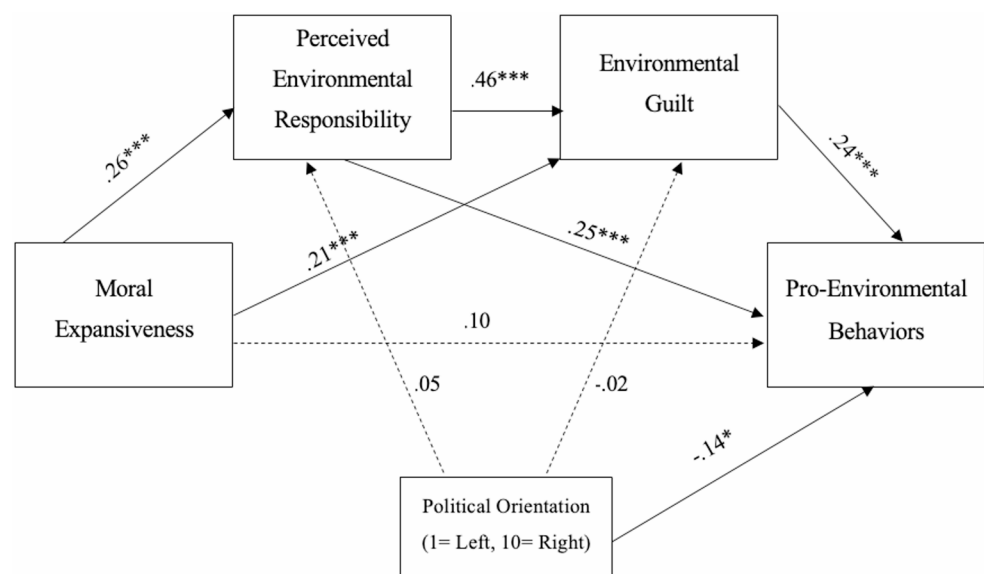
While the direct effect of moral expansiveness on pro-environmental behaviors was not significant ($\beta=0.10, p=.09$), the indirect effects through perceived environmental responsibility ($\beta=0.06, SE = 0.02, 95\%CI [0.02, 0.12]$), environmental guilt ($\beta=0.05, SE = 0.02, 95\%CI [0.02, 0.09]$) and both of them sequentially ($\beta=0.03, SE = 0.01, 95\%CI [0.01, 0.05]$) were all significant (see Fig. 2).

Discussion

Capturing the psychological mechanisms underlying pro-environmental behaviors is essential for addressing the pressing challenges posed by global ecological crises and ecological degradation. Pro-environmental behavior, as a form of prosocial moral action aimed at ensuring a sustainable future, inherently requires a moral stance (Krettenauer, 2017; van der Werff, 2023). Therefore, examining the moral mechanisms that underpin these behaviors is essential for guiding both theory and practice related to pro-environmental behavior. To this end, the current study aimed to examine the predictors of pro-environmental behaviors through the lens of moral expansiveness, environmental guilt, and perceived environmental responsibility.

The results supported our hypothesized model. Through expanded moral circle, environmental responsibility increases, which in turn is linked to enhanced sense of guilt and higher levels of pro-environmental behavior. Pro-environmental behavior itself is a *morally driven* behavior, so it was not surprising to capture a positive association with moral expansiveness (van der Werff, 2023). The related literature has also been increasingly drawing attention to concept of moral expansiveness as a promising factor in shaping our far future (Anthis & Paez, 2021; Ghasemi & Kyle, 2021). Parallel to this, several research findings highlighted that individuals who have broader moral circles tend to engage in pro-environmental behavior and support pro-environmental policies (Bratanova et al., 2012; Starzyk et al., 2021; Yanco et al., 2021), even prioritizing environmental concerns over their self-interest (Crimston et al., 2016).

Fig. 2 The final path model.
Notes. (1) * $p < .05$, ** $p < .01$, *** $p < .001$. (2) Nonsignificant paths are represented by dashed lines. (3) All regression coefficients are standardized



As the current findings also supported, expansion of moral concern serves as a moral motivator for caring for the natural environment. However, this study extends the relationship between moral expansiveness and pro-environmental behavior by examining the mediating roles of perceived responsibility and environmental guilt. Considering the first indirect path, expanded moral circle attributes moral obligation that motivates people to assume a personal responsibility to care for and protect human /non-human entities (Crimston et al., 2016; Law et al., 2026). Thus, when someone's moral expansiveness covers the environmental circle, one becomes more likely to have perceived environmental responsibility. This perceived responsibility prompts pro-environmental behavior, a pattern observed in our findings and echoed in earlier studies (e.g., Paço & Gouveia-Rodrigues, 2016). In fact, people hold biased beliefs about the environmental impact of their actions by attributing responsibility to others for causing environmental damage (Pasca & Poggio, 2023). However, based on the current findings, the expanding moral circle of people may mitigate these biased beliefs and enable them to act more eco-friendly.

Despite mounting ecological evidence, the global community remains largely passive in confronting environmental disasters like climate change. Acknowledging responsibility for this reality seems to elicit some negative emotions like guilt, which explains the emotional function of taking responsibility in pro-environmental behavior, ultimately motivating restorative actions and positive outcomes such as environmentally friendly behaviors. For instance, experimental manipulations of environmental culpability demonstrate that inducing responsibility drives acute feelings of guilt, which subsequently fuel intentions to restore the damage (Harth et al., 2013). In other words, when human beings feel guilty for a cause, they put a particular effort into taking reparative actions, including pro-environmental behaviors. Indeed, when individuals experience guilt regarding an ecological cause, they exert considerable effort toward reparative behaviors (Rees et al., 2015; Tam, 2019; for a review, see Shipley & van Riper, 2022). This pattern fits within a growing body of literature highlighting the broader role of "eco-emotions", including eco-anxiety, eco-anger, and eco-depression, as distinct emotional pathways that translate psychological states into relevant environmental actions (Bontempo et al., 2026). Notably, individual differences in emotion regulation likely determine how these affective forces shape behavioral outcomes; the capacity to effectively manage and channel intense eco-emotions can either amplify or dampen the link between personal characteristics and constructive pro-environmental engagement (Giancola et al., 2023).

We also introduced a social-moral identity perspective that builds on, rather than replaces, the existing value-based and norm-based approaches (e.g., Value-Belief-Norm Theory of Environmentalism, see Stern et al., 1999), which often treat environmental values or obligations in a relatively abstract way. By treating moral expansiveness as a foundational factor, we can ask whether seeing a wider range of beings, including non-human entities and the natural world as worthy of moral concern leads people to feel more responsible for environmental outcomes and more guilty when environmental norms are violated. From this viewpoint, pro-environmental behavior is not only about endorsing biospheric values, but also about who is counted as part of one's moral community. Our model thus shows how moral expansiveness can indirectly encourage pro-environmental behavior by shaping feelings of responsibility and guilt, and in doing so, it links moral, emotional, and behavioral processes within a single, coherent framework.

Furthermore, understanding these internal moral-emotional mechanisms is particularly vital when considering cross-cultural variations in pro-environmental behavior. Recent cultural research highlights that environmental decision-making is inherently embedded within socio-cultural contexts, and that external social norms often fail to drive sustainable behavior unless they are translated into internal ethical evaluations (Wang et al., 2023). In collectivist cultures, individuals are generally more predisposed to internalize collective obligations, priorities group welfare, and align their ethical evaluations with societal harmony. Therefore, a collectivist backdrop may act as a powerful catalyst for the mechanisms observed in our model. While moral expansiveness represents the foundational boundary of an individual's moral concern, collectivist values may amplify the translation of this inclusive concern into a deeper sense of environmental responsibility and subsequent guilt. This reinforces the theoretical necessity of exploring internal moral pathways, rather than relying only on normative compliance.

While our model aligns with universal psychometric patterns, the specific cultural landscape of Türkiye provides an interesting backdrop to observe these mechanisms. Moreover, research in the field of environmental psychology, along with the rest of psychology as a discipline (Henrich et al., 2010), lacks cultural diversity (Tam & Milfont, 2020). In that sense, examining the current hypotheses in a non-Western culture also contributes to a more generalizable understanding and may shed light on culture-specific interventions for pro-environmental behavior. Particularly, considering Türkiye's collectivist orientation compared to Global North countries (e.g., the USA) (Cuhadar & Rudnak, 2022), emphasizing collective environmental

responsibility to protect present and future generations, and framing environmental protection as an act for the nation's well-being by drawing on the positive role of patriotism in pro-environmental engagement (e.g., Aydın et al., 2022) through initiatives such as public service announcements (e.g., "Water is Homeland") may be influential in promoting environmental participation. Additionally, the negative path from political orientation to behavior ($-.14$) in our model suggests that in Türkiye, as in many Western contexts, environmentalism remains a policy issue for the left, rather than the right. However, the fact that moral expansiveness remains a robust predictor suggests that expanding the moral circle can 'bridge' political divides. By framing environmental protection as a matter of moral inclusivity rather than partisan policy, interventions may be able to bypass political resistance. Finally, although not explicitly measured, the cultural presence of certain Islamic religious values, such as the concept of nature as a sacred trust, may further act as an amplifier for the responsibility-guilt pathway, framing environmental degradation as a moral transgression against a higher order. This is also evident from the weak but significant finding of a correlation of religiosity with moral expansiveness, along with perceived environmental responsibility.

Limitations and future research directions

While this study offers important insights regarding research and practice, it is not without its limitations. First off, the cross-sectional design limits the ability to establish causal links between the variables. To enhance the robustness of these findings, it is imperative for future research to incorporate experimental and longitudinal designs and employ a broader range of data collection methods beyond self-report measures (for a review see, Lange & Dewitte, 2019). Another limitation concerns the sample, which solely consisted of undergraduates. Although student samples are common in psychological research, they represent a relatively narrow segment of the population in terms of age and education, which may limit the extent to which the findings can be generalized to broader social and cultural contexts. In addition, we did not include individual-level measures of cultural orientations and relied exclusively on a university student sample, thus the strength of any cultural or broader social interpretations is constrained. Future research should therefore incorporate cultural values and use cross-national and representative samples to address the cultural questions in environmental psychology more directly.

A further limitation of this paper concerns its reliance on self-reported data. Particularly, participants may have engaged in impression management to present themselves in a socially desirable manner (Bratt et al., 2015) or sought

consistency with their earlier responses provided throughout the study (Lange & Dewitte, 2019). Meta-analytic evidence indicates that self-reported pro-environmental behavior (PEB) accounts for only 21% of the variance in actual behavioral outcomes (Kormos & Gifford, 2014). Considering these issues, future research would benefit from employing diverse data collection strategies, such as diary methods and direct behavioral measures. As an example, future research could experimentally manipulate moral expansiveness by randomly assigning participants to a moral circle expansion condition (e.g., perspective-taking and writing tasks that highlight the moral status of nonhuman entities) versus a neutral control condition, followed by measures of moral expansiveness, environmental guilt, environmental responsibility, and both behavioral intentions and actual pro-environmental behavior (e.g., signing a petition or donating part of a bonus to an environmental NGO). Such a design would allow a direct test of whether experimentally increased moral expansiveness causally promotes pro-environmental outcomes via heightened feelings of guilt and responsibility.

Finally, the directional relationship between environmental responsibility and environmental guilt may be open to debate. Although the conceptual model in the present study was informed by theoretical frameworks and prior research, these two constructs are closely interrelated, and it cannot be conclusively stated that cognitive appraisals of responsibility unidirectionally give rise to guilt. In fact, some studies suggest that the experience of guilt can itself enhance perceived responsibility (Antonetti & Maklan, 2014). Therefore, future research should employ experimental and longitudinal designs to more clearly examine the causal and temporal nature of this relationship.

Theoretical and practical implications

Despite these limitations, the present study enhances our understanding of the factors that promote pro-environmental behavior, highlighting moral inclusivity as a crucial predictor that cognitively and emotionally motivates individuals to engage in eco-friendly actions. By incorporating environmental guilt and perceived environmental responsibility as mediators, the current study provides a nuanced understanding of the psychological mechanisms underlying moral expansiveness and positive ecological engagement. Thus, in addition to expanding individuals' moral circles through intervention programs (e.g., Kirby et al., 2024; Yanco et al., 2021) and highlighting the intrinsic value of nature and non-human entities, future interventions should aim to encourage environmental responsibility and guilt. Highlighting ecological issues to encourage collective responsibility and stressing the moral implications of inaction (e.g., guilt) can

promote environmentally responsible behavior (e.g., Moore & Yang, 2020; Shipley & van Riper, 2022).

In conclusion, we focused on Türkiye to illustrate how a non-WEIRD context can inform research on pro-environmental behavior. Our central aim was to test whether a moral–emotional model of pro-environmental behavior, largely developed in WEIRD settings, also holds in a non-WEIRD and climate-vulnerable country such as Türkiye, whose socio-economic and cultural profile differs from the

Western contexts that dominate the existing literature. At the same time, we did not directly measure culture-related constructs (e.g., individualism–collectivism, cultural values), so our discussion of the Turkish context should be viewed as providing background and motivation rather than as a test of cultural mechanisms, and future work should incorporate explicit cultural variables and cross-national samples to address these questions more directly.

Appendix

Table 2 Turkish translation environmental guilt items

English Version	Turkish Version
1. I am regretful about humans' lack of performance on environmental protection.	1. İnsanların çevreyi koruma konusundaki performans eksikliğinden dolayı üzgünüm.
2. I feel guilty for how little humans have done to improve the quality of the environment.	2. İnsanların çevrenin kalitesini iyileştirmek için yaptıkları şeylerin azlığından dolayı kendimi suçlu hissediyorum.

Table 3 Turkish translation of perceived environmental responsibility items

English Version	Turkish Version
1. I should be responsible for protecting our environment.	1. Çevremizi korumaktan sorumlu olmam gerekir.
2. Environmental protection starts with me.	2. Çevreyi korumak benimle başlar.
3. I think I have responsibility in protecting the environment.	3. Çevreyi koruma konusunda sorumluluğum olduğunu düşünüyorum.
4. I have taken responsibility for environmental protection since I was young.	4. Küçüklüğümde beri çevreyi korumada sorumluluk aldım.
5. I'm willing to take up responsibility to protect the environment.	5. Çevreyi korumak için sorumluluk almaya istekliyim.
6. Environmental protection is the responsibility of my government, not me. (Reverse Item)	6. Çevrenin korunması benim değil, hükümetimin sorumluluğundadır. (Ters Yönlü Madde)
7. Environmental protection is the responsibility of the environmental organisations, not me. (Reverse Item)	7. Çevrenin korunması benim değil, çevre kuruluşlarının sorumluluğundadır. (Ters Yönlü Madde)

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Declarations

Ethics approval and consent to participate and publish This study was performed in line with the principles of the Declaration of Helsinki.

Approval was granted by Middle East Technical University. Informed consent was obtained from all individual participants included in the study. All participants provided informed consent permitting the publication of anonymized data collected in the study.

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