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The Moderating Role of Place Attachment in the Association Between Eco-Emotions and Pro-Environmental Behaviours

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Abstract

The present study examined the relationship between eco-emotions (i.e., eco-anxiety, eco-depression, and eco-anger) and pro-environmental behaviours (PEBs), focusing on the moderating role of place attachment. A total of 250 participants (mean age = 33.69 years, SD = 14.67; 170 females) were enrolled. Results showed that only eco-anger was positively correlated with PEBs. Moreover, results indicated that place attachment moderated the association between eco-anger and PEBs, such that the positive relationship was weakened at higher levels of place attachment. No moderating effects of place attachment emerged for eco-anxiety and eco-depression. These findings suggest that place attachment may function as a subjective context-related factor associated with how eco-anger and PEBs co-vary at a single point in time. Overall, this study contributes to a more nuanced understanding of the cross-sectional associations between eco-emotions, subjective place-related bonds, and PEBs. The study offers implications for residential environmental communication strategies grounded in locally feasible behavioural options.

Keywords: sustainability; sustainable behaviours; environmental psychology; emotions; moderation

1. Introduction

Climate change and environmental degradation are among today's main global challenges, affecting individuals' psychological experiences, emotional responses, and perceptions of daily life [1,2]. Research has shown that environmental transformations affect mental health and well-being, contributing to increased distress, uncertainty, emotional dysregulation, and negative affect, particularly when environmental threats are perceived as ongoing and beyond individuals' control [1,3]. Within this context, increasing attention has been devoted to the emotional responses elicited by climate change, commonly referred to as eco-emotions [1,4]. Eco-emotions entail affective reactions to perceived environmental threats and ecological degradation and represent a key emotional mechanism through which individuals process climate-related information [5]. These eco-emotions may be associated with evaluation processes and behavioural tendencies related to environmental issues [6].

Among eco-emotions, eco-anxiety, eco-depression, and eco-anger are the most frequently examined in the literature [4]. Eco-anxiety is typically characterised by anticipated worry, fear, and uncertainty about the future consequences of climate change, while eco-depression reflects feelings of sadness, despair, and emotional exhaustion in response

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to perceptions of environmental losses and degradation [3,7]. Eco-anger is an activating emotion associated with frustration, moral indignation, and perceptions of environmental injustice and has been conceptualised as an action-oriented emotional response that may motivate individuals to engage in behaviours aimed at caring for the natural environment [8,9].

Previous studies have indicated that eco-emotions are functionally distinct and may be associated, in different ways, with the adoption of pro-environmental behaviours (PEBs), a wide range of actions aimed at reducing environmental impact, including energy saving, recycling, reuse of materials, waste reduction, and environmentally responsible consumption choices [10–12]. Whilst some eco-emotions may encourage the adoption of PEBs, others may inhibit them, potentially causing a state of eco-paralysis [13]. These different behavioural responses appear to depend on individuals' agency, coping resources, and beliefs about response efficacy to environmental crises [14,15]. Evidence has suggested that eco-anger is positively associated with PEBs, likely due to its activating and approach-oriented motivational properties. In contrast, eco-anxiety and eco-depression display more heterogeneous and contradictory associations with PEBs [4,16], potentially reflecting differences in perceived controllability, coping resources, and action efficacy. In this context, understanding the emotional mechanisms underlying PEBs has become a central focus of contemporary environmental psychology [7,17].

In addition to eco-emotions, PEBs may also be associated with the relational and contextual bonds individuals develop with the places they inhabit. Place attachment is commonly defined as a positive emotional bond between individuals and meaningful places (e.g., their home, neighbourhood, and broader urban surroundings), characterised by emotional connection, perceived closeness, and a desire to maintain proximity to those environments [18,19]. By capturing the emotional significance of places as sources of identity, belonging, and continuity over time [20,21], place attachment represents a key construct in environmental psychology for understanding how individuals relate to their living environments.

Previous studies have shown that place attachment is associated with PEBs, although the direction and strength of this association appear to depend on contextual and psychological factors [22,23]. Place attachment can be linked to a sense of responsibility and care for the environment and may lead to a greater commitment to actions aimed at preserving or improving the local environment [18]. At the same time, when environmental threats are perceived as distant or insufficiently relevant to one's place of residence, place attachment may be associated with lower emotional arousal, thereby potentially weakening the association between negative eco-emotions and PEBs. This dual role highlights the need to conceptualise place attachment not as a static or uniformly positive predictor of PEBs, but as a relational factor that may condition the cross-sectional association between emotional responses to climate change and behaviour [22].

Despite growing interest in eco-emotions and place attachment as predictors of PEBs, these constructs have largely been examined separately. In particular, relatively little is known about how place attachment and eco-emotions jointly explain individual differences in PEBs [24]. Indeed, it remains unclear whether the association between eco-emotions and PEBs differs according to levels of place attachment. Addressing this gap is essential for advancing theoretical models that integrate emotional and contextual processes in the explanation of PEBs.

A Person–Context Perspective on Eco-Emotions, Place Attachment, and PEBs

Previous research has sought to address the main factors underpinning PEBs from different theoretical perspectives. Some research relies on the Norm Activation Theory

(NAT) [25] and the Value–Belief–Norm Theory (VBNT) [26], which emphasise the critical roles of personal norms, attitudes, responsibility, personality, values, and emotions in eliciting PEBs [27]. Other research addressed individual differences in PEBs through the lens of the Theory of Planned Behaviour (TPB) [28], which posits that PEBs depend on a set of individual features, including attitudes (i.e., the evaluation of the behaviour), subjective norms (i.e., social pressure toward the behaviour), and perceived behavioural control (the personal assessment of the feasibility of the behaviour in a specific context) [28].

These frameworks have significantly contributed to the understanding of PEBs by identifying individual-level psychological variables associated with environmental engagement. However, they fail to capture how emotional states and subjective context-related factors jointly relate to PEBs.

To situate the present study within a broader person–context perspective, this study relies on the logic of the Process–Person–Context–Time (PPCT) framework [29,30]. The PPCT expands the Bioecological Model of Human Development (BMHD) [29,30], detailing how individuals, their characteristics, proximal processes, contextual conditions, and time jointly shape developmental and behavioural patterns across time. The PPCT model advances four integrated dimensions: process, referring to recurring interactions between individuals and their environments; person, referring to individual characteristics; context, referring to social, institutional, and environmental conditions; and time, referring to short-term fluctuations and long-term developmental change.

Notably, this research does not test the full PPCT model. The PPCT framework includes processual and temporal assumptions that require longitudinal designs. The current research, by contrast, relies on a cross-sectional design and therefore cannot examine the short- and long-term changes between individuals and their environments. Accordingly, the present study does not examine proximal processes, developmental change, reciprocal person–context dynamics, or temporal trajectories of eco-emotions and PEBs. Instead, the study provides a single time-point estimate of how person-level affective responses to climate change and subjective place-related bonds are associated with PEBs.

It is important to note that place attachment should not be regarded as a direct measure of the built environment. Rather, it reflects the way in which individuals experience their residential context, which encompasses their home, neighbourhood, and city emotionally and relationally. From the perspective of the built environment, this distinction is crucial because individuals' place attachment can function differently depending on the physical conditions of their residence, such as neighbourhood density, the availability of green infrastructure, walkability, access to public transport, recycling facilities, the energy efficiency of housing, and exposure to local environmental stressors. Although these objective characteristics were not measured in the present study, they represent key contextual conditions for interpreting the role of place attachment within a person–context framework.

From this person–context perspective, PEBs can be examined as actions associated with both individual affective states and subjective context-related experiences. Eco-emotions may reflect how individuals emotionally respond to climate change, whereas place attachment may reflect how individuals are psychologically connected to their environment. Their interaction may indicate whether the association between eco-emotions and PEBs differs according to the degree of place attachment.

Based on previous evidence that eco-anger is more consistently and positively associated with PEBs than eco-anxiety and eco-depression [4,6], the first hypothesis focused specifically on eco-anger:

H1. *Eco-anger is positively correlated with PEBs.*

Given the proposed person–context perspective and considering that strong place attachment may be associated with a weaker cross-sectional link between generalised eco-anger and everyday environmental action, the second hypothesis was formulated as follows:

H2. *Place attachment moderates the association between eco-anger and PEBs, such that the positive relationship between eco-anger and PEBs is weaker among individuals with higher levels of place attachment.*

2. Materials and Methods

2.1. Participants and Procedure

A total of 257 individuals participated in the study. Following data screening procedures, three missing cases were identified, and four participants were excluded as outliers based on z-scores above the range of ±4.0, recommended as a benchmark for samples larger than 100 [31–34].

The final sample consisted of 250 participants (mean age = 33.69 years, SD = 14.67; 170 females). Participants were recruited from three regions in central Italy, namely Abruzzo, Lazio, and Molise. Recruitment was conducted using a non-probability snowball sampling strategy. The first respondents were selected through the researchers' personal and professional networks and had to be adults (≥18 years) residing in central Italy. These participants were invited to complete an online questionnaire, after which the survey link was further disseminated through social networks (e.g., Facebook, Instagram, WhatsApp). Although this recruitment approach facilitated access to a heterogeneous sample across different regions, the referral process was not monitored, and no quotas or stratification criteria were applied.

All participants provided informed consent and completed both the set of self-report questionnaires and the sociodemographic questionnaire via the Google Forms online platform. Participation was entirely voluntary, and no monetary or non-monetary incentives were offered. The survey took approximately 10 min. The study protocol was approved by the local ethics committee and was conducted in accordance with the principles of the Declaration of Helsinki.

2.2. Measures

Eco-emotions were evaluated using the Italian version of the Eco-Emotions Scale (EES) [4,35]. The EES consists of 6 items on a 5-point Likert scale (1 = not at all this way; 5 = a great deal). Participants rated how and to what extent climate change makes them feel eco-depressed (depressed, unhappy), eco-anxious (anxious, afraid), and eco-angry (angry, frustrated). Participants were also asked which emotion they felt most often in relation to climate change (i.e., depressed, unhappy, anxious, scared, angry, frustrated). In previous studies, the three subscales of eco-emotions (i.e., eco-anxiety, eco-depression, and eco-anger) demonstrated good psychometric properties. The eco-emotion scale also demonstrated good reliability, with the Spearman–Browne coefficient ranging from 0.82 to 0.84 [4]. In the current research, the Spearman–Browne coefficient was 0.73, 0.71, and 0.69 for eco-anxiety, eco-depression, and eco-anger, respectively.

Place attachment was evaluated using the Place Attachment Scale (PAS) [18]. Because no officially validated Italian version was available, the questionnaire was translated into Italian using standard forward–backward translation procedures (see Appendix A). The PAS consists of 9 items (e.g., "I would be sorry to move out of my neighbourhood, without the people") on a 5-point Likert scale (1 = not at all agree; 5 = completely agree). The PAS measures the degree of attachment to the environment, including home and

neighbourhood contexts, as well as social relationships in the neighbourhood, and the role these play in reference to place attachment. In previous studies, the PAS demonstrated good psychometric properties in terms of convergent and discriminant validity as well as reliability with acceptable Cronbach's alpha = 0.72 (e.g., [18]). In the current research, the internal consistency was good with Cronbach's alpha = 0.79.

PEBs were evaluated using the Italian version of the Pro-environmental Behaviour Questionnaire (PEBQ) [10,36]. The PEBQ consists of 16 items along a 4-point Likert Scale (0 = Never; 3 = Always), indexing everyday actions related to saving energy, reusing, recycling, conserving water, and using environmentally friendly products (e.g., "*Collects and recycles used paper*"). In previous studies, the PEBQ demonstrated acceptable reliability with Cronbach's alpha ranging from 0.73 to 0.78 [36,37]. In the current research, the internal consistency was acceptable with Cronbach's alpha = 0.78.

2.3. Statistical Analysis

Statistical analyses were performed using SPSS Statistics version 26 (IBM Corporation, Armonk, NY, USA). Descriptive statistics were computed to analyse the demographic features of the sample, and bivariate correlations were used to preliminarily examine the relationships among the study variables. Moderation analyses were conducted using the PROCESS macro for SPSS (version 3.5) [38], employing Model 1. Three separate models were estimated to examine whether place attachment moderated the relationship between each eco-emotion (eco-anxiety, eco-depression, and eco-anger) and PEBs. All predictor variables were mean-centred prior to analysis to reduce multicollinearity and facilitate the interpretation of interaction terms. The significance of the interaction effects was assessed using a bootstrapping procedure with 5000 resamples, generating 95% bias-corrected confidence intervals (CIs) [39]. Bootstrapping is a non-parametric resampling technique that does not rely on normality assumptions and allows for a more robust estimation of indirect and interaction effects, particularly in small-to-moderate sample sizes [40,41]. Moderation effects were considered statistically significant when the 95% CI did not include zero [39]. Model fit was evaluated using R^2. All statistical tests were two-tailed, and the level of significance was set at $p < 0.05$.

3. Results

The Shapiro–Wilk test revealed that all study variables are not normally distributed. Harman's single-factor test [42] suggested that the variance explained by a single-factor exploratory model was 30.32%, revealing no common method bias problems (test critical threshold $\geq 50\%$) [43]. In addition, Spearman's correlational analysis (Table 1) indicated that PEBs were positively associated with eco-anger ($r = 0.27$, $p < 0.01$), whereas no significant correlations were found with eco-depression ($r = 0.06$, $p > 0.05$) and eco-anxiety ($r = 0.06$, $p > 0.05$).

Moderation analyses (Table 2) indicated that eco-anger was positively associated with PEBs (b = 0.08, SE = 0.03, t = 4.22, 95% CI [0.06, 0.16]). Place attachment significantly moderated the association between eco-anger and PEBs (b = −0.09, SE = 0.04, t = −2.10, 95% CI [−0.18, −0.01]), such that the positive relationship between eco-anger and PEBs weakened as levels of place attachment increased. In contrast, no significant moderating effect of place attachment emerged in the association between eco-anxiety and PEBs (b = −0.08, SE = 0.04, t = −1.82, 95% CI [−0.17, 0.01]) or between eco-depression and PEBs (b = −0.08, SE = 0.05, t = −1.68, 95% CI [−0.18, 0.01]).

Table 1. Correlation analysis among the study variables.

	1.	2.	3.	4.	5.	6.	7.
1. Age	1						
2. Sex	−0.02	1					
3. Eco-depression	−0.04	−0.03	1				
4. Eco-anxiety	−0.19 **	−0.14 *	0.51 **	1			
5. Eco-anger	−0.02	0.01	0.57 **	0.45 **	1		
6. Place attachment	0.15 *	0.01	0.06	0.05	0.04	1	
7. PEBs	0.12 *	−0.08	0.06	0.06	0.27 **	0.03	1

Note. n = 250, PEBs = pro-environmental behaviours. Sex (0 = female, 1 = male). * $p < 0.05$. ** $p < 0.01$.

Table 2. Regression coefficients for the moderation analyses.

	B	SE	t	LLCI	ULCI
Eco-depression	0.04	0.03	1.40	−0.02	0.11
Place attachment	−0.02	0.04	−0.53	−0.06	0.02
Eco-depression × Place attachment	−0.08	0.05	−1.68	−0.18	0.01
R^2 = 0.05					
$F(5, 244)$ = 2.27					
Eco-anxiety	0.05	0.03	1.85	−0.01	0.11
Place attachment	−0.01	0.04	−0.31	−0.10	0.07
Eco-anxiety × Place attachment	−0.08	0.04	−1.82	−0.17	0.01
R^2 = 0.04					
$F(5, 244)$ = 2.20					
Eco-anger	0.11	0.03	4.22	0.06	0.16
Place attachment	0.01	0.04	0.29	−0.07	0.09
Eco-anger × Place attachment	−0.09	0.04	−2.10	−0.18	−0.01
R^2 = 0.11					
$F(5, 244)$ = 6.11 ***					

Note. n = 250; SE = standard error; LLCI = lower limit of the 95% confidence interval; ULCI = upper limit of the 95% confidence interval. *** $p < 0.001$.

4. Discussion

Drawing specifically on the person–context rationale of the PPCT framework, the present study examined the associations between eco-emotions and PEBs and the moderating role of place attachment. Importantly, the present research was not designed to test the full PPCT model, as it did not include longitudinal assessments, repeated observations, experimental manipulations, or objective contextual indicators. Therefore, the research did not capture the evolution of eco-emotions over time, nor did it examine proximal processes, reciprocal person–context transactions, or temporal changes in PEBs. The findings should instead be interpreted as a static psychological snapshot of how person-level affective responses to climate change and place attachment co-vary with PEBs in a specific cohort at a single point in time.

Results confirmed H1, showing that only eco-anger was positively correlated with PEBs. These findings are consistent with previous evidence indicating that eco-anger may represent an activating emotional response that is more likely than eco-anxiety or eco-depression to co-occur with PEBs [4,6,44,45]. Notably, in the present study, eco-anxiety and eco-depression were not significantly associated with PEBs. This finding supports the view that these emotional responses, while reflecting high levels of concern and emotional involvement, do not necessarily translate into behavioural engagement. High levels of eco-anxiety and eco-depression may contribute to emotional overload, uncertainty, and reduced perceived efficacy, potentially leading to a state of eco-paralysis [17,46]. Therefore,

the absence of significant associations in the present study suggests that different emotional responses to climate change may show distinct patterns of association with PEBs depending on their motivational quality, perceived controllability, and the subjective resources available to the individual.

Furthermore, results revealed that place attachment moderates the association between eco-anger and PEBs, confirming H2. Specifically, the positive association between eco-anger and PEBs was stronger among individuals with low and moderate levels of place attachment. In addition, the strength of this association was weaker among those individuals with higher levels of place attachment. This finding suggests that place attachment represents a subjective psychological condition under which the association between eco-anger and PEBs varies. One possible interpretation is that, among individuals with lower or moderate place attachment, eco-anger may co-occur more clearly with generalised environmental engagement. When individuals do not strongly rely on their immediate environment as a source of identity, continuity, or emotional security, eco-anger related to climate change may show a stronger cross-sectional association with PEBs at a single point in time. Conversely, among individuals with stronger place attachment, eco-anger may be embedded within a more complex psychological configuration involving local identity, perceived residential stability, emotional security, and subjective continuity. In this context, high place attachment may be associated with a reduced tendency for generalised eco-anger to co-vary with broad, everyday PEBs, particularly when climate threats are not perceived as directly affecting one's immediate residential context [22,47–49]. However, this interpretation remains tentative because the present study did not assess whether participants perceived climate-related threats as locally immediate, spatially distant, or materially connected to their residential environment.

A further point concerns the physical granularity of the residential context. In the present study, place attachment was assessed as a subjective, context-related factor for the home, neighbourhood, and city, but objective built-form characteristics were not measured. This distinction is important because the psychological meaning of place attachment may vary depending on the material conditions of the residential environment. For instance, high place attachment in a neighbourhood with accessible green infrastructure, walkable streets, efficient public transport, visible recycling facilities, and energy-efficient housing may support the association between eco-anger and everyday PEBs by making sustainable action feasible and locally meaningful. Conversely, in dense neighbourhoods with limited green space, poor housing energy performance, inadequate waste-management facilities, car-dependent mobility patterns, or few opportunities for collective environmental action, eco-anger may be less strongly associated with PEBs because the built environment constrains behavioural opportunities.

This point is particularly relevant for research on buildings and the built environment. From this perspective, residential PEBs cannot be understood mainly as individual psychological outcomes. They are also embedded in domestic and neighbourhood affordances, including the energy performance of the housing stock, the availability of low-carbon mobility options, the design of shared residential spaces, proximity to green areas, and the accessibility of recycling and waste-management systems. Accordingly, subjective context-related factors may be most informative when interpreted alongside the physical characteristics of the places to which individuals are attached. Future built-environment research could clarify whether place attachment strengthens, weakens, or redirects the association between eco-emotions and PEBs, depending on the concrete sustainability affordances available in residential settings.

From a theoretical perspective, the present study shows that the association between eco-anger and PEBs varies according to the degree of place attachment. However, the

theoretical contribution of the present study is deliberately circumscribed. The findings do not demonstrate temporal person–context processes. Rather, they show that a person-level affective state (i.e., eco-anger) and a subjective context-related factor (place attachment) are jointly associated with PEBs in a cross-sectional sample. In this sense, the study contributes to environmental psychology and built-environment research by showing that the association between eco-emotions and PEBs may depend on the extent to which individuals are psychologically bonded to their residential environment. This contribution can be understood as a static person–context snapshot that can inform future longitudinal, spatially enriched, and multilevel tests of PPCT-consistent mechanisms. This cautious interpretation also requires explicit acknowledgement of endogeneity. The present moderation model statistically specifies that eco-emotions and place attachment predict PEBs, but this ordering should not be interpreted causally. Individuals who frequently engage in PEBs may develop stronger bonds with their residential environment because sustainable practices can reinforce feelings of responsibility, belonging, and environmental stewardship. Similarly, stronger place attachment may increase attention to local environmental threats, thereby intensifying eco-anger. Therefore, the observed moderation may reflect mutually reinforcing associations among eco-anger, place attachment, and PEBs rather than a unidirectional pathway.

The practical implications should be interpreted cautiously and primarily at the level of individual residential practices and their local enabling conditions. Specifically, communication strategies could consider that the association between eco-anger and PEBs across individuals may vary according to place attachment. For individuals reporting high place attachment, messages that connect environmental actions to the protection of valued local places, community continuity, neighbourhood well-being, and residential identity may be more psychologically resonant, provided that locally feasible behavioural options are available. For individuals reporting lower place attachment, broader climate-related messages may be more closely aligned with general forms of environmental engagement, although this possibility should be tested in future research. The findings also suggest that environmental communication should avoid relying exclusively on undifferentiated climate distress. Eco-anxiety and eco-depression were not significantly associated with PEBs in the present study, whereas eco-anger showed a positive association that varied according to place attachment. This pattern suggests that communication strategies may benefit from distinguishing among different emotional responses rather than assuming that all forms of climate-related distress are similarly associated with environmental engagement. However, such applications require careful ethical consideration, as communication should not seek to intensify negative emotions without providing feasible, meaningful, and contextually appropriate behavioural options. From a built-environment perspective, these options are likely to depend on local resources and constraints, such as recycling facilities, public transport, housing energy efficiency, green areas, mobility patterns, and opportunities for collective environmental action. In contexts where these affordances are limited, or where renters and economically constrained residents have little capacity to modify domestic energy practices, eco-anger may remain psychologically salient but behaviourally blocked. Therefore, practical recommendations should not prescribe broad macroscopic environmental strategies but should focus on aligning emotional engagement with accessible residential infrastructure and locally actionable behaviours.

5. Limitations and Future Research Directions

Several limitations should be acknowledged. First, the cross-sectional design precludes causal inferences. Moreover, it prevents the study from examining the temporal and processual assumptions embedded in the PPCT framework. Consequently, the findings

cannot show whether eco-anger precedes PEBs, whether PEBs strengthen place attachment, or whether place attachment changes as a result of repeated environmental practices. The observed interaction should therefore be interpreted as a static association among psychological variables rather than as evidence of developmental or ecological processes over time. Future research should use longitudinal, intensive repeated-measures, ecological momentary assessment, or experimental designs to examine reciprocal dynamics among eco-emotions, place attachment, and PEBs over time. Second, another important limitation concerns the absence of objective indicators of the residential built environment. The present study measured place attachment as a subjective bond with the home, neighbourhood, and city but did not assess physical characteristics such as neighbourhood density, building energy efficiency, availability of green infrastructure, public transport accessibility, walkability, recycling facilities, local air quality, or exposure to urban heat. As a result, it remains unclear whether the observed moderation differs across materially distinct residential contexts. This limitation is especially relevant for research on buildings and the built environment, where subjective residential experience should ideally be examined alongside objective spatial and architectural indicators. Third, the study is vulnerable to endogeneity due to omitted variables and the mutually constitutive nature of the constructs under investigation. Variables such as environmental identity, perceived behavioural control, self-efficacy, collective efficacy, political orientation, environmental values, local climate risk perception, socio-economic status, housing tenure, neighbourhood deprivation, and access to pro-environmental infrastructure may be associated with eco-emotions, place attachment, and PEBs simultaneously [50–54]. Moreover, PEBs and place attachment may be mutually reinforcing: sustainable behaviours may strengthen feelings of residential responsibility and belonging. Future studies should include these variables to provide a more comprehensive account of the psychological and contextual correlates of environmental behaviour. Fourth, all variables were assessed using self-report measures, which may be susceptible to social desirability bias. In particular, future studies should incorporate behavioural, observational, or performance-based indicators of PEBs to improve ecological validity [11]. Fifth, the sample was recruited exclusively from central Italy, which may limit the generalisability of the findings. Future research should examine whether the observed patterns replicate across different cultural, geographical, and environmental contexts. Moreover, additional individual and contextual factors, such as cognitive styles, creativity, perceived self-efficacy, local environmental risk, collective efficacy, and contextual constraints, should be considered to provide a more comprehensive account of the mechanisms that are jointly associated with PEBs [50–54]. Sixth, the sample was predominantly female, which may limit the generalisability of the findings across genders. Future studies should aim to recruit more sex-balanced samples. Seventh, data were collected through snowball sampling, which may have increased the risk of self-selection bias and reduced sample representativeness. Future research should address these limitations to ensure greater demographic heterogeneity and stronger external validity.

6. Conclusions

Overall, the present study provides a cross-sectional person–context snapshot of the association between eco-emotions, place attachment, and PEBs. Eco-anger, but not eco-anxiety or eco-depression, was positively associated with PEBs. Importantly, place attachment moderated the association between eco-anger and PEBs, weakening its strength at higher levels of attachment. These findings should not be interpreted as evidence of temporal, developmental, or causal processes, but as conditional associations within a specific sample at a single point in time. The study suggests that subjective bonds with residential places may shape how climate-related anger co-varies with everyday

environmental behaviour. Future research should integrate longitudinal designs, objective built environment indicators, and multilevel spatial data to clarify how psychological and physical residential contexts jointly relate to sustainable behaviour.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

PLACE ATTACHMENT SCALE (PAS)

[ITA] Istruzioni: Per ciascuna delle seguenti affermazioni scegli la risposta che ritieni più opportuna seguendo la scala riportata di seguito: 1 = completamente in disaccordo; 2 = leggermente d'accordo; 3 = d'accordo; 4 = completamente d'accordo.

[ENG] Introduction: For each of the following statements, please select the answer you feel is most appropriate using the scale below: 1 = strongly disagree; 2 = slightly agree; 3 = agree; 4 = strongly agree.

1. [ITA]	Mi dispiacerebbe andarmene da casa mia, senza le persone con cui vivo
1. [ENG]	I would be sorry to move out of my house, without the people I live with
2. [ITA]	Mi dispiacerebbe se le persone con cui ho vissuto se ne andassero senza di me
2. [ENG]	I would be sorry if the people I lived with moved out without me
3. [ITA]	Mi dispiacerebbe se io e le persone con cui ho vissuto ci trasferissimo
3. [ENG]	I would be sorry if I and the people I lived with moved out
4. [ITA]	Mi dispiacerebbe lasciare il mio quartiere, senza le persone che vi abitano
4. [ENG]	I would be sorry to move out of my neighbourhood, without the people who live there
5. [ITA]	Mi dispiacerebbe se le persone che apprezzavo nel quartiere si trasferissero
5. [ENG]	I would be sorry if the people whom I appreciated in the neighbourhood moved out
6. [ITA]	Mi dispiacerebbe se io e le persone che apprezzo nel quartiere ci trasferissimo
6. [ENG]	I would be sorry if I and the people whom I appreciated in the neighbourhood moved out

7. [ITA]	Mi dispiacerebbe andarmene dalla mia citta, senza le persone che vi abitano
7. [ENG]	I would be sorry to move out of my city, without the people who live there
8. [ITA]	Mi dispiacerebbe se le persone che apprezzo in città se ne andassero
8. [ENG]	I would be sorry if the people whom I appreciate in the city moved out
9. [ITA]	Mi dispiacerebbe se io e le persone che apprezzo in città ce ne andassimo
9. [ENG]	I would be sorry if I and the people whom I appreciate in the city moved out

Note. No reverse item.

THE PRO-ENVIRONMENTAL BEHAVIOURS QUESTIONNAIRE (PEBQ)

[ITA] Istruzioni: Nell'ultimo anno, quanto spesso hai messo in atto i seguenti comportamenti? Si prega di dare una risposta da 0 (mai) to 3 (sempre).

[ENG] Instructions: During the past year, how often have you engaged in the following behaviours? Please rate your response on a scale of 0 (never) to 3 (always).

1. [ITA]	Aspettare di avere un carico completo per fare il bucato
1. [ENG]	Waits until having a full load for laundry
2. [ITA]	Guidare ad una velocità inferiore a 100 km/h sulle autostrade
2. [ENG]	Drive at speeds below 100 on freeways
3. [ITA]	Conservare e riciclare carta già utilizzata
3. [ENG]	Collects and recycles used paper
4. [ITA]	Portare le bottiglie vuote in un cestino per la raccolta differenziata
4. [ENG]	Brings empty bottles to a recycling bin
5. [ITA]	Far notare le abitudini non ecologiche
5. [ENG]	Has pointed out unecological behaviour
6. [ITA]	Comprare cibi pronti *
6. [ENG]	Buys convenience foods *
7. [ITA]	Comprare prodotti in confezioni ricaricabili
7. [ENG]	Buys products in refillable packages
8. [ITA]	Comprare prodotti stagionali
8. [ENG]	Buys seasonal product
9. [ITA]	Usare l'asciugatrice *
9. [ENG]	Uses a clothes dryer *
10. [ITA]	Informarsi riguardo ai problemi ambientali
10. [ENG]	Reads about environmental issues
11. [ITA]	Parlare agli amici dei problemi ambientali
11. [ENG]	Talks to friends about environmental problems
12. [ITA]	Uccidere gli insetti con insetticidi chimici *
12. [ENG]	Kills insects with a chemical insecticide *

13. [ITA]	Spegnere il condizionatore quando si lascia un posto
13. [ENG]	Turn down air conditioning when leaving place
14. [ITA]	Cercare un modo per riutilizzare le cose
14. [ENG]	Looks for ways to reuse things
15. [ITA]	Incoraggiare amici e parenti al riciclo
15. [ENG]	Encourages friends and family to recycle
16. [ITA]	Risparmiare carburante andando a piedi o in bicicletta
16. [ENG]	Conserves gasoline by walking or bicycling

Note. * Items 6, 9, and 12 are reverse-coded.

ECO-EMOTIONS SCALE (EES)

[ITA] Istruzioni: Per ognuna delle parole che seguono, indica come ti fa sentire la questione del cambiamento climatico. Indicare le risposte in base alla seguente scala: 1 = Mai; 2 = Raramente; 3 = A volte; 4 = Spesso; 5 = Sempre.

[ENG] Instructions: For each of the words below, please indicate how the issue of climate change makes you feel. Please rate your responses on the following scale: 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Always.

1. [ITA]	Depresso
1. [ENG]	Depressed
2. [ITA]	Infelice
2. [ENG]	Miserable
3. [ITA]	Ansioso
3. [ENG]	Anxious
4. [ITA]	Spaventato
4. [ENG]	Afraid
5. [ITA]	Arrabbiato
5. [ENG]	Angry
6. [ITA]	Frustrato
6. [ENG]	Frustrated

Note. No reverse item.

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