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Perceived Biodiversity Loss and Willingness to Engage in Community Green Programs

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ABSTRACT

This study examines whether how perceived biodiversity loss affects students' intentions to participate in community-based green programs - environmental concern and community trust in environmental programs serve as mediators, while the exposure to an environmental knowledge platform acts as a moderator. Data were collected using a cross-sectional quantitative approach with recollection of past 12 month experience through structured questionnaires from 250 university students living and studying in the vicinity of the Cenderawasih forest area, Papua, Indonesia. Data analysis was conducted using Partial Least Squares Structural Equation Modelling (PLS-SEM). The findings also show that perceived biodiversity loss strongly enhances environmental concern while additionally having a harmful direct effect on community trust. Environmental concern and community trust each have significant positive direct effects on willingness to participate in community green programs with mediating effect between nature loss perception and intention. The relationship between perceived biodiversity loss and environmental concern is stronger among those exposed to knowledge about the environment, indicating a role of exposure in magnifying pro environmental responses. This paper provides evidence empirically that psychological and relational mechanisms of how perceptions of biodiversity were channeling community engagement. The original contribution of this study is the integration of loss perception of biodiversity, street-level dual mediation mechanisms and knowledge-based moderation into a classroom near-forest student sample in a developing area. The results have implications for the development of community-based conservation initiatives focusing on education and trust-building in order to increase local participation.

1. Introduction

Biodiversity loss has become one of the most serious global environmental problems, having profound implications on both ecology and society as well as on the economy (Kopittke et al., 2025; Perrings et al., 1992). In addition, quick land-use changes, deforestation, habitat fragmentation and expanded human explotation has greatly accelerated diversity loss especially in biodiversity hotspots (Mir et al., 2025). Recent empirical research reveals that local communities and young adults now tend to consider biodiversity loss not only as an environmental problem, but also as a cause of the decline in ecosystem services, food provision and human well-being (Moloise et al., 2025; Reyes-Bonilla et al., 2025; Sá, 2025; Xu et al., 2025). Nonetheless, despite the increasing knowledge about it, involvement of the public in community-based green programs has been inconsistent, with a discrepancy between awareness and consciousness towards loss of biodiversity and active participation in conservation.

This gap between knowledge and action is symptomatic of a larger problem in the science of biodiversity conservation, where awareness does not always lead to behavioural change. More recent studies in the field of behavioural-environmental research also indicate that members of the public may cognitively recognize biodiversity loss without creating a sense of urgency to pursue biocentric and/or anthropocentric action (Yehle et al., 2025)(Guerrero & Sjöström, 2025; Peters & Fuchs, 2025). For a community

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conservation impetus, willingness to participate is contingent upon perceiving ecological deterioration as well as emotive concern, social trust and program credibility. In the absence of such underpinnings, public awareness about biodiversity loss is in danger of being largely symbolic rather than action-oriented.

At the theoretical level, this study builds on Value Belief Norm (VBN) theory and environmental concern models that suggest perceptions of environmental decline trigger moral concern and responsibility, which in turn influence pro-environmental behavior (Lou et al., 2025; Stern, 2024). Furthermore, theories of institutional trust and community-based governance stress that trust in local environmental programs is a key determinant of collective action (Koliev & Bäckstrand, 2025; Maier et al., 2023; Suchman, 1995). These are posited to explain how perceived loss of biodiversity can affect disposition to take part in green program based on both emotional concern and trust-related assessments on local initiatives.

However, despite these theoretical developments the recent literature shows a number of important gaps. First, a majority of research on biodiversity behaviour focuses on proxies for issue involvement (ecological indicators and general attitudes to the environment) but fails to take into account perceived biodiversity loss as a separate heuristic cue feeding into behavioural engagement. Second, few empirical studies include both environmental concern and community trust as two mediating factors between biodiversity perceptions and engagement intentions at the same time (Buta et al., 2014; Chen et al., 2025; Gregg et al., 2025; Lau & Hashim, 2019; Wang et al., 2025). Third, the literature omits consideration of biodiversity-rich local contexts (such as forest-adjacent communities), where perceived loss may be more onerous, yet engagement is curtailed by social and informational barriers. Filling these gaps is an important step to develop socially-anchored and behaviorally-effective biodiversity conservation strategies.

This research is also pertinent in settings that border conservation areas (in this case the Cenderawasih forest area) as depletion of biodiversity directly impacts the community livelihoods, and education environment. This is important as young people in universities are future leaders and actors for change within conservation. Knowledge on how perceived biodiversity loss influences their willingness to participate in community green programs provides a new perspective to the design of conservation projects based in local perceptions, emotions and trust dynamics. The innovation of this study is to empirically incorporate perceived biodiversity loss, environmental concern and community trust into one behavioural model, cutting through linear awareness–action models.

Therefore, this study seeks to investigate the association between perceived loss of biodiversity and willingness to participate in community-led green programs with environmental concern and trust in community-based environmental initiatives as mediating factors. By considering a high biodiversity local context and using a survey-based quantitative approach, this study advances the literature on biodiversity conservation by connecting ecological issues with behavioral and governance-oriented accounts.

The remainder of this study is organized as follows. Section 2 presents the literature review and hypothesis development. Section 3 describes the research methods. Section 4 reports the results and findings. Section 5 discusses the results in light of relevant theories and prior studies. Finally, Section 6 concludes the study and highlights its contributions.

2. Literature review

2.1 Perception of loss of biodiversity and concern for the environment

The concept of perceived biodiversity loss refers to cognitive evaluations of ecological depletion in one's local surroundings and has been identified as a major antecedent to people's affective environmental responses. According to recent evidence, when people can readily see changes in species diversity, habitat quality and how ecosystems are functioning they are more prone to experience higher levels of emotional concern and moral unease about environmental change (Hainsworth et al., 2023; Princen, 1999). This pattern accords with the findings of environmental psychology literature suggesting that perceived environmental decline stimulates concern through heightening of both perceived seriousness and personal relevance of nature-related difficulties (Straka et al., 2025; Veijonaho et al., 2025). Empirically, perception of loss of biodiversity is additionally found to be particularly prominent in regions rich in biodiversity, where ecological change can be readily noticed and closely associated with local livelihoods. Hence, it was assumed that more severe perceptions of biodiversity decline would augument environmental concern among people living next to forest.

Hypothesis 1: Endangered spicieuousness is positively correlated to environmental concern.

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2.2 The perceived loss of biodiversity and trust in community environmental programs

Public perceptions of biodiversity loss can also influence public assessments of institutional and local community responses to environmental problems. As perceived biodiversity loss increases, the effectiveness, transparency, and legitimacy of community-based environmental program are being scrutinised more closely by individuals (Renck et al., 2026). Recent studies indicate that, whereas concerns about environmental deterioration can lead to trust in local initiatives that are seen as credible and action focused, this is the case only when programs 'speak' to what people value most e.g. their community)or what conservation aims they want to be realized (Busby et al., 2025; Renck et al., 2026). On the other hand, tangible loss of biological diversity could diminish trust if programs are seen as not working. In localized scenarios where local community conservation programs happen and are noticeable, the perception of wildlife loss could be expected to enhance trust by reaffirming respect for such initiatives in terms of their need and relevance.

Hypothesis 2: Perceived biodiversity loss is positively associated with community trust in environmental programs.

2.3 Environ- mental concern and attitude to participate in community green activities

Environmental concern is an affective and moral response, which has been shown to lie at the heart of pro-environmental behavioural motivation. Previous research has consistently found that those who are more concerned with damage degradation of the environment and biodiversity is likely to participate in conservation measures. This association can be biologically explained in part by behavioural theories: Emotional involvement leads to heightened concern and sense of responsibility towards the environment (Li et al., 2025; Maleknia & Enescu, 2025). At the community level, environmental concern promotes involvement by helping individuals feel a personal stake in collective environmental effects and by providing rationale for people's voluntary investments of time or effort such as participation in green programs.

Hypothesis 3: Environmental concern positively predicts willingness to participate in the community-green programs.

2.4 Community trust and willingness to engage in community green programs

Confidence in community-based environmental initiatives is a strong predictor of collective involvement. Trust reduces uncertainty about programme outcomes, reduces perceived risks in participation, and increases individuals' confidence that their efforts will have a significant impact (Al-kfairy et al., 2025). More recent empirical research suggests that trust in local institutions, transparency of decision making and perceived fairness are associated with high levels of interest in participation and community action on aspects of the environment (Antwi et al., 2025; Dominique et al., 2025). In conservation of biodiversity, trust emerges as a relational means by which awareness and concern for environment flows into tangible behavioural support.

Hypothesis 4: Environmental program trust is positively related with willingness to participate in community green programs.

2.5 The mediating roles of environmental concern and community trust

The connection between perceived biodiversity loss and behavioural engagement might not be linear (Masson et al., 2025). Behavioral environmental theories propose that cognitive beliefs about ecological deterioration shape behavior primarily through affective and relational mechanisms (Jordi et al., 2025; Khuadthong et al., 2025). Environmental concern translates biodiversity loss perceptions into moral motivation, and community trust ensures that engagement activities will be perceived as effective and legitimate. Recent research increasingly calls for considering the overall process of pro-environmental behavior formation by simultaneously examining a number of mediators rather than one mediator at a time (Balakrishnan et al., 2025; Huang & Li, 2025). Such conjoining of concern for the environment and community trust as similar mediators gives a richer account of how perceived loss impacts on intentions to engage.

Hypothesis 5a: Environmental concern mediates the relationship between perceived biodiversity loss and willingness to engage in community green programs.
Hypothesis 5b: Community trust in environmental programs mediates the relationship between perceived biodiversity loss and willingness to engage in community green programs.

2.6 The moderating role of environmental knowledge exposure

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Environmental knowledge exposure influences how individuals interpret and respond to biodiversity. Frequent exposure to biodiversity-related information enhances understanding, strengthens cognitive processing, and increases the salience of environmental problems (Masson et al., 2025; Shen & Wu, 2025). Recent research suggests that information-rich contexts amplify emotional and evaluative responses to environmental degradation by enabling individuals to better connect observed biodiversity loss with broader ecological consequences. Consequently, environmental knowledge exposure is expected to strengthen the effects of perceived biodiversity loss on both environmental concern and community trust (Jensen et al., 2025).

Hypothesis 6a: Environmental knowledge exposure positively moderates the relationship between perceived biodiversity loss and environmental concern.
Hypothesis 6b: Environmental knowledge exposure positively moderates the relationship between perceived biodiversity loss and community trust in environmental programs.

2.7 Conceptual framework of perceived biodiversity loss and community green engagement

This study proposes a conceptual framework explaining how perceived biodiversity loss influences willingness to engage in community green programs through environmental concern and community trust. The model integrates cognitive, affective, and relational mechanisms, while environmental knowledge exposure is positioned as a moderating factor that strengthens the effects of perceived biodiversity loss on both mediators. This framework provides a holistic explanation of biodiversity-related behavioural engagement in community-based conservation contexts.

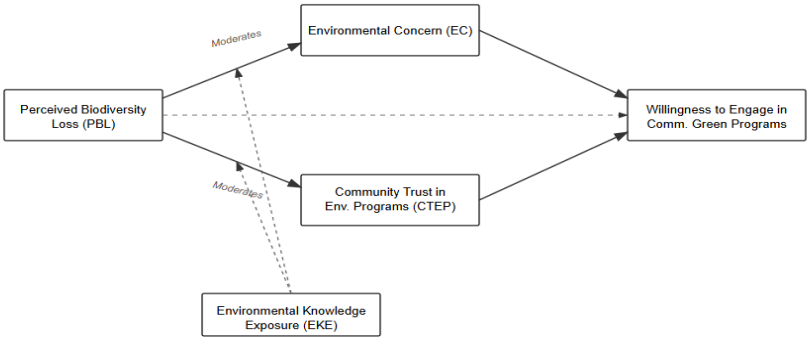

Figure 1. Conceptual framework of perceived biodiversity loss, mediating mechanisms, and willingness to engage in community green programs.

3. Methods

3.1 Research design

The quantitative cross-sectional survey design was used in this research to explore the links between perceived biodiversity loss, environmental concern, community trust and willingness for participating in community green programmes. This approach is based on environmental behaviour theory and social–cognitive frameworks, which maintain that perceptions, evaluations and beliefs create pro-environmental intentions (Ajzen, 1991; Stern, 2000). Survey designs are especially appropriate for recording hidden psychological and social phenomena that cannot be measured directly. Recent studies on conservation and sustainability have shown that cross-sectional questionnaires analyzed with the SEM are useful for predicting biodiversity-related perceptions and behavioral intentions, especially in community-based or educational settings where experimental designs may be less feasible (van der Linden et al., 2023; Clayton & Karazsia, 2024; Fischer et al., 2025).

3.2 Study area and respondent profile

The research area was located in the vicinity of Cenderawasih forest, an area which is extremely level with a rich biodiversity and high ecological value and encompasses high human-environmental interchanges. Periurban forested areas such as this present a good context to investigate the perception of biodiversity, because environmental change is visible and in connection with on-the-ground actions of local communities and educational institutions. The respondents of the study were all university students who are living or doing any academic-based activity near forest, providing a frequency environmental information and conservation discourse. Recent research in biodiversity and conservation increasingly acknowledges students are a key population

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to study their perceptions toward loss of biodiversity and pro environmental engagement, as they will become the future decision makers and potential advocates for conservation. The demographic characteristics of each participant are summarized in **Appendix data A1** Balanced distributions of respondents' sex, age groups, academic years, and disciplines were achieved; the more diversified participant demographics mainly reflected sample representativeness and analysis accuracy.

3.3 Research instrument

The measurement instrument of this study was based on theoretical (behavioural–environment) and empirical (biodiversity) evidence to guarantee conceptual validity and empirical rigour. Perceived Biodiversity Loss was operationalized in terms of two dimensions – ecological decline and habitat degradation -, reflecting the dimensionality of cognitive appraisals underlying individuals' perceptions of species loss and ecosystem deterioration as central drivers of environmental responses. Environmental Concern captures both the affective and moral dimensions of environmentalism, driven by classic theories in environmental psychology that specify the role of emotions and ethical obligations to environment in pro-environmental actions (Stern 2000) and supported by new empirical work showing its importance for biodiversity-related issues. Community Trust in Environmental Programs) tapping trust was grounded on both institutional trust and legitimacy theory, which suggest that the perceived credibility and fairness of governing actors will foster collective action. Readiness to Participate in CGP The criteria used to evaluate participation in community green programs focused on readiness (measured as behavioral intention), which is consistent with the theory of planned behavior, stating that intention is the immediate antecedent of behavior (Ajzen, 1991). Climate Knowledge Exposure finally reflects information-based influence on perception formation, as supported by recent findings showing that exposing individuals repeatedly and credibly to information increases environmental concern and trust formation.

3.4 Data analysis

Data were analyzed using Partial Least Squares Structural Equation Modelling (PLS-SEM) with SmartPLS 4, which is well suited for predictive and exploratory models incorporating mediation and moderation effects. PLS-SEM is appropriate for analysing complex relationships among latent constructs and does not impose strict distributional assumptions on the data. The analysis followed a two-stage approach, comprising evaluation of the measurement model (internal consistency reliability, convergent validity, and discriminant validity) and assessment of the structural model (path coefficients, mediation and moderation effects, effect sizes, and predictive relevance). Statistical significance was assessed using a bootstrapping procedure with 5,000 resamples, in line with recent methodological recommendations for sustainability and behavioural research (Hair et al., 2022; Sarstedt et al., 2023; Hair et al., 2024).

4. Results and findings

4.1 Measurement model assessment

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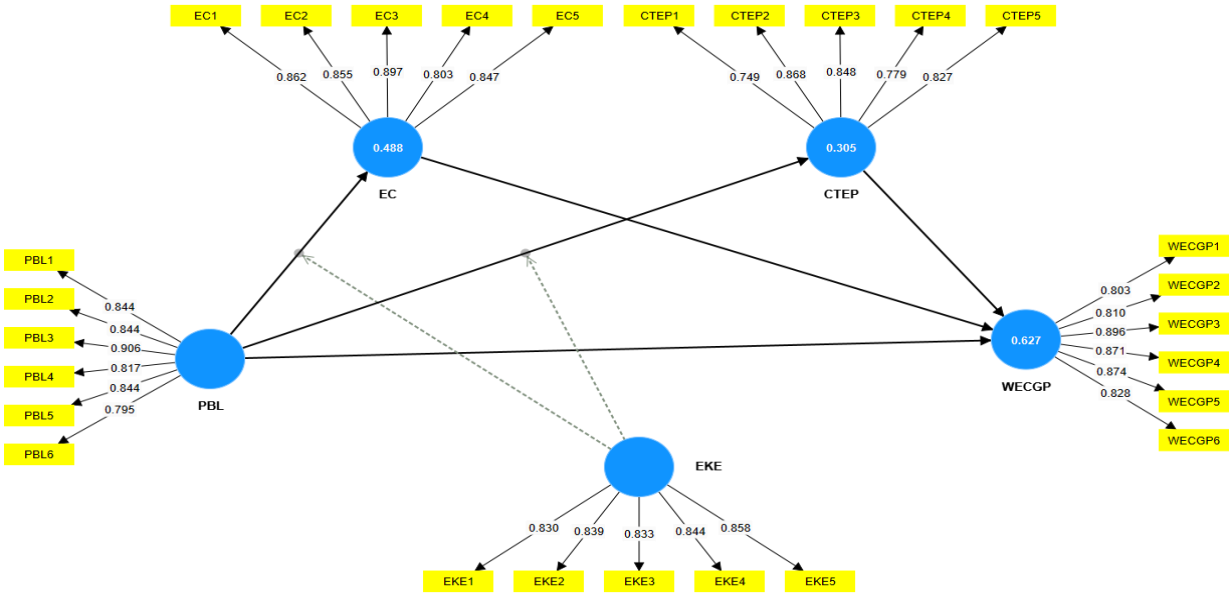

Figure 1. Measurement model (outer model) with standardised indicator loadings

Interpretation (Table 1). Table 1 Indicates that all reflective indicators load strongly and significantly on their respective constructs, ranging from 0.749 to 0.906, demonstrating robust convergent representation at the item level. The smallest loading (CTEP1 = 0.749) is still quite above the minimum acceptable cut-off (≥0.70), while several loadings exceed to a very large extent this value (e.g., PBL3 = 0.906, WECGP3 = 0.896, EC3 = 0.897), suggesting an excellent reliability of the indicators used in measuring these constructs. The interaction term EKE × PBL is set to 1.000 as it was in the case of product-indicator or single-term handling (SmartPLS 2) when dealing with moderation modeling.

Table 1. Outer loadings of measurement indicators

Matrix	CTEP	EC	EKE	PBL	WECGP	EKE x PBL
CTEP1	0.7487172					
CTEP2	0.8675617					
CTEP3	0.8478514					
CTEP4	0.7788833					
CTEP5	0.8274467					
EC1		0.8619054				
EC2		0.8553498				
EC3		0.8965915				
EC4		0.8031609				
EC5		0.8471032				
EKE1			0.8296838			
EKE2			0.8391702			
EKE3			0.8332412			
EKE4			0.8440600			
EKE5			0.8580483			
PBL1				0.844354		
PBL2				0.8437988		
PBL3				0.9056987		
PBL4				0.8174864		
PBL5				0.8439706		
PBL6				0.7953436		
WECGP1					0.8030365	
WECGP2					0.8097919	
WECGP3					0.8962835	
WECGP4					0.8712421	
WECGP5					0.8737152	
WECGP6					0.8279081	
EKE x PBL						1

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Strong internal consistency and convergent validity across all constructs are presented in Table 2. Cronbach′ s alpha scores are from 0.873 to 0.921 which surpass the 0.70 cut off value and show a satisfying item inter-correlation43). Composite reliability coefficients are also high (rho_c = 0.908–0.939; rho_a = 0.880–0.926), indicating a stable construct measurement in the context of PLS-SEM model structure. Convergent validity receives support as the AVE values of all constructs are greater than 0.50 (AVE = 0.665–0.728), indicating that more than half of the variance in the indicators is explained by each construct. Overall, the measurement model has acceptable reliability and convergent validity to be further tested in a structural model.

Table 2. Internal consistency reliability and convergent validity results

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
CTEP	0.873	0.880	0.908	0.665
EC	0.906	0.908	0.930	0.728
EKE	0.896	0.897	0.923	0.707
PBL	0.918	0.920	0.936	0.710
WECGP	0.921	0.926	0.939	0.719

It is indicated in Table 3 that discriminant validity holds as all the HTMT values are less than the conservative cut-off of 0.85 (greatest = 0.722 for CTEP–WECGP; 0.721 for EKE–WECGP; 0.715 for EC–WECGP). These findings suggest that each disposition represents a separate conceptual domain, rather than being highly overlapping with other dispositions. In addition, the interaction term (EKE × PBL) presents very low HTMT values with the main constructs (0.065–0.273), indicating that it operates as a statistically relevant moderator variable rather than replicating variance of EKE or PBL. Accordingly, the model meets conditions of discriminant validity and is suitable for testing structural hypotheses.

Table 3. Discriminant validity assessment using the HTMT criterion

	CTEP	EC	EKE	PBL	WECGP	EKE x PBL
CTEP						
EC	0.418					
EKE	0.594	0.551				
PBL	0.057	0.642	0.355			
WECGP	0.722	0.715	0.721	0.342		
EKE x PBL	0.091	0.273	0.065	0.108	0.202	

4.2 Structural model results and hypothesis testing

As can be seen from Table 4, perceived loss of biodiversity significantly increases environmental concern and decreases the trust in community program; environmental concerns and trust in community programme are both positively associated with Willingness to join community green program. Environmental information exposure directly positively affects environmental concern and community trust. The direct impact of perceived biodiversity loss on willingness to engage is not significant (a full mediation pattern across environmental concern and community trust). Interaction effects indicate that the exposure to environmental knowledge mediated through perceived biodiversity loss significantly increases the effect of perceived biodiversity loss on environmental concern, but not on community trust. Overall, however, we identify more general attitudes lending support to H1a and H1b (see Table 4).

Table 4. Structural path coefficients and hypothesis testing results

Hypothesis	Path	β (O)	t-value	p-value	Result
H1	PBL → EC	0.46	9.862	0.000	Supported
H2	PBL → CTEP	−0.160	2.649	0.008	Supported
H3	EC → WECGP	0.462	8.627	0.000	Supported
H4	CTEP → WECGP	0.48	12.015	0.000	Supported
H5	EKE → EC	0.337	6.882	0.000	Supported
H6	EKE → CTEP	0.576	12.049	0.000	Supported
H7	PBL → WECGP	0.03	0.572	0.567	Not supported
H8	EKE × PBL → EC	0.183	4.787	0.000	Supported

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Hypothesis	Path	β (O)	t-value	p-value	Result
H9	EKE × PBL → CTEP	0.065	1.244	0.214	Not supported

Substantial explanatory and predictive ability of the model is shown in Table 5. The predictors account for 48.8% of the variance in environmental concern, 30.5% in community trust and 62.7% in readiness to participate in a green community program knowledge, which are moderate to strong effects by standards of behavioural and sustainability research (Giles & Price, 2008). All Q^2 values are above zero (0.197–0.443), indicating predictive relevance of the structural model for principal endogenous constructs, thus confirming the appropriateness of the model for prediction-driven PLS-SEM analysis.

Table 5. Coefficient of determination (R^2) and predictive relevance (Q^2)

Endogenous construct	R^2	R^2 adjusted	Q^2 (redundancy)
Environmental Concern (EC)	0.488	0.481	0.348
Community Trust in Environmental Programs (CTEP)	0.305	0.297	0.197
Willingness to Engage in Community Green Programs (WECGP)	0.627	0.623	0.443

4.3 Effect size and model explanatory power

As evident from Table 6, community trust and environmental concern contribute substantially to explain willingness for participatory in community green programs with large magnitude and moderate effect size respectively. The perceived loss of biodiversity has a strong impact on en environmental concern while only a moderate effect on community trust, and no direct impact on willingness to get involved which again strengthens the mediating role of (psycho-logial and relational) mechanisms. Sensitivity Sensitivity of English respondents to environmental knowledge exposure is strong in both the explanation of community trust and in the shaping of environmental concern, with relatively low-values for the moderating influence of education on proenvironmental beliefs.

Table 6. Effect size (f^2) of structural relationships

Structural path	f^2	Effect size
EC → WECGP	0.302	Medium
CTEP → WECGP	0.499	Large
EKE → CTEP	0.428	Large
EKE → EC	0.198	Medium
PBL → EC	0.367	Large
PBL → CTEP	0.033	Small
PBL → WECGP	0.001	Negligible
EKE × PBL → EC	0.071	Small
EKE × PBL → CTEP	0.007	Negligible

4.4 Mediation effects

Environmental concern and community trust In Table 7, it is shown that environmental concern and community trust are important mediators when perceived biodiversity loss and exposure to environmental knowledge trigger willingness to participate in green based programs. Arguably, the most robust and indirect pathway acts via community trust regarding environmental knowledge exposure, whereas perceived biodiversity loss predominantly works through increased environmental concern to impact on engagement. The lack of a significant moderation via community trust in the interaction term indicates that most of the moderation is occurring through cognitive–affective concern and not relational trust.

Table 7. Specific indirect effects and mediation analysis results

Indirect relationship	Indirect effect (β)	t-value	p-value	Result
PBL → EC → WECGP	0.212	6.202	0.000	Supported
PBL → CTEP → WECGP	−0.077	2.518	0.012	Supported

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EKE → EC → WECGP	0.156	4.92	0.000	Supported
EKE → CTEP → WECGP	0.277	7.591	0.000	Supported
EKE × PBL → EC → WECGP	0.084	4.136	0.000	Supported
EKE × PBL → CTEP → WECGP	0.031	1.228	0.219	Not supported

4.5 Moderation effects

Interpretation (Table 8). Table 8 shows that environmental knowledge exposure significantly enhances the positive association between perceived biodiversity loss and environmental concern, meaning people who are more informed respond more to ecological degradation. Environmental knowledge exposure, however, does not moderate the relationship between perceived loss of biodiversity and community trust to a statistically significant degree. This result suggests that trust in community environmental programs is influenced not only by the rational and relational, but also by individual knowledge intensity.

Table 8. Moderating effects of environmental knowledge exposure on structural relationships

Moderation path	Interaction effect (β)	t-value	p-value	Result
EKE × PBL → EC	0.183	4.787	0.000	Supported
EKE × PBL → CTEP	0.065	1.244	0.214	Not supported

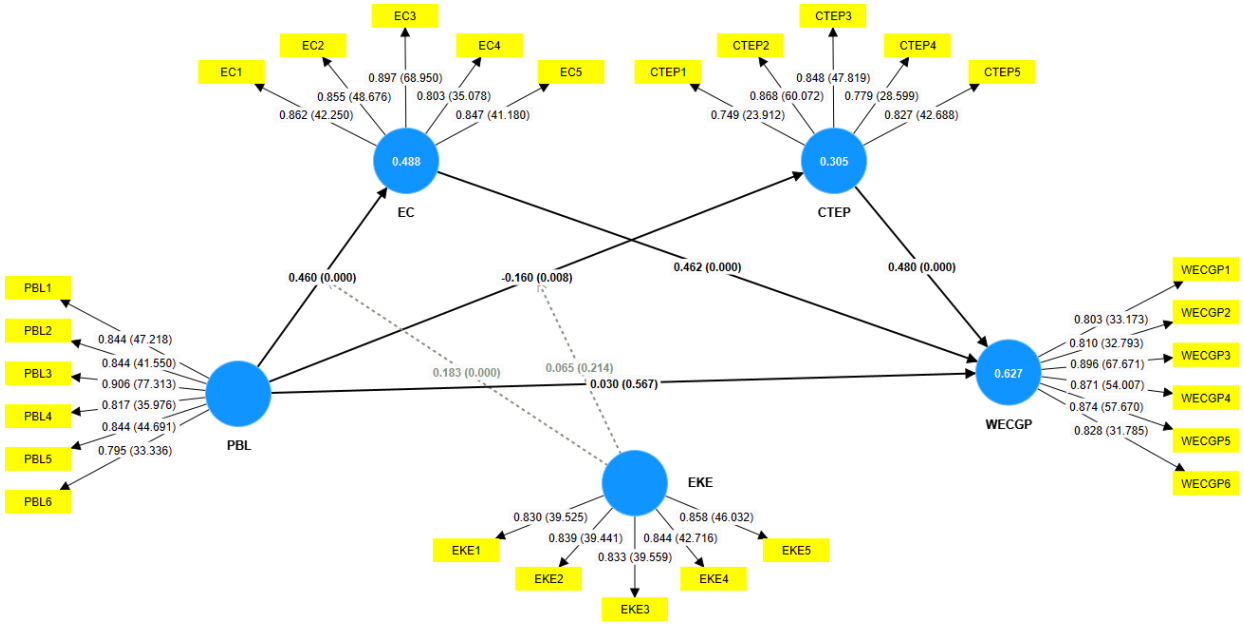

Figure 2. Structural model (inner model) with standardised path coefficients and R^2 values

5. Discussion

5.1 Perceived biodiversity loss as a cognitive trigger of pro-environmental responses

The findings suggest that perceived loss of biodiversity is a prime cognitive source for increasing the environmental concern, consistent with theoretical assertions from environmental behaviour and references therein and the value–belief–norm (VBN) framework (e.g. awareness of ecological degradation before moral and affective engagement). When people perceive severe biodiversity loss, they ratchet up their perceptions of risk and moral concerns, which activates concern. Recent high profile research has demonstrated that perceived ecosystem degradation is a strong predictor of environmental concern and pro-conservation attitudes especially among well-educated young people living around threatened ecosystems (Díaz et al., 2024; Leclère et al., 2024; van der Linden et al., 2023). However, the non-significant direct impact of perceived biodiversity depletion on willingness to act

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suggests that cognitive recognition seldom directly translates into action and supports arguments that cognitive appraisal should be processed through affective and social processes in order to translate into behavioural engagement.

5.2 Mediating roles of environmental concern and community trust

The mediation results emphasize environmental concern as an important mediating psychological process between perceived biodiversity loss and readiness to participate in community green efforts. This is consistent with affective-moral models of pro-environmental action, in which the proximity of emotions, obligation and personal norms as determinants of behaviour. Indeed, recent conservation psychology research shows that concern consistently acts as a mediator between environmental perceptions and behavioural intentions (Clayton & Karazsia, 2024; O′ Neill et al., 2024; Stern et al., 2024). In addition, trust within the community plays a significant mediating role, especially in enabling exposure to environmental knowledge to mediate engagement behaviour. This is in line with social capital and environment governance studies that have indicated that trust towards local institutions lower uncertainty and enhances the willingness of collective action (Bennett et al., 2023; Manes-Rossi et al., 2024; Salih, 2024). The negative indirect effect of perceived biodiversity loss via trust also implies that severe degradation is likely to undermine trust in local initiatives if governance performance is seen as poor.

5.3 Moderating role of environmental knowledge exposure

The moderation analysis reveals that the relationship between perceived biodiversity loss and environmental concern is enhanced by exposure to environmental knowledge, implying that informed individuals are more sensitive to biodiversity loss and can engender stronger affective responses. This confirms social–cognitive theory according to which information improves the capacity of persons to interpret issues and to be emotionally involved with environmental risks. Recent evidences indicate that exposure to authentic environmental information increases concern and moral urgency, especially among students/young adults (van der Linden et al., 2023; Liu et al., 2024; Mondal & Bauri, 2024). But the lack of a strong moderating effect on community trust indicates that trust is less about how much information there is and more a matter of direct experience and institutional factors. That is consistent with new research in governance that suggests that transparency, fairness and the showing of effectiveness are more important influence on trust than reward alone (Bennett et al., 2023; Deegan, 2019; Salih, 2024).

5.4 Integrated explanatory power and theoretical implications

The findings as a whole suggest that willingness to participate in community green programs is well explained by combining cognitive with affective and social dimensions. The findings inform contemporary environmental behaviour studies by providing empirical evidence that perceived loss of biodiversity affects engagement through concern and trust, rather than directly. This resonates with recent calls within sustainability and biodiversity literature to move from awareness-based models toward integrated approaches that include emotional engagement and institutional trust (Díaz et al., 2024; O′ Neill et al., 2024; Stern et al., 2024). Finally, the addition of exposure to environmental knowledge as a moderator is an innovative contribution which brings insight into the circumstances under which perceptions on biodiversity are likely to strengthen concern. On a more practical level, the implications of this discussion are that any conservation actions need to incorporate communication on biodiversity while working towards local trust and building participatory grass-roots governance in order for community based green action to be effective.

6. Conclusion

This study indicates that perceived loss of biodiversity affects willingness to participate in community green programs mainly through indirect psychological and social mediating processes rather than straightforward ones. Environmental concern appears to be the more prominent route in which biodiversity perceptions are processed into behavioural intentions, with community trust providing a complementary function in influencing confidence towards collective environmental action. Understanding environmental knowledge exposure enhances the effect of perceived biodiversity loss on environmental concern, demonstrating that credible information can magnify emotional involvement in conservation issues. It provides a new integrative approach by establishing an empirical relationship between cognitive appraisal, affective–moral reaction and institutional trust in one PLS-SEM model and focusing on a forest-proximity student population. The results of this study added to previous research on biodiversity aroused a perception that `knowing alone is not enough′ and show that knowledge exposure acts as a conditional variable in the activation of concern. In a practical sense, the findings indicate that successful community conservation programs might consider integrating two key components; biodiversity education and trust-building governance measures to ensure sustained public engagement.

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Author Contributions

Conceptualization, S.S. and E.K.R.; methodology, S.S.; instrument development and data collection, S.S. and E.K.R.; data analysis and interpretation, S.S.; writing–original draft preparation, S.S.; writing–review and editing, E.K.R.; supervision, E.K.R. All authors have read and agreed to the published version of the manuscript.

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflict of interest.

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Ethical Approval

This study was conducted in accordance with established ethical standards for social and behavioural research. Ethical approval was obtained from the institutional ethics committee of Universitas Cenderawasih.

Informed Consent Statement

Informed consent was obtained from all participants involved in the study. Participation was voluntary, and respondents were assured that their responses would remain anonymous and confidential.

Appendix data A1. Socio-demographic characteristics of the respondents

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	112	44.8
	Female	138	55.2
Age	18–20 years	78	31.2
	21–23 years	122	48.8
	≥24 years	50	20
Study level	Undergraduate (S1)	175	70
	Graduate (S2)	75	30
Field of study	Forestry	75	30
	Biology	63	25.2
	Social sciences	50	20
	Others	62	24.8

Appendix A2. Measurement instruments

No.	Variable (Code)	Indicator code	Dimension	Source
1	Perceived Biodiversity Loss (PBL)	PBL1–PBL6	Ecological decline perception Habitat & species loss	Díaz et al., 2024 Leclère et al., 2024
2	Environmental Concern (EC)	EC1–EC5	Affective–moral concern	Clayton & Karazsia, 2024
3	Community Trust in Environmental Programs (CTEP)	CTEP1–CTEP5	Institutional & relational trust	Bennett et al., 2023

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No.	Variable (Code)	Indicator code	Dimension	Source
4	Willingness to Engage in Community Green Programs (WECGP)	WECGP1–WECGP6	Behavioural intention	O'Neill et al., 2024
5	Environmental Knowledge Exposure (EKE)	EKE1–EKE5	Information exposure	van der Linden et al., 2023

References

Al-kfairy, M., Sendaba, O., & Alfandi, O. (2025). Understanding trust in educational Metaverse: the role of social cognitive theory constructs and perceived risks. *Kybernetes*. https://doi.org/10.1108/K-11-2024-3057

Antwi, S. H., Stephens, C. G., Rolston, A., Getty, D., & Linnane, S. (2025). Public participation in environmental decision-making: A water sector perspective. *Environmental and Sustainability Indicators*, *26*, 100656. https://doi.org/https://doi.org/10.1016/j.indic.2025.100656

Balakrishnan, J., Al-Ahmadi, M. S., Baabdullah, A. M., Al-Busaidi, A. S., & Dwivedi, Y. K. (2025). Examining Digital Nudges to Influence Pro-Environmental Behavior. *Journal of Computer Information Systems*, 1–17. https://doi.org/10.1080/08874417.2025.2526385

Busby, I., Palmer, A., Harcourt, N., & Jones, C. (2025). Can community-based conservation improve social acceptance of invasive species management? Lessons from New Zealand. *People and Nature*, *7*(7), 1639–1651. https://doi.org/https://doi.org/10.1002/pan3.70061

Buta, N., Holland, S. M., & Kaplanidou, K. (2014). Local communities and protected areas: The mediating role of place attachment for pro-environmental civic engagement. *Journal of Outdoor Recreation and Tourism*, *5–6*, 1–10. https://doi.org/https://doi.org/10.1016/j.jort.2014.01.001

Chen, J., Chen, Y., & Geng, L. (2025). Optimal visitor experience at urban horticultural expositions: Antecedents and positive social outcomes. *Urban Forestry & Urban Greening*, *112*, 129000. https://doi.org/https://doi.org/10.1016/j.ufug.2025.129000

Dominique, G., Dossa, K. F., Larivière, D., & Khasa, D. P. (2025). Environmental, health and social acceptability issues associated with rare earth elements: a systematic literature review. *Discover Environment*, *3*(1), 79. https://doi.org/10.1007/s44274-025-00274-y

Gregg, E. A., Garrard, G. E., Bekessy, S. A., Kusmanoff, A. M., Martin, J. K., Selinske, M. J., Kidd, L. R., & Robinson, J. A. (2025). Barriers to public engagement with biodiversity conservation. *Conservation Biology*, *39*(4), e70078. https://doi.org/https://doi.org/10.1111/cobi.70078

Guerrero, G., & Sjöström, J. (2025). Critical scientific and environmental literacies: a systematic and critical review. *Studies in Science Education*, *61*(1), 41–87. https://doi.org/10.1080/03057267.2024.2344988

Hainsworth, N., Cummins, A., Newnham, E., & Foureur, M. (2023). Learning through relationships: The transformative learning experience of midwifery continuity of care for students: A qualitative study. *Women and Birth*, *36*(4), 385–392. https://doi.org/https://doi.org/10.1016/j.wombi.2022.12.006

Huang, X., & Li, J. (2025). The "label code" of pro-environmental behavior–a study on pro-environmental behavior based on behavioral label theory. *Scientific Reports*, *15*(1), 34711. https://doi.org/10.1038/s41598-025-18357-4

Jensen, J. K., Persson, A. S., & Soga, M. (2025). Toward a unified understanding of people's aversion to nature: biophobia. *Frontiers in Ecology and the Environment*, *n/a*(n/a), e70019. https://doi.org/https://doi.org/10.1002/fee.70019

Jordi, L.-S., Lamberti, G., & Abedini, N. (2025). One size does not fit all consumers: How social context shape the behavioral drivers behind organic food purchases. *Cleaner and Responsible Consumption*, *17*, 100273. https://doi.org/https://doi.org/10.1016/j.clrc.2025.100273

Khuadthong, B., Taweephol, R., Promsivapallop, P., Imjai, N., & Aujirapongpan, S. (2025). How do ecological literacy, green mindfulness, and social contingency thinking shape sustainable tourism behaviors of Thai Gen Z hospitality students? *Journal of Hospitality, Leisure, Sport & Tourism Education*, *37*, 100584. https://doi.org/https://doi.org/10.1016/j.jhlste.2025.100584

Koliev, F., & Bäckstrand, K. (2025). Citizen preferences for climate policy implementation: the role of multistakeholder partnerships. *International Environmental Agreements: Politics, Law and Economics*, *25*(1), 41–59. https://doi.org/10.1007/s10784-024-09658-6

Kopittke, P. M., Harper, S. M., Asio, L. G., Asio, V. B., Batalon, J. T., Batuigas, A. M. T., Gonzaga, A. B., Gonzaga, N. R., de Guzman, M. T. L., Lumanao, D. M., McKenna, B. A., Soyon, G. B., Vergara, J. R. M., & Sanchez, P. B. (2025). Soil degradation: An integrated model of the causes and drivers. *International Soil and Water Conservation Research*, *13*(4), 744–755. https://doi.org/https://doi.org/10.1016/j.iswcr.2025.07.010

ISSN: XXXX-XXXX, P-ISSN: XXXX-XXXX
Innovation Biology Research (IBR), Vol 1, No 1, June 2025, Page. 15-28
DOI: https://doi.org/10.69725/ibr.v1i1.310

Lau, J. L., & Hashim, A. H. (2019). Mediation analysis of the relationship between environmental concern and intention to adopt green concepts. *Smart and Sustainable Built Environment*, *9*(4), 539–556. https://doi.org/10.1108/SASBE-09-2018-0046

Li, Q., Wang, Y., Shan, W., & Guan, J. (2025). Dual trust, emotional bond, and tourists' on-site pro-environmental behavior at nature-based destinations: Extending norm-activation theory from the perspective of social dilemma. *Journal of Outdoor Recreation and Tourism*, *49*, 100839. https://doi.org/https://doi.org/10.1016/j.jort.2024.100839

Lou, X., Ito, K., & Li, L. M. W. (2025). Rethinking environmental values in psychology from the perspective of anthropocentrism. *Journal of Environmental Psychology*, *101*, 102518. https://doi.org/https://doi.org/10.1016/j.jenvp.2025.102518

Maier, C., Thatcher, J. B., Grover, V., & Dwivedi, Y. K. (2023). Cross-sectional research: A critical perspective, use cases, and recommendations for IS research. *International Journal of Information Management*, *70*, 102625. https://doi.org/https://doi.org/10.1016/j.ijinfomgt.2023.102625

Maleknia, R., & Enescu, R. E. (2025). Does climate change stimulate citizens' responses to conserving urban forest? Insights from stimulus-organism-response theory. *Ecological Modelling*, *501*, 111000. https://doi.org/https://doi.org/10.1016/j.ecolmodel.2024.111000

Masson, Torsten, Siebert, Julia, Köhler, Sabrina, Fritsche, Immo, & Zabel, Jörg. (2025). Citizen Science Goes to School: Intervention Effects on Biodiversity Knowledge, Nature Relatedness, and Biodiversity Action in Secondary School Students. *Environment and Behavior*, *57*(5–6), 359–398. https://doi.org/10.1177/00139165251345383

Mir, Y. H., Mir, S., Ganie, M. A., Bhat, J. A., Shah, A. M., Mushtaq, M., & Irshad, I. (2025). *Overview of Land Use and Land Cover Change and Its Impacts on Natural Resources BT - Ecologically Mediated Development: Promoting Biodiversity Conservation and Food Security* (H. S. Jatav, V. D. Raiput, & T. Minkina (eds.); pp. 101–130). Springer Nature Singapore. https://doi.org/10.1007/978-981-96-2413-3_5

Moloise, S. D., Matamanda, A. R., & Bhanye, J. I. (2025). "Taboos No Longer Exist here!": Factors Undermining Value and Use of Traditional Ecological Knowledge in Conservation and Management of Savanna Ecosystem Services in South Africa. *Human Arenas*. https://doi.org/10.1007/s42087-025-00531-9

Perrings, C., Folke, C., & Mäler, K.-G. (1992). The Ecology and Economics of Biodiversity Loss: The Research Agenda. *Ambio*, *21*(3), 201–211.

Peters, A., & Fuchs, M. (2025). A relational exploration of tourists' environmental values and their perception of restrictions in protected nature. *Journal of Sustainable Tourism*, *33*(1), 28–45. https://doi.org/10.1080/09669582.2023.2295234

Princen, T. (1999). Consumption and environment: some conceptual issues. *Ecological Economics*, *31*(3), 347–363. https://doi.org/https://doi.org/10.1016/S0921-8009(99)00039-7

Renck, V., Vivacqua, M., Moura, G., Serafini, T. Z., Hellebrandt, L., & Gonçalves, L. R. (2026). Reimagining coastal management: Addressing socio-environmental conflicts in a traditional fishing community in the delta of the Amazon River. *Marine Policy*, *183*, 106904. https://doi.org/https://doi.org/10.1016/j.marpol.2025.106904

Reyes-Bonilla, M. A., Moreno Díaz, C., Castaño, N., Cárdenas López, D., Núñez-Avellaneda, M., Agudelo Córdoba, E., Peña-Venegas, C. P., Osorno-Muñoz, M., Atuesta-Dimian, N., Barona-Colmenares, A. A., & Jaramillo Hurtado, L. F. (2025). The economic value of annual forest loss in the Colombian Amazon. *Ecosystem Services*, *75*, 101757. https://doi.org/https://doi.org/10.1016/j.ecoser.2025.101757

Sá, R. M. (2025). *The IPBES Thematic Assessment on Invasive Alien Species and Their Control: Futurity and Policy Opportunities in a More than Human-World BT - Global Public Goods Communication: Mapping Actors, Policies, and Narratives* (S. P. Sebastião & A.-M. Cotton (eds.); pp. 135–156). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-90667-1_9

Shen, X., & Wu, H. (2025). The Impact of the Performance Gap on Corporate Biodiversity Disclosure. *Australian Accounting Review*, *n/a*(n/a). https://doi.org/https://doi.org/10.1111/auar.70014

Stern, R. J. (2024). A reinterpretation of the past 2.5 billion years of Earth's tectonic history: Two episodes each of plate and single-lid tectonics. *GSA Bulletin*, *137*(5–6), 2079–2100. https://doi.org/10.1130/B37966.1

Straka, T. M., Glahe, C., Dietrich, U., Bui, M., & Kowarik, I. (2025). From nature experience to pro-conservation action: How generational amnesia and declining nature-relatedness shape behaviour intentions of adolescents and adults. *Ambio*, *54*(7), 1165–1184. https://doi.org/10.1007/s13280-025-02135-7

Suchman, M. C. (1995). Managing Legitimacy: Strategic and Institutional Approaches. *Academy of Management Review*, *20*(3), 571–610. https://doi.org/10.5465/amr.1995.9508080331

Veijonaho, S., Hietajärvi, L., Ojala, M., & Salmela-Aro, K. (2025). From distress to action? – A three-wave longitudinal study of climate

ISSN: XXXX-XXXX, P-ISSN: XXXX-XXXX
Innovation Biology Research (IBR), Vol 1, No 1, June 2025, Page. 15-28
DOI: https://doi.org/10.69725/ibr.v1i1.310

change distress, pro-environmental behavior, and coping strategies among Finnish adolescents. *Journal of Environmental Psychology*, *105*, 102676. https://doi.org/https://doi.org/10.1016/j.jenvp.2025.102676

Wang, C., Hao, J., Solomon, T., Liu, H., Liu, D., & He, Y. (2025). The Impact of Livelihood Capital on Farmers′ Willingness to Participate in Wildlife Conservation: Evidence from the Communities Around the Jiyuan Macaque Nature Reserve in China. In *Sustainability* (Vol. 17, Issue 16, p. 7332). https://doi.org/10.3390/su17167332

Xu, D., Liu, G., Zhao, H., Li, S., Li, H., Meng, F., Zhang, L., & Chen, Y. (2025). Trade traceability assessment of regional biodiversity loss under multiple environmental pressures. *Journal of Cleaner Production*, *501*, 145284. https://doi.org/https://doi.org/10.1016/j.jclepro.2025.145284

Yehle, L., Michaelsen, P., Harring, N., & Jagers, S. C. (2025). Conservation for nature and wildlife′s sake: the effects of (non-)anthropocentric ethical justifications on policy acceptability. *Journal of Public Policy*, *45*(1), 97–119. https://doi.org/DOI: 10.1017/S0143814X24000266