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The Importance of Climate Hope and a Sense of Connection with Nature for Pro-Environmental Behavior and Mental Health

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Abstract

Achieving sustainability goals depends not only on knowledge about climate change but also on the psychological resources that sustain engagement in climate action and protect human well-being. This study examined whether climate hope and nature connectedness are associated with pro-environmental intentions and well-being. It also tested whether nature connectedness mediates these links. An online survey of Polish adults (n = 620; aged 18–74, M = 31.95, SD = 13.55) measured constructive climate hope, nature connectedness, mental health (MHC-SF) and pro-environmental intentions. Data were analyzed using correlations, hierarchical regression and bootstrapped mediation analysis. Climate hope and nature connectedness were positively related to intentions (r = 0.38 and 0.33) and mental health (r = 0.29 and 0.32). Beyond age and gender, they explained additional variance in intentions ($\Delta R^2 = 0.17$) and well-being ($\Delta R^2 = 0.12$). Climate hope was the strongest predictor of intentions ($\beta = 0.30$), whereas nature connectedness was the strongest predictor of well-being ($\beta = 0.24$). Nature connectedness partially mediated the effect of climate hope on both intentions and well-being (indirect effect = 0.06 in each case), although direct effects predominated. These findings suggest that climate hope and a connection with nature are resources that help foster care for the environment and one's own well-being.

Keywords: climate hope; mental health; pro-environmental behavior; connection with nature

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1. Introduction

Contemporary research shows that knowledge about climate change does not automatically translate into pro-environmental engagement [1]. To take action, individuals need, among other things, hope, which is understood as a positive cognitive and motivational resource comprising the belief that a goal can be achieved and the recognition of pathways leading to its realization [2]. Climate hope is a cognitive–emotional experience that arises when a desired environmental goal is attainable. It implies that the individual feels a sense of agency, perceives the climate goal, and knows how to achieve it. This construct is thus a form of "domain-specific hope" [2,3]. It functions like general hope but applies to a particular area of life—the natural environment. Climate hope is a psychological resource

that enables an individual to maintain a belief in the possibility of positive change, despite being aware of the threats associated with climate change [4]. Hope helps us to maintain motivation to act despite experiencing negative emotions, such as anxiety, sadness or frustration, associated with the climate crisis [5], and protects people from feelings of helplessness and resignation. Hope related to climate change can take various forms. Research indicates that constructive hope, consisting of a positive reappraisal of nature and trust in oneself and others as agents acting on behalf of nature, is associated with greater climate engagement and more frequent pro-environmental behavior. In contrast, hope based on denial of the problem is associated with lower levels of pro-environmental activity [6,7].

A meta-analysis in this area confirmed that hope is associated with greater climate engagement; however, the type of hope is significant [8]. The willingness to engage in pro-environmental behaviors more than doubles when hope is based on one's own agency, which is a key factor of constructive hope [5,6]. Across the currently available body of research, pro-environmental behaviors are most often attributed to negative emotions. A recent meta-analysis of studies published between 2023 and 2025 [9] reveals that, out of 174 quantitative studies analyzed, only 15 examine hope as a factor influencing pro-environmental behavior or attitudes (primarily emotional ones). Negative emotions, such as anxiety, guilt, and sadness, are well-documented predictors of pro-environmental behavior. In contrast, hope is typically viewed either as a mechanism for regulating negative climate-related emotions or as a co-occurring emotion within a broader set of factors driving pro-environmental behavior. Furthermore, the significance of hope for pro-environmental behavior varies depending on the cultural context [7]. The aforementioned meta-analysis [9] identified only five studies concerning the Polish population (in the areas of psychometrics and climate stress). This limited number of studies on climate hope, combined with the absence of such research within the Polish population, inspired the decision to design this study.

Hope is regarded not only as a predictor of pro-environmental behavior, but also as a resource that supports mental health, due to the belief that one is capable of achieving a goal (agency) and the belief that there are ways to achieve it (pathways); this results in better self-regulation and is beneficial to mental health [3]. Experiencing climate hope does not preclude climate anxiety, as this state of anxiety is a consequence of awareness of the threats and, at the same time, accompanies a belief in the possibility of change [4,7,9]. People in Poland demonstrate a high level of awareness of climate threats; however, their conviction that the crisis can be effectively addressed is sometimes limited, which may lead to a weakening of climate hope [10]. On the other hand, climate hope may foster pro-environmental actions that are stronger than negative emotions (such as sadness or anxiety) and can also reinforce them when combined with those emotions [9]. The limited number of studies on the consequences of positive emotions on pro-environmental behaviors, combined with small effect sizes and significant group heterogeneity, necessitates caution when drawing conclusions about pro-environmental activity and highlights the need for further research (p. 26, [9]).

In the classical sense, Mayer and Frantz [11] define a connection with nature as the perception of oneself as part of the natural world, which results in a sense of communion with nature. In a more recent perspective, a connection with nature is defined as a lasting emotional and psychological relationship between a person and the natural world, which can be developed through everyday experiences of contact with nature, and which, in turn, is significant for human well-being [12]. People with a stronger connection to nature demonstrate higher levels of eudaimonic well-being, a sense of meaning in life and personal development [13]. It appears that people with a stronger connection to nature not only enjoy better health outcomes but also exhibit more environmentally friendly behaviors [11,14], a finding which has also been confirmed by longitudinal studies [15]. These associations were

further corroborated in a meta-analysis [16]. This suggests a mechanism of environmental defense resulting from identification with nature, in line with the principle that a threat to the environment may be perceived as a threat to something of value. A value is a cognitive representation of a desirable motivational goal that remains stable across various situations and consistently motivates the individual to strive for its attainment [17,18]. Furthermore, a connection with nature implies that a person feels like they are a part of the natural world. Consequently, a healthy natural environment fosters a sense of contentment and tranquility, whereas environmental degradation is perceived as a personal harm. This mechanism may explain the increased motivation to take action toward environmental protection among people who feel constructive climate hope. The few available empirical findings confirm that both cognitive factors regarding one's personal attitude toward nature and embodied emotions explain intentions to engage in pro-environmental behaviors. Furthermore, a sense of connection with nature can influence the intensity of these behaviors [19]. Research on connection with nature most often focuses on its relationship with climate anxiety [9,20]. There is a lack of research regarding the significance of the connection to nature as a driver of pro-environmental behavior and its link to climate hope. The present study addresses this gap.

Pro-environmental behavior is defined as actions taken to reduce negative impacts on the environment or to support its protection. These may include both everyday consumer practices and actions related to reducing greenhouse gas emissions, saving energy or changing dietary habits [21]. In research on pro-environmental intentions, according to Ajzen's [22] theory of planned behavior, intentions are the most proximal predictor of actual behavior. Measuring intentions allows one to assess an individual's readiness to undertake actions that promote environmental protection, such as reducing meat consumption or cutting down on energy use. Some studies suggest that engaging in pro-environmental behavior may be associated with greater psychological well-being [23]. Research findings [24] indicate that dispositional hope is positively associated with numerous indicators of mental health like emotional and social well-being, physical and psychological health, and positive prospective thinking. A similar mechanism was revealed in a study by Rizeq and Ojala, in which young Swedes with high levels of climate hope experienced greater life satisfaction, even when they were worried about the climate; this effect was not observed among young Qataris [7]. Similar findings regarding the positive associations between climate hope and well-being were reported in a meta-analysis [9]. This mechanism may be linked to a sense of purpose, consistency between actions and values, and an improved self-image [25]. However, intense pro-environmental behavior can lead to emotional overload, frustration and activist burnout [26], which paints a more complex picture of the relationship between pro-environmental behavior and mental well-being. The level of pro-environmental behavior among people in Poland varies, and declared concern for the environment does not always translate into action [27]; economic or practical considerations often play a greater role [28].

The variables described above are statistically significantly related to well-being [7,12,23]. According to the concept of well-being proposed by Keyes [29], well-being consists of three interrelated components: psychological, social, and emotional and constitutes an important element of mental health. Accordingly, the term "mental health" is used in the empirical section to reflect the conceptual framework of the instrument employed [30]. In addition to psychological variables, the significance of sociodemographic variables was analyzed. The literature reports that gender influences pro-environmental behavior [31]. Women show greater concern for the environment and are more engaged in this area, which can be explained by the theory of gender role socialization, according to which women are more likely to display caring and prosocial behavior [32]. Regarding age, the findings are mixed;

however, young people are more likely to experience emotional reactions to the climate crisis [33,34].

2. Materials and Methods

A review of the literature indicates a lack of research on climate hope in Poland, which may contribute to the gap between awareness of the crisis and climate action. The primary aim of this study is to determine the role of constructive climate hope and the sense of connection to nature in shaping pro-climate behaviors and subjective well-being. Based on the concepts of dispositional hope [3] and constructive climate hope [6], an individual who is convinced that nature conservation requires action and knows how to achieve it is more inclined to engage in such activities [5,6] and derives a sense of well-being from doing so. Hope as a cognitive, goal-oriented mindset motivates and reinforces the value of nature, a value experienced as a connection to the natural world. This valuation of the goal enhances the individual's positive assessment of and concern for nature, manifesting as environmentally friendly behavior (or the intention to act accordingly) and a sense of well-being. This study hypothesizes:

H1. *Climate hope and a sense of connection with nature are positively associated with mental health.*

H2. *Climate hope and a sense of connection with nature are positively linked to the adoption of pro-climate behaviors.*

H3. *Age, gender, climate hope and a sense of connection with nature are predictors of pro-climate behavior and mental health.*

H4a. *The positive relationship between climate hope and pro-environmental behaviors is mediated by the sense of nature connectedness.*

H4b. *The positive relationship between climate hope and mental health is mediated by the sense of nature connectedness.*

2.1. Data Collection and Participants

The current study was conducted as part of the Hope Barometer international research program. The Polish sample consisted of 629 participants recruited through word-of-mouth and social media accounts of the University of Lodz and Kazimierz Wielki University (463 women, 73.6%; 157 men, 25.0%; and 9 individuals who identified as another gender, 1.4%). In the full sample, ages ranged from 18 to 74 years (M = 31.86, SD = 13.54). Because the gender category "another gender" was too small for reliable statistical inference (n = 9), these nine participants were excluded from the inferential analyses, yielding an analytic sample of n = 620 (463 women, 157 men; age M = 31.95, SD = 13.55; range 18–74).

Data were collected using an online self-report questionnaire. Prior to participation, all respondents provided informed consent and were assured of the anonymity and confidentiality of their responses. The study protocol was designed in accordance with the ethical guidelines of the Declaration of Helsinki. Approval was also obtained from the Ethics Committee of Kazimierz Wielki University in Bydgoszcz (Approval no. 19/30.06.2026).

2.2. Measures

To test the formulated hypotheses, a set of standardized psychological instruments was used. Where applicable, scales were translated and adapted into Polish using a standard back-translation procedure involving subject-matter experts [35].

1. Climate Hope: Climate hope was measured using an 8-item Constructive Hope scale developed by Ojala [6]. This measure assesses the extent to which individuals feel optimistic about the future of the climate based on positive reappraisal and trust in the capabilities of societal actors (e.g., scientists, politicians, and laypeople). Higher scores indicate a higher level of constructive climate hope. Internal consistency for this scale in the current study was high ($\alpha = 0.87$). The mean score in the current sample was 3.20 (SD = 1.21).
2. Nature Connectedness: The sense of connection with the natural world was assessed using the Nature Connection Index (NCI) [12]. The NCI is a brief, 6-item scale that captures the affective and experiential relationship individuals have with nature (e.g., "I feel part of nature", "I always find beauty in nature"). Responses were recorded on a 7-point scale (1 to 7). Higher average scores reflect a stronger psychological bond with the natural environment. The reliability of the scale in this sample was excellent ($\alpha = 0.91$), with a mean score of 5.80 (SD = 1.19).
3. Mental Health: Mental health was operationalized using the Mental Health Continuum (MHC): it was measured using the 14-item Mental Health Continuum-Short Form (MHC-SF) [29,30]. The MHC-SF assesses emotional, psychological, and social well-being, allowing for the evaluation of an individual's overall flourishing in life. Higher scores indicate a higher level of subjective well-being. The scale demonstrated excellent reliability in this study ($\alpha = 0.93$), with an average score of 3.79 (SD = 1.03).
4. Pro-environmental Intentions: The willingness to engage in climate-friendly actions was measured using a 10-item pro-environmental intentions scale [36]. Participants rated their likelihood of undertaking various pro-environmental actions (e.g., supporting climate policies, reducing carbon footprint). Higher scores represent a stronger intent to act pro-environmentally. The reliability for this scale was good ($\alpha = 0.84$), with an average score of 4.21 (SD = 1.04).

Furthermore, sociodemographic variables were controlled for. Participants provided demographic information, including age (measured continuously in years) and gender.

2.3. Analytical Procedures

All statistical analyses were conducted in the R 4.5.1 programming environment [37] and using the lavaan package [38,39]. First, descriptive statistics and bivariate Pearson's correlations were calculated to examine the baseline relationships between the continuous variables and to test Hypotheses 1 and 2. Statistical significance was assessed at the 0.05 level. Skewness and kurtosis values for all continuous variables fell well within the acceptable range of −2 to +2, indicating that the data were normally distributed and suitable for parametric testing [40]. To control for inflated Type I error among the five pre-specified H1/H2 Pearson correlations (climate hope, nature connectedness, well-being, pro-environmental intentions, and age), *p*-values for these focal tests were adjusted using the Holm step-down procedure [41].

To test Hypothesis 3 regarding the specific predictors of pro-environmental intentions and mental health (MHC well-being), two hierarchical multiple Ordinary Least Squares (OLSs) regression models were employed, one for each outcome. Prior to interpretation, regression assumptions (multicollinearity, normality of residuals, heteroscedasticity, and influential outliers) were verified. In both models, Step 1 (the baseline model) included the sociodemographic variables age and gender, to control for their effects. Step 2 added the core psychological variables. The two nested models were compared using an F-test (ANOVA) to determine whether adding climate hope and nature connectedness yielded a statistically significant increase in explained variance (ΔR^2) beyond sociodemographic variables alone. Because the Breusch–Pagan test indicated heteroscedasticity in the intentions model, all

regression coefficients were tested with a case-resampling bootstrap (5000 resamples, 95% CI), which does not assume normally distributed or homoscedastic residuals.

Post-hoc power analyses were conducted in G*Power 3.1.9.7 [42] for a fixed-model R^2 increase ($\alpha = 0.05$). For the observed Step-2 improvement (intentions: $\Delta R^2 = 0.170$, $f^2 = 0.22$; well-being: $\Delta R^2 = 0.121$, $f^2 = 0.15$; both models had two tested predictors, four total predictors and $n = 620$), the achieved power was 1.00. A sensitivity analysis under the same design indicated that an effect as small as $f^2 = 0.016$ would still be detected with power = 0.80. Additionally, with $n = 620$, bivariate correlations of approximately $|r| \geq 0.11$ achieve power ≈ 0.80 ($\alpha = 0.05$, two-tailed).

To test Hypothesis 4, two single-mediator path models were estimated in R with the *lavaan* package (version 0.6-21), with climate hope as the predictor, nature connectedness as the mediator, and pro-environmental intentions (Model 1) or mental health (Model 2) as the outcome. Indirect effects were tested with bias-corrected percentile bootstrap confidence intervals based on 5000 resamples. The mediated proportion was computed as the indirect effect divided by the total effect. As a sensitivity analysis, both models were re-estimated with age and gender as covariates in both equations. Power for the indirect effects was estimated by Monte Carlo simulation of the single-mediator model (2000 replications per condition) [43]. With $n = 620$, the observed standardized indirect effects ($ab = 0.07$ in both models) were detected with power > 0.99, and a sensitivity analysis showed that an indirect effect as small as $ab = 0.017$ would be detected with power = 0.80.

3. Results

3.1. Descriptive Statistics and Preliminary Analyses

All scales demonstrated good-to-excellent internal consistency (Cronbach's α ranging from 0.84 to 0.93). Descriptive statistics are presented in Table 1.

Table 1. Descriptive Statistics and Scale Reliabilities ($n = 620$).

Variable	M	SD	Skewness	Kurtosis	Min–Max	α
1. Climate Hope	3.20	1.21	−0.18	−0.47	0–6	0.87
2. Nature Connectedness	5.80	1.19	−1.18	1.05	1–7	0.91
3. Mental Health (MHC)	3.79	1.03	−0.10	−0.51	1–6	0.93
4. Pro-environmental Intentions	4.21	1.04	−0.50	−0.20	1–6	0.84
5. Age	31.95	13.55	0.93	−0.05	18–74	–

3.2. Correlation Analyses

To test the first two hypotheses, a Pearson correlation matrix was computed (see Table 2). Hypothesis 1 posited that climate hope and nature connectedness are significantly associated with individuals' mental health. The analysis supported this assumption. Climate hope was positively correlated with subjective well-being (MHC; $r = 0.29$, $p < 0.001$). Similarly, nature connectedness showed a positive relationship with well-being ($r = 0.32$, $p < 0.001$). All five pre-specified H1/H2 correlations remained statistically significant after Holm correction. Hypothesis 2 assumed that climate hope and nature connectedness would be positively correlated with intentions to engage in climate-friendly actions. The results confirmed this: both climate hope ($r = 0.38$, $p < 0.001$) and nature connectedness ($r = 0.33$, $p < 0.001$) exhibited significant, positive correlations with pro-environmental intentions.

Table 2. Bivariate Pearson Correlations Between Main Study Variables.

Variable	1	2	3	4	5
1. Age	–				
2. Climate Hope	0.12 **	–			
3. Nature Connectedness	0.27 ***	0.27 ***	–		
4. Mental Health (MHC)	0.21 ***	0.29 ***	0.32 ***	–	
5. Pro-environmental Intentions	0.09 *	0.38 ***	0.33 ***	0.11 **	–

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.3. Predictors of Pro-Environmental Intentions and Mental Health

Before interpreting the regression models, OLS assumptions were evaluated for both outcomes. Multicollinearity was not an issue, as the Variance Inflation Factor (VIF) values for all predictors ranged from 1.06 to 1.17, falling well below the conservative threshold of 5 [40]. For intentions, residuals are compatible with normality (Shapiro–Wilk $W = 0.996$, $p = 0.071$), but the Breusch–Pagan test indicated the presence of heteroscedasticity ($BP = 41.62$, $df = 4$, $p < 0.001$); nevertheless, OLS parameter estimates remain unbiased in large samples. In the well-being model, the Shapiro–Wilk test turned out to be significant ($W = 0.995$, $p = 0.033$), suggesting a slight deviation from a perfectly normal distribution. However, because the W statistic is exceptionally close to 1, and the test is highly sensitive to minor deviations in large samples ($n = 620$), this deviation was deemed negligible. The Breusch–Pagan test did not indicate the presence of heteroscedasticity ($BP = 4.55$, $df = 4$, $p = 0.337$). Finally, the models were screened for influential outliers using Cook's distance. The maximum Cook's distance was 0.028 for pro-environmental behavioral intentions and 0.037 for well-being, which is far below the critical threshold of 1, indicating that no single observation exerted undue influence on the model.

To test Hypothesis 3, two hierarchical multiple regression analyses were conducted (see Table 3). Sociodemographic control variables (age and gender) were entered for both. This baseline model of pro-environmental intentions was significant—$F(2, 617) = 13.21$, $p < 0.001$—and accounted for approximately 4.1% of the variance in pro-environmental intentions ($R^2 = 0.041$). Age was a significant positive predictor ($\beta = 0.11$, $p = 0.007$), as was female gender ($\beta = 0.18$, $p < 0.001$). In Step 2, climate hope and nature connectedness were added to the model. The inclusion of these psychological variables resulted in a statistically significant improvement in the model's predictive power, increasing the explained variance by an additional 17.0 percentage points ($\Delta R^2 = 0.170$, $p < 0.001$). The final model (Step 2) explained 21.1% of the total variance, $F(4, 615) = 41.16$, $p < 0.001$. Supporting Hypothesis 3, higher levels of climate hope ($\beta = 0.30$, $p < 0.001$) and stronger nature connectedness ($\beta = 0.24$, $p < 0.001$) emerged as the strongest and most significant positive predictors of pro-environmental intentions, above and beyond the effects of age and gender. Age was no longer a significant predictor in the final model, whereas the effect of female gender weakened but remained significant ($\beta = 0.08$, $p = 0.027$).

The baseline model of MHC well-being was also significant—$F(2, 617) = 14.64$, $p < 0.001$—explaining 4.5% of the variance. Age was a significant positive predictor ($\beta = 0.21$, $p < 0.001$), whereas gender was not. Adding the psychological variables produced a significant improvement ($\Delta R^2 = 0.121$, $p < 0.001$), and the final model explained 16.6% of the variance, $F(4, 615) = 30.67$, $p < 0.001$. Climate hope ($\beta = 0.22$, $p < 0.001$) and nature connectedness ($\beta = 0.24$, $p < 0.001$) were significant positive predictors of well-being. Age remained a significant, though weaker, predictor ($\beta = 0.12$, $p = 0.003$), and gender remained non-significant. Finally, Hypothesis 3 was supported for both outcome variables, except for the effect of gender on mental health. Additionally, age was not retained in the final model of pro-environmental intentions.

Table 3. Hierarchical Multiple Regression Predicting Pro-environmental Intentions and Mental Health.

Predictors of Pro-environmental Behavior Intentions	Step 1: Estimate B, SE	Step 1: β	Step 1: *p*	Step 2: Estimate B, SE	95% CI	Step 2: β	95% CI	Step 2: *p*
Intercept	3.63 (0.13) ***		<0.001	2.01 (0.20) ***	[1.62, 2.40]			<0.001
Sociodemographic Variables								
Age	0.01 (0.00) **	0.11	0.007	0.00 (0.00)	[−0.01, 0.01]	0.00	[−0.07, 0.07]	0.998
Gender (female)	0.43 (0.09) ***	0.18	<0.001	0.20 (0.09) *	[0.01, 0.39]	0.08	[0.01, 0.16]	0.027
Psychological Variables								
Climate Hope				0.26 (0.03) ***	[0.19, 0.33]	0.30	[0.22, 0.38]	<0.001
Nature connectedness				0.21 (0.03) ***	[0.14, 0.28]	0.24	[0.16, 0.32]	<0.001
Model Statistics	$R^2 = 0.041$ F(2, 617) = 13.21 ***		<0.001	$R^2 = 0.211$ F(4, 615) = 41.16 ***				<0.001
				$\Delta R^2 = 0.170$ ***				<0.001
Predictors of Mental Health	Step 1: Estimate B, SE	Step 1: β	Step 1: *p*	Step 2: Estimate B, SE		Step 2: β	95% CI	Step 2: *p*
Intercept	3.22 (0.13) ***		<0.001	1.78 (0.20) ***	[1.37, 2.17]			<0.001
Sociodemographic Variables								
Age	0.02 (0.00) ***	0.21	<0.001	0.01 (0.00) **	[0.003, 0.015]	0.12	[0.04, 0.19]	0.003
Gender (female)	0.06 (0.09)	0.02	0.553	−0.14 (0.09)	[−0.32, 0.05]	−0.06	[−0.14, 0.02]	0.118
Psychological Variables								
Climate Hope				0.19 (0.03) ***	[0.12, 0.25]	0.22	[0.14, 0.29]	<0.001
Nature connectedness				0.21 (0.03) ***	[0.15, 0.28]	0.24	[0.17, 0.32]	<0.001
Model Statistics	$R^2 = 0.045$ F(2, 617) = 14.64 ***		<0.001	$R^2 = 0.166$ F(4, 615) = 30.67 ***				<0.001
				$\Delta R^2 = 0.121$ ***				<0.001

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. For categorical variables, the reference group was "Male" (for gender). Case-resampling bootstrap 95% confidence intervals (5000 resamples) gave the same pattern of significance for every predictor.

3.4. Mediation Analysis

To test Hypothesis 4 (4a and 4b), a mediation analysis was conducted. First, the mediation effect analysis identified a significant indirect pathway through nature connectedness (Model 1). Climate hope exerted a moderate positive influence on nature connectedness ($\beta = 0.27$, $p < 0.001$), which in turn significantly positively predicted pro-environmental intentions ($\beta = 0.25$, $p < 0.001$). Bootstrap analysis confirmed that nature connectedness is a significant but small mediator in the relationship between climate hope and pro-environmental intentions (indirect effect = 0.06, 95% CI [0.04, 0.09]) (see Table 4). This pattern is consistent with the proposed model, in which climate hope is linked to pro-environmental intentions partly through a stronger sense of connection with nature. The indirect effect accounted for 17% of the total effect, highlighting that nature connectedness represents a small but significant pathway linking climate hope to pro-environmental intentions.

Table 4. Effects of Climate Hope on Pro-Environmental Intentions and Mental Health through Nature Connectedness.

Effect	B (SE)	95% CI	β	95% CI
Model 1, outcome: Pro-environmental Intentions (H4a)				
a. Climate Hope → Nature Connectedness	0.26 (0.04)	[0.18, 0.35]	0.27	[0.19, 0.34]
b. Nature connectedness → Pro-environmental Intentions	0.22 (0.03)	[0.15, 0.28]	0.25	[0.17, 0.33]
Direct effect, c′	0.27 (0.04)	[0.20, 0.34]	0.32	[0.24, 0.39]
Indirect effect, a × b	0.06 (0.01)	[0.04, 0.09]	0.07	[0.04, 0.10]
Total effect	0.33 (0.03)	[0.26, 0.40]	0.38	[0.31, 0.46]
Proportion mediated	0.17 (0.04)	[0.10, 0.27]		
Model 2, outcome: Mental Health (H4b)				
a. Climate Hope → Nature Connectedness	0.26 (0.04)	[0.18, 0.35]	0.27	[0.19, 0.34]
b. Nature Connectedness → Mental Health	0.23 (0.03)	[0.17, 0.30]	0.27	[0.20, 0.34]
Direct effect, c′	0.19 (0.03)	[0.12, 0.25]	0.22	[0.14, 0.29]
Indirect effect, a × b	0.06 (0.01)	[0.04, 0.09]	0.07	[0.04, 0.10]
Total effect	0.25 (0.04)	[0.18, 0.32]	0.29	[0.21, 0.36]
Proportion mediated	0.25 (0.06)	[0.16, 0.38]		

Note: n = 620. No covariates. Bias-corrected bootstrap, 5000 resamples, for B and for the proportion mediated. Standardized intervals use the bootstrap standard error. All paths $p < 0.001$. The proportion mediated is the unrounded indirect effect divided by the unrounded total effect.

Second, nature connectedness was also found to be a significant mediator between climate hope and mental health (Model 2). Path analysis further revealed a significant direct effect from climate hope to mental health (β = 0.22, $p < 0.001$). All path coefficients are significant and confirmed the relations between climate hope and nature connectedness, and between nature connectedness and mental health. The indirect effect was small but significant (B = 0.06, 95% CI [0.04, 0.09]). This result is consistent with climate hope being linked to better mental health partly through stronger nature connectedness. The indirect effect accounted for 25% of the total effect, indicating that a sense of connection to nature serves as a significant, albeit weak, mediating factor in the relationship between hope in the context of climate change and mental health. When age and gender were added as covariates to both equations, both indirect effects remained significant (intentions: B = 0.04, 95% CI [0.02, 0.07], 14.5% of the total effect; mental health: B = 0.05, 95% CI [0.03, 0.07], 19.2% of the total effect).

4. Discussion

The present study examined whether climate hope and nature connectedness are associated with pro-environmental intentions and mental health. Overall, the findings support the role of both constructs as relevant psychological resources in the context of the climate crisis. Climate hope and nature connectedness were positively associated with pro-environmental intentions and well-being. Importantly, when added to the sociodemographic variables, both constructs remained significant predictors of both outcomes. For pro-environmental intentions, the explained variance increased from 4.1% to 21.1% ($\Delta R^2 = 0.170$), and for mental health, from 4.5% to 16.6% ($\Delta R^2 = 0.121$). These substantial increases suggest that psychological resources may provide greater explanatory value for both outcomes than sociodemographic characteristics alone.

Climate hope proved to be the strongest predictor of pro-environmental intentions (β = 0.30), which is consistent with the findings of earlier studies linking hope to engagement with climate issues [4–6,8]. This finding is consistent with the concept of hope as a motivational resource [2,3], and in the context of climate change, such a resource may

be particularly important, as awareness of environmental threats can foster agency and action. It has been shown that climate hope can encourage climate-friendly behavior, but also that the reverse is true: pro-environmental behavior can strengthen climate hope [44]. Hope and action may form a reinforcing feedback loop rather than a simple one-directional relationship. Importantly, climate hope should not be understood as mere optimism or a denial of climate threats. Rather, constructive hope may enable individuals to acknowledge the seriousness of climate change while retaining the conviction that meaningful action and positive change remain possible [4]. These findings therefore suggest that maintaining a realistic sense of possibility may be important for sustaining a willingness to engage with climate-related challenges.

A connection with nature was also an independent predictor of pro-environmental intentions ($\beta = 0.24$), which is consistent with previous evidence pointing to a link between a stronger connection with nature and environmental engagement [11,13,15,16]. Nature connectedness may be one of the earlier stages in the process leading to environmental self-identity, which in turn may influence intentions and behavior [45]. Although this relationship was somewhat weaker than that for climate hope, this finding suggests that these two constructs may represent complementary psychological pathways. A connection with nature may provide an emotional and identity-based foundation for concern for the natural world, while climate hope may contribute a more motivational, explicitly future-oriented dimension. Furthermore, their positive correlation ($r = 0.27$) suggests that these resources are interrelated, yet also complementary. Importantly, nature connectedness may not represent a fixed individual characteristic but rather a malleable psychological resource that can be strengthened through targeted interventions, suggesting a promising avenue for fostering both environmental engagement and psychological well-being [46].

The regression result confirms that the same psychological resources were also relevant for mental health. Climate hope and nature connectedness were both significant, independent factors of well-being after controlling for age and gender, jointly accounting for an additional 12.1% of the variance. In contrast to pro-environmental intentions, the two predictors contributed almost equally to well-being, with nature connectedness having a slightly greater contribution. The association of nature connectedness with well-being is consistent with literature on the emotional and psychological benefits of feeling like part of the natural world [11,13,15]. The association of climate hope with well-being suggests that, despite the threatening nature of climate change, hope may serve as a protective resource similarly to nature connectedness. Nevertheless, the sources of psychological well-being lie in an individual's general resources, such as a dispositional hope or social relationships [2,3,9,24]. Therefore, one should not expect a strong correlation between psychological well-being and climate hope or a connection to nature, because these constructs relate only to a narrow domain of life. Our findings are consistent with this explanation.

The mediation analyses add to this picture (Table 4). Nature connectedness partially mediated the relationship between climate hope and pro-environmental intentions. Climate hope was positively related to nature connectedness ($\beta = 0.27$), which in turn predicted intentions ($\beta = 0.25$), yielding a significant indirect effect (0.06). That accounted for about 17% of the total effect. Thus, most of the association between climate hope and intentions was direct, while nature connectedness offers one of the possible pathways. This pattern is consistent with the proposed model, in which hope is understood as a goal-oriented mindset accompanied by positive emotions. The motivational component of climate hope may drive action for the sake of the environment, while the emotional component may provide the courage to protect nature and enhance its value. A strengthened sense of connection to the natural world increases the motivation to take action [6–9]. This result is consistent with

the findings of Cao et al. [19], who demonstrated that a sense of connection to nature is a good predictor of engagement in sustainable actions.

Connection with nature also partially mediates the relationship between hope in the context of climate change and well-being. Both climate hope and nature connectedness were positively associated with mental health, with a standardized direct effect of climate hope ($\beta = 0.22$) and a standardized association between nature connectedness and mental health ($\beta = 0.27$). This is consistent with previous research linking a sense of connection with nature to eudaimonic well-being [13] and suggests that a connection with nature may have significance beyond environmental attitudes and intentions. The direct pathway is consistent with the view of hope as a resource that combines a sense of agency with the recognition of pathways to a goal, which supports self-regulation and mental health [3]. The paradox of mental health [47] lies in the possibility that individuals may remain psychologically functional despite experiencing negative symptoms, such as anxiety, while simultaneously experiencing positive psychological states such as hope [9].

From this perspective, climate hope, when translated to intentions and behavior, may materialize in well-being benefits, such as greater environmental mastery, higher life satisfaction, or a stronger sense of collective belonging. A comparable indirect pathway was observed for mental health. Climate hope was related to well-being both directly ($\beta = 0.22$) and indirectly through nature connectedness (indirect effect = 0.06). The mechanism by which a connection to nature mediates the relationship between climate hope and well-being is similar to the one described in the context of pro-environmental intentions. Climate hope may foster well-being through an emotional dimension that reinforces the conviction that nature is important and deserving of protection, which, in turn, may improve mental health by enhancing emotional well-being, self-esteem, and social relationships.

The results of the research further emphasize the importance of taking sociodemographic factors into account when analyzing pro-environmental intentions and mental health. Women demonstrated stronger pro-environmental intentions, which is consistent with previous research on gender differences in environmentalism [29]. These differences may partly reflect gender socialization processes that encourage women to adopt more other-oriented values [46], as well as gender differences in environmental identity and perceptions of climate change [47]. Gender differences should be analyzed with great caution due to the uneven distribution of men and women in the sample. It is worth noting that age was significant in the sociodemographic model predicting intentions but ceased to be significant once climate hope and a sense of connection with nature were taken into account. While sociodemographic differences may be relevant to pro-environmental behavior [34], psychological factors accounted for substantially more additional variance in pro-environmental intentions than the sociodemographic variables alone. In contrast to pro-environmental intentions, in the well-being model, age remained significant after climate hope and nature connectedness were entered ($\beta = 0.12$, $p = 0.003$), and gender was not significant at either step.

These findings have several practical implications. Climate communication and environmental education may benefit from moving beyond the transmission of knowledge alone, particularly given the documented knowledge–action gap [1]. Approaches that combine accurate information about climate risks with the fostering of climate hope can help promote sustainable action. Educational efforts aimed at building a connection with nature can strengthen one's engagement with the natural world. An additional personal benefit for those who feel connected to nature and remain hopeful about positive environmental change is an improvement in psychological well-being. Such approaches should nevertheless be evaluated empirically, as the present findings concern associations and intentions rather than observed behavior.

Several limitations should be acknowledged. First, the cross-sectional design precludes drawing causal conclusions; while it is theorized that hope and nature connectedness drive behavior, engaging in pro-environmental actions may also recursively foster hope and well-being [23,25]. Second, the study measured pro-environmental intentions rather than actual behavior. The gap between environmental knowledge, intentions, and objective actions is well-documented [1] and future research should use behavioral observations or longitudinal designs to verify these links. Finally, the sample was predominantly female (74.7%), which may limit the generalizability of the findings. These limitations highlight the need for longitudinal research integrating measures of psychological resources, pro-environmental intentions, and actual behavior.

5. Conclusions

Constructive climate hope and nature connectedness were associated with greater pro-environmental intentions and better well-being. Nature connectedness partially mediated the association between climate hope and pro-environmental intentions and mediated a modest indirect association with mental health. This corroborates recent meta-analytic evidence [8], which demonstrated that empowering, constructive hope is a key driver of climate engagement. Unlike hope based on denial, which often reduces pro-environmental behavior [6], constructive hope may motivate individuals to act despite the presence of climate-related anxiety [33].

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