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# Contribution to an Ecological Worldview: Adaptation and validation of the New Ecological Paradigm Scale to the European Portuguese language



Contribution à une vision écologique du monde : adaptation et validation de l'échelle du New Ecological Paradigm en langue portugaise européenne

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# ABSTRACT

*Introduction.* – The growing need for societies to adopt a more ecological and sustainable mindset highlights the importance of instruments such as the 15-item New Ecological Paradigm Scale (NEP Scale). The scale measures the individuals' endorsement of an ecological worldview, contrasting with the perspective of human dominance and exemptionalism.

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*Objective.* – This study aimed to validate the European Portuguese version of the NEP Scale using a cross-validation approach.

*Method.* – The total sample, consisting of 511 participants (56.4% women; aged between 18-73 years old), was split into two halves, with the first half used to perform an exploratory factor analysis (EFA) to refine the scale, and the second half to perform a confirmatory factor analysis (CFA).

*Results.* – The EFA revealed a 14- item two-factor latent structure, which was subsequently confirmed through CFA (CFI=0.98; TLI=0.97; RMSEA=0.04; SRMR=0.06). Internal consistency was assessed using Cronbach's alpha ( $\alpha$ ) and McDonald's omega ( $\omega$ s), with factor 1 (Ecocentrism;  $\alpha$ =.88;  $\omega$ s=.87), and factor 2 (Anthropocentrism;  $\alpha$ =.80;  $\omega$ s=.81) showing strong internal consistency. Significant moderate correlations between both NEP Scale dimensions and the Ecologically Conscious Consumer Behavior (ECCB) scale (r1=.383; r2=.313) provided convergent evidence for construct validity. The correlation between NEP dimensions was .70, indicating an acceptable discriminant validity.

*Conclusion.* – This study adds to the evidence of the European Portuguese version of NEP being a valid, reliable, and valuable tool for assessing environmental orientation within Portuguese speaking samples. Moreover, average NEP scores showed that the Portuguese are akin to a pro-ecological worldview (M = 3.72, SD = 0.68), specially among young women with low income.

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# RÉSUMÉ

*Introduction.* – La nécessité croissante pour les sociétés d'adopter un état d'esprit plus écologique et durable souligne l'importance d'instruments tels que l'échelle du nouveau paradigme écologique (échelle NEP), qui comporte 15 questions. Cette échelle mesure l'adhésion des individus à une vision écologique du monde, qui contraste avec la perspective de la domination humaine et de l'exemption. *Objectif.* – Cette étude visait à valider la version portugaise européenne de l'échelle NEP à l'aide d'une approche de validation croisée.

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Méthode. - L'échantillon total, composé de 511 participants (56,4 % de femmes, âgées de 18 à 73 ans), a été divisé en deux moitiés, la première servant à effectuer une analyse Powered by Editorial Manager® and ProduXion Manager<sup>®</sup> from Aries Systems Corporation factorielle exploratoire (AFE) pour affiner l'échelle, et la seconde à effectuer une analyse factorielle confirmatoire (AFC).

Résultats. – L'EFA a révélé une structure latente à deux facteurs de 14 éléments, qui a ensuite été confirmée par l'AFC (CFI = 0,98 ; TLI = 0,97 ; RMSEA = 0,04 ; SRMR = 0,06). La cohérence interne a été évaluée à l'aide de l'alpha de Cronbach ( $\alpha$ ) et de l'oméga de McDonald ( $\omega$ s), le facteur 1 (écocentrisme ;  $\alpha$  = 0,88 ;  $\omega$ s = 0,87) et le facteur 2 (anthropocentrisme ;  $\alpha = 0.80$  ;  $\omega s = 0.81$ ) présentant une forte cohérence interne. Des corrélations modérées significatives entre les deux dimensions de l'échelle NEP et l'échelle ECCB (r1 = .383 ; r2 = .313) ont fourni des preuves convergentes de la validité de la construction. La corrélation entre les dimensions du PEN était de 0,70, ce qui indique une validité discriminante acceptable.

Conclusion. – Cette étude ajoute à la preuve que la version portugaise européenne du NEP est un outil valide, fiable et précieux pour évaluer l'orientation environnementale au sein d'échantillons lusophones. En outre, les scores moyens au NEP ont montré que les Portugais ont une vision du monde pro-écologique (M = 3.72, SD = 0.68), en particulier chez les jeunes femmes à faible revenu.

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The increasing need for societies to embrace ecological and sustainable mindsets underscores the value of tools like the 15-item New Ecological Paradigm (NEP) Scale. The scale measures the individuals' endorsement of an ecological worldview. contrasting with the perspective of human dominance and exemptionalism. This study aimed to validate the European Portuguese version of the NEP Scale using a cross-validation approach. The total sample, consisting of 511 participants (56.4% women; aged between 18-73 years old), was split into two halves, with the first half used to perform an exploratory factor analysis (EFA) to refine the scale, and the second half to perform a confirmatory factor analysis (CFA). The EFA revealed a 14-item two-factor latent structure, which was subsequently confirmed through CFA (CFI=0.98; TLI=0.97; RMSEA=0.04; SRMR=0.06). Internal consistency was assessed using Cronbach's alpha ( $\alpha$ ) and McDonald's omega ( $\omega$ s), with factor 1 (Ecocentrism;  $\alpha$  = .88;  $\omega$ s = .87), and factor 2 (Anthropocentrism;  $\alpha$  = .80;  $\omega$ s = .81) showing strong internal consistency. Significant moderate correlations between both NEP Scale dimensions and the Ecologically Conscious Consumer Behavior (ECCB) scale ( $r_1 = .383$ ;  $r_2$  = .313) provided convergent evidence for construct validity. The correlation between NEP dimensions was .70, indicating an acceptable discriminant validity. This study adds to the evidence of the European Portuguese version of NEP being a valid, reliable, and valuable tool for assessing environmental orientation within Portuguese-speaking samples. Moreover, average NEP scores showed that the Portuguese are akin to a pro-ecological worldview (M=3.72, SD=0.68), specially among young women with low income.

# 1. Abbreviations

CFA	Confirmatory Factor Analysis
CITC	Corrected Item-Total Correlation
ECCB	Ecologically Conscious Consumer Behavior
EFA	Exploratory Factor Analysis

- DSP **Dominant Social Paradigm**
- Human Exemptionalism Paradigm HEP
- MIIC Mean Inter-Item Correlation
- Maximum Likelihood with Robust Standard Errors MLR
- NEP New Ecological Paradigm
- PA Parallel Analysis

# 2. Introduction

The first industrial revolution represented a significant milestone in societies' perception of the environment. Alongside unprecedented economic, technological, and population growth, the shift towards an industrialized world led humankind to believe that natural resources were unlimited and fated to be subdued according to their needs and interests (Dunlap, 2010; Steinberg, 1986). This era of faith in endless progress and resources' abundance nourished an anthropogenic vision of the environment, particularly in the field of sociology, later entitled the Human Exemptionalism Paradigm (HEP), also considered as the Dominant Social Paradigm (DSP; Catton & Dunlap, 1978; Dunlap, 2008). One of its key assumptions concerns the misconception that human beings are a unique and superior species endowed with ingenuity and cultural accumulation capable of solving the utmost problems, thus being exempted from any ecological constraints (Catton & Dunlap, 1978). However, the perception of the environment's limitations for socio-economic development, hitherto neglected, progressively began to change after the evidence of environmental consequences from industrialization and urbanization (e.g., Frisken, 1971; Meadows et al., 1972). The recognition of limits to growth triggered the attention of workers from different fields, including sociologists, who began to recognize the relevance of the environmental sphere. Fostered by the emergence of environmental sociology, the replacement of the anti-ecological traditional paradigm with the New Ecological Paradigm (NEP) started to be witnessed (Buttel, 1987; Catton & Dunlap, 1980; Dunlap, 2008). Unlike the HEP, the NEP proposes that humans live within an interdependent ecosystem with limited resources, where their actions can trigger feedback responses. Consequently, the social and ecological repercussions could pose a threat to societal development (Buttel, 1987; Catton & Dunlap, 1980; Dunlap, 1980, 2008)

At the time the HEP was dominant, it was evident how peoples' beliefs, values, and the way they perceive the world can impact their relationship with it - a period of high environmental exploitation that gave rise to environmental issues such as climate change. Since a "successful adaptation to the changed situations can be seriously impeded by archaic worldviews and obsolete scientific paradigms" (Catton & Dunlap, 1980, p. 31), the ecological movement also prompted a new body of research to discover and search for changes in societies' environmental attitudes and concerns (Rüdig, 2001). Given this purpose, Dunlap and Van Liere (1978) developed an instrument - the New Environmental Paradigm - as a measure of the population's endorsement of an ecological worldview, initially composed of 12 items. The latest revision was

proposed to address several objectives: (a) increase the number of items opposing the New Ecological Paradigm (NEP) to balance those favoring it; (b) enhance the theoretical scope by addressing concerns such as exceptionalism beliefs and the potential for an ecological crisis; (c) replace gender-biased language; and (d) introduce a midpoint on the response scale. This revised version culminated in a 15-item scale with improved psychometric properties, which was subsequently renamed the New Ecological Paradigm Scale (Dunlap et al., 2000).

Due to its relevance, the NEP Scale is considered the most widely used measure of environmental orientation, also used to assess other psychological dimensions related to the environment such as attitudes, values, and beliefs (Dunlap, 2008; Hawcroft & Milfont, 2010; Sookram, 2013). The rampant consumption of natural and energy resources has led to environmental challenges like climate change, with already evident repercussions across various levels. Extreme weather events (heatwaves, heavy precipitation, typhoons, cyclones), the melting and subsequent rise in mean sea level, the drying of soils, acidification of oceans, extinction of species, and threats to food production and security in agricultural fields (Allen et al., 2018; Wagner & Weitzman, 2016; WMO, 2018) are just a few manifestations of a crisis with negative implications for human health and life (Campbell-Lendrum et al., 2003; World Bank, 2014). The need for societies to shift towards a more ecological and sustainable paradigm is clear. Given this need, the NEP Scale can be useful for measuring the progress towards such societies.

Sociodemographic and cultural factors seem to play an important role in predicting environmental perceptions, with several studies using this instrument to evaluate the contribution of variables such as age, gender, cultural background, educational level, parental status, and area of residence (e.g., Berenguer et al., 2005; Costache & Sencovici, 2019; Johnson et al., 2004; Karpudewan, 2021; Ntanos et al., 2019; Spínola, 2016). Other studies have used this instrument to examine changes in endorsing an ecological worldview before and after interventions (Harraway et al., 2012; Woodworth et al., 2011) or to monitor the evolution of people's environmental concerns or attitudes (Shephard et al., 2014). Other studies have examined the relationship between holding an ecological worldview and the individual's propensity to exhibit other environmentalist attitudes, beliefs, or behaviors (e.g., Chang et al., 2016; Xue et al., 2016). Ntanos et al. (2019) found a positive correlation between NEP scores and the willingness to pay for the expansion of renewable energies. Interestingly, a pro-NEP vision showed a higher impact on this environmental attitude than income. These findings highlight the importance of policymakers and educational institutions in cultivating a stronger ecological endorsement. Regarding business and accounting students, there was an association between a stronger endorsement of the NEP and a heightened recognition of the need to integrate environmental education into the curriculum. These findings emphasize the utility of the NEP Scale to yield insights related to environmental attitudes, extending its application in the educational field (Ntanos et al., 2020). Another study concluded that behaviors like information seeking, green consumption, and recycling correlated positively with ecological sensitivity among students, as measured by the NEP Scale. However, active participation (such as volunteering for environmental cleanup or improvement projects) was unrelated to the NEP Scale. This poses questions regarding the need to motivate and encourage more proactive green involvement among students (Kyriakopoulos et al., 2020). Other studies based on Portuguese samples have also used the NEP to evaluate the link between environmental beliefs and scientific beliefs, such as confidence and prudence (Castro & Lima, 2001), while Spínola (2015, 2023) identified areas in environmental topics that need more focus in educational settings, aiming to elevate Portuguese students' commitment to sustainability. Guerra and Schmidt (2013) focused on the NEP results to analyze the paradigm shift in the Portuguese case, and consequently compare it with the European framework.

Given the high utility of the NEP scale across various research domains, it becomes important to adapt and validate this instrument for easier application in the Portuguese context. In the case of Portugal, a transnational study examined the latent factor structure using a sample from Algarve, a region in Portugal, and another one from Romania (Denis & Pereira, 2014). Although the authors found a five-factor model in both samples, the scope of the study focused on assessing the dimensionality and reliability of the NEP Scale. Additionally, Vidal et al. (2022) studied the psychometric properties and the factor structure of the NEP Scale among a sample of 132 urban green spaces users. Through EFA, they identified a fourfactor structure. However, neither of the aforementioned studies used a cross-validation process to ensure the validity of the instrument. Consequently, to the best of the authors' knowledge, there has been no study to date that has adapted and validated the NEP Scale for the adult population in European Portuguese.

# 3. Aims of the study

Current generations face a critical juncture in relation to environmental issues, and their perceptions have an impact on the current and future societies. The present study emphasizes the importance of environmental attitudes as a metric of progress towards environmentally conscious societies. In this context, the New Ecological Paradigm Scale, considered one of the most widely used instruments to measure people's ecological views, was deemed relevant for further study.

The aim of this study was threefold: 1) to adapt and validate the NEP Scale to allow the assessment of individuals' ecological worldview in future empirical studies conducted with European Portuguese-speaking samples; 2) to provide a descriptive analysis of the ecological orientations of the sample; and 3) to identify which sociodemographic variables (age, gender, current income, education level, family household) predict NEP endorsement.

# 4. Method

# 4.1. Participants

A sample comprising a total of 558 participants was recruited through a snowball sampling method from October 2020 to February 2021. The inclusion criteria were: 1) 18 years of age or older; 2) Portuguese citizenship; and 3) speak European Portuguese. From the original sample, participants were excluded for (a) not having a Portuguese nationality (n=7), and for (b) presenting missing values on the NEP Scale (n=40). The final sample comprised a total of 511 Portuguese, all European Portuguese speakers, aged between 18 and 73 years old (M=32.24; SD=12.67). More than half of the participants were women (n=288; 56.4%), and six participants preferred not to reveal their gender. Most participants have a higher education level (n=393; 76.9%) and the household size ranged between 1 and 7 individuals (M=3.36; SD=1.22) (see Table 1 for sociodemographic details).

# 4.2. Procedure

One of the authors of the original and revised versions of the NEP Scale conceded the use of the original instrument to be translated and culturally adapted into European Portuguese. After due author authorization, the present study was submitted and approved by the Ethics Committee of the University (ref. 82/2020). The procedure of translation and back-translation of the 15 items of the

NEP Scale from English to Portuguese was made independently by a bilingual native English professor and by two other individuals proficient in both languages. Adjustments were made as necessary. A survey was created on Qualtrics<sup>®</sup> and the link was shared on social media platforms, such as LinkedIn and Facebook. The link was also distributed through a personnel email network of authors. All participants acknowledged and accepted the informed consent before responding. This consent outlined the study's purpose, assured anonymity, and affirmed participants' right to withdraw. They took around 30 min to complete, as the survey also required participants to validate a set of ecological images with respect to their affective content, in addition to responding to both scales.

# 4.3. Measures

The European Portuguese version of the NEP Scale, adapted to access the endorsement of an ecological worldview in the Portuguese population, is derived from the 15-item English version of the NEP revised scale ( $\alpha$  = .83; Dunlap et al., 2000). The revised NEP scale was developed to encompass and assess the following five facets regarding an ecological worldview: the reality of limits to growth (items 1, 6, 11), antianthropocentrism (items 2, 7, 12), the fragility of nature's balance (items 3, 8, 13), rejection of exemptionalism (items 4, 9, 14), and the possibility of an ecocrisis (items 5, 10, 15) (Dunlap et al., 2000). The agreement with the oddstatements and the disagreement with the even-statements reflect a pro-ecological worldview. Responses were given on a five-point Likert scale (1–5), anchored from Strongly disagree (1) to Strongly agree (5). After recoding the inverted items (items 2, 4, 6, 8, 10, 12, 14), higher scores indicate a greater alignment of the individual's vision with the new ecological paradigm.

Participants' ecologically conscious consumer behavior, applied to various aspects of their daily consumption, was evaluated using the Ecologically Conscious Consumer Behavior scale (ECCB; Roberts, 1996). The ECCB is composed of 22 items and is answered on a five-point Likert scale (1 = "Never true" to 5 = "Always true"). For the present study, a response option of "non-applicable" was added since some items might not align with the respondent's profile (e.g., younger age groups who do not own a car or are not responsible for purchasing electrical appliances). This response was scored as zero, and an adjustment score was made to ensure comparable responses. In terms of consumption, it is considered that an individual's environmental consciousness manifests through the purchase of eco-friendly products. However, environmental orientation is recognized as a contributing factor to the practice of pro-environmental behaviors (Kollmuss & Aygeman, 2002) and is positively associated with consumption choices that have a lower environmental impact (e.g., Moon et al., 2016; None & Kumar Datta, 2011; Schlegelmilch et al., 1996). For this reason, the ECCB is considered a suitable instrument for testing the convergent validity of the NEP Scale. The internal consistency of the ECCB in this study was high ( $\alpha = .91$ ).

# 4.4. Data preparation and statistical analysis

The validation of the NEP Scale in European Portuguese proceeded through several steps. The initial step involved examining missing data, leading to the exclusion of responses from participants who had not answered all 15 items of NEP scale. Subsequently, the entire sample was randomly divided into two distinct subsamples: (a) the first was used to conduct a parallel analysis (PA) followed by an exploratory factor analysis (EFA); (b) the second subsample was reserved for a confirmatory factor analysis (CFA). The PA was conducted with 2000 random samples, aimed to extract the adequate number of latent factors (Pires et al., 2019). Then, the EFA was used to identify and refine the latent structure of the scale (Karami, 2014) using the Maximum likelihood with robust standard errors (MLR) method. Based on Reise et al.'s (2000) recommendations, acknowledging the likely presence of correlations between factors is more realistic, the GEOMIN (oblique) rotation was applied. Subsequently, a CFA was conducted to confirm whether the data observed in the first subsample presented a good fit to the pre-suggested latent structure (Mueller & Hancock, 2001). After confirming the factor-structure with the CFA, the total sample (N=511) was used to assess the convergent/discriminant validity and the reliability of the European Portuguese version of the NEP Scale, as suggested by Kyriazos (2018). The convergent validity was examined through correlations of its overall and subscales scores with the ECCB score, ensuring that the instrument measures its intended construct (Krabbe, 2017). For testing discriminant validity, Brown's (2006) recommendations relative to the observed inter-factor correlation were followed, where an inter-factor correlation above .80 suggests poor discriminant validity.

Total and subscale scores were subsequently computed as the mean item score for each scale using the entire sample (N=511). The internal reliability of each subscale and the overall scale was assessed using McDonald's omegas ( $\omega$ s and  $\omega$ t, respectively) and Cronbach's alpha (Costa et al., 2018). Following guidelines, values between .60 and .70 are indicative of acceptable internal consistency, while values between .70 and .95 indicate good consistency (Hair et al., 2009; Lee et al., 2005). Additionally, the mean interitem correlation (MIIC) and the corrected item-total correlation (CITC) were computed to estimate the items' homogeneity (Clark & Watson, 1995), and to test the discriminative power of each item and its contribution to the latent factor (Moreira et al., 2022), respectively. MIIC values between .15 and .50 are acceptable (Clark & Watson, 1995), while CITCs above .30 are considered adequate (Field, 2013; Nunnally & Bernstein, 1994). Finally, a multiple linear regression analysis was performed to predict the overall NEP Scale score based on sociodemographic variables such as gender, age, education level, current income, and family household.

Descriptive statistics, reliability, and regression analysis were performed with the JASP software (version 0.16.2). Both EFA and CFA were conducted using Mplus 8.3 software (Muthén & Muthén, 2017). In all statistical procedures, a significance level of 0.05 was set.

#### 5. Results

#### 5.1. Preliminary data and statistical assumptions checks

Since data from participants with at least one missing value on the NEP Scale were previously excluded from the analysis, it was not necessary to check for incomplete data. After reversing the evenitems, a random sampling procedure was performed to divide (1:1 ratio) the total sample into two subsamples: the calibration sample (n = 255) and the validation sample (n = 256) to conduct the EFA and CFA, respectively. The two subsamples presented similar sociodemographic variables, with chi-square tests indicating that gender,  $\chi 2$  (2) = 1.02, p = .602), educational level,  $\chi 2$  (4) = 6.47, p = .167, and current income,  $\chi 2$  (3) = 2.13, p = .546, were similarly distributed across both subsamples.

The descriptive statistics of the NEP 15 Scale items for the entire sample and both subsamples are presented in Table 2. Considering the total sample, item 7 from the original antian-thropocentrism facet ("Plants and animals have as much right as humans to exist") showed the highest average rating score (M = 4.29). Item 12 ("Humans were meant to rule over the rest of nature") from the same facet presented the greatest variability in responses (SD = 1.21) illustrating greater disagreement among the

Descriptive statistics of the total	sample ( <i>N</i> = 511).
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Demographic characteristics	Frequency (n)	(%)
Gender		
Women	288	56.4
Men	217	42.5
Prefer not to say	6	1.2
Education Level		
Primary School	3	0.6
Middle School	18	3.5
Secondary School	97	19.0
Higher Education	393	76.9
Current Income		
It is very difficult to live with it	37	7.2
It is difficult to live with it	82	16.0
I can live with it	225	44.0
Allows comfortable living	167	32.7
	М	SD
Age	32.24	12.67
Family household	3.36	1.22

sample regarding humanity's power over the remaining species and natural resources.

Before further analysis, multicollinearity and normality assumptions were evaluated to guarantee data consistency within both subsamples. All the predictor variables showed VIFs less than 5, suggesting no multicollinearity concerns for both subsamples. All items showed Skewness and Kurtosis scores within |2|, indicating that data distributions are close to a univariate normality (George & Mallery, 2010; Gravetter & Wallnau, 2014). However, in both subsamples Mardia's tests were significant (ps = .001) indicating a non-normal multivariate distribution. Consequently, the MLR estimation method was applied.

## 5.2. Exploratory Factor Analysis

An EFA was performed on the calibration sample (n=255) to evaluate the latent factor structure, using the MLE method and Goemin oblique rotation. The PA indicated a two-factor structure. To corroborate the PA results, sequential models encompassing 1-, 2-, 3-, 4-, and 5-factors were run (Bandalos & Finney, 2010). Based on the Bayesian Information Criterion (BIC; Izquierdo et al., 2014; Schwarz, 1978), the two-factor structure presented the lowest value (BIC = 10478.39) compared to other factor structures, indicating the best fit to the data (Kass & Raftery, 1995). Nevertheless, because all items are allowed to load on both factors in the EFA, it was important to set the following criteria to evaluate the quality of individual items: (a) loadings > .45 and statistically significant (p < .05) to be considered an important contribution to the factor (Comrey& Lee, 1992; Hair et al., 2009), and (b) a difference of at least .15 between the primary and alternative factor loading (Post & Walma van der Molen, 2018). Because item 6 ("The Earth has plenty of natural resources if we just learn how to develop them") presented salient cross-loading in both factors ( $F_1$  = .48 and  $F_2$  = .53), it was considered ambiguous and then removed from the scale structure. After reperforming an EFA, a final two-factor solution with 14 items was found, as shown in Table 3. Factor loadings for all items were statistically significant and the two latent factors were found to be positively correlated (r=.397; p<.05). Factor 1 was labeled "Ecocentrism" since it relates to the recognition that natural resources are limited and that the balance of nature needs to be respected and preserved by the human being. It consists of 8 items (1, 3, 5, 7, 9, 11, 13, 15; Eigenvalue = 5.37) and explains 38.35% of the variation. In turn, factor 2 was entitled "Anthropocentrism" since individuals who disagree with the statements go against the anthropocentric vision that nature exists to serve humans on the first row and with their capability to be exempted from any environmental problem.

This factor is composed of 6 items (2, 4, 8, 10, 12, 14; Eigenvalue = 2.32) and represents 16.60% of the explained variation.

# 5.3. Confirmatory Factor Analysis

In relation to CFA, an examination was carried out to assess the degree to which the factor structure suggested by EFA aligned with the validation results using the second subsample (n=256). The following fit indexes were used to assess the validity of the stand-alone model: (1) the comparative fit index (CFI); (2) the Tucker-Lewis index (TLI); (3) the root mean square error of approximation (RMSEA); and (4) the standardized root mean square residual (SRMR). According to recommended cut-off criteria, CFI and TLI values over .90 are indicators of an acceptable model fit, with values closer to or exceeding .95 being the ideal (Hu & Bentler, 1999). SRMR should be below .08 to indicate a good fit, and an RMSEA cut-off point up to .05 reveals an excellent fit with values between .06 to .08 revealing an acceptable fit (Hair et al., 2009; Hu & Bentler, 1999). Examining modification indices, some constraint misspecifications in the model were suggested (change in chi-square  $\geq$  30). Thus, two residual covariances were incorporated between items 11 and 13 from factor 1 (Ecocentrism), and between items 4 and 14 from factor 2 (Anthropocentrism). The respecified CFA model revealed an adequate fit of the twofactor model to the observed data (CFI = .98; TLI = .97; RMSEA = .04; SRMR = .06) with all the items being explained by the latent factor (all items were statistically significant at .05). Therefore, the final structure with 14 items distributed among 2 factors, with factor loadings ranging from .33 to .85, was confirmed to be in line with the previous hypothesized structure (Fig. 1).

# 5.4. Convergent and Discriminant Validity

The two factors' convergent validity was analyzed by the correlation between each factor and the ECCB 22-item version (Roberts, 1996). Pearson's correlation coefficients showed positive associations between the ECCB scale and the NEP Scale dimensions, Ecocentrism (r=.383; p=.001) and Anthropocentrism (r=.313; p=.001), and the overall scores (r=.414; p=.001) indicating convergent validity. Therefore, it is confirmed that both factors from the Portuguese version of the NEP Scale measure the same construct. To assess the instrument's discriminant validity, the correlation between both factors was assessed, as recommended by Brown (2006). The CFA indicated an acceptable discriminant validity of the instrument with an inter-factor correlation of .70, respecting the recommended cut-off point (< .80).

# 5.5. Reliability

As shown in Table 4 , both dimensions demonstrate adequate reliability ( $\omega$ t,  $\omega$ s, and  $\alpha$  > .70 for the two constructs) suggesting good internal consistency (Hair et al., 2009; Rosa et al., 2022; Pires et al., 2019). Both MIICs values varied between .15 and .50, confirming that the items belonging to each factor exhibit a certain uniformity among themselves but do not present isomorphism (Clark & Watson, 1995). Finally, the CITCs values were checked, with all items having satisfactory values above .30 in accordance with conventional criterion (e.g., Field, 2013; Nunnally & Bernstein, 1994), revealing a good discriminating power for both subscales. However, in the case of the Overall NEP score, it was observed that item 4 exhibited a CITC of .23, falling below the recommended threshold of .3 (Field, 2013).

Furthermore, after confirming its validity and reliability and the intercorrelation of .70 between the factors in the CFA, there is evidence to support the use of the scale as an overall score, and for treating each subscale separately. In addition, the average scores

Descriptive Statistics for each item by Total Sample (N=511), Calibration Sample (n=255), and Validation Sample (n=256).

Items	Total Sample (N=511)		Calibration sample - EFA (n=255)		Validation sample - CFA (n=256)	
	M	SD	M	SD	M	SD
1. We are approaching the limit of the number of people the Earth can support.	3.45	1.17	3.46	1.15	3.54	1.16
(Nós estamos a aproximar-nos do limite do número de pessoas que a Terra consegue suportar.)						
<ul> <li>2. Humans have the right to modify the natural environment to suit their needs. (R)</li> <li>(Os humanos têm o direito de modificar o ambiente natural reme environment index)</li> </ul>	3.83	1.14	3.85	1.13	2.08	1.11
<ul> <li>3. When humans interfere with nature it often produces disastrous consequences.</li> <li>(Quando os humanos interferem com a natureza isso traz,</li> </ul>	3.85	1.05	3.80	1.05	3.86	1.08
<b>4. Human ingenuity will ensure that we do not make the Earth unlivable. (R)</b> (A engenhosidade Humana vai assegurar que a Terra não se tarma inghitával.)	3.04	1.16	3.05	1.15	2.88	1.16
<b>5. Humans are seriously abusing the environment.</b> (Os humanos estão a abusar seriomente do ambiente )	4.12	1.04	4.11	1.02	4.10	1.06
<ul> <li>6. The Earth has plenty of natural resources if we just learn how to develop them. (R)</li> <li>(A Terra tem recursos naturais infindáveis se nós aprendermos aprender decemvelvá lo )</li> </ul>	2.25	1.05	2.19	1.05	3.72	1.02
<ul> <li>7. Plants and animals have as much right as humans to exist. (As plantas e os animais têm tanto direito de existir como os humanos.)</li> </ul>	4.29	0.98	4.29	1.00	4.25	1.03
<ul> <li>8. The balance of nature is strong enough to cope with the impacts of modern industrial nations. (R)</li> <li>(O equilibrio da natureza é suficientemente forte para lidar com o impacto das nacões industriais modernas.)</li> </ul>	3.69	1.18	3.73	1.16	2.25	1.15
<ul> <li>9. Despite our special abilities, humans are still subject to the laws of nature.</li> <li>(Apesar das nossas capacidades especiais, os Humanos continuum suicitos às lais da natureza )</li> </ul>	4.14	0.97	4.11	0.97	4.10	1.01
<b>10.</b> The so-called "ecological crisis" facing humankind has been greatly exaggerated. (R) (A chamada "crise ecológica" que a humanidade enfrenta tem sido muito exagerada.)	3.74	1.17	3.81	1.15	2.21	1.19
<ul> <li>11. The Earth is like a spaceship with very limited room and resources.</li> <li>(O planeta Terra é como uma nave espacial com espaço e regursos muito limitedos.)</li> </ul>	3.41	1.16	3.35	1.16	3.43	1.14
<b>12. Humans were meant to rule over the rest of nature. (R)</b> (Os humans estão destinados a controlar o resto da natureza )	3.79	1.21	3.75	1.21	2.18	1.21
13. The balance of nature is very delicate and easily upset. (O equilibrio da natureza é muito delicado e facilmente perturbado.)	3.70	1.11	3.70	1.11	3.75	1.11
<ul> <li>14. Humans will eventually learn enough about how nature works to be able to control it. (R)</li> <li>(Os humanos irão eventualmente aprender o suficiente como a natureza funciona para pader controlá-la )</li> </ul>	3.31	1.15	3.25	1.16	2.70	1.14
<ul> <li>15. If things continue on their present course, we will soon experience a major ecological catastrophe. (Se as coisas continuarem desta forma, nós iremos experienciar, em breve, a major catástrofe ecológica.)</li> </ul>	3.94	1.10	3.90	1.17	3.93	1.14

for NEP (both total scale and subscales) presented similar values, all above 3, which is the midpoint of the scale, as shown in Table 4. The final European Portuguese version of the NEP scale, along with scoring instructions, is provided in the Appendix.

#### 5.6. Sociodemographic predictors of an ecological worldview

Prior to multiple regression analysis, various assumptions about using linear multiple regression were examined: linearity, multicollinearity, independence of residuals, normality of residuals, and presence of outliers. Linearity was assessed both with scatter plots and bivariate correlations between each sociodemographic variable and the overall NEP scale score. The linearity between gender and overall NEP scale score was examined using the pointbiserial correlation, after excluding the category "Prefer not to say" due to its small representation in the study sample. Men were coded with 0 and women with 1 (dummy coding). These showed that current income, age, and gender had a linear relationship with the overall NEP scale score, thus meeting the assumption of linearity. The family household and education level were not linearly correlated with the NEP scale score (p > .05), and therefore were not included in the statistical model.

With regards to multicollinearity, the VIF was calculated, showing that none of the remaining independent variables (gender, age, and current income) presented multicollinearity problems (all VIFs < 10) (Hair et al., 2009). Durbin–Watson (D–W) test was used to examine the independence of residuals (lack of autocorrelation). D–W was 1.52, which is in the acceptable range (1.5 to 2.5) accor-



Fig. 1. Measurement model (CFA) of the European Portuguese version of the NEP Scale (*n* = 256). Two-headed arrows between ellipses represent the inter-factor correlation after items from the Anthropocentrism factor have been recoded. Arrows to the right indicate standardized regression weights between latent factors and items of the NEP scale. Residual variances (standardized) for each item are presented in small circles. Double-headed arrows between small circles represent residual covariances.

Two factor-structure of the Portuguese version of the NEP Scale and respective factor loadings and communalities.

Items		Factors	
	1	2	
5. Humans are seriously abusing the environment.	0.82	0.03	0.30
(Os humanos estão a abusar seriamente do ambiente.)			
15. If things continue on their present course, we will soon experience a major ecological catastrophe.	0.79	-0.02	0.45
(Se as coisas continuarem desta forma, nós iremos experienciar, em breve, a maior catástrofe ecológica.)			
3. When humans interfere with nature it often produces disastrous consequences.	0.77	0.14	0.58
(Quando os humanos interferem com a natureza isso traz, frequentemente, consequências desastrosas.)			
7. Plants and animals have as much right as humans to exist.	0.72	0.03	0.34
(As plantas e os animais têm tanto direito de existir como os humanos.)			
9. Despite our special abilities, humans are still subject to the laws of nature.	0.65	-0.01	0.69
(Apesar das nossas capacidades especiais, os Humanos continuam sujeitos às leis da natureza.)			
13. The balance of nature is very delicate and easily upset.	0.61	-0.03	0.54
(O equilíbrio da natureza é muito delicado e facilmente perturbado.)			
1. We are approaching the limit of the number of people the Earth can support.	0.56	-0.02	0.48
(Nós estamos a aproximar-nos do limite do número de pessoas que a Terra consegue suportar.)			
11. The Earth is like a spaceship with very limited room and resources.	0.51	-0.14	0.42
(O planeta Terra é como uma nave espacial com espaço e recursos muito limitados.)			
12. Humans were meant to rule over the rest of nature. (R)	0.01	0.74	0.45
(Os humanos estão destinados a controlar o resto da natureza.)			
14. Humans will eventually learn enough about how nature works to be able to control it. (R)	0.11	0.71	0.23
(Os humanos irão eventualmente aprender o suficiente como a natureza funciona para poder controlá-la.)			
4. Human ingenuity will ensure that we do not make the Earth unlivable. (R)	-0.22	0.64	0.55
(A engenhosidade Humana vai assegurar que a Terra não se torne inabitável.)			
2. Humans have the right to modify the natural environment to suit their needs. (R)	0.15	0.59	0.36
(Os humanos têm o direito de modificar o ambiente natural para satisfazer as suas necessidades.)			
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations. (R)	0.22	0.58	0.45
(O equilíbrio da natureza é suficientemente forte para lidar com o impacto das nações industriais modernas.)			
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated. (R)	0.27	0.52	0.72
(A chamada "crise ecológica" que a humanidade enfrenta tem sido muito exagerada.)			

Note. h<sup>2</sup>: communality. Items shown in bold significantly loaded greater than .45 onto their factors (*p* < 0.05) and are sorted in descending order of absolute magnitude.

Descriptive and Reliability measures for NEP total scale and its subscales.

	Descriptive measures		Reliability measures		
	M (SD)	McDonald's omega	Cronbach's alpha	MIIC	CITC
Factor 1 Ecocentrism	3.86 (0.77)	.87	.88	.46	All items > 40
Factor 2 Anthropocentrism	3.56 (0.83)	.81	.80	.40	All items > 40
Overall NEP score (average)	3.72 (0.68)	.92	-	.33	All items > 40, except item 4 (.23)

MIIC: mean inter-item correlation; CITC: corrected item-total correlation.

#### Table 5

Regression model summary for age, current income and gender predicting overall NEP scale score.

Model	Unstandardized Coefficients		Standardized coefficients	t	р
	В	SE	Beta		
Constant	4.21	0.10		124.26	<.001
Age	-0.01	0.00	01	-2.46	.014
Current income	-0.23	0.03	.29	7.33	<.001
Gender <sup>a</sup>	0.40	0.05	30	-7.49	<.001

<sup>a</sup> Reference category: Men (coded as 0).

ding to Turner's recommendations (Turner, 2020). The normality of residuals was assessed through a standardized residuals histogram. A symmetric bell shape indicated that the normality assumption was met. Finally, Cook's distance (Cook' D) was calculated to detect any influential observations. This measure estimates the influence of a data point, considering both the leverage and residual of each observation. Cook' D > 1 indicates substantial influence by the case in affecting the estimated regression coefficients (Kim & Storer, 1996). In our model, no influential outliers were found.

Then, a multiple regression model including age, gender, and current income as predictors of overall NEP scale score was examined.

The results revealed that the regression model has explanatory power ( $R^2 = 0.21$ , F(3, 497) = 44.34, p < .001), explaining 21.1% of the variance in the ecological worldview. The regression coefficients are presented in Table 5.

All the sociodemographic variables included in the statistical model were significant predictors of the NEP Scale overall score. Specifically, it was found that age and current income were both negatively associated with the ecological worldview, whereas gender was positively associated with higher scores on NEP Scale. Based on how gender was categorized in the model, women tended to express a greater alignment with an ecological worldview compared to men. Overall, the results indicate that a pro-ecological worldview is higher for young women with a lower income.

### 6. Discussion

The NEP Scale was developed to measure individuals' ecological orientation and concern. Due to its relevance and strong popularity, this cross-sectional study aimed to adapt and validate this instrument in a sample of adult European Portuguese speakers.

Results from the EFA revealed that 14 items of the original 15items of the NEP Scale had salient loadings in one of the two factors. Item 6 ("The Earth has plenty of natural resources if we just learn how to develop them") was removed from the analysis and thus excluded from the scale due to strong cross-loadings on both latent factors. In the original revised NEP Scale (Dunlap et al., 2000), this item belonged to the dimension "Limits to growth", which reflects a lower ecological orientation, and intended to test the idea of resources' limitation. However, in the present study, this item was not clearly associated with either factor, therefore its interpretation will be more open to multiple interpretations, potentially leading to difficulties in categorizing it. One of the possible interpretations for item 6 might be related to the reference "develop them". The act of developing could have been associated with harnessing and transforming natural resources into more renewable and sustainable types of energy, such as solar panels, hydropower, or wind power, which aligns with the increasingly contemporary efforts towards renewable energy (e.g., McKinsey Sustainability, 2017), and environmental actions like recycling. A comparable trend was found in Spínola's research (2023), which examined the environmental orientation of students from Madeira Island. Spínola's study revealed that while the average students' scores indicated an ecological orientation among the sample, there was minimal disagreement with item 6. This suggests that these students also interpreted the item in a manner that aligns with a feeling of hope and belief in humanity's capacity to positively impact the management of natural resources, thus preventing the rendering of Earth uninhabitable. This optimistic perspective was also verified in the study conducted by Vaněk (2017), who found that most of the participants strongly agreed with item 6, although the three countries analyzed had shown a pro-ecological worldview.

In the present study, a two-factorial structure was found with one factor being entitled "Ecocentrism" composed of 8 items, and the other as "Anthropocentrism" consisting of 6 items. These results are in alignment with previous validations of the scale conducted across diverse cultural contexts, which also revealed a bifactorial structure (Dyr & Prusik, 2020; Moyano-Diaz & Palomo-Vélez, 2014; Nistor, 2012; Reis Neto et al., 2021; Reyna et al., 2018; Sánchez-Domínguez et al., 2021; Xue et al., 2016). Within the scope of the current study, it becomes apparent that factor 1, denoted as 'Ecocentrism', is associated with the recognition of a potential ecological crisis and the need to preserve the eco-environment. On the other hand, factor 2, designated as "Anthropocentrism' measures the level of agreement with nature's dominance for human gain. The EFA showed a pattern of distribution wherein odd items were predominantly aligned with the ecocentrism factor, while even items were loaded on the anthropocentric factor. Similar results were observed in different countries, such as Argentina (Reyna et al., 2018), Chile (Moyano-Diaz & Palomo-Vélez, 2014), and Brazil (Reis Neto et al., 2021). Nevertheless, it is important to note that other authors did not find this distribution pattern. For instance, in the studies conducted by Dyr and Prusik (2020) and by

Xue et al. (2016), the item 7 ("Plants and animals have as much right as humans to exist") exhibited significant loading on the factor associated with human dominance and anthropocentrism.

The current validated version may alter the original balance between odd and even-numbered numbers items due to the omission of item 6. However, it does not appear to introduce acquiescence bias. In addition to the observed variability across various cultures and samples (as highlighted in Dunlap et al., 2000 and Fleury-Bahi et al., 2015), discrepancies in scale length can also pose challenges when attempting cross-cultural comparisons. This concern has been demonstrated to affect NEP scores (Hawcroft & Milfont, 2010). For instance, in Sánchez-Domínguez et al. (2021) examination of the NEP Scale factor structure with a sample of Mexican university students, they retained only one even-numbered item, resulting in a validated bi-factorial version comprising 9 items. In the Polish adaptation (Dyr & Prusik, 2020), the 12-item bi-factorial structure demonstrated the most favorable performance. The authors intentionally chose to retain three items showing cross-loaded values, while raising the concern that the use of general questions can lead to open interpretation.

In the current study, the CFA confirmed the two-factor structure with all the 14 items being statistically explained by the expected factor. After observing the modification indices (Brown, 2006), an improvement in the fit of the data was identified after assuming the correlation of measurement errors between two pairs of items. Items 4 and 14 relate to human ingenuity (item 4) and the ability to learn (item 14), emphasizing mankind's potential to control nature and address environmental challenges. These items share a semantic similarity regarding human resourcefulness. The error covariance between items 11 and 13 was assumed because of the close semantic similarity between these items in the Portuguese language. Both statements refer to the vulnerability of nature (very limited, very delicate) and point out the importance of balance (easily upset; item 13) between demand for natural resources and the capacity of the Earth (limited resources; item 11).

Concerning reliability, Cronbach's a and McDonald's w demonstrated a good internal consistency for both factors ( $\alpha_1 = .88$ ,  $\omega 1 = .87$ ;  $\alpha_2 = .80$ ,  $\omega_2 = .81$ ). Dyr and Prusik (2020) also presented these two reliability indexes, highlighting the need for caution when employing the Polish validated version due to perceived low reliability, particularly in the factor related to limits of nature ( $\alpha$  and  $\omega$  < .64), which corresponds in the present validation to the ecocentric dimension. Other studies have only reported Cronbach's, which fell below .70 in some countries, such as the cases of Argentina (Reyna et al., 2018), Chile (Moyano-Diaz & Palomo-Vélez, 2014), and Brazil (Reis Neto et al., 2021). Specifically, in the Brazilian sample,  $\alpha$  was .56. This result led the authors to raise concerns regarding the adequacy of content or the number of items belonging to the anthropocentric dimension. Importantly, such limitations were not observed in the current study validating the NEP scale in European Portuguese, where both dimensions showed good reliability in measuring the ecological worldview.

Regarding convergent validity, the relation between the NEP Scale and the ECCB scale was examined, as both instruments aim to assess individuals' ecological perspectives concerning the world (attitudes) and consumption (behavior). The results showed significant moderate positive correlations between the two dimensions of the NEP Scale and the ECCB scale, suggesting that both scales appear to measure similar underlying constructs or aspects of environmental attitudes and behaviors, This implies that individuals who score high on NEP Scale are likely to exhibit a higher inclination towards engaging in conservation behaviors. It also indicates the utility in assessing a shared aspect of individuals' environmental orientations. However, because the relation is not strong, each measure seems to capture complementary information about individuals' environmental attitudes and behaviors. In addition, discriminant validity was considered satisfactory as the inter-factor correlation of .70 meets the criteria (Brown, 2006). Considering this finding, in the future, it would be relevant to examine the presence of one general factor (g factor) through a bifactor analysis.

Finally, adequate reliability was observed for each dimension of the NEP Scale with McDonald's  $\omega$  and Cronbach's  $\alpha$  values > .70 and MIIC values within the recommended range. An analysis of the CITC values also revealed a good discriminating power of items. Furthermore, despite item 4 demonstrating limited discriminatory power in relation to the overall NEP score, it is recommended to include this item in the computation of the global score, as it has minimal impact on Cronbach's  $\alpha$ .

Additionally, it was found that the average NEP score was above 3. It is widely accepted that a NEP score of 3 serves as the boundary between an anthropocentric and a pro-ecological worldview (see Rideout et al., 2005; Van Petegem & Blieck, 2006). In this study, the average score for the NEP Scale was 3.72, indicating that ecological attitudes within this Portuguese sample were more aligned with a pro-ecological worldview. This finding is consistent with the orientation observed in the sample collected in Algarve region, which also exhibited a pro-NEP endorsement of 3.41, albeit slightly lower (Denis & Pereira, 2014). One factors that may explain this pro-ecological trend is the increased investment of teaching institutions in environmental education in recent years (Schmidt et al., 2011). While in the present study, education level did not emerge as a significant predictor of NEP score, past research suggests that students from higher education institutions tend to be well-informed about environmental problems, and are conscious of the importance of environmental protection and sustainability for the future (Aleixo et al., 2021; Sousa et al., 2020). Therefore, these findings might be attributed to the relatively small variation in education levels in our sample, as most participants (95.9%) reported having at least a secondary education, with many being undergraduate or master's students. This restricted range, as noted in previous studies (e.g., Abrami et al., 2001; Aron & Aron, 2003), may explain for the reduced variability in both education level and the NEP scale score (1-5), ultimately resulting in a non-significant correlation coefficient. Moreover, the current digital era has facilitated the rapid and effortless dissemination of information via social media, which seem to be an effective tool for raising environmental awareness (Mallick & Bajpai, 2019). Online platforms have empowered environmental activists, non-governmental organizations such as Greenpeace, companies, and even everyday citizens with the opportunity to encourage others to support ecological causes and advocate for a change in behaviors.

In Portugal, the recognition of nature's constraints may also be triggered by the increasingly visible consequences of climate change within the country. The climate in Portugal is progressively becoming drier, marked by prolonged hot seasons and shorter periods of rainfall, leading to concerns of water scarcity. In turn, the repercussions of hydric stress, including drought and desertification, are having a strong impact on the agricultural sectors, such as cereal and olive production, the wine industry, and livestock farming. Every year, several wildfires are also registered, and local populations are threatened. In 2017, strong winds stemming from Hurricane Ophelia coupled with dry soil and extreme temperatures resulted in a highly burnt area and the drastic loss of over 120 human lives (Turco et al., 2019). On the other hand, when there are extreme rainfall events, land displacement and floods near housing areas have a severe impact on the population (Schleussner et al., 2019). The combination of all these extreme events related to nature may contribute to a feeling of helplessness and smallness that may explain the anti-anthropocentric pattern of this Portuguese sample. For an in-depth review, refer to the report on climate impacts in Portugal by Schleussner et al. (2019), and the recent

review by Medeiros (2023) which underscores the critical risks facing the Portuguese territory in the upcoming decades, and some of European Union funding initiatives aimed at managing and mitigating climate changes.

Regarding the predictors of an ecological worldview, gender, age, and current income were found to be significant factors, collectively explaining 21.1% of the variance in NEP scores. In relation to gender, women showed a more pronounced proenvironmental view compared to men. This aligns with previous research indicating that females tend to express greater concerns about environmental issues (e.g., Harraway et al., 2012; Johnson et al., 2004; McCright, 2010). Although other studies reported contradictory findings (e.g., Moyano-Diaz & Palomo-Vélez, 2014), the current results provide additional support for this gender difference and recommend further investigation about the underlying reasons why women tend to show a greater ecocentric perspective. These findings prompt questions regarding societal roles, as women are often characterized as being more protective, nurturing, and compassionate (Casey & Scott, 2006; Zelezny et al., 2000), while men tend to lean toward more technocentric attitudes, reflecting a stronger belief in the role of technology in addressing environmental issues (Müderrisoglu & Altanlar, 2011). Aligned with the findings from past research, the current study also showed that younger individuals tend to report a higher pro-NEP endorsement (e.g., Dunlap et al., 2000; Johnson et al., 2004; Reyna et al., 2018). Additionally, income was negatively related with NEP scores, in line with the original findings presented in the revised NEP scale by Dunlap et al. (2000) and with the Grendstad (2007) study, who identified that higher income was significantly related to lower ecological concerns among a sample of organized environmentalists. Other studies presented contradictory evidence, with some studies not finding significant associations between income and NEP scores (Ntanos et al., 2019; Denis & Pereira, 2014), and others (Atik et al., 2021) reporting that students from families with higher incomes exhibited a higher level of environmental attitudes and positing that individuals with lower incomes prioritize other basic needs over environmental problems. Given these mixed findings about the role of income in predicting ecological concerns, it is recommended to further investigate this relationship, both in the general population and among environmental activists. Moreover, it is recommended to use specific numerical thresholds for income, as the present study employed a scale subject to respondents' interpretation.

# 7. Conclusions

Societies are currently contending with the consequences of an era characterized by excessive environmental exploitation, underscoring the increasing imperative to transition towards a sustainable present and future. In this regard, instruments such as the NEP Scale provide relevant insights into individuals' environmental orientations. It can serve as a valuable instrument for monitoring progress, identifying influential variables, and ultimately pinpointing specific areas or topics that require attention and action to cultivate environmentally conscious societies.

To optimize the applicability of this scale within European Portuguese samples, this study aimed to evaluate the psychometric properties of a Portuguese adaptation of the 15-item revised NEP Scale. Employing a cross-validation approach involving both exploratory and confirmatory factor analyses, a two-factor solution with 14 items emerged as the most suitable model for the observed data. Although this adaptation does not entirely replicate the original revised version and diverges from the unidimensional structure initially proposed by its creators (Dunlap et al., 2000), it demonstrated robust psychometric properties. Both NEP dimensions (Ecocentrism and Anthropocentrism) showed high reliability. Additionally, the scale displayed evidence of both convergent and discriminant validity, making it a suitable and reliable choice for research focused on European Portuguese samples. This study also addressed the role of sociodemographic characteristics within the sample on NEP scores, with age, gender, and income emerging as significant predictors of NEP score.

Nevertheless, some limitations have been identified. The use of a non-probabilistic sample restricts the generalizability of the findings to the broader Portuguese population, notably because a substantial portion of the collected sample comprises highly educated individuals. Additionally, the choice of a cross-sectional design precludes the ability to draw conclusions about the instrument's temporal stability. Future research should consider implementing test-retest procedures to assess the instrument's temporal stability.

To enhance the robustness of the results, future studies should test the measurement invariance of the European Portuguese NEP Scale through multiple group analysis. Additionally, non-sampledependent techniques, such as Item Response Theory, could be applied to refine the instrument further and ensure its reliability across diverse populations. (e.g., Lopes et al., 2018). Furthermore, it would be valuable in future research to examine the impact of wording on the European Portuguese version, since a recent article focused on enhancing the structure of the NEP in the Chinese language posited that the wording effect may be the reason why some studies have not confirmed the unidimensional structure of the scale (Tang et al., 2023).

# **Disclosure of interest**

The authors declare that they have no competing interests.

# Availability of data

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

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# Références

- Abrami, P. C., Cholmsky, P., & Gordon, R. (2001). Statistical analysis for the social sciences: An interactive approach. Allyn & Bacon.
- Aron, A., & Aron, E. N. (2003). Statistics for psychology (3rd ed.). Prentice-Hall.
- Aleixo, A. M., Leal, S., & Azeiteiro, U. M. (2021). Higher education students' perceptions of sustainable development in Portugal. *Journal of Cleaner Production*, 327, 129429. https://doi.org/10.1016/j.jclepro.2021.129429
- Allen, M. R., Dube, O. P., & Solecki, W. (2018). Impacts of 1.5 °C global warming on natural and human systems (Chapter 1). IPCC. https://www.ipcc.ch/sr15/chapter/chapter-1/
- Atik, A. D., Işıldar, G. Y., & Erkoç, F. (2021). Prediction of secondary school students' environmental attitudes by a logistic regression model. Environment, Development and Sustainability, 24, 4355–4370. https://doi.org/10.1007/s10668-021-01618-3
- Bandalos, D. L., & Finney, S. J. (2010). Exploratory and confirmatory factor analysis. In G. R. Hancock, & R. O. Mueller (Eds.), Quantitative Methods in the Social and Behavioral Sciences: A Guide for Researchers and Reviewers. Routledge.
- Berenguer, J., Corraliza, J. A., & Martín, R. (2005). Rural-urban differences in environmental concern, attitudes, and actions. European Journal of Psychological Assessment, 21(2), 128–138. https://doi.org/10.1027/1015-5759.21.2.128
- Brown, T. A. (2006). Confirmatory factor analysis for applied research. The Guilford Press.
- Buttel, F. H. (1987). New directions in environmental sociology. Annual Review of Sociology, 13(1), 465–488. https://doi.org/10.1146/annurev.so.13. 080187.002341

- Campbell-Lendrum, D. H., Corvalán, C. F., & Prüss Ustün, A. (2003). How much disease could climate change cause? In A. J. McMichael, D. H. Campbell-Lendrum, C. F. Corvalán, K. L. Ebi, A. Githeko, J. D. Scheraga, & A. Woodward (Eds.), Climate change and human health: Risks and responses. WHO.
- Casey, P. J., & Scott, K. (2006). Environmental concern and behaviour in an Australian sample within an ecocentric–anthropocentric framework. *Australian Journal of Psychology*, 58(2), 57–67. https://doi.org/10.1080/00049530600730419
- Catton, W. R., Jr., & Dunlap, R. E. (1978). Environmental sociology: A new paradigm. The American Sociologist, 13(1), 41–49.
- Catton, W. R., & Dunlap, R. E. (1980). A new ecological paradigm for post-exuberant sociology. American Behavioral Scientist, 24(1), 15–47. https://doi.org/10.1177/2F000276428002400103
- Chang, G., Wang, L., Meng, L., & Zhang, W. (2016). Farmers' attitudes toward mandatory water-saving policies: A case study in two basins in northwest China. *Journal of Environmental Management*, 181, 455–464. https://doi.org/10.1016/j.jenvman.2016.07.007
- Castro, P., & Lima, M. L. (2001). Old and new ideas about the environment and science. *Environment and Behavior*, 33(3), 400–423. https://doi.org/10.1177/00139160121973052
- Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, 7(3), 309–319. https://doi.org/10.1037/1040-3590.7.3.309
- Comrey, A. L., & Lee, H. B. (1992). A First Course in Factor Analysis (2nd ed.). Lawrence Erlbaum.
- Costa, C., Tyner, K., Rosa, P. J., Sousa, C., & Henriques, S. (2018). Desenvolvimento e Validação da Escala de Literacia Mediática e Informacional para Alunos dos 2° e 3° Ciclos do Ensino Básico em Portugal. *Revista Lusófona de Educação*, 41, 11–28. https://doi.org/10.3414/ME16-02-0006
- Costache, A., & Sencovici, M. (2019). Age, gender and endorsement of the new ecological paradigm [Book]. 19th International Multidisciplinary Scientific GeoConference SGEM 2019, Albena, Bulgary.
- Denis, H. D., & Pereira, L. N. (2014). Measuring the level of endorsement of the new environmental paradigm: A transnational study. *Dos Algarves: A Multidisciplinary e-Journal*, 23, 4–26.
- Dunlap, R. E. (1980). Paradigmatic change in social science: From Human Exemptions to an Ecological Paradigm. American Behavioral Scientist, 24(1), 5–14. https://doi.org/10.1177/000276428002400102
- Dunlap, R. E. (2008). Promoting a paradigm change. Organization & Environment, 21(4), 478–487. https://doi.org/10.1177/1086026608328872
- Dunlap, R. E. (2010). 17. A New Ecological Paradigm for Sociology. In A. Giddens, & P. W. Sutton (Eds.), Sociology: Introductory readings (pp. 92–97). Polity.
- Dunlap, R. E., & Van Liere, K. D. (1978). The "new environmental paradigm": A proposed measuring instrument and preliminary results. *Journal of Environmental Education*, 9, 10–19. https://doi.org/10.1080/00958964.1978.10801875
  Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endor-
- Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the new ecological paradigm: A revised NEP scale. *Journal of Social Issues*, 56(3), 425–442. https://doi.org/10.1111/0022-4537.00176
- Dyr, W., & Prusik, M. (2020). Measurement of proecological attitudes within new ecological paradigm in Polish current settings. Social Psychological Bulletin, 15(3) https://doi.org/10.32872/spb.3697

Field, A. (2013). Discovering Statistics using IBM SPSS Statistics (4th ed.). SAGE.

- Fleury-Bahi, G., Marcouyeux, A., Renard, E., & Roussiau, N. (2015). Factorial structure of the New Ecological Paradigm Scale in two French samples. *Environmental Education Research*, 21(6), 821–831. https://doi.org/10.1080/13504622.2014.913127
- Frisken, W. R. (1971). Extended industrial revolution and climate change. *Eos Transactions*, 52(7), 500–508. https://doi.org/10.1029/E0052i007p00500
- George, D., & Mallery, M. (2010). SPSS for windows step by step: A simple guide and reference 17. 0 update (10th ed.). Pearson.
- Gravetter, F., & Wallnau, L. (2014). Essentials of statistics for the behavioral sciences (8th ed.). Wadsworth.
- Grendstad, G. (2007). The new ecological paradigm scale: Examination and scale analysis. Environmental Politics, 8(4), 194–205. https://doi.org/10.1080/09644019908414503
- Guerra, J., & Schmidt, L. (2013). Environmental awareness, ecological values: The Portuguese case in the European context. Fundação para a Ciência e Tecnologia.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2009). *Multivariate data analysis* (6th ed.). Prentice-Hall.
- Harraway, J., Broughton-Ansin, F., Deaker, L., Jowett, T., & Shephard, K. (2012). Exploring the use of the revised New Ecological Paradigm Scale (NEP) to monitor the development of students' ecological worldviews. *The Journal of Environmental Education*, 43(3), 177–191. https://doi.org/10.1080/00958964.2011. 634450
- Hawcroft, L. J., & Milfont, T. L. (2010). The use (and abuse) of the new environmental paradigm scale over the last 30 years: A meta-analysis. *Journal of Environmental Psychology*, 30(2), 143–158. https://doi.org/10.1016/J.JENVP.2009.10.003
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55. https://doi.org/10.1080/10705519909540118
- Izquierdo, I., Olea, J., & Abad, F. J. (2014). Exploratory factor analysis in validation studies: Uses and recommendations. *Psicothema*, 26(3), 395–400. https://doi.org/10.7334/psicothema2013.349
- Johnson, C. Y., Bowker, J. M., & Cordell, H. K. (2004). Ethnic variation in environmental belief and behavior. Environment and Behavior, 36(2), 157–186. https://doi.org/10.1177/0013916503251478

- Karami, H. (2014). Exploratory factor analysis as a construct validation tool: (Mis)applications in applied linguistics research. *TESOL Journal*, 6(3), 476–498. https://doi.org/10.1002/tesj.176
- Kass, R., & Raftery, A. (1995). Bayes Factors. Journal of the American Statistical Association, 90, 773–795.
- Karpudewan, M. (2021). The influence of ethnicity and other sociodemographic characteristics on pro-environmental attitudes: A Malaysian perspective. *Local Environment*, 26(10), 1284–1298. https://doi.org/10.1080/13549839.2021.1973976
- Kim, C., & Storer, B. E. (1996). Reference values for Cook's distance. Communications in Statistics - Simulation and Computation, 25(3), 691–708. https://doi.org/10.1080/03610919608813337
- Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? Environmental Education Research, 8(3), 239–260. https://doi.org/10.1080/13504620220145401
- Krabbe, P. F. M. (2017). Validity. In P. F. M. Krabbe (Ed.), The measurement of health and health status: Concepts, methods and applications from a multidisciplinary perspective (pp. 113–134). Academic Press. https://doi.org/10.1016/C2013-0-19200-8
- Kyriakopoulos, G., Ntanos, S., & Asonitou, S. (2020). Investigating the environmental behavior of business and accounting university students. *International Journal of Sustainability in Higher Education*, 21(4), 819–839. https://doi.org/10.1108/IJSHE-11-2019-0338
- Kyriazos, T. A. (2018). Applied psychometrics: The 3-faced construct validation method, a routine for evaluating a factor structure. *Psychology*, 9, 2044–2072. https://doi.org/10.4236/psych.2018.98117
- Lee, M. K., Cheung, C. M., & Chen, Z. (2005). Acceptance of internet-based learning medium: The role of extrinsic and intrinsic motivation. *Information & Management*, 42(8), 1095–1104. https://doi.org/10.1016/j.im.2003.10.007
- Lopes, P., Silva, R., Oliveira, J., Ambrósio, I., Ferreira, D., Crespo, C., Feiteira, F., & Rosa, P. J. (2018). Rasch analysis on the Academic Motivation Scale in Portuguese university students. *NeuroQuantology*, 16(3), 41–46. https://doi.org/10.14704/nq.2018.16.3.1062
- Mallick, R., & Bajpai, S. (2019). Impact of social media on environmental awareness. In S. Narula, A. Rai, & Sharma (Eds.), Environmental awareness and the role of social media (pp. 140–149). IGI Global.
- McKinsey Sustainability. (2017). Discover technology's impact on natural resources. https://www.mckinsey.com/business-functions/sustainability/our-insights/ discover-technologys-impact-on-natural-resources
- McCright, A. M. (2010). The effects of gender on climate change knowledge and concern in the American public. *Population and Environment*, 32, 66–87. https://doi.org/10.1007/s11111-010-0113-1
- Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W., III. (1972). The limits to growth: A report for the club of Rome's project on the prediction of mankind (3rd ed.). Universe Books.
- Medeiros, E. J. R. (2023). EU Funding to Promote Climate Change Adaptation and Risk Prevention and Management in Portugal: Potential Effects on Mitigating Health Hazards. In W. Leal Filho, D. G. Vidal, & M. A. P. Dinis (Eds.), Climate Change and Health Hazards. Climate Change Management. Cham: Springer. https://doi.org/10.1007/978-3-031-26592-1.17
- Moon, S., Bergey, P. K., Bove, L. L., & Robinson, S. (2016). Message framing and individual traits in adopting innovative, sustainable products (ISPs): Evidence from biofuel adoption. *Journal of Business Research*, 69(9), 3553–3560. https://doi.org/10.1016/j.jbusres.2016.01.029
   Moreira, B., Rosa, P. J., Brazão, N., & Carvalho, J. (2022). Dimensionality
- Moreira, B., Rosa, P. J., Brazão, N., & Carvalho, J. (2022). Dimensionality and measurement invariance of the sexually aggressive behaviors scale across male and female Portuguese college students. *Sexes*, 3(3), 336–350. https://doi.org/10.3390/sexes3030026
- Moyano-Diaz, E., & Palomo-Vélez, G. (2014). Propriedades psicométricas de la escala nuevo paradigma ecológico (NEP-R) en población Chilena. *Psicologia Ambiental*, 45(3), 415–423. https://doi.org/10.15448/1980-8623.2014.3.17276
   Müderrisoglu, H., & Altanlar, A. (2011). Attitudes and behaviors of undergraduate
- Müderrisoglu, H., & Altanlar, A. (2011). Attitudes and behaviors of undergraduate students toward environmental issues. *International Journal of Environmental Science & Technology*, 8(1), 159–168. https://doi.org/10.1007/BF03326205
- Mueller, R. O., & Hancock, G. R. (2001). Factor analysis and latent structure, confirmatory. International Encyclopedia of the Social & Behavioral Sciences, 5239–5244. https://doi.org/10.1016/B978-0-08-097086-8.25009-5
- Muthén, L. K., & Muthén, B. O. (2017). Mplus user's guide (8th ed.). Muthén & Muthén. Nistor, L. (2012). The new environmental paradigm (NEP) in Romania: Some empirical findings. Sociologie Românească, 10(4), 75–98.
- None, I., & Kumar Datta, S. (2011). Pro-environmental concern influencing green buying: A study on Indian consumers. *International Journal of Business and Mana*gement, 6(6), 124–133. https://doi.org/10.5539/IJBM.V6N6P124
- Ntanos, S., Kyriakopoulos, G., Skordoulis, M., Chalikias, M., & Arabatzis, G. (2019). An application of the New Environmental Paradigm (NEP) Scale in a Greek context. *Energies*, *12*(2), 1–18. https://doi.org/10.3390/en12020239
- Ntanos, S., Asonitou, S., Kyriakopoulos, G., Skordoulis, M., Chalikias, M., & Arabatzis, G. (2020). Environmental sensitivity of business school students and their attitudes towards social and environmental accounting. In A. Kavoura, E. Kefallonitis, & P. Theodoridis (Eds.), Springer Proceedings in Business and Economics (pp. 195–203). Springer. https://doi.org/10.1007/978-3-030-36126-6.22
- Nunnally, J., & Bernstein, I. (1994). Psychometric theory (3rd ed.). McGrawHill.
- Pires, C., Rosa, P. J., Vigário, M., & Cavaco, A. (2019). Validation of a new tool for evaluating subjects' satisfaction with medicine package leaflets: A cross-sectional descriptive study. São Paulo Medical Journal, 137(5), 454–462. https://doi.org/10.1590/1516-3180.2019.0123160919

- Post, T., & Walma van der Molen, J. H. (2018). Development and validation of a questionnaire to measure primary school children's images of and attitudes towards curiosity (the CIAC questionnaire). *Motivation and Emotion*, 43, 159–178. https://doi.org/10.1007/s11031-018-9728-9
- Reis Neto, J. F., Souza, C. C., Bitencourt, T. D. A., Cupertino, C. M., Melo Neto, P. L., Soares, D. G., & Oliveira Rodrigues, I. (2021). Validating the scale of the new ecological paradigm (NEP) in Brazilian university students. *Research, Society and Development*, 10(4) https://doi.org/10.33448/RSD-V10I4.13947
- Reise, S. P., Waller, N. G., & Comrey, A. L. (2000). Factor analysis and scale revision. *Psychological Assessment*, 12(3), 287–297. https://doi.org/10.1037/%2F1040-3590.12.3.287
- Reyna, C., Bressán, E., Mola, D., Belaus, A., & Ortiz, M. V. (2018). Validating the structure of the New Ecological Paradigm Scale among Argentine citizens through different approaches. *Pensamiento Psicológico*, 16(1), 107–118.
- Rideout, B. E., Hushen, K., McGinty, D., Perkins, S., & Tate, J. (2005). Endorsement of the New Environmental Paradigm in systematic and e-mail samples of college students. *Journal of Environmental Education*, 36(2), 15–23. https://doi.org/10.3200/JOEE.36.2.15-23
- Roberts, J. A. (1996). Green consumers in the 1990s: Profile and implications for advertising. Journal of Business Research, 36(3), 217–231. https://doi.org/10.1016/0148-2963(95)00150-6
- Rosa, P. J., Brazão, N., & Carvalho, J. (2022). Psychometric properties of the Sexually Aggressive Behaviors Scale: Factor structure, reliability, and construct validity in a sample of Portuguese female college students. International Journal of Offender Therapy and Comparative Criminology, 00(0) https://doi.org/10.1177/0306624X221113535
- Rüdig, W. (2001). Western European Studies: Environment. In N. J. Smelser, & P. B. Baltes (Eds.), International Encyclopedia of the Social & Behavioral Sciences(pp.16463–1646). Elsevier Science Ltd. https://doi.org/10.1016/b0-08-043076-7/03255-1
- Sánchez-Domínguez, J. P., Lara-Severino, R. C., Bretón, J. G. C., & Bretón, R. M. C. (2021). Internal consistency and factorial structure of the New Revised Ecological Paradigm Scale on university students from the southeast of Mexico, Journal of Social. *Technological and Environmental Science*, 10(1), 74–93. https://doi.org/10.21664/2238-8869.2021v10i1
- Schlegelmilch, B. B., Bohlen, G. M., & Diamantopoulos, A. (1996). The link between green purchasing decisions and measures of environmental consciousness. *European Journal of Marketing*, 30(5), 35–55. https://doi.org/10.1108/03090569610118740
- Schleussner, C.-F., Menke, I., Theokritoff, E., van Maanen, N., & Lanson, A. (2019). Climate impacts in Portugal. https://youth4climatejustice.org/ wp-content/uploads/2021/01/Climate-Analytics-Climate-Impacts-in-Portugalmin.pdf
- Schmidt, L., Nave, J. G., O'Riordan, T., & Guerra, J. (2011). Trends and dilemmas facing environmental education in Portugal: From environmental problem assessment to citizenship involvement. *Journal of Environmental Policy & Planning*, 13(2), 159–177. https://doi.org/10.1080/1523908X.2011.576167
- Schwarz, G. (1978). Estimating the dimension of a model. The Annals of Statistics, 6(2), 461–464. https://doi.org/10.1214/AOS%2F1176344136
- Shephard, K., Harraway, J., Jowett, T., Lovelock, B., Skeaff, S., Slooten, L., Strack, M., & Furnari, M. (2014). Longitudinal analysis of the environmental attitudes of university students. *Environmental Education Research*, 21(6), 805–820. https://doi.org/10.1080/13504622.2014.913126
- Sookram, R. (2013). Environmental attitudes and environmental stewardship: Implications for sustainability. *The Journal of Values-Based Leadership*, 6(2), 1–11.
- Sousa, S., Correia, E., Leite, J., & Viseu, C. (2020). Environmental knowledge, attitudes and behavior of higher education students: A case study in Portugal. *International Research in Geographical and Environmental Education*, 30(3), 1–18. https://doi.org/10.1080/10382046.2020.1838122
- Spínola, H. (2015). Environmental literacy in 9th-grade students from Madeira Island (Portugal). The Online Journal of New Horizons in Education, 5(4), 28–36.
- Spínola, H. (2016). Environmental literacy in Madeira Island (Portugal): The influence of demographic variables. *International Electronic Journal of Environmental Education*, 6(2), 92–107.
- Spínola, H. (2023). Environmental attitudes among students at the University of Madeira, Portugal. International Journal of Development Education and Global Learning, 15(1), 56–68. https://doi.org/10.14324/IJDEGL.15.1.06
- Steinberg, T. L. (1986). An ecological perspective on the origins of industrialization. Environmental Review, 10(4), 261–276. https://doi.org/10.2307/3984350
- Tang, C., Yang, B., & Tian, H. (2023). Examination of the wording effect in the new ecological paradigm scale in China: a bi-factor modeling approach. *Current Psy*chology, https://doi.org/10.1007/s12144-023-04801-z

- Turco, M., Jerez, S., Augusto, S., Tarín-Carrasco, P., Ratola, N., Jiménez-Guerrero, P., & Trigo, R. M. (2019). Climate drivers of the 2017 devastating fires in Portugal. *Scientific Reports*, 9, 13886. https://doi.org/10.1038/s41598-019-50281-2
- Turner, P. (2020). Critical values for the Durbin-Watson test in large samples. Applied Economics Letters, 27(18), 1495–1499. https://doi.org/10.1080/13504851.2019.1691711
- Van Petegem, P., & Blieck, A. (2006). The environmental worldview of children: A cross-cultural perspective. *Environmental Education Research*, 12, 625–635. https://doi.org/10.1080/13504620601053662
- Vaněk, J. (2017). New Ecological Paradigm as a research approach in the Czech Republic: An analysis of environmental attitudes of Czechs. [Master's thesis, Univerzita Karlova]. http://hdl.handle.net/20.500.11956/86367
- Vidal, D. G., Dias, R. C., Seixas, P. C., Dinis, M. A. P., Fernandes, C. O., Barros, N., & Maia, L. R. (2022). Measuring environmental concern of urban green spaces' users (UGSU) through the application of the New Ecological Paradigm Scale (NEPS): Evidence from a southern European city. In W. Leal Filho, D. G. Vidal, M. A. P. Dinis, & R. C. Dias (Eds.), Sustainable Policies and Practices in Energy, Environment and Health Research (pp. 21–35). World Sustainability Series. Springer. https://doi.org/10.1007/978-3-030-86304-3-2
- Wagner, G., & Weitzman, M. L. (2016). Climate shock: The economic consequences of a hotter planet (1st ed.). Princeton University Press.
- WMO. (2018). WMO statement on the state of the global climate in 2017. (WMO-No. 1212). World Meteorological Organization. https://library.wmo.int/doc\_num.php?explnum\_id=4453
- Woodworth, B. L., Steen-Adams, M. M., & Mittal, P. (2011). Role of an environmental studies course on the formation of environmental worldviews: A case study of a core curriculum requirement using the NEP Scale. *Journal of Environmental Studies and Sciences*, 2(1), 126–137. https://doi.org/10.1007/S13412-011-0013-4
- WorldBank. (2014). Turn down the heat: Confronting the new climate normal. http://hdl.handle.net/10986/20595~
- Xue, W., Marks, A. D. G., Hine, D. W., Phillips, W. J., & Zhao, S. (2016). The New Ecological Paradigm and responses to climate change in China. *Journal of Risk Research*, 21(3), 323–339. https://doi.org/10.1080/13669877.2016.1200655
- Zelezny, L. C., Chua, P.-P., & Aldrich, C. (2000). Elaborating on gender differences in environmentalism. *Journal of Social Issues*, 56(3), 443–457. https://doi.org/10.1111/0022-4537.00177

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