Assessing environmental attitudes in Portugal using a new short version of the Environmental Attitudes Inventory

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Abstract

Most environmental problems are caused and/or enhanced by human behaviour; thus, it is crucial to understand environmental attitudes that underlie individual's behaviour towards the environment. In Portugal, a highly vulnerable region to environmental change and serious local-scale natural hazards, environmental attitudes have never been systematically addressed. Therefore, the main goal of this study is to evaluate environmental attitudes in a Portuguese sample using the most appropriate short version of Milfont & Duckitt's Environmental Attitudes Inventory (J. Environ. Psychol. 30 (2010) 80-94).

Reliability and validity analyses showed that the 36-item version of the Environmental Attitudes Inventory (EAI-36) was more adequate than the 24-item version. Using EAI-36, preservation and utilisation emerged as orthogonal dimensions, forming the vertical structure of environmental attitudes, and were negatively and moderately correlated in the Portuguese sample, expressing an ecocentric viewpoint. Mean scores for the first- and second-order factors were similar to values from other developed countries. Differences in age, gender and study area were found, with older participants, women and individuals from the natural sciences showing higher levels on preservation and lower on utilisation.

Keywords: Environmental attitudes; preservation; utilisation; psychometry; Portugal

Introduction

Environmental attitudes are a fundamental construct in environmental psychology and can be defined as an individual's tendency to evaluate the natural environment with some degree of favour or disfavour, *i.e.*, the degree to which an individual is concerned about the protection, understanding or enhancement of the natural environment (Gifford 2014a; Milfont 2007). Environmental attitudes are held and expressed by people to satisfy different purposes, which can be grouped into three main function categories: an understanding function that help us understand the world, a social-identity function that allows the expression of our basic values, and a protective function that enhances and maintains our self-esteem (Milfont 2007).

Regarding their structure, three different components are generally distinguished (Gifford, 2014a). First, the cognitive component represents an individual's beliefs, thoughts and knowledge about the environment. For instance, people who believe that nature is fragile are the most environmentally concerned, whilst those who believe that nature is resilient are the least concerned (Poortinga et al. 2003); education has also been associated to environmental concern, although education alone does not lead to more proenvironmental behaviour, serving instead as a priming agent (Gifford 2014b). Second, the affective component includes emotions and feelings about the environment; for instance, a mix of negative and positive emotions (worry, hope and joy) has been positively related to recycling behaviours (Ojala 2008). Third, a conative or behavioural component refers to an individual's behavioural intentions towards the environment (Gifford 2014a); however, intentions do not always translate into actual proenvironmental behaviour. This three-component model of attitudes is widely accepted, although a more contemporary approach to attitude structure

argues that beliefs, affects and behaviours are the basis from which environmental attitudes derive, *i.e.*, they interact with attitudes, rather than being their parts (Albarracín et al. 2005).

Different models have been suggested to explain the vertical and horizontal structures of environmental attitudes, from a unidimensional, bipolar construct (e.g., New Environmental Paradigm: Dunlap & Van Liere, 1978), to a multidimensional construct composed by different bipolar dimensions (Milfont & Duckitt, 2010) that can be aggregated into one (generalised environmental attitudes) or two (preservation and utilisation) second-order dimensions (see Milfont, 2007 and references therein). The two-dimensional model of Wiseman and Bogner (2003) suggests that environmental attitudes are divided into preservation attitudes that express the belief that the preservation and diversity of nature should be prioritized, and utilisation attitudes that express the belief that the exploitation of all natural resources for human objectives is right, appropriate and necessary (Milfont & Duckitt, 2010). These two orthogonal dimensions reflect Blaikie's (1992) dilemma between how to balance conservation of the natural environment (preservation) with the need for some forms of exploitation of the environment (utilisation). However, preservation and utilisation attitudes may be strongly and negatively correlated (Domingues et al. n.d.), especially in environmentally-oriented participants (Milfont, 2007).

Early models considered that proenvironmental behaviour was the result of environmental knowledge leading to a higher environmental awareness and concern, which in turn resulted in proenvironmental behaviour (Kollmuss and Agyeman 2002). However, research has shown that environmental attitudes may indeed influence proenvironmental behaviours (Heyl et al. 2013), but not always (Kollmuss & Agyeman, 2002). Proenvironmental behaviour results from the interactions between an individual’s attitudes towards the environment, and other variables such as childhood experience, knowledge and education, personality, values and worldviews, among others (Gifford 2014b). Differences

between self-reported behaviour, that is usually over-reported, and actual/observed behaviour are also relevant in this context (Chao and Lam 2011); hence, associations between environmental attitudes and observed behaviour tend to be weaker (Gifford and Sussman 2012). Environmental attitudes have been studied across cultures and in multiple contexts; overall, higher levels of environmental concern are usually found in women, younger people, and citizens from middle and upper-middle-classes (Gifford & Sussman, 2012 and references therein). Many other variables, such as personality, values, education, personal experience with nature, religion and political views, may affect environmental attitudes and concern, but results across studies are inconsistent.

Measuring environmental attitudes and understanding what drives individual behaviour towards the environment is necessary to devise programs to help ameliorate environmental issues, by fostering proenvironmental behaviour (McIntyre and Milfont 2016). Self-report questionnaires are usually the preferred way to measure environmental attitudes and an array of psychometric instruments are available, based on different conceptual and theoretical frameworks (Milfont & Duckitt, 2010). The most widely used is probably the New Environmental Paradigm Scale (NEP; Dunlap & Van Liere, 1978) and its revised version NEP-R (Dunlap et al. 2000), a 15-item, unidimensional scale that measures the ecological worldview, *i.e.*, the view that humans are part of nature, in opposition to the dominant social paradigm, *i.e.*, the view that humans are superior to all other species. Many other instruments have been developed to measure environmental attitudes, some focused on specific issues (e.g., transportation of nuclear waste: Larsen, 1994) or specific populations, such as children (e.g., Larson, Green, & Castleberry, 2009) and college students (e.g., Schindler, 1999), and others more general (e.g., Weigel & Weigel, 1978).

Other instruments, such as the Environmental Attitudes Inventory (EAI; Milfont & Duckitt, 2010), have approached environmental attitudes as a multidimensional construct,

addressing different facets of environmental attitudes related to both preservation and utilisation views of nature. The EAI includes 12 subscales: enjoyment of nature (scale 1), support for interventionist conservation policies (scale 2), environmental movement activism (scale 3), conservation motivated by anthropocentric concern (scale 4), confidence in science and technology (scale 5), environmental fragility (scale 6), altering nature (scale 7), personal conservation behaviour (scale 8), human dominance over nature (scale 9), human utilisation of nature (scale 10), ecocentric concern (scale 11), and support for population growth policies (scale 12) (Milfont and Duckitt 2010). These first-order factors can be grouped into two higher- or second-order factors, preservation and utilisation. Preservation attitudes express the belief that the preservation and diversity of nature should be prioritized, whilst utilisation attitudes express the belief that the exploitation of all natural resources for human objectives is right, appropriate and necessary (Milfont and Duckitt 2010).

The full version of EAI includes 10 items, 5 pro- and 5 con-trait, for each of the 12 scales, for a total of 120 items to be answered in a 7-point rating scale. An initial assessment showed that the EAI possesses good psychometric properties, the 12 scales are unidimensional with high internal consistency and homogeneity, and is relatively free from the effects of social desirability (Milfont 2007; Milfont and Duckitt 2010). Given that response and completion rates are likely to be negatively affected with the inclusion of a large number of similar items (Sutton and Gyuris 2015), two shorter, balanced versions were also developed, namely a short 72-item version (EAI-S) and a brief 24-item version (EAI-24) (Milfont and Duckitt 2010). The 120 and 72-item versions of the EAI were tested in different cultural contexts, and most of the previous findings regarding the psychometric properties of EAI were replicated, providing support for the cross-cultural validity of the instrument (Milfont 2007). The shorter and brief versions have also been adapted and validated in other

languages, namely Brazilian-Portuguese (Milfont et al. 2005), Afrikaans (Milfont and Duckitt 2010) and French (Moussaoui et al. 2016).

The Environmental Attitudes Inventory has been adapted and modified by other researchers. For instance, Sutton & Gyuris (2015) optimized the 72-item version, and developed and tested a shorter, 36-item version in terms of reliability and validity, with the goal of assessing the utility of the EAI for evaluating and monitoring environmental attitudes of tertiary education students. Sutton & Gyuris (2015) suggested that the brief, 24-item version of the EAI contains a large amount of redundancy, due to the reversed pairs of items, and are likely to be perceived by respondents as unnecessarily repetitive, thus affecting response and completion rates. Moussaoui et al. (2016) developed a very short, 12-item version of EAI in French, with satisfactory internal reliability, predictive ability and test-retest reliability, in order to study attitudinal aspects of proenvironmental behaviours of francophone populations.

The EAI has also been used in different areas of environmental psychological research. For instance, the 72-item version was used to evaluate whether environmental attitudes mediate the relationship between the need for cognition and proenvironmental goal choice (Barbaro et al. 2015). A 36-item version of EAI was applied to evaluate environmental attitudes of occupants of sustainable housing as indicators of sustainable behaviour (O'Callaghan et al. 2012). The 24-item version was used to test whether thermal preferences of occupants in low-energy houses were influenced by their environmental values (Daniel et al. 2015). A balanced 12-item version was also used to relate environmental attitudes to environmental action (Ernst et al. 2017).

Specific scales of the EAI have been used to address particular issues. For instance, scales 6 (environmental fragility) and 8 (personal conservation behaviour) were applied to distinguish environmental attitudes of carpoolers versus non-carpoolers (Delhomme and

Gheorghiu 2016), whilst scales 9 (human dominance over nature) and 10 (utilisation of nature) were used to evaluate mediating mechanisms that could explain differences in climate change beliefs between right-wing and left-wing adherents (Hoffarth and Hodson 2016).

In Portugal, tools such as the Eurobarometers have been administered to evaluate people's opinions on environmental issues (Schmidt and Delicado 2014). Relationships between environmental attitudes and other variables, such as purchase behaviours (do Paço et al. 2013), or environmental awareness of specific populations, such as surf tourists (Frank et al. 2009), have been occasionally addressed using the NEP scale. However, the attitudes, beliefs, risk perceptions, and behaviours towards the environment are still poorly studied in the Portuguese population. Given that Portugal is located in a region highly vulnerable to climate change (IPCC 2014) and other local-scale natural hazards, many of them enhanced by human behaviour, knowledge on the psychological dimensions of environmental change is crucial. In addition, cultural-based differences in environmental attitudes have been showed in several cross-cultural studies (Deng et al. 2006; Leung and Rice 2002), suggesting possible differences in the horizontal structure of environmental attitudes (Milfont 2007); the accumulation of data on environmental attitudes in different population is thus pertinent. In this context, the goals of this study are: a) to assess the structural validity of two different Portuguese short versions of the Environmental Attitudes Inventory using confirmatory factor analysis, and b) to evaluate environmental attitudes in a Portuguese sample using the most appropriate short version of the Environmental Attitudes Inventory.

Methods

Instruments

The Portuguese version of the 120-item EAI (EAI-PT) was used as a basis to extract the items for two brief versions, a 24- and 36-item short forms. The Portuguese EAI was obtained using the translation-backtranslation procedure (Brislin 1976); both the English and Portuguese versions were compared and the most accurate Portuguese version of each item was chosen. In order to accommodate cultural and social differences, some items were adapted into Portuguese, instead of literally translated (van de Vijver and Leung 1997). In addition, some items that were reversed in the English version were presented in a pro-trait way in the Portuguese version for clarity (see Domingues et al. n.d. for details on the production and psychometric properties of EAI-PT).

For EAI-36 (Annex 1), the three items with the highest loadings in each scale, obtained from a Portuguese sample, were selected; this version is not balanced, with 30 pro-trait and 6 con-trait items. The 24-item version (Annex 2), with 12 pro-trait and 12 con-trait items, was suggested by Milfont and Duckitt (2010).A 5-point response scale was used for EAI-24 and a 7-point scale was used for EAI-36, ranging from 1 = “strongly disagree” to 5 or 7 = “strongly agree”.

Participants and procedure

Non-probability sampling techniques were used to recruit participants. For EAI-36, a paper version of the questionnaire was administered to a convenience sample composed by university students, and an online version was used with a snowball sample obtained through social media. Participants in EAI-24 were recruited through snowball sampling and responded to the online version of the questionnaire. A total of 719 participants responded to EAI-36 and 618 to EAI-24. After removal of multivariate outliers based on the Mahalanobis distance, final samples of 651 and 601 respondents were obtained for EAI-36 and EAI-24, respectively. Participants in EAI-36 are 20.8% male and 79.2% female, with a mean age of

219 31.4 ± 11.0 years, ranging between 17 and 69 years old, and 60.0% have higher education
220 studies. Participants in EAI-24 are 10.3% male and 89.7% female, with a mean age of 39.0 ±
221 9.6 years, ranging between 17 and 72 years old; 77.4% have higher education studies.
222
223 **Data analysis**
224 Mean scores for preservation, utilisation and generalised environmental attitudes
225 (GEA, obtained by reversing the utilisation items and aggregating these and the preservation
226 items) were calculated. For each first-order and second-order factors, descriptive statistics
227 (mean, standard deviation, skewness and kurtosis) were calculated. Skewness and kurtosis
228 absolute values lower than 2 and 7, respectively, indicated no significant deviations from
229 normality (West et al. 1995).
230 Cronbach's alpha was used to evaluate scale reliability; alpha coefficients higher than
231 0.80 indicate good internal consistency (Nunnally and Bernstein 1994). Convergent related
232 validity was assessed by computing the maximum variance extracted (AVE) and composite
233 reliability (CR); AVE $\geq$ 0.5 and CR $\geq$ 0.7 are indicative of construct convergent related
234 validity (Hair et al. 2005; Marôco et al. 2014). Discriminant validity was also evaluated as
235 proposed by Fornell and Larcker (1981); two constructs show discriminant validity if both
236 AVE are higher than the determination coefficient between them.
237 Confirmatory factor analysis (CFA) with maximum-likelihood estimation was used to
238 test model fit. Missing values were replaced through multiple imputation using the
239 expectation maximization algorithm (McLachlan and Krishnan 1997). For EAI-36, three
240 manifest indicators of each scale were used, whereas for EAI-24 two manifest indicators were
241 used for each latent variable. Different fit indices were used to evaluate and compare model
242 fit, including the likelihood ratio test (chi-square test), the normed chi-square (chi-square to
243 degrees of freedom ratio, χ^2/df), the root mean square error of approximation (RMSEA), the

standardized root mean square residual (SRMR), the comparative fit index (CFI), the expected cross-validation index (ECVI) and the consistent Akaike information criterion (CAIC). Normed chi-square between 1.0 and 5.0 (Schumacker and Lomax 1996), RMSEA < 0.06 and SRMR < 0.08 (Hu and Bentler 1999), and CFI ≥ 0.90 (Carlson and Mulaik 1993) were considered as indicators of good model fit. In addition, when comparing multiple models, lower ECVI and CAIC values reflected the better-fitting model (Schermelleh-Engel et al. 2003). Confidence intervals for RMSEA and ECVI were also computed, to assess the precision of the estimates.

Models tested with CFA included: 1) EAI-24-PT, the 24-item, 12 scales version suggested by Milfont and Duckitt (2010); 2) EAI-36-PT, the brief version with 36 items and 12 scales. We also tested two models that did not include scales 5 and 12, as suggested by Domingues et al. (n.d.), given that these scales were uncorrelated with the other scales in a previous study, suggesting that they are not related with environmental attitudes; models tested were 3) EAI-20-PT, a 20-item, 10-scale version, and 4) EAI-30-PT, a 30-item, 10-scale version. For each of the 12 and 10-scale models, two measurement models that included second-order factors, first-order factors (latent variables) and their indicators (measured variables) were tested: model A with two correlated second-order factors (preservation and utilisation); and model B with one second-order factor (generalised environmental attitudes).

After selection of the most appropriate short version of the Portuguese EAI, correlations between scales were evaluated with Pearson's correlations. Significant differences among different socio-demographic groups (age, gender, study area) were tested with independent samples *t*-tests; homogeneity of variances was tested with Levene's tests. The model of ecological values (Wiseman and Bogner 2003) was used to distribute participants along orthogonal axes of utilisation *versus* preservation; responses on a 7-point

scale were transformed by subtracting 4, hence obtaining a response scale ranging between -3 and +3.

Statistical analyses were considered at a 0.05 significance level. Effect sizes were computed with G*Power software. All other analyses were performed with IBM SPSS Statistics v. 22 and AMOS v.22.

Results

Cronbach's alpha coefficients, means, standard deviations, skewness and kurtosis for the twelve scales and second-order factors of EAI-36 and EAI-24 are presented in Table 1. Overall, EAI-36 scales presented higher internal consistency (alpha coefficients between 0.578 and 0.862) than EAI-24 scales (alpha coefficients between 0.414 and 0.851). Skewness and kurtosis absolute values (<2 and <4, respectively) indicated no deviations from normality. Average variance explained (AVE) and composite reliability (CR) were computed to assess convergent and discriminant validity. Most scales of EAI-36 (but not scales 2, 4, 6, 10 and 11) presented AVE $\geq$ 0.5 and CR $\geq$ 0.7, indicating convergent related validity (Table II). Regarding EAI-24, only scale 1 met the criteria for convergent related validity. Discriminant validity was evaluated between preservation and utilisation scales; determination coefficients between P and U scales varied between .00 and .37 for EAI-36; except in one case (between scales 2 and 10), all R^2 were lower than the AVE of the scales, suggesting discriminant validity between the preservation and utilisation scales (Table 2).

All versions of EAI, either with 36 items and 12 scales (EAI-36-PT), 30 items and 10 scales (EAI-30-PT), 24 items and 12 scales (EAI-24-PT), or 20 items and 10 scales (EAI-20-PT), demonstrated adequate fit (Table 3), with χ^2/df between 2.0 and 3.0, RMSEA < .06, SRMR < .08 and CFI > .90. Comparing models A with two correlated second-order factors

(preservation and utilisation) and models B with one second-order factor (GEA), the only noteworthy differences are in CAIC and ECVI fit indices; lower ECVI and CAIC values suggest a better fit of models A. Overall, all tested models presented adequate fit indices. Given that EAI-36 is more comprehensive than EAI-24 (3 items vs. 2 items per scale) and EAI-36 models presented lower RMSEA and SRMR and higher CFI values, we chose the 36-item version for the subsequent description of environmental attitudes in our sample.

Therefore, environmental attitudes in a Portuguese sample (n = 651) were evaluated with the 36-item version of EAI-PT on a 7-point scale. Mean values for the seven preservation scales (scales 1, 2, 3, 6, 8, 11 and 12) varied between 3.06 (SD = 1.56) and 6.33 (SD = 0.84), and mean values for the five utilisation scales (scales 4, 5, 7, 9 and 10) varied between 2.15 (SD = 1.08) and 4.03 (SD = 1.23). Preservation, utilisation and GEA mean values were 5.53 (SD = 0.64), 2.96 (SD = 0.75) and 5.32 (SD = 0.61), respectively (Table 1). Considering preservation and utilisation as orthogonal dimensions, most participants fell on the preservation+ utilisation- quadrant, representing the ecocentric viewpoint (Figure 1).

Most EAI scales showed significant moderate and strong intercorrelations ($|r| > 0.4$; Table 4). Scales 5 (confidence in science and technology) and 12 (support for population growth policies) did not correlate with any of the other scales ($|r| < 0.2$). Preservation and utilisation were moderately and negatively correlated ($r = -.57$, n = 651, $p < .001$). Significant differences in environmental attitudes between socio-demographic groups were found (Table 5). Overall, women (n = 515) scored higher on the preservation scales and lower on the utilisation scales in relation to men (n = 135); these gender differences were significant ($p < 0.05$) and the effect sizes were medium or large ($d > 0.50$) for seven EAI scales and for the three second-order factors (Table 5). Regarding age, the sample was divided in two groups for comparisons: participants aged 30 years or less (n = 313) and participants over 30 years old (n = 334). Significant differences were found between the two groups for all scales and

second-order factors, except scales 3 and 5. Older participants scored higher on the preservation scales and lower on the utilisation scales than younger participants; effect sizes were medium or large for five of the EAI scales and for utilisation and GEA (Table 5). We also compared environmental attitudes between participants with a background in the natural sciences (n = 54) and the other participants (n = 427). Only a few significant differences were found in the EAI scales (scales 2, 3, 7, 9, 11 and 12) and most effect sizes were small (d < 0.50). Significant differences were also observed for the three second-order factors, with medium effect sizes for preservation and GEA (Table 5). Overall, participants from the natural sciences scored higher in the preservation and GEA scales than participants from other study areas.

Despite the observed differences in EAI scales for specific socio-demographic groups, comparison of Pearson's correlations between preservation and utilisation attitudes yield no significant differences between gender (women: r = -.54, n = 515, p < .001; men: r = -.53, n = 135, p < .001) and study area (natural sciences: r = -.38, n = 54, p < .005; other areas: r = -.48, n = 427, p < .001). The only significant differences in P vs. U correlation were found for age groups, with a significantly higher correlation (p < .01) found for participants aged 30 years or less (r = -.60, n = 334, p < .001) in relation to older participants (r = -.44, n = 313, p < .001).

Discussion

This study aimed to compare two different short versions of Milfont and Duckitt's (2010) Environmental Attitudes Inventory and evaluate environmental attitudes in a Portuguese sample. Models tested were based on 24- and 36-item short versions of the Portuguese adaptation of EAI. Regarding the vertical structure of environmental attitudes,

models with two correlated second-order factors (preservation and utilisation) were slightly better fitting than models with one second-order factor (GEA), suggesting that an orthogonal structure for second-order factors is more adequate than a bipolar construct with utilisation and preservation attitudes at opposite ends. Other studies have found that the structure with two second-order factors is better fitting than the one second-order factor, but the differences are minimal (e.g., Milfont, Duckitt, & Wagner, 2010); empirical and theoretical evidence supporting both models exist (see Milfont et al., 2010 and references therein).

Our results reflect Wiseman and Bogner's (2003) view of preservation and utilisation as contrasting and complementary, not opposing dimensions. Therefore, one view is not necessarily the antithesis of the other and people can possess both beliefs. Milfont and Duckitt (2004) suggested that the correlation between preservation and utilisation might be positive in developing countries where poverty and underdevelopment are major social issues, whereas people from first world countries may consider preservation and utilisation as opposites and hence the two factors are negatively correlated.

Indeed, in industrialised countries, the relationship between preservation and utilisation is usually moderate and negative. For instance, Milfont (2007) estimated correlation coefficients of -.68, -.57 and -.54 in New Zealand, Brazil and South Africa, respectively, with higher scores for preservation attitudes. A moderate and negative correlation of -.57 was also found for an Australian sample (O'Callaghan et al. 2012). Other studies that used the 2-factor Model of Environmental Attitudes (2-MEV; Bogner & Wiseman, 2006) for the measurement of preservation and utilisation in adolescents and children have found moderate (-.45: Johnson & Manoli, 2010) and negligible (-.036: Boeve-de Pauw & Van Petegem, 2011) correlations between these second-order factors.

In our Portuguese sample, preservation and utilisation were also moderately and negatively correlated (r = -.57), with most participants falling on the P+ U- quadrant; this

suggests that people are greatly concerned with the conservation of the natural environment and are apathetic towards the utilisation of the environment to fulfil humans' needs, thus expressing ecocentric values (Wiseman and Bogner 2003). However, the fact that in most studies preservation scores higher than utilisation can be an artifact caused by social desirability, *i.e.*, people will tend to give socially desirable responses. It has been shown that responses regarding environmental attitudes can be contaminated by social desirability (Kaiser et al. 1999), particularly preservation scales (Wiseman and Bogner 2003). Milfont (2007) has found that the influence of social desirability seems to be restricted to aspects of proenvironmental behaviour (particularly scales 1, 3 and 8 of EAI), but other preservation and utilisation scales are free from its effects.

Regarding the horizontal structure of environmental attitudes, the removal of scales 5 (confidence in science and technology) and 12 (support for population growth policies) from the Portuguese version of the Environmental Attitudes Inventory has been proposed (Domingues et al., n.d.). These scales did not correlate with any of the other EAI scales (this study: $.02 \leq |r| \leq .17$), suggesting that attitudes towards science and technology, and control of population growth are not related to attitudes towards the environment in the Portuguese sample. The lack of relationship between environmental attitudes and confidence in science and technology in our sample should be further explored, because confidence in science has emerged as a key variable explaining attitudes towards several environmental issues, particularly climate change (Miller 2004). Conversely, the lack of correlation between environmental attitudes and support for population growth policies is justifiable, given that overpopulation is not a problem in Portugal (Domingues et al. n.d.).

Overall, participants scored higher in the preservation scales ($M = 5.53$, $SD = 0.64$) in relation to the utilisation ones ($M = 2.96$, $SD = 0.75$). Scales with the highest scores were enjoyment of nature, conservation policies, environmental fragility, personal conservation

behaviours and ecocentric concern (M > 6.00), whereas scales with the lowest scores were anthropocentric concern, human dominance over nature and human utilisation of nature (M < 3.00). A comparison of our data with a worldwide sample (that could be considered as representative of the world) and with a Brazilian sample (given the common language and some cultural proximity) yields slight differences in some scales (Table 6); for instance, the Portuguese sample shows the highest scores for enjoyment of nature (scale 1), environmental fragility (scale 6) and personal conservation behaviours (scale 8), and the lowest scores for anthropocentric concern (scale 4), human dominance over nature (scale 9), human utilisation of nature (scale 10) and support for population growth policies (scale 12), but when environmental attitudes are taken as a whole, these differences are probably not significant. However, cross-cultural differences in environmental attitudes have been found in other studies; for instance, stronger environmental concern was observed in a collectivist, past-oriented country in relation to an individualist, future-oriented one (Sarigöllü 2009). Environmental concern has been associated with postmaterialistic shifts in cultural values in developed societies, but research has shown that developing countries are also highly concerned about the environment (see Rauwald & Moore, 2002 and references therein).

Socio-demographic variables can be important predictors of environmental attitudes. In the Portuguese sample, significant differences in environmental attitudes associated with age, gender and study area were observed. Regarding age, older participants (≥30 years old) scored significantly higher in the preservation attitudes and lower in the utilisation attitudes than younger participants. Results across the literature have been inconsistent regarding age, with many studies indicating that younger people are more environmentally concerned than older people (Theodori and Luloff 2002; Van Liere and Dunlap 1980), while other studies indicate a positive relationship between age and environmental attitudes (e.g., Mayer & Frantz, 2004). Significant gender differences were also found in this study, with women

418 scoring higher on preservation attitudes and lower on utilisation attitudes in relation to men.
419 These results are in agreement with a significant body of literature that demonstrates that
420 women, as a result of differences in personality and values, particularly in altruistic values
421 (Dietz et al. 2002), tend to be more environmentally concerned than men (Seebauer et al.
422 2017; Theodori and Luloff 2002; Zelezny et al. 2000), but not always (McFarlane and Hunt
423 2006).

424 Finally, we considered Milfont's (2007) hypothesis that biology students are probably
425 more environmentally concerned than students from other areas or the general population,
426 and tested for differences between participants with a background in the natural sciences and
427 participants from other study areas. Indeed, significant differences were found for
428 preservation and utilisation second-order factors, with participants from the natural sciences
429 scoring higher in P and lower in U. Other studies have also observed that students enrolled in
430 environment-related areas were more environmentally concerned than students from other
431 study areas (Heyl et al. 2013).

432

433 **Conclusions**

434

435 In this study we compared two different short versions of the Environmental Attitudes
436 Inventory, a 24-item version and a 36-item version. Both versions demonstrated appropriate
437 psychometric properties, and we chose the more comprehensive 36-item version to further
438 explore environmental attitudes in Portugal. Overall, the Portuguese sample showed high
439 scores on the preservation scales and low values on the utilisation scales, falling on the P+U-
440 quadrant of Wiseman and Bogner's (2003) model of ecological values. This suggests that our
441 Portuguese sample express ecocentric values, being primarily concerned with the
442 conservation of the natural environment and apathetic in regard to the utilisation of nature for

human purposes. The correlation between preservation and utilisation was moderate and negative, similar to values observed in other developed countries. Scores on the twelve scales of EAI were also similar to values observed in other developed countries. Socio-demographic differences in environmental attitudes were found in our Portuguese sample; overall, older people and women had significantly higher pro-environmental attitudes than younger participants and men. Participants with a background in the natural sciences also demonstrated higher environmental attitudes in relation to participants from other study areas. A more thorough exploration of the nomological network of environmental attitudes, including socio-demographic, psychological and political variables, should follow, in order to understand the basis of environmental attitudes in Portugal, as well as the relationships between environmental attitudes and observed proenvironmental behaviour. This knowledge is relevant in the context of global environmental change, given that only with a systematic understanding of the determinants of behavioural intentions and proenvironmental behaviour can we address maladaptive behaviours and, thus, contribute to the amelioration of environmental problems.

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Fig. 1 Distribution of participants along orthogonal axes of utilisation versus preservation, according to the model of ecological values (Wiseman & Bogner, 2003). n = 651

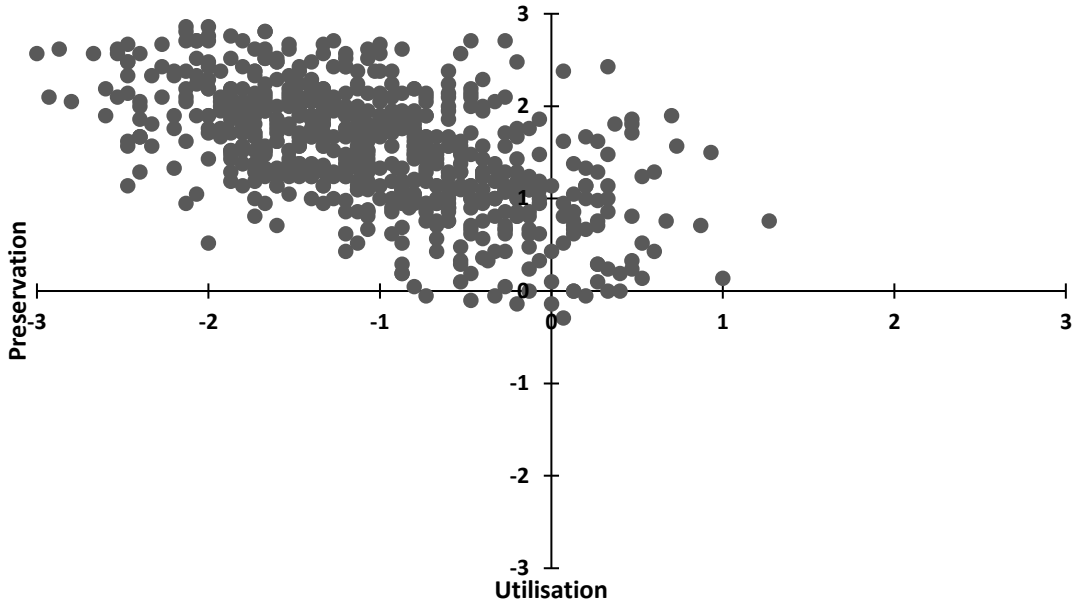

Table 1 – Internal consistency (Cronbach's alpha) and descriptive statistics (mean; standard deviation, SD; skewness; kurtosis) for the 12 scales and second-order factors of EAI-36 (n = 651) and EAI-24 (n = 601). P (preservation) refers to mean scores for scales 1, 2, 3, 6, 8, 11 and 12; U (utilisation) refers to mean scores for scales 4, 5, 7, 9, and 10; GEA (general environmental attitudes) is the aggregation of the preservation and reversed utilization items. EAI-36 and EAI-24 used different scales (7-point and 5-point scales, respectively).

		alpha		**mean**		**SD**		**skewness**		**kurtosis**	
		EAI-36	EAI-24	EAI-36	EAI-24	EAI-36	EAI-24	EAI-36	EAI-24	EAI-36	EAI-24
P	**S01**	.839	.611	6.33	4.72	0.84	0.49	-1.36	-1.98	1.32	3.77
	S02	.715	.758	6.10	4.34	0.85	0.72	-0.85	-0.95	0.01	0.46
	S03	.843	.851	4.69	3.71	1.29	0.97	-0.23	-0.50	-0.07	-0.19
	S06	.726	.508	6.15	4.69	0.83	0.52	-0.90	-1.86	0.11	3.09
	S08	.862	.839	6.24	4.34	0.84	0.67	-0.96	-0.84	0.17	0.04
	S11	.602	.482	6.14	4.53	0.80	0.59	-0.82	-1.16	-0.09	0.60
	S12	.858	.749	3.06	1.73	1.56	0.89	0.49	1.28	-0.52	1.30
U	**S04**	.659	.414	2.15	1.42	1.08	0.64	0.81	1.52	-0.36	1.41
	S05	.723	.766	4.03	3.03	1.23	0.98	-0.27	-0.14	-0.29	-0.34
	S07	.619	.758	3.96	2.67	1.26	0.98	-0.21	0.14	-0.33	-0.21
	S09	.838	.834	2.38	1.44	1.27	0.71	0.70	1.69	-0.43	2.27
	S10	.578	.489	2.25	2.36	0.99	0.77	0.50	-0.38	-0.49	-0.87
P		.730	.682	5.53	4.01	0.64	0.42	-0.29	-0.50	-0.30	-0.04
P-12		.827	.737	5.94	4.39	0.68	0.45	-0.65	-0.74	-0.01	0.12
U		.637	.451	2.96	2.18	0.75	0.46	0.16	0.10	-0.34	0.57
U-5		.696	.501	2.69	1.97	0.84	0.50	0.26	0.36	-0.54	0.01
GEA		.795	.703	5.32	4.13	0.61	0.40	-0.26	-0.43	-0.42	-0.16
GEA-5-12		.856	.753	5.69	4.24	0.67	0.38	-0.45	-0.52	-0.36	-0.18

Table 2 – Average variance explained (AVE) and composite reliability (CR) for the 12 scales of EAI-36 and EAI-24.

		AVE		CR	
		EAI-36	EAI-24	EAI-36	EAI-24
Preservation	**S01**	.60	.63	.82	.77
	S02	.34	.64	.60	.60
	S03	.66	.58	.86	.56
	S06	.34	.26	.61	.29
	S08	.60	.57	.82	.55
	S11	.23	.26	.47	.29
	S12	.76	.78	.91	.68
Utilisation	**S04**	.33	.45	.58	.45
	S05	.63	.79	.84	.69
	S07	.52	.73	.76	.66
	S09	.62	.75	.83	.67
	S10	.26	.56	.51	.55

Table 3 – Fit indices for different measurement models of the Portuguese brief versions of the Environmental Attitudes Inventory: EAI-36-PT (36 items, 12 scales, 3 items/scale), EAI-30-PT (30 items, 10 scales, 3 items/scale), EAI-24 (24 items, 12 scales, 2 items/scale) and EAI-20 (20 items, 10 scales, 2 items/scale). For each brief version of EAI, two measurement models were tested: model A with two correlated second-order factors (preservation and utilization), and model B with one second-order factor (GEA). χ^2 – chi-square (all chi-square statistics are significant with $p < 0.001$); df – degrees of freedom; RMSEA – root mean square error of approximation; SRMR – standardized root mean square residual; CFI – comparative fit index; ECVI – expected cross-validation index; CAIC – consistent Akaike information criterion; 90% CI – 90% confidence interval. Models EAI-36-PT-A and EAI-30-PT-B have 2 less indicators than the corresponding models B, due to Heywood cases.

	model	**no. indicators**	**X^2**	**df**	**X^2/df**	**RMSEA (90% CI)**	**SRMR**	**CFI**	**ECVI (90% CI)**	**CAIC**
EAI-36-PT n = 651	**A**	34	1098.19	514	2.14	.042 (.038-.045)	.053	.938	1.94 (1.80-2.09)	1703.95
	B	36	1270.44	580	2.19	.043 (.040-.046)	.054	.931	2.22 (2.07-2.38)	1913.59
EAI-30-PT n = 651	**A**	28	731.64	339	2.16	.042 (.038-.046)	.049	.950	1.33 (1.22-1.56)	1232.52
	B	30	882.71	393	2.25	.044 (.040-.048)	.050	.942	1.58 (1.45-1.72)	1421.16
EAI-24-PT n = 601	**A**	24	595.06	240	2.48	.050 (.045-.055)	.065	.916	1.19 (1.08-1.32)	1038.98
	B	24	630.60	241	2.62	.052 (.047-.057)	.067	.908	1.25 (1.13-1.38)	1067.12
EAI-20-PT n = 601	**A**	20	361.89	159	2.28	.046 (.040-.052)	.046	.943	0.77 (0.69-0.87)	739.22
	B	20	397.12	160	2.48	.050 (.044-.056)	.049	.934	0.83 (0.74-0.93)	767.05

Table 4 – Intercorrelations of the EAI-36 scales. Significant correlations are marked with * for $p < 0.05$ and ** for $p < 0.01$ (two-tailed). Moderate and strong correlations ($r > 0.40$) are in bold. n = 651.

	preservation							utilisation				
	1	2	3	6	8	11	12	4	5	7	9	10
1	-											
2	**.50****	-										
3	.38**	.38**	-									
6	**.44****	**.63****	.33**	-								
8	**.42****	**.58****	.37**	**.50****	-							
11	**.52****	**.66****	.39**	**.57****	**.53****	-						
12	.02	.05	.16**	.13**	-.03	.08*	-					
4	-.32**	**-.53****	-.22**	**-.44****	**-.40****	**-.44****	.05	-				
5	-.02	-.08*	.06	-.19**	-.05	-.10*	.04	.10**	-			
7	-.27**	-.28**	-.27**	-.20**	-.25**	-.27**	-.08*	.26**	.06	-		
9	-.31**	**-.46****	-.23**	-.39**	-.34**	**-.44****	-.05	**.46****	.14**	.29**	-	
10	**-.43****	**-.61****	-.39**	**-.51****	**-.45****	**-.55****	-.04	**.48****	.17**	.33**	**.46****	-

Table 5 – Independent samples *t*-tests for gender (women vs. men), age (<30 vs. ≥30 yrs.) and study area (natural sciences vs. other areas), for the twelve Environmental Attitudes Inventory scales and second-order factors (P = preservation, U = utilisation, GEA = generalized environmental attitudes). *t* – *t*-test statistics; df – degrees of freedom; *p* – *p*-value; *d* – Cohen's *d*. *p*-values and Cohen's *d* in bold represent significant differences (p < .50) and medium or large effect sizes (d ≥ 0.50), respectively.

	Gender				**Age**				**Study area**			
	women n = 515		*men n = 135*		*<30 n = 313*		*≥30 n = 334*		*natural sci. n = 54*		*other areas n = 427*	
	t	df	*p*	*d*	*t*	df	*p*	*d*	*t*	df	*p*	*d*
P	6.39	648	**<.001**	**0.60**	-5.65	630.91	**<.001**	0.44	4.26	479	**<.001**	**0.65**
S01	4.42	184.72	**<.001**	0.45	-4.49	637.08	**<.001**	0.35	1.38	479	.169	0.21
S02	5.83	183.21	**<.001**	**0.60**	-8.40	633.73	**<.001**	**0.66**	2.08	479	**.039**	0.31
S03	4.40	221.51	**<.001**	0.42	-1.38	625.88	.169	0.11	5.11	479	**<.001**	**0.80**
S06	5.55	648	**<.001**	**0.52**	-4.70	633.94	**<.001**	0.37	1.84	479	.066	0.28
S08	7.40	180.27	**<.001**	**0.76**	-9.06	606.58	**<.001**	**0.71**	1.00	479	.320	0.15
S11	5.43	187.73	**<.001**	**0.66**	-8.06	611.66	**<.001**	**0.63**	2.38	479	**.018**	0.36
S12	-2.00	229.10	**.046**	0.19	2.98	645	**.003**	0.23	2.79	479	**.005**	0.40
U	-8.40	648	**<.001**	**0.82**	8.52	640.84	**<.001**	**0.67**	-2.10	479	**.036**	0.32
S04	-7.10	186.56	**<.001**	**0.72**	8.71	612.36	**<.001**	**0.68**	-1.66	479	.097	0.25
S05	-2.76	648	**.006**	0.27	1.97	618.25	.050	0.16	1.77	479	.077	0.25
S07	-4.19	228.84	**<.001**	0.39	5.24	645	**<.001**	0.41	-3.16	479	**.002**	**0.57**
S09	-4.97	188.09	**<.001**	**0.50**	4.87	641.85	**<.001**	0.38	-2.57	479	**.010**	0.40
S10	-7.00	648	**<.001**	**0.66**	6.66	643.15	**<.001**	**0.52**	-0.97	479	.334	0.14
GEA	8.36	648	**<.001**	**0.80**	-7.93	626.96	**<.001**	**0.62**	3.79	479	**<.001**	**0.58**

Table 6 – Mean values (M) and standard deviations (SD) for the EAI scales and second-order factors obtained in our and other studies. Worldwide and Brazil data is from Milfont and Duckitt (2010). All studies used a 7-point response scale. n = number of participants.

	our study		**worldwide**[1]		**Brazil**[1]	
	n = 651		n = 468		n = 229	
	M	SD	M	SD	M	SD
P	5.53	0.64	5.55	0.72	5.60	0.62
1	6.33	0.84	6.11	0.97	5.78	0.97
2	6.10	0.85	6.02	0.94	6.18	0.62
3	4.69	1.29	5.17	1.30	5.34	0.99
6	6.15	0.83	5.46	1.03	5.82	0.76
8	6.24	0.84	5.82	0.96	5.48	0.85
11	6.14	0.80	6.13	0.83	6.21	0.63
12	3.06	1.56	4.12	1.46	4.41	1.17
U	2.96	0.75	3.18	0.53	3.37	0.68
4	2.15	1.08	3.51	0.86	3.59	0.79
5	4.03	1.23	3.63	1.27	4.17	0.97
7	3.96	1.26	3.55	1.01	3.68	0.88
9	2.38	1.27	2.54	1.37	2.39	1.04
10	2.25	0.99	2.67	1.05	3.01	0.72

Annex 1 – Items included in EAI-36-PT and corresponding items in Milfont and Duckitt's original English version (Milfont & Duckitt, 2010). R = reversed items.

EAI-36-PT	**Original version (Milfont & Duckitt, 2010)**
Escala 01. Apreciação da natureza	*Scale 01. Enjoyment of nature*
02. Eu gosto mesmo de passear pelo campo, por exemplo em florestas ou zonas rurais. 05. Estar perto da natureza reduz-me o stresse. 07. Gosto de passar tempo em espaços naturais, simplesmente porque gosto de estar no meio da natureza.	02. I really like going on trips into the countryside, for example to forests or fields. 05. Being out in nature is a great stress reducer for me. 07. I enjoy spending time in natural settings just for the sake of being out in nature.
Escala 02. Apoio a políticas de conservação	*Scale 02. Support for interventionist conservation policies*
01. A indústria devia ser obrigada a usar materiais reciclados, mesmo quando a produção sai mais cara. 04. No futuro, as pessoas nas sociedades desenvolvidas vão ter de adotar um estilo de vida mais adequado à conservação da natureza. 06. Eu acho que as pessoas nas sociedades desenvolvidas vão ter de adotar um estilo de vida mais adequado à conservação da natureza no futuro.	01. Industry should be required to use recycled materials even when this costs more than making the same products from new raw materials. 04. People in developed societies are going to have to adopt a more conserving life-style in the future. 06. I don't think people in developed societies are going to have to adopt a more conserving life-style in the future. (R)
Escala 03. Ativismo ambiental	*Scale 03. Environmental movement activism*
04. Eu seria capaz de me envolver numa organização ambientalista. 05. A proteção do ambiente custa muito dinheiro. Estou disposto(a) a ajudar em campanhas de recolha de fundos. 09. Eu gostaria de apoiar uma organização ambientalista.	04. I would NOT get involved in an environmentalist organization. (R) 05. Environmental protection costs a lot of money. I am prepared to help out in a fund-raising effort. 09. I would like to support an environmental organization.
Escala 04. Conservação motivada por preocupações antropocêntricas	*Scale 04. Conservation motivated by anthropocentric concern*
02. A pior coisa da perda da floresta tropical é que vai limitar o desenvolvimento de novos medicamentos. 03. Uma das razões mais importantes para manter os rios e lagos limpos é para que as pessoas possam praticar desportos aquáticos. 09. Precisamos de manter os rios e lagos limpos para proteger o ambiente, e não para termos lugares para as pessoas praticarem desportos aquáticos. (R)	02. The worst thing about the loss of the rain forest is that it will restrict the development of new medicines. 03. One of the most important reasons to keep lakes and rivers clean is so that people have a place to enjoy water sports. 09. We need to keep rivers and lakes clean in order to protect the environment, and not as places for people to enjoy water sports. (R)
Escala 05. Confiança na ciência e tecnologia	*Scale 05. Confidence in science and technology*
02. A ciência e a tecnologia irão eventualmente resolver os nossos problemas de poluição, excesso de população e escassez de recursos naturais. 04. A ciência moderna não será capaz de resolver os nossos problemas ambientais. (R) 10. A ciência moderna irá resolver os nossos problemas ambientais.	02. Science and technology will eventually solve our problems with pollution, overpopulation, and diminishing resources. 04. Modern science will not be able to solve our environmental problems. (R) 10. Modern science will solve our environmental problems.
Escala 06. Fragilidade ambiental	*Scale 06. Environmental fragility*

01. Se as coisas continuarem neste rumo, em breve estaremos perante uma grande catástrofe ecológica. 05. Os seres humanos estão a abusar gravemente do ambiente. 09. Acredito que os seres humanos abusaram severamente do ambiente.	01. If things continue on their present course, we will soon experience a major ecological catastrophe. 05. Humans are severely abusing the environment. 09. I do not believe that the environment has been severely abused by humans. (R)
Escala 07. Alteração da natureza 03. Eu prefiro um jardim pouco cuidado e natural a um bem tratado e organizado. (R) 06. Eu prefiro um jardim bem tratado e organizado a um não tratado e natural. 09. A relva e as ervas daninhas a crescer entre as pedras do pavimento dão realmente um ar descuidado.	*Scale 07. Altering nature* 03. I'd prefer a garden that is wild and natural to a well-groomed and ordered one. (R) 06. I'd much prefer a garden that is well groomed and ordered to a wild and natural one. 09. Grass and weeds growing between pavement stones really looks untidy.
Escala 08. Comportamentos pessoais de conservação 01. Preocupo-me com a poupança de água e de outros recursos naturais. 07. No meu dia-a-dia, tento encontrar formas de poupar água ou energia. 09. Sempre que possível, tento poupar recursos naturais.	*Scale 08. Personal conservation behaviour* 01. I could not be bothered to save water or other natural resources. (R) 07. In my daily life I try to find ways to conserve water or power. 09. Whenever possible, I try to save natural resources.
Escala 09. Dominância humana sobre a natureza 01. Os seres humanos estão destinados a dominar a natureza. 02. Os seres humanos foram criados ou evoluíram para dominar a natureza. 09. Eu acredito que os seres humanos tenham sido criados ou evoluído para dominar a natureza.	*Scale 09. Human dominance over nature* 01. Humans were meant to rule over the rest of nature. 02. Human beings were created or evolved to dominate the rest of nature. 09. I do not believe humans were created or evolved to dominate the rest of nature. (R)
Escala 10. Utilização humana da natureza 03. Os seres humanos não têm o direito de danificar o ambiente apenas para alcançar um maior crescimento económico. (R) 06. Nós não devíamos continuar a usar a natureza como um recurso para fins económicos. (R) 09. A questão do ambiente é secundária face ao crescimento económico.	*Scale 10. Human utilization of nature* 03. Humans do NOT have the right to damage the environment just to get greater economic growth. (R) 06. We should no longer use nature as a resource for economic purposes. (R) 09. The question of the environment is secondary to economic growth.
Escala 11. Preocupação ecocêntrica 05. Acredito que a proteção do ambiente é um assunto importante. 09. Acredito que a natureza é um bem valioso por si só. 10. Chateia-me que as florestas estejam a ser devastadas para a agricultura.	*Scale 11. Ecocentric concern* 05. I do not believe protecting the environment is an important issue. (R) 09. I do not believe nature is valuable for its own sake. (R) 10. I don't get upset at the idea of forests being cleared for agriculture. (R)
Escala 12. Apoio a políticas de controlo de crescimento populacional 03. As famílias deviam ser encorajadas a limitar o número de filhos a dois ou menos. 04. Um casal deve ter tantos filhos quantos quiser, desde que possa cuidar adequadamente deles. (R)	*Scale 12. Support for population growth policies* 03. Families should be encouraged to limit themselves to two children or less. 04. A married couple should have as many children as they wish, as long as they can adequately provide for them. (R)

05. O nosso Governo devia educar as pessoas sobre a importância de ter dois filhos ou menos.	05. Our government should educate people concerning the importance of having two children or less.

Annex 2 – Items included in EAI-24-PT and corresponding items in Milfont and Duckitt's original English version (Milfont & Duckitt, 2010). R = reversed items.

EAI-24-PT	**Original version (Milfont & Duckitt, 2010)**
Escala 01. Apreciação da natureza 02. Eu gosto mesmo de passear pelo campo, por exemplo em florestas ou zonas rurais. 10. Acho aborrecido passar tempo na natureza. (R)	*Scale 01. Enjoyment of nature* 02. I really like going on trips into the countryside, for example to forests or fields. 10. I think spending time in nature is boring.
Escala 02. Apoio a políticas de conservação 02. Os governos deviam controlar a taxa a que as matérias-primas são utilizadas, para garantir que duram tanto quanto possível. 10. Acho que os governos devem controlar e regular a forma como as matérias-primas são usadas, para fazê-las durar mais tempo.	*Scale 02. Support for interventionist conservation policies* 02. Governments should control the rate at which raw materials are used to ensure that they last as long as possible. 10. I am opposed to governments controlling and regulating the way raw materials are used in order to try and make them last longer. (R)
Escala 03. Ativismo ambiental 02. Eu gostaria de aderir e participar ativamente num grupo ambientalista. 04. Eu seria capaz de me envolver numa organização ambientalista.	*Scale 03. Environmental movement activism* 02. I would like to join and actively participate in an environmentalist group. 04. I would not get involved in an environmentalist organization. (R)
Escala 04. Conservação motivada por preocupações antropocêntricas 03. Uma das razões mais importantes para manter os rios e lagos limpos é para que as pessoas possam praticar desportos aquáticos. 09. Precisamos de manter os rios e lagos limpos para proteger o ambiente, e não para termos lugares para as pessoas praticarem desportos aquáticos. (R)	*Scale 04. Conservation motivated by anthropocentric concern* 03. One of the most important reasons to keep lakes and rivers clean is so that people have a place to enjoy water sports. 09. We need to keep rivers and lakes clean in order to protect the environment, and not as places for people to enjoy water sports. (R)
Escala 05. Confiança na ciência e tecnologia 04. A ciência moderna não será capaz de resolver os nossos problemas ambientais. (R) 10. A ciência moderna irá resolver os nossos problemas ambientais.	*Scale 05. Confidence in science and technology* 04. Modern science will not be able to solve our environmental problems. (R) 10. Modern science will solve our environmental problems.
Escala 06. Fragilidade ambiental	*Scale 06. Environmental fragility*

05. Os seres humanos estão a abusar gravemente do ambiente. 09. Acredito que os seres humanos abusaram severamente do ambiente.	05. Humans are severely abusing the environment. 09. I do not believe that the environment has been severely abused by humans. (R)
Escala 07. Alteração da natureza 03. Eu prefiro um jardim pouco cuidado e natural a um bem tratado e organizado. (R) 06. Eu prefiro um jardim bem tratado e organizado a um não tratado e natural.	*Scale 07. Altering nature* 03. I'd prefer a garden that is wild and natural to a well-groomed and ordered one. (R) 06. I'd much prefer a garden that is well groomed and ordered to a wild and natural one.
Escala 08. Comportamentos pessoais de conservação 08. Eu sou o tipo de pessoa que se esforça para poupar recursos naturais. 09. Sempre que possível, tento poupar recursos naturais.	*Scale 08. Personal conservation behaviour* 08. I am not the kind of person who makes efforts to conserve natural resources. (R) 09. Whenever possible, I try to save natural resources.
Escala 09. Dominância humana sobre a natureza 02. Os seres humanos foram criados ou evoluíram para dominar a natureza. 09. Eu acredito que os seres humanos tenham sido criados ou evoluído para dominar a natureza.	*Scale 09. Human dominance over nature* 02. Human beings were created or evolved to dominate the rest of nature. 09. I do not believe humans were created or evolved to dominate the rest of nature. (R)
Escala 10. Utilização humana da natureza 02. Proteger o emprego das pessoas é mais importante do que proteger o ambiente. 07. Proteger o ambiente é mais importante do que proteger os empregos das pessoas.	*Scale 10. Human utilization of nature* 02. Protecting peoples' jobs is more important than protecting the environment. 07. Protecting the environment is more important than protecting peoples' jobs. (R)
Escala 11. Preocupação ecocêntrica 07. Fico triste por ver as florestas devastadas para a agricultura. 08. Fico triste por ver ambientes naturais destruídos.	*Scale 11. Ecocentric concern* 07. It makes me sad to see forests cleared for agriculture. 08. It does not make me sad to see natural environments destroyed. (R)
Escala 12. Apoio a políticas de controlo de crescimento populacional 03. As famílias deviam ser encorajadas a limitar o número de filhos a dois ou menos. 04. Um casal deve ter tantos filhos quantos quiser, desde que possa cuidar adequadamente deles. (R)	*Scale 12. Support for population growth policies* 03. Families should be encouraged to limit themselves to two children or less. 04. A married couple should have as many children as they wish, as long as they can adequately provide for them. (R)