

Article

Dimensionality of Environmental Values and Attitudes: Empirical Evidence from Malaysia

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Abstract: This paper aims to examine the dimensions of environmental values from the combination of biospheric and altruistic values; and the dimensions of environmental attitudes using a revised New Ecological Paradigm (NEP) scale in a developing country. The unit of analysis was individual respondents who live in Klang Valley, Malaysia. Descriptive, reliability, exploratory, and confirmatory factor analyses were used to analyze the 500 useable data. The findings supported the reliability and validity of the research instruments. Both environmental values and attitudes are recommended as a single dimensional rather than multidimensional structure in a multicultural context of Malaysia. Respondents placed altruistic and biospheric values in the same environmental value cluster, and a shorter version of the revised NEP scale is provided. As such, segregating environmental values and attitudes into multiple dimensions to segment and target individuals in Malaysia is not recommended. The distinction between altruistic and biospheric values has rarely been validated in empirical research; and the suitability of the revised NEP scale to measure environmental attitudes is debatable due to the issues of its reliability, dimensionality, and applicability in the context of a non-Western developing country.

Keywords: attitudes; dimensions; environment; NEP; values



Citation: Tan, B.C.; Khan, N.; Lau, T.C. Dimensionality of Environmental Values and Attitudes: Empirical Evidence from Malaysia. *Sustainability* **2022**, *14*, 14201. <https://doi.org/10.3390/su142114201>

Academic Editor: Antonio Boggia

Received: 29 July 2022

Accepted: 1 September 2022

Published: 31 October 2022

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1. Introduction

Environmental issues are not new in Asian society as continuous damage inflicted on the natural environmental resources has resulted in an alarming environmental crisis. Severe environmental problems, such as global warming, ozone depletion, water and air pollution, species extinction, and farmland erosion, have had a significant impact on the quality of the environment and human life. Human behavior is both the cause and solution to the present environmental problems [1,2], and these problems are deep-rooted in human values [3] and attitudes on the environment [4]. Subsequently, psychological factors, such as values and attitudes in predicting pro-environmental behavior, have been researched extensively over the last few decades. However, due to the issue of reliability, validity, and dimensionality of measurement scales used to measure these variables, the outcome of past studies has been inconclusive.

Over the years, a number of the studies have been conducted to investigate the relationship between values, general and specific beliefs, intentions, and environmental related behavior in the environmental psychology studies. Attention was mainly focused towards determining the right measurement tools/items, as well as deciding the dimensions of environmental values and attitudes to be able to better explain the environmental related behavior. Generally, most value orientation studies in the context of environmental research were based on Schwartz's [5] universal value system which consisted of 56 value items, and later it was replaced by three different value orientations: an egoistic, a social-altruistic, and a biospheric value orientation [6,7] with shorter items used in survey. Nevertheless,

in many studies, biospheric value orientation could not be distinguished from the altruistic value orientation, and both value orientations acted as a single dimension to explain environmental behavior. With this, it is important to validate the value instrument and to reveal whether biospheric value orientation is emerging from an altruistic value orientation and whether these two value orientations provide a distinct basis for environmental beliefs, intention, and behavior. In addition, a revised NEP scale [8], which consists of 15 items, used to measure environmental attitudes was criticized for several shortcomings due to the issue of reliability, dimensionality, and universal result of poor attitude–behavior relations. The details of literature review, both theoretical and empirical, will be discussed in Section 2. Therefore, this paper intends to achieve two objectives. The first objective is to examine the dimension of environmental values from the combination of biospheric and altruistic values. According to De Groot and Steg [1] three value orientations can explain pro-environmental behavior: egoistic, altruistic, and biospheric values. However, the distinction between altruistic and biospheric values has rarely been validated in empirical research. The second objective is to determine the dimension of environmental attitudes using a revised NEP scale. The suitability of such a scale to measure the environmental attitudes is debatable, particularly in terms of its reliability, dimensionality, and applicability in the context of a non-Western developing country [9,10]. Further research in these areas is timely as it helps to present a more reliable and valid measurement tool to measure the environmental values and attitudes. The validated measurement tools could contribute to better understanding the relationship between values, general and specific beliefs, intention, and environmental related behavior. To achieve these two objectives, the sample size of 600 respondents who lived in Klang Valley, will be approached in this study. The details of the research methodology will be explained in Section 3.

2. Literature Review

2.1. Value Orientation

Schwartz [5] (p. 21) defined value as “... a desirable trans-situational goal varying in importance, which serves as a guiding principle in the life of a person or other social entity”. According to Stern [11], it is important to study human values because values influence attitudes and behavior significantly. As such, Schwartz [5] summarizes the following five characteristics of values:

- Value is about the concept or beliefs;
- Value is about desirable end states or behaviors;
- Value transcends specific situations;
- Value guides the selection or evaluation of persons, behavior, and events;
- Value is ordered by relative importance.

2.1.1. Conceptualization of Value Orientations

Schwartz Value Theory [5] is a well-known theory widely used in environmental research [1,12–14]. According to Schwartz [5] (p. 21), “values represent, in the form of conscious goals, responses to three universal requirements with which all individuals and societies must cope: needs of individuals as biological organisms, requisites of coordinated social interaction, and requirements for the smooth functioning and surviving of groups”. Schwartz outlined ten different types of values and classified them into four dimensions of self-enhancement, self-transcendence, openness to change, and tradition values. An individual who is holding self-enhancement value is concerned with his or her self-interest, whereas an individual who is holding the self-transcendence value cares about the welfare and interests of others. On the other hand, he or she who possesses the openness to change values tends to be more open minded and are willing to try new things, as compared to those with traditional values who always refuse to change [5].

In terms of the research instruments to measure value orientation, the value instruments proposed in the Schwartz Value Theory consists of 56 items and is often criticized by other researchers for being too long and time consuming to be applied in quantitative

studies [1,14,15]. As a result, several researchers have reduced the number of items in Schwartz's value instrument [6,7,16,17] or excluded openness to change and conservation values to focus mainly on the self-enhancement and self-transcendence values of respondents [1,14,18–20]. De Groot and Steg [1] (p. 35) revealed that “by focusing on two value clusters only, the value instrument is brief and easier to administer in more encompassing studies compared to the full 56-item scale of Schwartz or other extensive value scales including more items are/or more value cluster”. People who value the welfare and interests of others (self-transcendence values) will care more about environmental issues than those who value self-interest or self-enhancement values [1,14,21].

Generally, to explain environmental attitudes and behavior, Stern et al. [6] reduced the numbers of value instruments proposed in the Schwartz Value Theory and furthered conceptualized the value orientations into three dimensions, which are egoistic values (i.e., concerned about himself or herself), altruistic values (i.e., concerned about other people or human elements), and biospheric values (i.e., concerned about the well-being of living things or non-human elements). Subsequently, Stern et al. [7] combined both biospheric and social-altruistic values to create biospheric–altruistic values, and the term was further renamed by Deng et al. [22] to environmental values used in a cultural study.

To assess biospheric values and to examine whether biospheric and altruistic values are separate entities in empirical studies, Stern et al. [7] used the shorter version of the Schwartz Value instrument and only included two biospheric value items, namely, “preventing pollution and respecting the earth,” to the dimension of self-transcendence values. They claimed that biospheric value items are under-represented in the original Schwartz Value Theory scale. In summary, biospheric and altruistic values comprised of the subscale of self-transcendence values in the Schwartz Value Theory. Stern et al. claimed that both values should be distinguished because biospheric values focused on the intrinsic value of nature.

Unlike previous studies conducted by Stern et al. [7], de Groot and Steg [1,14] omitted the cluster of openness to change and traditional values and emphasized mainly on self-transcendence and self-enhancement values. They adopted 11 value items from self-transcendence and self-enhancement values presented in Schwartz Value Theory and added two biospheric value items adopted from Stern et al. Out of these 13 items, 5 value items—social power, influence, wealth, authority, and ambition—were utilized to measure egoistic values; 4 items from self-transcendent values—social justice, equality, a world at peace, and helpfulness—were utilized to measure altruistic values. Lastly, 2 items from self-transcendence values related to the natural environment—unity with nature and protecting the environment—and two additional biospheric items—preventing pollution and respecting the earth were combined to measure biospheric values in their studies.

2.1.2. Dimensionality of Environmental Values

The dimensionality of value orientations has been debated extensively in past environmental behavioral studies. Table 1 presents the dimensionality of environmental values extracted from previous environmental studies.

Table 1. Dimensionality of environmental values.

Author	Dimensions (D)	Value Items	Country	Distinguished AV and BV (Yes/No)
Stern et al. [7]	4Ds (ST, SE, OT, T)	34	United States	No
Grunert and Juhl [23]	No Ds	56	Denmark	No
Stern et al. [17]	4Ds (ST, SE, OT, T)	34	United States	No
Stern et al. [24]	4Ds (ST, SE, OT, T)	26	United States	No
Schultz and Zelezny [25]	10 value types	37	United States	No
Follows and Jobber [26]	3Ds (ST, SE, T)	11	Canada	No
Aoyagi-Usui [27]	3Ds (BV-T, AV, EV)	12	Japan	Yes
Dietz et al. [16]	4Ds (SE, ST, OT, T)	26	United States	No
Nordland and Garvill [28]	2Ds (SE, ST)	24	Sweden	No
Thøgersen and Ölander [29]	5value types (SE, ST)	16	Denmark	No
Steg et al. [30]	3Ds (EV, AV, BV)	12	Netherlands	Yes
Deng et al. [22]	2Ds (AV, BV)	10	Canada	Yes
Milfont [2]	2Ds (SE, AV)	6	New Zealand	No
de Groot et al. [20]	3Ds (EV, AV, BV)	13	Austria, Czech Republic, Italy, Netherland, Sweden	Yes
de Groot and Steg [14]	3Ds (EV, AV, BV)	13	Austria, Czech Republic, Italy, Netherland, Sweden	Yes
de Groot and Steg [1]	3Ds (EV, AV, BV)	13	Netherlands	Yes
Ramayah et al. [31]	3Ds (SE, ST, T)	11	Malaysia	No
Steg et al. [32]	3Ds (EV, AV, BV)	13	Netherlands	Yes
Kim [4]	2Ds (SE, ST)	7	Korea	No
Lopez-Mosquera and Sanchez [19]	3Ds (EV, AV, BV)	12	Spain	Yes
de Groot et al. [33]	3Ds (EV, AV, BV)	13	Hungary	Yes
Harring and Jagers [12]	2Ds (EV, AV)	9	Sweden	No

Legend: D = Dimensions, EV = Egoistic values, AV = Altruistic values, BV = Biospheric values, SE = Self-enhancement values, ST = Self-transcendence values, OT = Openness to change, T = Tradition.

Generally, only self-transcendence versus self-enhancement values is found in most value-related studies. De Groot and Steg [20] commented that, in the previous studies based on the Schwartz Value Theory, only a few biospheric value items are included. Thus, obtaining a distinct construct of biospheric values via factor analysis is difficult. Kim [4] hypothesized that self-transcendence and self-enhancement values are related to the environmental attitude of students. Follows and Jobber [26] and Ramayah et al. [31] investigated the effect of self-transcendence, self-enhancement, and tradition values on attitudes towards the environmentally friendly purchase intention of baby cloth diapers in Malaysia. The results showed that the distinction between altruistic and biospheric values was not established because very few biospheric value items were added in the clusters of value scales. In a recent study conducted by Tamar et al. [34] to predict pro-environmental behavior, the outcome did not find a significant direct effect of altruistic value on pro-environmental behavior, while biospheric value served as an important predictor of such behavior among the 500 undergraduate students in 14 different faculties from a university

in the eastern part of Indonesia. Similarly, a study conducted by Marchall et al. [35] in Australia, results suggested that biospheric and altruistic values influenced all climate change responses. Both altruistic and biospheric values served as two distinct constructs rather than a single construct in these two studies. In addition, some of the studies strongly supported the pivotal role of values in explaining pro-environmental behavior and reported that certain types of values (e.g., egoistic and social-altruistic) can influence environmental behavior positively. This can be witnessed from the studies conducted to control human consumptions [36], promote green lifestyle [37], encourage social environmentalism, conservation, and environmental citizenship [38]. Given the different results reported from past studies, future research should validate the value instrument and examine the distinction of biospheric and altruistic values [1,14,30,39]. The application of this instrument in developing and multicultural countries, such as Malaysia, is limited.

2.2. Attitudes

Attitude can be defined as “a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object” [40] (p. 211). It is an enduring set of beliefs about an object that causes people to act in certain ways toward the object [41]. It also refers to the psychological tendency of evaluating a specific entity with some degree of favor or disfavor [42].

2.2.1. Environmental Attitudes

According to Milfont [2] (p. 12), environmental attitude can be defined as the “psychological tendency that is expressed by evaluating perceptions of or beliefs regarding the natural environment, including factors affecting its quality, with some degree of favor or disfavor.” The terms “environmental attitudes” and “environmental concern” have been used interchangeably to evaluate the overall state of the environment [43]. Nevertheless, several researchers classified these two terms separately in their studies [44,45]. Environmental attitude measures the positive or negative effect of an individual towards environmental issues, topics, or activities [25] and are usually related to the factors that affect the environmental quality [46]. It is related to his or her cognitive judgement to protect and promote the environment [47].

2.2.2. New Ecological Paradigm Scale (NEP)

With regard to the measures of environmental attitude, Dunlap and Jones [43] noted that previous environmental studies have presented at least 700 measures of environmental attitude. Among these 700 measures, the New Environmentalism Paradigm (NEP) scale [8,48] is the most popular measure of environmental attitude utilized to measure the overall relationship between individuals and the environment [1,14,20,30,32,33,49–53].

The original NEP scale consists of 12 items. The original NEP was criticized for several shortcomings, including a lack of internal consistency among individual responses, poor correlation between the scale and behavior, and “dated” language used in the instrument’s statements. As a result, it has been subsequently improved and expanded to 15 items and renamed New Ecological Paradigm scale or a revised NEP scale [8]. The revised NEP scale aims to improve the original NEP scale. The revised scale offers a broader range of facets that addresses the ecological worldview and consists of an equal number of items that capture positive and negative features of NEP. In addition, it aims to avoid outdated terminologies [8,54].

Subsequently, three major concerns have been raised from past environmental literature concerning the use of the NEP scale to measure environmental attitude. The first concern involves criticism of the NEP scale when used to measure environment-related behavior [55] because of the universal result of poor attitude–behavior relations. Using general attitudinal measures to predict a specific behavior is inappropriate [40,41]. The second concern addresses the dimensionality of environmental attitude when the NEP scale is used, that is, whether it should be regarded as a unidimensional or multidimen-

sional construct [10,21,56]. The third concern is about the reliability of the NEP scale (low Cronbach alpha values) when used in non-Western cases [9,54,57].

2.2.3. Dimensionality of Environmental Attitude Using NEP Scale

With regard to the use of the NEP scale based on the unidimensional approach, several studies are consistent with the insertions of Dunlap and Van Liere [48] and Dunlap et al. [8] (e.g., 44, 45, 11, 25). However, contrary to the unidimensional approach of the NEP scale, Cottrell [58] identified two dimensions, whereas Luo and Deng [53], Manoli et al. [59], and Muderrisoglu and Altanlor [51] identified three dimensions. Furthermore, Erdogan [52], Deng et al., [22], and Robert and Bacon [60] identified four dimensions, whereas Luck [61] identified five dimensions.

Nonetheless, the findings on the applicability of the NEP scale to Western and non-Western cases remained inconclusive [54]. An increasing number of studies on the use of the NEP scale in an Asian context have reported satisfactory level of internal consistency (alpha values = 0.65–0.85), such as studies in Japan [62] (Pierce et al., 1986), Korea [4,63], China [53,64,65], and Hong Kong [50]. Hawcroft and Milfont [66] suggested that NEP can be used effectively not only in developed countries. As a result, the degree to which the NEP scale remains a valid and reliable measurement tool for environmental attitude or concern is open for discussion [67]. Such different results give rise to the question on the reliability and dimensionality of the scale when used in different countries, especially in non-Western developing countries, such as Malaysia. Further research in this area is recommended by several researchers [54,67].

3. Methods

In this study, a modified version of Schwartz's value scale [5] developed by de Groot and Steg [1,14] was used. The value instrument consisted of eight value items to measure environmental value (i.e., biospheric and altruistic values). The component of biospheric values consists of four items, namely, preventing pollution, respecting the earth, unity with nature, and protecting the environment; while the component of altruistic values includes equality, a world at peace, social justice, and being helpful. Respondents were asked to rate the importance of the values as "a guiding principle in their lives" on a seven-point Likert scale from 1 ("not at all important") to 7 ("of supreme importance"). Instead of asking respondents to only select a few values where they think are important to them, this study required respondents to rate all the value items based on their importance, which aim to choose the measurement items for the next dimensionality test of the construct.

As for the measurement scale of environmental attitude, a revised NEP scale [8] was used. Respondents were asked to rate the degree to which they agree with the 15 items to measure their attitudes towards the environment (i.e., environmental attitudes) on a seven-point Likert-type scale from 1 ("strongly disagree") to 7 ("strongly agree"). Eight of these items were positively narrated statements, and seven were negatively narrated (*). Respondents were also asked to fill up the questions related to the demographic profile. A survey link was sent online via WhatsApp and social media platform to 600 respondents randomly. After discarding missing data, the sample size with 500 respondents was found to be satisfactory (i.e., 83.33% response rate). SPSS version 16 was used to perform the frequency test to explain the demographic profile of respondents, followed by the exploratory factor analysis (EFA) to determine the dimensions of the constructs. Next, AMOS-SEM version 21 was used to perform the confirmatory factor analysis (CFA) to confirm the dimensionality of the constructs tested from the EFA, as well as the reliability, validity, and uni-dimensionality checking.

4. Results

Table 2 shows the demographic profile of respondents and the frequency tests. From the analyzed sample (N = 500), 56.4% of the respondents were female, 38% between the age of 26 and 35 years old, 54.4% having a bachelor degree qualification, and 39.2% earning

the monthly income in the range of RM3501 to RM5000. With regard to their occupational level, many of them were executives (33.8%) and students (31.2%). As for ethnicity, 54.8% of them were Chinese, followed by 22.2% Malay, and 16.4% Indian.

Table 2. Respondents' demographic profile.

Profile	Frequency (N = 500)	Percentage (100%)
<i>Gender</i>		
Female	282	56.4
Male	218	43.6
<i>Age</i>		
18–25	155	31
26–35	190	38
36–45	100	20
45–65	52	10.4
66 and above	3	0.6
<i>Educational</i>		
High school	60	12
Certificate/Diploma	109	21.8
Bachelor degree	272	54.4
Postgraduate degree	59	11.8
<i>Monthly income (RM)</i>		
Less than 1500	85	17
1501–3500	196	39.2
3501–5000	141	28.2
5001 and above	78	15.6
<i>Occupational</i>		
Managerial level	115	23
Executive level	169	33.8
Clerical level	38	7.6
Housewife	22	4.4
Student	156	31.2
<i>Ethnicity</i>		
Malay	111	22.2
Chinese	274	54.8
Indian	82	16.4
Others	33	6.6

Table 3 shows the mean, standard deviation, overall mean scores, and Cronbach alpha for environmental value (V) and environmental attitude (EA). The overall mean score of 5.392 out of 7 scales for V items shows that the respondents highly cared about the welfare and interests of others. This concern served as their guiding principle in life. In addition, the overall mean score of 5.177 out of 7 scales for EA items indicated that respondents demonstrated a significant positive attitude towards the environment. They do care about environmental problems. The Cronbach's alpha of 0.947 and 0.916 for V and EA, respectively, met the cut of criterion (i.e., >0.6) and achieved the desired internal consistency [68]. Therefore, the result implies that the scales used to measure V and EA are reliable, thus the results are replicable over time.

Table 3. Means, standard deviations, overall mean scores and Cronbach alpha for environmental value (V), and environmental attitudes (EA) items.

Items (V)	Mean	Standard Deviation	Items (EA)	Mean	Standard Deviation
V1	5.16	1.520	EA1	5.05	1.192
V2	5.17	1.434	EA2	5.03	1.372
V3	5.39	1.542	EA3	5.26	1.324
V4	5.53	1.533	EA4	4.85	1.103
V5	5.48	1.547	EA5	5.40	1.329
V6	5.47	1.496	EA6	5.45	1.441
V7	5.36	1.583	EA7	5.46	1.354
V8	5.58	1.491	EA8	5.07	1.336
-	-	-	EA9	5.25	1.289
-	-	-	EA10	4.76	1.330
-	-	-	EA11	5.26	1.309
-	-	-	EA12	5.23	1.260
-	-	-	EA13	5.15	1.176
-	-	-	EA14	4.85	1.283
-	-	-	EA15	5.59	1.281
Overall mean score = 5.392	Cronbach alpha = 0.947		Overall mean score = 5.17	Cronbach alpha = 0.916	

Exploratory factor analysis (EFA) was then conducted to determine the dimensionality of environmental value (V) and environmental attitude (EA). EFA is the best method to use because it considers the correlated factor loadings of all items related to a construct and determines the right number of independent factor dimensions [68]. Several guidelines recommended by Hair et al. [68] for EFA were followed. Firstly, the Bartlett's test of sphericity must be at a significant level of <0.05 to confirm sufficient correlations among the variables. Secondly, the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy must be >0.50 [68] (p. 105). Thirdly, factors with eigenvalues greater than 1 were considered. Fourthly, 60% of the total variance is considered satisfactory in social science studies. Fifthly, factor loadings at ± 0.50 or higher were considered significant. Sixthly, communalities less than 0.50 failed to meet acceptable levels of explanation.

The results of the EFA and reliability of the construct of environmental value (V) and environmental attitude (EA) were presented in Table 4. The Bartlett's test of sphericity of V reported was significant at 3600.854 and the Kaiser–Meyer–Olkin (KMO) measures of sampling adequacy was above 0.90 (>0.50). The presence of one component extracted exceeded the recommended value of 1. For interpretative purposes, factor loadings of 0.81 (>0.50) or higher reported for all items were considered significant. Lastly, the Cronbach's alpha values reported were greater than 0.90 (>0.60), showing that all of the research constructs had high internal consistency [68].

As for the items of environmental attitudes (EA), several items were removed (i.e., EA1, EA2, EA4, EA8, EA10, EA11, EA12, and EA14) because of the poor value of communalities (<0.50) and low loadings (<0.50). The percentages of the total variance explained for environmental attitudes added from 46.379% to 60.40% after the items were removed. Overall, 60% of the total variance is considered satisfactory in social science studies [68]. The Bartlett's test of sphericity reported was significant at 3600.854 and KMO was above 0.90 (>0.50). The presence of one component extracted exceeded the recommended value of 1. The factor loadings of 0.724 (>0.50) and higher reported for all the items were deemed significant for interpretative purposes. Lastly, the Cronbach's alpha values reported were greater than 0.80 (>0.60), indicating the high internal consistency of items for the research construct [68]. Thus, only seven items of environmental attitudes were retained after EFA for further analysis.

Table 4. Results of EFA and reliability for environmental values (V) and environmental attitudes (EA).

Construct	Items	Factor Loading	KMO	Bartlett's Test of Sphericity	Eigenvalue	Total Variance Explained	Alpha (α)
Environmental Values (V)	V1	0.812	0.932	3600.854 ***	5.862	73.277	0.947
	V2	0.856					
	V3	0.890					
	V4	0.836					
	V5	0.892					
	V6	0.856					
	V7	0.812					
	V8	0.888					
Environmental Attitudes (EA)	EA3	0.761	0.922	1546.053 ***	4.158	59.40	0.885
	EA5	0.807					
	EA6	0.759					
	EA7	0.768					
	EA9	0.782					
	EA13	0.724					
	EA15	0.791					

*** significant.

Subsequently, confirmatory factor analysis (CFA) was performed to further confirm the dimensionality of the construct. In this study, the desirable criteria for the goodness-of-fit indices, such as CMIN/df, GFI, RMSEA, NFI, CFI, and TLI, were used. As suggested by previous researchers, CMIN/df value of five or less [69,70], GFI greater than 0.90 [68,71], RMSEA of less than 0.08, NFI value greater than 0.90 [68,72], CFI value greater than 0.90 [68,73], and TLI value greater than 0.90 [68,74] suggested a reasonable fit. CFA provides a series of tests to confirm the measurement theory that requires a construct to be defined first [75]. To derive a well-fitting model based on the desirable range of multiple goodness-of-fit indices, the original measurement model is revised or improved if the fit indices of the model exhibit poor fit. This process is called model re-specification, and the detection of specification errors can be guided by examining the modification index (MI) in this process [68]. Moreover, error items can be correlated in cases where questionnaire items are similarly worded [75], whereas items with a factor loading smaller than 0.5 should be deleted [68].

The original and final revised measurement models of environmental values are presented in Figure 1. The MI of the environmental value scale showed that V2 and V3 should be discarded and that one error covariance path was connected between V1 and V8. V1 for “preventing pollution” was an extra biospheric value added to the scale [1,6,7,30,32,33], and V8 for “protecting the environment” originated from Schwartz’s value theory. Both items (V1 and V8) were closely related. After the model was revised, the overall CMIN/df value improved to 3.082; GFI increased to 0.984, NFI to 0.989, CFI to 0.993, and TLI to 0.987; and RMSEA declined from 0.167 to 0.065. Table 5 summarizes the goodness-of-fit indices of environmental value construct for both original and revised measurement models. Following the improvement of the original measurement model of the environmental value construct, six items from this construct were retained in the revised measurement model for further analysis.

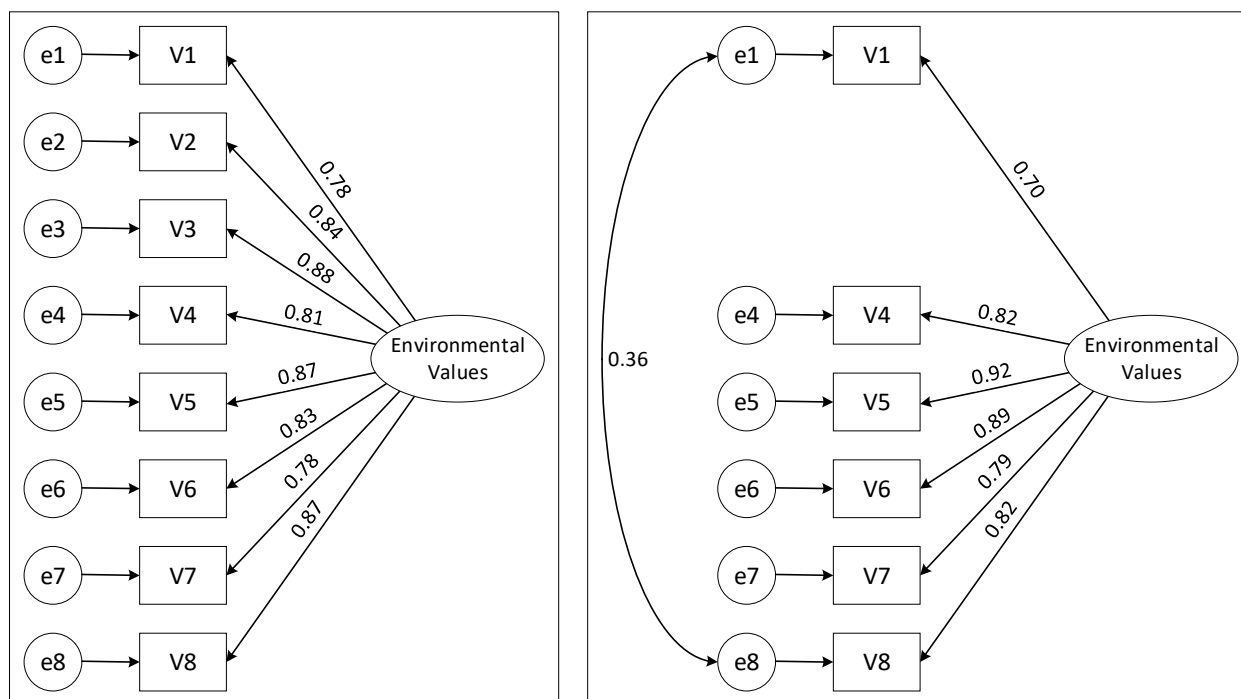


Figure 1. Original and revised measurement models for environmental values construct.

Table 5. Goodness-of-fit indices for environmental values construct.

Goodness-of-Fit Indices	Desirable Range	Original Measurement Model	Revised Measurement Model
CMIN/df	<5	14.892	3.082
GFI	>0.90	0.845	0.984
RMSEA	<0.08	0.167	0.065
NFI	>0.90	0.918	0.989
CFI	>0.90	0.923	0.993
TLI	>0.90	0.892	0.987

Next, the modification index (MI) of the environmental attitudes scale was examined through CFA. Further modification was not required based on the examination of MI. This is because the goodness-of-fit indices for the original model of environmental attitudes construct presented in Table 6 met the desirable ranges as recommended by the researchers, thus indicated a good fit to the data (CMIN/df = 1.294, GFI = 0.990, RMSEA = 0.024, NFI = 0.988, CFI = 0.997, TLI = 0.996). Therefore, the original environmental attitude measurement model with seven items shown in Figure 2 was retained.

Table 6. Goodness-of-fit indices for environmental attitudes construct.

Goodness-of-Fit Indices	Desirable Range	Original Measurement Model
CMIN/df	<5	1.294
GFI	>0.90	0.990
RMSEA	<0.08	0.024
NFI	>0.90	0.988
CFI	>0.90	0.997
TLI	>0.90	0.996

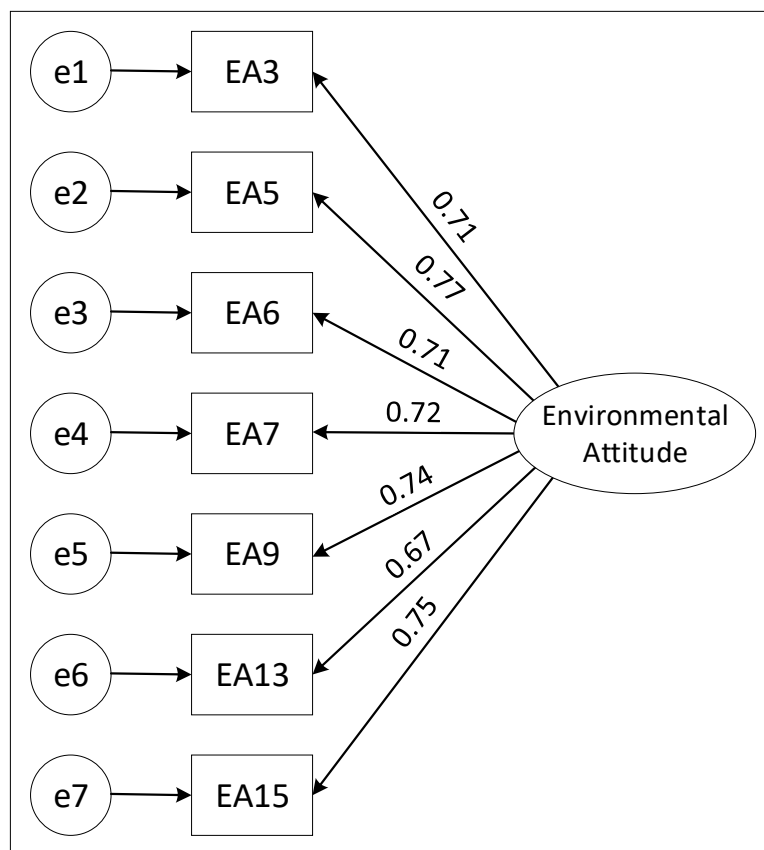


Figure 2. Original measurement model for environmental attitudes construct.

As for the uni-dimensionality check, CFI was used as an important indicator [76,77] to confirm the presence of a single dimension for all the construct dataset used in this study. The CFIs reported in Table 5 for V (i.e., 0.993) and in Table 6 for EA (i.e., 0.991) fulfilled the required CFI value (≥ 0.90), thus indicating no major threat to uni-dimensionality [76,77]. Next, convergent validity was tested through several criteria. Firstly, standardized factor loading estimates should be 0.50 or higher [68] (Hair et al., 2010). Researchers should interpret these estimates because they are constrained to a range between -1.0 and $+1.0$. Secondly, an average variance extracted (AVE) of 0.50 or higher suggests adequate convergence [68,78]. Thirdly, Bagozzi and Yi [72] suggested that convergent validity is achieved if the composite reliability meets the cut-off criterion of 0.60, whereas Hair et al. [68] indicated that reliabilities ranging from 0.60 to 0.70 are reasonable if other constructs in the model exhibit the desired construct validity.

Table 7 shows that the standardized factor loading estimates for all items of environmental values (V) from 0.70 to 0.91 and environmental attitudes (EA) from 0.667 to 0.773 were above the minimum point of 0.50 suggested by Hair et al. (2010). Next, the AVEs reported for V = 0.69; EA = 0.53 exceeded the minimum threshold of 0.50 [68,78]. Moreover, the composite reliability values for V = 0.85; EA = 0.82 were above the recommended point of 0.60 [68,71]. Therefore, the convergent validity of the construct was sufficient because it met the three criteria recommended by researchers. Both (i) composite reliability (CR) and (ii) average variance extracted (AVE) were computed based on the formulas suggested by Hair et al. [68].

Table 7. Composite reliability and average variance extracted (AVE) for environmental values (V) and environmental attitudes (EA).

Construct	Item	t-Value	Standardized Factor Loadings	Squared Standardized Factor Loadings/ SMC	Error Variance
Environmental Values (V)	V1	-	0.704	0.495	1.164
	V4	17.466	0.820	0.672	0.770
	V5	19.297	0.916	0.840	0.383
	V6	18.682	0.886	0.784	0.482
	V7	16.954	0.795	0.632	0.920
	V8	21.423	0.820	0.672	0.728
	Total	Nil	4.941	4.095	4.447
	Squared of Total	Nil	24.413	Nil	Nil
Composite Reliability = $24.413 / (24.413 + 4.447) = 0.85$, AVE = $4.095 / 6 = 0.69$					
Environmental Attitudes (EA)	EA3	15.635	0.715	0.511	0.856
	EA5	16.961	0.773	0.598	0.709
	EA6	15.487	0.711	0.505	1.025
	EA7	15.672	0.722	0.522	0.874
	EA9	16.143	0.739	0.545	0.753
	EA13	14.665	0.667	0.445	0.766
	EA15	-	0.750	0.563	0.716
	Total	Nil	5.077	3.689	5.699
	Squared of Total	Nil	25.775	Nil	Nil
Composite Reliability = $25.775 / (25.775 + 5.699) = 0.82$, AVE = $3.689 / 7 = 0.53$					

Legend: SMC = squared multiple correlation; AVE = average variance extracted; Nil = nothing in line.

5. Discussion

The study's first objective is to examine the dimensionality of environmental values from the combination of altruistic and biospheric value items. Stern and colleagues [6,7,17] developed environmental values by combining the two dimensions of biospheric and altruistic values, which were derived from the concept of self-transcendence values in the Schwartz Value Theory [5]. Two extra biospheric value items were added in the scale to represent the biospheric values [6,7,17]. In this study, the one-dimensionality of environmental values is extracted with total variance explained at 73.27% and an alpha value of 0.94 via EFA. The CFA confirms the construct's uni-dimensionality with a CFI of 0.99 (>0.90) for the examined model [76,77]. The findings of this study clearly show that, in the Malaysian context, both value orientations cannot be distinguished empirically. Thus, this construct is recommended as a uni-dimensional measure with six items and is described as having biospheric–altruistic values. Both biospheric and altruistic values are considered by respondents to be part of the same set of environmental values that lead them to care about the well-being and interests of others (i.e., human and non-human elements). Numerous environmental behavioral studies conducted in the past reported that environmental values should be deemed as two separate dimensions (i.e., biospheric and altruistic values) in explaining environmental relevant attitudes and behavior [1,14,22,30,32,33]. However, other researchers did not demonstrate a distinction between altruistic and biospheric values in their research [2,4]. The findings of this study contribute to the understanding of the dimensionality of environmental values (i.e., biospheric–altruistic values) in Malaysian context. As such, distinguishing the environmental values (i.e., biospheric and altruistic values) into two dimensions to measure environmental values of Malaysians is not recommended because both values belong to the same dimension of environmental values.

The second objective of this study is to determine the dimensions of environmental attitudes using a revised NEP scale. Both EFA and CFA analyses were conducted to test the dimensionality, reliability, and validity of the measurement scale. In the reliability test

on the 15 items of the revised NEP scale, the alpha value of 0.916 indicates good internal consistency among the items within the scale. However, eight items were removed from this construct because values of communalities were poor (<0.50) through EFA, thus leading to a uni-dimensional construct of environmental attitudes with seven items ($\alpha = 0.885$). Via CFA, CFI = 0.997, composite reliability = 0.82, AVE = 0.53, and the factor loadings of all the items ranging from 0.667 to 0.750 supported the uni-dimensionality, reliability, and validity of the construct. Respondents of this study demonstrated a significant positive attitude towards the environment. From the findings, a full version of the revised NEP scale with 15 items were inapplicable in the Malaysian context. Instead, a shorter version of the revised NEP scale with 7 items presented in a uni-dimensional approach was recommended as a valid and reliable measurement tool in measuring the environmental attitudes of individuals in Malaysia, a non-western country. The outcome of this study addressed the concern raised from past environmental literature concerning the dimensionality of environmental attitudes when the NEP scale is used [10,21,56], as well as the reliability of the NEP scale when used in the non-Western cases [9,54,57].

In this study, the instruments and dimensionality of environmental values and attitudes were tested and confirmed. Theoretically, this study helps to ensure that the results can be consistently reproduced under the same conditions (i.e., reliability) and it can also be used to represent what they are supposed to measure (i.e., validity). One plausible reason why one-dimensionality of environmental values was extracted from the sample could be because values are innate and there was no difference between altruistic and biospheric values since both are measuring the same things, which was the concern of human towards others (i.e., pro-others both human and non-human elements). In sum, all human traits including the social values are heritable [79], their variability is largely the same all around the world, thus there is no difference between altruistic and biospheric values in the sample of this study. Similarly, the 7 items reported to measure environmental attitudes in a single dimension provided a simpler and time saving tool in survey as compared to the original NEP scale which comprised of 12 items and a revised NEP scale with 15 items. Nevertheless, due to the cultural differences that exist between different populations in different countries, the English words and phrases used in the measurement instruments may not necessarily be interpreted the same way in Malaysia, although English is widely spoken and understood by many Malaysians. As such, multiple versions of languages can be used to translate the English version of the questionnaires to suit local contexts in future studies.

As for the practical implications, the study did not investigate the effects of environmental values and attitudes on pro-environmental behavior (i.e., purchase and non-purchase) after testing the items, the significant relationships between the constructs were not explored. Thus, there was insufficient information to suggest strategies to the industry players and government related parties to encourage various types of sustainable behavior. Nevertheless, communications that target or encourage altruism (through understanding and empathy towards others- human elements) and biospherism (through information on environmental problems impacts on the non-human elements, such as animals and plants) could work. The uni-dimensionality outcomes of the constructs contributed to the decision of omitting the process of market segmentation, as segregating environmental values and attitudes into multiple dimensions to segment individuals in Malaysia is not recommended.

6. Conclusions

This paper examined the dimensionality of environmental values and attitudes, and to provide reliable and valid measurement scales to understand individuals in Malaysia. Through both exploratory and confirmatory factor analyses, results from a sample size of 500 supported the reliability and validity of the environmental value and attitude instruments. Both variables were recommended as a single dimensional rather than multi-dimensional structure. This will certainly benefit industrial practitioners to better segment

and target environmentally conscious consumers who are concerned about the welfare of others and having positive attitudes towards the environment to purchase green products that are manufactured in an environmentally friendly manner to minimize the harmful impact on the environment. Lastly, there are three limitations in this study. Firstly, the sample size of 500 reported in this study may not be able to represent the population of multiethnic country, such as Malaysia. Future study is recommended to validate the refined environmental values and attitudes instrument with a larger sample size in the Malaysian context and further examine their impact on pro-environmental behavior (i.e., purchase and non-purchase). Secondly, this study only reported the dimensionality of two constructs (i.e., environmental values and attitudes). Future researchers can choose to validate the instruments, as well as testing the structural relationships of the constructs to explain the environmental significant behavior simultaneously in a single study. Thirdly, this study was a cross-sectional study in that the sample was examined at a specific point of time. A test–retest study could be conducted to measure the instruments over time, and the duration may vary from two to six weeks in the future study.

Author Contributions: The authors worked together for this research. Conceptualization, B.C.T., N.K. and T.C.L.; data curation, B.C.T.; formal analysis, B.C.T.; methodology, B.C.T.; project administration, B.C.T. and T.C.L.; resources, B.C.T.; software, B.C.T.; supervision, N.K.; validation, N.K.; writing—original draft, B.C.T., N.K. and T.C.L.; writing—review and editing, B.C.T. and T.C.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: All respondents were over 18 years old and informed and verbal consent was obtained.

Data Availability Statement: Not applicable.

Acknowledgments: The authors would like to thank Multimedia University in sponsoring the article processing charge.

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

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