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Attitude towards the Environmental Problems: The Construction of Environmental Concerns Scale *

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Abstract

Measurement issues and structure of environmental concerns (ECs) were assessed in this study. The present paper compared two different scales used in previous research to measure beliefs about awareness of consequences (ACs), or concerns, for egoistic, altruistic, and biospheric-valued objects. 110 participants from two separated Universities in Myanmar completed both the ACs and ECs scales. The findings have theoretical and practical implications for research into ECs, and for applications of the value-belief-norm (extended norm activation) theory. The important finding was demonstrated that the EC scale is superior to the AC Beliefs scale in terms of reliability and dimensionality of sub-scales in Myanmar samples. As the main purpose of this study was to establish which scale of Western developed measures for environmental problems is most suitable in Myanmar, in terms of dimensionality and reliability of its sub-scale, a confirmatory factor analysis (CFA) was conducted again in order to test the ECs scale factor structure. The three factor structure model gave a significantly better fit to the ECs data than the uni-dimensional structure and two different factor structure models. Moreover, the CFA results provided that the three-factor structure model was an excellent acceptable model of fit. Thus, in order to further study the environmental attitudes, values, intention, and behavior of the people in Myanmar, the ECs scale would be essential, applicable, and beneficial for future research.

Key words: Environmental Problems, Environmental Concerns (ECs), the AC Beliefs, CFA

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Introduction

Environmental problems have been an important issue in the past several decades. Global warming and climate change due to Greenhouse effects, deforestation and species extinction, exhaustion of fisheries, agricultural land, and pollution of air and water supplies are some of the main dangers to earth's environment (Oskamp, 2000). These environmental problems may be viewed as caused by maladaptive human behavior (Kyi Kyi Hla, 2010; Maloney and Ward, 1973).

It has been argued that environmental problems are largely ingrained into the traditional values, attitudes, and beliefs of a given society. More than three decades ago, Maloney, Ward, and Braucht (1975) pointed out that "we must determine what the population knows, thinks, feels, and actually does regarding ecology and pollution" (p. 787). According to Johnson, Bowker, and Cordell (2004), different populations with specific social practices and cultural traits are likely to hold different values on and attitudes toward nature or the environment. Therefore, an empirical study of environmental attitudes for one culture is of particular importance. Indeed, "little is known about the environmental issue, attitudes, education and conservation in Myanmar" (Tin Aung Moe, 2006). Recently, Myanmar like some Asian neighbours badly felt the full impact of the world ecological imbalance caused by global warming and climate change on 3rd -4th May, 2008, when parts of Yangon and Ayeyarwaddy Divisions were battered by the Cyclone Nargis causing many death and destruction (Kyi Kyi Hla, 2010). Again, more recently some parts of the Rakhine State also suffered many damages and losses by hitting Cyclone Giri on 22nd -23rd October, 2010, and its reconstructions and rehabilitations have not been yet completed. As a result, Myanmar learnt that it is the time to emphasize the interests of this crucial environmental conservation and sustainable development although its natural environment has not yet reached the dimensions of deterioration as in developed countries. A few studies, however, have yet been empirically conducted to examine the attitudes toward the environmental problems in Myanmar. Thus, the main objective of the study was to construct a scale to measure the environmental attitude of the Myanmar people. In other words, the purpose of this study was to establish which scale of Western developed measures for environmental problems is most suitable in Myanmar, in terms of dimensionality and reliability of its sub-scale.

Measurements of Attitude toward Environmental Problems

There have been two main approaches to measurement, the first by Stern et al. (1993, 1995) and more recently by Schultz (2000). Each group developed scales for the measurement of beliefs about ACs for, or attitudes of concern towards, valued objects that are representative of egoistic, altruistic, or biospheric value orientations. Studies using those scales are reviewed below. Schultz's scale is the more recent, but Stern's scale is still being used by some researchers. Indeed, there has not been a previous empirical investigation into which of the two scales has better reliability and dimensionality, except one study by Snelgar (2006).

Awareness of Consequences Beliefs Scale (The AC Beliefs Scale)

Stern et al. (1993, 1995) reported tests of their value-belief-norm model. As described above, they theorized that beliefs about ACs could arise for three types of valued object: they used the terms egoistic AC, altruistic AC and biospheric AC. To measure these AC beliefs, they constructed three scales. Items retained for each AC belief were selected by Stern et al. (1993) using a theta scaling procedure. In this procedure, devised by Armor (1974), items for one scale are entered into a principal component analysis and those that load on the first component are retained. Then theta reliability is obtained; it is the internal consistency when each item is weighted by its loading. This procedure is carried out for each scale separately. Thus Stern et al. (1993, 1995) do not appear to have assessed the dimensionality overall of the items in their AC scales. Using this procedure, Stern et al. (1993) produced AC Belief scales containing three items each. They reported that the reliabilities of the three AC Beliefs scales were only moderate (thetas were .66, .62, and .56).

Stern et al. (1995) used items modified from their 1993 paper, again using a theta scaling procedure. The resultant items were somewhat different from those of Stern et al. (1993), with two items for egoistic AC, two for altruistic AC, and four for biospheric AC. Theta reliabilities for the three sub-scales were better: .77, .71, and .73. Other researchers have also used the AC Beliefs scales. Joireman, Lasane, Bennett, Richards, and Solaimani (2001) used items from Stern et al. (1993, 1995) to measure beliefs about egoistic (four items), altruistic (five items) and biospheric (four items) ACs. They did not factor analyze the items, but reported that the α's were moderate (.67, .76, and .65). Garling, Fujii, Garling, and Jakobsson (2003) measured

egoistic AC, altruistic AC, and biospheric AC using three items for each from Stern et al. (1993). They then carried out principal components and reliability analyses to improve the sub-scales. After eliminating one question from each of the three sub-scales, Cronbach's α's were .45, .42, and .54. Thus, these studies show that the reliabilities of each of the AC Beliefs scales tend to be moderate and poor, and it is not clear whether each is unidimensional.

Environmental Concerns Scale (The ECs Scale)

An alternative approach to measurement was taken by Schultz (2000), in order to investigate what he termed ECs toward valued objects that are representative of the egoistic, altruistic or biospheric value orientations. He developed an EC scale in which several objects for each value orientation are assessed on a 7-point scale for the importance of that object as a matter of concern to the participant in terms of environmental issues. Example objects are, for egoistic, altruistic, and biospheric value orientations respectively, my health, children, and birds. In developing his scale of 12 items Schultz initially used a larger number of items. The specific 12 items used in the EC scale varied somewhat between the studies reported next. Schultz (2000, 2001), Schultz, Shriver, Tabanico, and Khazian (2004), and Schultz et al. (2005) collected data with the EC scale from a range of samples including USA adults and students, and students in Spain, Germany, Czech Republic, Russia, New Zealand, India, and several countries in Latin America. For most of the countries, the highest mean score was for altruistic concerns. Of egoistic and biospheric concerns, which is the higher varies between countries. Schultz (2001) showed that the USA and Spanish samples gave higher egoistic, than biospheric, mean concern score, but the reverse tended to be seen in South and Central America samples. Samples from Brazil, Germany, Czech Republic, New Zealand, and India gave higher biospheric, than egoistic, mean concern score, whereas the Russian sample showed the opposite pattern (Schultz et al, 2005). These differences between egoistic and biospheric concerns are not large; the direction of the difference is the issue.

Schultz has assessed the factor structure of the EC scale using structural equation modeling. In his initial report on the scale, Schultz (2000) tested three structural models: a one-factor model, of uni-dimensional EC; a two-factor model; and a three-factor model. The two-factor model was of biospheric items loading on

one factor with both egoistic and altruistic items loading on another factor, following Thompson and Barton's (1994) suggestion that there are ecocentric attitudes (nature valued for its own sake) and anthropocentric attitudes (nature valued for its contribution to humanity). Schultz (2000) demonstrated that the three-factor model, of egoistic, altruistic, and biospheric concerns, fitted the data well, thus providing further support for the notion that three value-orientations underlie beliefs about ACs (Stern et al., 1993; Stern, 2000). Moreover, the three-factor model gave a significantly better fit than did the two-factor model. Schultz (2001) replicated the outcome on further samples: the three-factor model fit the data better than did the two-factor model for samples from Spain and Latin America, a reliabilities of the three sub-scales were high (.91, .92, and .94) for Schultz' (2000) sample. Reported α reliabilities from other samples (Mayer & Frantz, 2004; Schultz, 2001; Schultz et al., 2004, 2005) were not always so high; nonetheless they were mostly good to high.

These studies suggested that concerns resulting from biospheric and altruistic value orientations are indeed distinct from one another. It also contains indications that Schultz' EC scale has a better factor structure and more reliable sub-scales than does Stern and colleagues' AC Beliefs scale. The issue of which scale gives better measures of these constructs is important for research questions into ECs or beliefs about ACs involving value orientations towards egoistic, altruistic and biospheric valued objects. It appears, however, that the two scales have not been directly compared. The AC Beliefs scale, which consists of a series of statements about consequences of environmental aspects for a valued object, is a different type of scale to the EC scale, in which a series of objects for each value orientation is assessed in terms of how much EC they evoke. Nonetheless, both scales were constructed in order to assess beliefs about consequences for, or concern towards, valued objects related to the three value orientations proposed by Stern et al. (1993) for their extended norm-activation model, the value-belief-norm theory. Thus after empirical making a comparison of the two scales, selecting one which is most appropriate for Myanmar culture is theoretically and practically useful.

Methods

Participants and procedure

Data were collected in 2010 from 110 students at the Universities of Eastern

Yangon and Sittway, in an undergraduate psychology module as part of course activities. Cases with missing data were excluded listwise from the relevant scale data: 108 gave complete data for the AC Beliefs scale and the EC scale. This is a relatively small sample. Nonetheless, it is sufficient for exploratory factor analysis, provided that there are at least five participants per variable and three or more variables per factor (Gorsuch, 1983).

Materials

A set of questionnaires contained both the AC Beliefs and ECs scales. ***AC Beliefs scale:*** For this study, all 13 items published in Joireman et al. (2001, after Stern et al., 1993, 1995) were used. The egoistic AC sub-scale consisted of four items, altruistic AC, five items, and biospheric AC, four items. The items were placed in random order. The instructions asked participants to respond on a scale from 1 to 7, where 1 was strongly disagree, 4 was neutral, and 7 was strongly agree. High scores indicate beliefs that environmental degradation adversely affects valued objects and that environmental protection benefits them. The 1-7 scale was chosen to allow for easy comparison with data from the EC scale. Joireman et al. (2001) used a 7-point scale, but Stern et al. (1993) used a 4-point scale, and Garling et al. (2003) used a 9-point scale.

ECs scale: The items making up the EC scale have also varied somewhat between studies (Schultz, 2000, 2001; Schultz et al., 2004). For this study 12 items were all used with the standard instructions: People around the world are generally concerned about environmental problems because of the consequences that result from harming nature. However, people differ in the consequences that concern them the most. Please rate the following items from 1 (not important) to 7 (supreme importance) in response to the question: I am concerned about environmental problems because of the consequences for_____. The items used for each concern were: egoistic: me, my future, my lifestyle, my health; altruistic: all people, children, people in Myanmar country, future generations; and biospheric: plants, marine life, birds, animals. The item order was mixed. A scale above the response boxes indicated that 1 was not important, 4 was neutral, and 7 was supreme importance.

Results

Exploratory factor and component analyses were carried out on each scale

separately. The aim was to explore dimensionalities and so various methods were used, as described below. Reliabilities were obtained for each subscale. Bivariate correlations for each pair of sub-scales are shown in Table 1.

Table 1. Correlations between means for sub-scales from both the AC Beliefs scale and the EC scale

	AC ego	AC alt	AC bio	EC ego	EC alt	EC bio
AC ego	1					
AC alt	.157	1				
AC bio	.062	.124	1			
EC ego	.060	.075	-.044	1		
EC alt	.185	.125	.036	.534**	1	
EC bio	.208*	.194*	-.055	.401**	.477**	1

*p<.05. **p<01. All two-tailed.

The AC Beliefs Scale

Exploratory component and factor analyses: For the AC Beliefs scale, there were five components with eigenvalue greater than one. The scree plot had no clear break. Table 2(i) shows the loadings obtained when three components (following theory) were extracted in a principal component analysis with varimax rotation. The items from each sub-scale do not fall onto the same component.

In order to check all possibilities that the AC Beliefs scale may show dimensionality, other analyses were carried out. When five components (following eigenvalues) were extracted, the heaviest loadings on each component were as follows: two altruistic and one egoistic item on the first; one biospheric and three altruistic items on the second; two biospheric items on the third; two egoistic items on the fourth; and one egoistic and one biospheric item on the fifth. An analysis was carried out in which the number of components extracted was reduced to two, in line with Stern et al. (1995) suggestion. Also, the principal component analyses were repeated with direct oblimin rotation, as correlations have previously been reported between the AC Beliefs sub-scales. Furthermore, two, three, four, or five factors were extracted using principal axis factoring both with varimax and with direct oblimin rotations. No clear structure was obtained with any of these analyses. Thus, it is not appropriate to attempt to label any of the factors/components. None of the AC Beliefs

sub-scales is uni-dimensional.

Alpha reliability for each of the AC sub-scales were: for egoistic AC, .263; for altruistic AC, .394; and for biospheric AC, .444. The deletion of one item from the egoistic AC sub-scale would improve α to .336. The deletion of one item from the altruistic AC sub-scale would improve α to .440. The deletion of one item from the biospheric AC sub-scale would improve α to .557. The mean scores for the three factors were as follows; for egoistic AC, M=5.53 (S.D=0.75); for altruistic AC, M=5.59 (S.D=0.75); for biospheric AC,M=4.20(S.D=1.07).

The ECs Scale

Exploratory component and factor analyses: For the EC scale, three components had eigenvalue greater than one. Moreover, the scree plot showed a clear break between the third and fourth factor. There is sometimes debate about whether the factor after the break should also be extracted. In this case when three components were extracted, the items from each sub-scale separated clearly with principal components analysis as shown in Table 2(ii). Other analyses were carried out as for the AC Beliefs scales. Interestingly, the same pattern of loadings was obtained for other methods as when three factors were extracted.

The Cronbach's α for each sub-scale of the EC scale were: for egoistic concern, .780; for altruistic concern, .744; and for biospheric concern, .789. The mean (S.D.) of each concern were as follows; for egoistic, 5.28 (1.04); for altruistic, 6.05 (0.88); for biospheric, 5.72 (1.09).

Table 2. Rotated Component Matrix (i) for AC Beliefs items and (ii) for EC items measured in Study

	Component		
	1	2	3
(i) AC Beliefs Scale			
ACaltl 1	.735		
ACaltl 3	.716		
ACegolO	.661		
ACegol	.448		
ACaltS		.708	
ACbio6		.702	
ACalt5		.587	
ACalt2		.511	
ACego4			.684
ACego7	.364		.617
ACbiol2			.586
ACbio3		.348	.433
ACbio9			.354
Eigenvalues	2.05	1.07	1.61
% of Variance	15.81	14,42	12.40
(ii) EC Scale			
Me (ECegol)	.819		.362
My future(ECego4)	.761		
Myhealth(ECego10)	.743		
My lifestyle(ECego7)	.567		
Birds(ECbio9)		.790	
Plants (ECbio3)		.776	
Marine life (ECbio6)		.747	
Animals (ECbioll)	.325	.638	
People in Myanmar			.834
country(ECalt5)			.676
All people (ECaltl2)			.674
Future generations (ECalt8)	.313		.601
Children (ECalt2)	4.66	1.60	1.14
Eigenvalues	21.12	20.97	19.53
% of Variance			

For each scale separately, three components were extracted in a principal component analysis with varimax rotation. Bold numbers are the largest loadings over .5 for that item.

Confirmatory Factor Analysis (CFA)

As the main purpose of this study was to establish which scale of Western developed measures for environmental problems is most suitable in Myanmar, in terms of dimensionality and reliability of its sub-scale, a confirmatory factor analysis (CFA) was conducted again on the ECs scale which is superior in both factor structure and sub-scale reliabilities to the AC Beliefs scale in priori exploratory factor analyses, by using LISREL 8 (Joreskog and Sorbom, 1993).

A critical issue in CFA is the assessment of the degree to which the data fit the model. A variety of fit indices have been developed, but there is no consensus among statisticians about the criteria required to demonstrate a reasonable fit (Schultz, 2001). In this study, seven most widely used indices were selected: Chi-square (x^2) with degree of freedom (df), the root mean square error of approximation (RMSEA), the expected cross-validation index (ECVI), the standardized root mean square residual (SRMR), the goodness of fit index (GFI), the adjusted goodness of fit index (AGFI), and the comparative fit index (CFI). ECVI, GFI, AGFI, and CFI of 0.90 or greater are typically interpreted as acceptable fit, while RMSEA of 0.10 or less and SRMR of 0.08 or less are indicated as acceptable model fit.

As the main goal of CFA was to test the three-factor structure model of the ECs scale, the CFA results of the three-factor model only was presented in the present paper although the one-factor and the two-factor models were performed. The three-factor structure model gave a significantly better fit to the ECs data than the two-factor structure model, which in turn was significantly better than the one-factor model that could be rejected. The three-factor structure model of the ECs was shown in Figure 1.

The fit indices for the three-factor model were (X^2=16.98, df=51 (p value=1.00); RMSEA=0.000; ECVI=0.981; SRMR=0.0376; GFI=0.974; AGFI-0.961; CFI=1.00). Thus, the conclusion could be drawn based on the results shown in Figure 1 that the three-factor model of the ECs was excellent acceptable model fit.

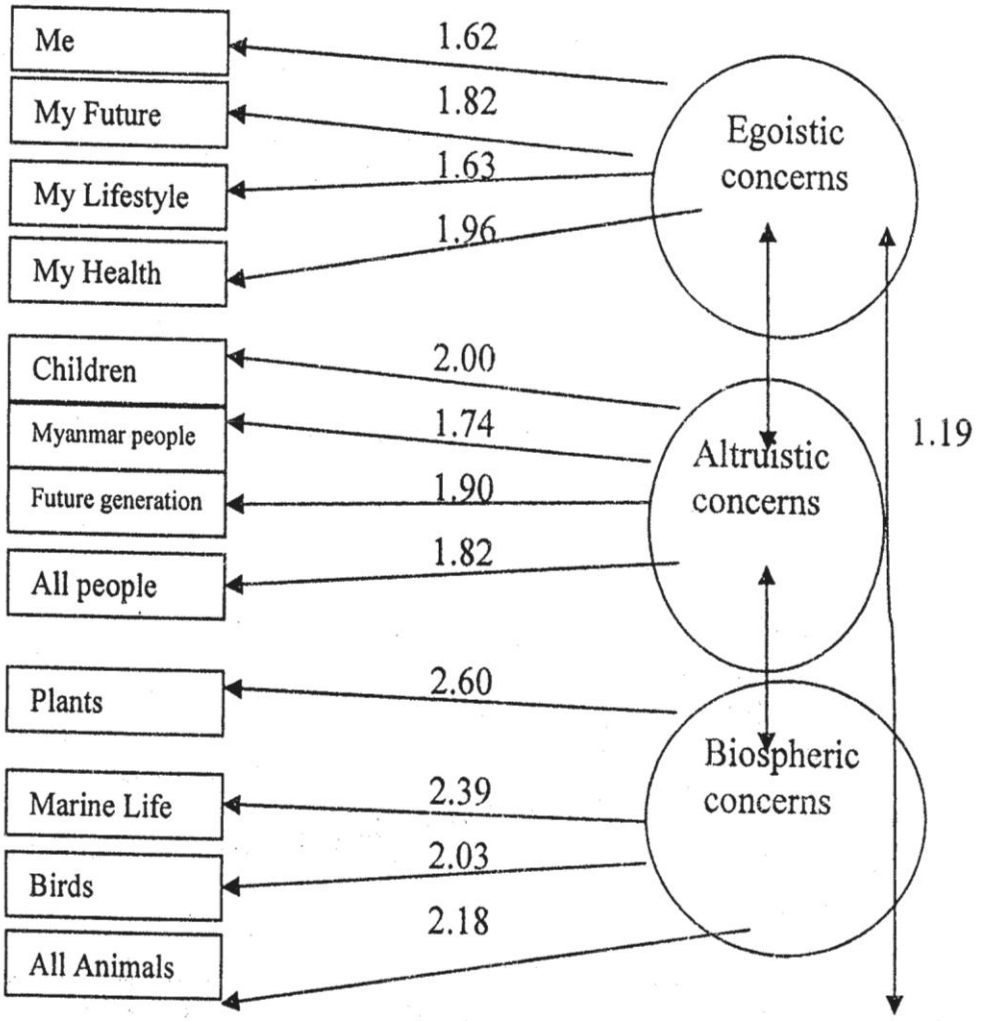

Figure 1: Results from a Confirmatory Factor Analysis

Note: X^2=16.98, df=51 (p value=1.00); RMSEA=0.000; ECVI=0.981; SRMR=0.0376; GFI=0.974; AGFI=0.961; CFI-1.00

Discussion

This study showed that the EC scale is superior, in both factor structure and sub-scale reliabilities, to the AC Beliefs scale. Each of the EC sub-scales has good reliability, and each also shows reasonable to good uni-dimensionality. The findings confirm indications found in previous research, reviewed in the Measurements of attitude towards environmental problems section. In the present study data for both scales were obtained from the same sample, which has less previously been done. Issues about the sample should be considered. This was a relatively small sample, of around 100, but for that N there were sufficient participants per variable, and sufficient variables per factor. It was a nonprobability sample and from a student

population, which can lead to reduced variation in responses. Such samples are often used in this type of research, but the conclusions should be considered with reference to the nature of the sample. Further research may be appropriate. Nonetheless, in terms of dimensionality the poor performance of the AC Beliefs scale relative to the EC scale was marked (see Table 2). Many of the statements in the AC Beliefs scale include more than one aspect, thus it is likely that these items do tap more than one of the AC beliefs. This would also explain why the correlations between AC and EC equivalent pairs of sub-scales are absent (see Table 1).

The results demonstrate clearly that the EC scale is superior to the AC Beliefs scale for measurement of egoistic, altruistic, and biospheric ECs. The reliabilities of the three sub-scales were better for the EC scale than for the AC Beliefs scale. Furthermore, in exploratory factor analyses the EC scale gave fairly clear dimensions that agreed with theory, whereas items in the AC Beliefs scale loaded on factors in a haphazard manner. This is the second time that the reliability and dimensionality of these two scales have been investigated in the same sample. Further research may be appropriate, however, in samples drawn from other populations. The finding has consequences for applications of the value-belief-norm theory (Stern et al., 1993, 1995). Both scales were developed in order to assess the concern towards, or beliefs about consequences for, the three value orientations proposed by Stern et al. (1993) as part of their theory. That theory, or similar modifications, has been applied to explanations of a range of environmental attitudes and behaviour. In some of those investigations the AC Beliefs scale was used to measure egoistic, altruistic, and biospheric concerns, yet the subscales do not distinguish those dimensions. Thus, the EC scale is recommended for any research requiring separate measures for these dimensions. In other words, the EC scale should be used, in preference to the AC Beliefs scale, to measure concerns about the environment resulting from egoistic, altruistic, and biospheric value orientations.

SEM (CFA) should, however, be applied in order to test hypotheses about the EC scale factor structure. Thus, a confirmatory factor analysis (CFA) was performed again on the ECs scale which is superior in both factor structure and sub-scale reliabilities to the AC Beliefs scale in priori exploratory factor analyses, by using LISREL 8 (Joreskog and Sorbom, 1993). The three-factor structure model gave a significantly better fit to the ECs data than the two-factor structure model, which in turn was significantly better than the one-factor model that could be rejected. In

addition, the CFA results showed that the three-factor model of the ECs was an excellent acceptable model of fit.

Methodological problems with measurement in this field should be mentioned. Social desirability can affect responses and may be responsible for mean scores being relatively high. This has been commented by others (e.g. Garling et al., 2003; Schultz et al., 2004). Some researchers have measured egoistic, altruistic, and biospheric concerns or ACs using scales other than those used in this paper, Stern, Dietz, Abel, Guagnano, and Kalof (1999) asked, with nine items and a 3-point response scale, whether each of three environmental issues would be a problem for self and family, the country as a whole, or for other species of plants and animals. A similar approach was employed by Garvill (1999, Chapter 19) who asked whether each of three environmental issues were a serious threat to, respectively, health and well being of self, health and well being of all humans, or to the balance of the ecological system, on a 7-point response scale. A future study could assess whether these types of scale and the EC scale have different levels of social desirability response.

Conclusions

The research finding reported in this paper has theoretical and practical implications for research into ECs, and for applications of the value-belief-norm (extended norm activation) theory. The important finding was demonstrated that the EC scale is superior to the AC Beliefs scale in terms of reliability and dimensionality of sub-scales in Myanmar samples. Again. The CFA results provided that the three-factor structure model was an excellent acceptable model fit. Therefore, in order to further study the environmental attitudes, values, intention, and behavior of the people in Myanmar, the EC scale would be essential, beneficial, and useful for future research.

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