Tackling the Complexity of the Pro-environmental Behavior Intentions of Visitors to Turtle Sites

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Abstract:

This empirical study improved our understanding of how to simulate visitors' pro-environmental behavior intentions (PEBIs) during interpretive marine turtle tours in Cyprus. Complexity theory was applied as a sufficient theoretical basis of the proposed configurational model that was tested using fuzzy set Qualitative Comparative Analysis (fsQCA) as an innovative set theoretic approach. Four configurations—demographics, values, beliefs, norms and attitudes—were used to explore causal recipes leading to both high and low PEBIs scores. The findings highlighted the heterogeneity issue in predicting PEBIs, addressed by determining the positive or negative role of PEBIs indicators along with attributes of other indicators in causal recipes. The fsQCA results of four configurations suggested 12 recipes for attaining high PEBIs scores. Further insight was obtained via configurational modeling of visitors' PEBIs during endangered species tours, which contributed to the current knowledge of tourism management in protected areas. Implications for practice and further research are discussed.

Keywords

Complexity theory, configurational modeling, fsQCA, causal recipe, endangered species tours, Cyprus

Introduction

The continuous growth of the tourism industry is accompanied by changes in tourist demands, from the stereotypical "4S" (sun, sand, sea, and sex) to progressively sophisticated and sustainable types of interpretive tourism, such as marine life tours (Lück 2016). Rather than being a threat due to a focus on the financial benefits of mass visits, this type of tourism can become an opportunity if the role of individuals is not ignored, as "each person can choose to adopt behaviors that are comparatively better for the environment. These behaviors are called pro-environmental behaviors (PEBs)" (Osbaldiston and Schott 2012, 2).

Orams (2002) highlighted the potential of education-based management strategies in conservation. One of the tenets of interpretive wildlife tourism is to educate visitors regarding the importance of wildlife conservation. Scholars have suggested that education and enjoyment of the marine wildlife tourism experience can contribute to the intended proenvironmental behavior (e.g., Pratt and Suntikul 2016). An ideal interpretive tour should provide a meaningful experience that increases visitor's awareness about environmental issues, which prompts proenvironmental behavior in the long term. The objective of such tours is likely to be satisfied, as visitors are willing to acquire more knowledge about wildlife and the sea in general and in a marine wildlife-watching tour setting in particular (Lück 2015).

Engaging marine life tourists in more PEBs is conspicuous due to the fact that the habitat of marine turtles is close to the shore, which overlaps with many local coastal activities, such as tourism. This fact, along with the very slow population increase of marine turtles and the current quantity of the endangered species (WWF 2016), signify the importance of education-based management strategies for conservation. In this regard, Steg and Vlek (2009, 315) challenged scholars to investigate the process and interactions of "cognitive, motivational and structural factors” to understand conditions in which people threaten or improve environmental sustainability.

Various theories, such as the theory of planned behavior (TPB; Ajzen 1985) and the value belief-norm (VBN) theory (Stern, Dietz, Abel, Guagnano, and Kalof 1999), have been employed to provide theoretical support in explaining the behavior of people toward environmental issues, which is a complex social phenomenon (Moghimehfar and Halpenny 2016; Lezak and Thibodeau 2016). Many scientists have also tried to modify, extend, or merge the relevant theories to present a more pragmatic theory to describe their proposed conceptual models that simulate PEBs (e.g., Han 2014, 2015; Hsu and Huang 2012; Kiatkawsin and Han 2017; Kim and Han 2010; López-Mosquera and Sánchez 2012; Ryu and Jang 2006).

Despite developing these multiple theoretical frameworks, Antimova, Nawijn, and Peeters (2012, 10) introduced PEB in sustainable tourism as a “black-box” and as an under-researched topic which requires more empirical studies that apply innovative methodological and theoretical approaches to conceptualize and validate PEB models (Juvan and Dolnicar 2017; Kiatkawsin and Han 2017; van Riper and Kyle 2014). Based on a review of relevant literature, past studies have focused on investigations of the “net effect” of indicators on pro-environmental behavior and have failed to explain the complexity of individuals' attitudes and behaviors. Assessing the net effect while the causal interactions are complex will lead to a false sense of confidence that offers misleading results regarding the complex process of decision-making (Armstrong 2012). Studies have thus far overlooked the fact that behavior will not change until the complex drivers shaping the behavior reach a certain “tipping point” level (Gladwell 1996). A straightforward prescription, which disregards the complex interactions of indicators, results in unforeseen consequences that may cost more than the problem itself, let alone solve the problem. This study aims to fill this gap by crafting and testing a configurational model using fuzzy set Qualitative Comparative Analysis (fsQCA) and complexity theory, which is a state-of-the-art approach to model the PEBIs of those engaging in marine turtle tours.

Contribution

By advancing theory and method, this study contributes to the current knowledge of the PEBIs of tourists. First, this study applies complexity theory to model the PEBIs of tourists, which is a non-linear and complex process (Kollmuss and Agyeman 2002; Krajhanzl 2010). As Lucas, Brooks, Darnton, and Jones stated, "Socio-psychological models of individual behavior reveal environment-related behaviors to be complex and non-linear, shaped by multiple antecedent factors applying in different sequences and with different weighting to determine the end behavior" (2008, 458).

The inherent complexity of PEBs and the complex interactions of many contextual factors result in researchers' skepticism about the sufficiency of any one scientific theory (e.g., the TPB and VBN theory) as a theoretical basis of their proposed PEB conceptual models. In this regard, Kim and Han (2010), Hsu and Huang (2012), and Goh, Ritchie, and Wang (2017) modified the TPB to explain the predictive model of PEB among travellers/visitors. Lee (2009) also extended the TPB to understand the behavioral intentions of online game players. Similarly, Han, Hwang, and Lee (2017) extended the VBN theory to predict the PEBs of cruise passengers. López-Mosquera and Sánchez (2012) went further and merged the TPB and the VBN theory to determine visitors' willingness to pay for park conservation. Han (2015) also merged these two theories to develop a model that predicted the PEBs of green hotel guests. Recently, Kiatkawsin and Han (2017) combined VBN theory with indicators of expectancy theory to provide a theoretical justification for explaining the PEBs of young travellers. Such modification, extension, and merging of current theories have revealed that these theories are necessary but insufficient for simulating people's PEBs. Evidence of heterogeneity in indicating PEBs not only shows the complexity of this outcome (e.g., Dolnicar and Grun 2008; Goh et al. 2017; Lee 2009; Steg, Bolderdijk, Keizer, and Perlaviciute 2014) but also the necessity of applying a sufficient theory for modeling PEBs (e.g., de Leeuw, Valois, Ajzen, and Schmidt 2015).

Demographic variables are key determinants in the formulation of PEBs that must be included in a predictive model. This is considered in a few related empirical studies (de Leeuw et al. 2015; Juvan and Dolnicar 2017; Panzone, Hilton, Sale, and Cohen 2016). Augmentation of the demographics of marine turtle tourists increases the complexity of the PEB simulation process (Olya and Gavilyan 2017). We employ complexity theory—which has recently been used and recommended for simulating complex social phenomena (i.e., PEBs) in the tourism industry—as a promising theory for justifying the heterogeneity issues in predicting PEBs (Hsiao, Jaw, Huan, and Woodside 2015; Olya and Altinay 2016; Olya and Gavilyan 2017; Olya, Khaksar, and Alipour 2017; Wu, Yeh, Huan, and Woodside 2014). This theory lists six tenants that the results of the model testing must support.

Second, fsQCA, which is a powerful tool for the model testing of nonlinear phenomena, is used to test the proposed model. This analytical approach is based on Boolean algebra and uses an asymmetric thinking method rather than a symmetric method (Ragin 2008). fsQCA addresses the drawbacks of the conventional research that stem from various assumptions—such as the normality of data and non-multicollinearity issues (Fiss 2007; Olya and Altinay 2016; Olya and Mehran 2017; Woodside 2015). It does so by exploring a combination of indicators as causal recipes (i.e., model, algorithm) to predict the high score of the desired outcome (i.e., PEBIs) as well as the outcome negation (i.e., ~PEBIs) (Olya et al. 2017; Olya and Gavilyan 2017; Wu et al. 2014). A negation outcome is equal to one minus the calibrated outcome score (Ragin 2008). In other words, fsQCA explores the complex conditions sufficient to achieve both high and low PEB intentions (PEBIs), which is helpful for both improving the PEBIs of marine turtle tourists and describing conditions in a way that does not lead to the PEBIs' negation (i.e., low levels of PEBIs). Since a complex combination of the indicators (i.e., configuration) is offered as a causal model, the indicators may play either a positive role or a negative role in the given causal model (Olya et al. 2017).

Furthermore, unlike the symmetric methods, fsQCA offers one or more causal recipes for predicting outcome conditions (Ragin 2008, 2014). The three aforementioned advantages of fsQCA enable researchers to explain the existence of heterogeneity by considering the views of contrarian cases in the model testing of complex social phenomena that were overlooked in conventional methods (Fiss 2007; Woodside 2015). For example, egoistic value has been reported as an indicator of PEBIs (Stern, Dietz, and Kalof 1993), and Steg et al. (2014) considered the negative role of egoistic value in predicting PEBIs. Interestingly, Zhang, Zhang, Zhang, and Cheng (2014) reported a non-significant relationship between egoistic value and the PEBs of tourists. There are similar instances for other indicators of PEBIs that researchers have tested using symmetric methods. (e.g., Dolnicar and Grun 2009; Goh et al. 2017; Lee 2009).

This empirical study is the first to identify occurrences of contrarian cases of PEBIs using cross-tabulation analysis and to test a proposed configurational model using fsQCA. In other words, fsQCA investigates causal recipes in which PEBIs indicators (e.g., egoistic value) can act as both positive and negative determinants, depending on the other factors featured in the causal recipe. In addition to fit validity, the predictive validity of the research model was tested, as recommended by Gigerenzer and Brighton (2009). As Woodside (2016, 235) noted, "Unfortunately, only a handful of studies report on predictive validity; nearly all studies report only on fit validity."

Third, apart from theoretical and methodological contributions, this empirical study is among the few that focus on the PEBIs of participants of marine life tours in general and of marine turtle tours specifically. To the best of our knowledge, this is the first empirical study that simulates the PEBIs of tourists visiting two endangered species of turtles—loggerhead turtles (Caretta caretta) and green turtles (Chelonia mydas)—in two major nesting sites of Cyprus. Anthropogenic and climate changes are two main reasons for the declining population of these endangered species (Wright et al. 2012). This is significant not only for predicting conditions promoting high PEBIs scores and inhibiting low PEBIs scores but also for enhancing social awareness about these vulnerable species in Mediterranean regions.

During the field survey, it was observed that many tour participants donated to help protect these species. Therefore, the results of this study can contribute as a guideline for target marketing to focus on the markets that have high intentions of behaving in a more eco-friendly way. This is in line with the precept of ecological modernization theory that "implies a partnership in which governments, businesses, moderate environmentalists, and scientists cooperate in the restructuring of the capitalist political economy along more environmentally defensible lines" (Giddens 1998, 57). Thus, instead of cancelling turtle tours or fencing the visitors out of marine protected areas for the sake of protection, we can target a segment of the tourism industry that is likely to socially and financially contribute to preserving these valuable marine species. To date, there is a paucity of studies on the application of ecological modernization theory in the context of tourism (Olya and Alipour 2015).

Theoretical Framework and Research Model

This study employs complexity theory as a core theory to support the proposed configurational model built using a combination of indicators of TPB and VBN theory that have been frequently used, modified, and merged to describe PEBIs (e.g., Goh et al. 2017; Han 2015; Han et al. 2017; Hsu and Huang 2012; Kiatkawsin and Han 2017; Kim and Han 2010; López-Mosquera and Sánchez 2012). As proposed by Ajzen (1985), TPB is an extended version of the theory of reasoned action (Fishbein and Ajzen 1975). TPB posits that intention is the key indicator of behavior and is influenced by the attitude toward the behavior, subjective norms, and perceived behavioral control (Ajzen 1991). Stern et al. (1999) developed VBN theory, an expanded version of the norm activation model, coupled with value theory and the new ecological view (i.e., new environmental paradigm or NEP). The VBN theory posits that PEBIs are determined according to the following sequence: values (i.e., biospheric, altruistic, and egoistic values) NEP adverse consequences for valued objects (adcon) ascribed responsibility (asres) personal norms (Klöckner 2013; Stern et al. 1999). The definitions of TPB and VBN determinants are elaborated in Han's (2015) study.

However, the development of interpretive experiences, which involves numerous interacting factors, is a complex phenomenon. Considering the complexity of human behavior (Ackoff 2005) and interactions of a wide range of PEBIs indictors, complexity theory well explains the occurrence of heterogeneity and the asymmetric associations of indictors and PEBs as an outcome (Baggio 2008). Though a clear-cut definition of 'complexity' does not exist and there is not a fully-fledged theory of complexity (Johnson 2007), this theory, which is rooted in systems theory, is a set of frameworks used for modeling and analyzing complex systems. A complex system is a system where the outcome(s) results from multiple interacting and intersecting parts. Moreover, in this system, the outcome of the sum of the parts is not greater but is entirely different from the parts in isolation, and the system loses its essential properties when the parts are considered separately. The parts of a complex system may themselves be systems, and every system may be part of a larger complex system (Ackoff and Emery 2005; Byrne 2001; Sterman 2000).

Complexity theory has been used in many disciplines (e.g., socio-economics, politics, biology, and health) to explain the dynamic processes of phenomena (e.g., PEBs) given that simple linear equilibrium cannot adequately enlighten “the black-box” of indictors’ associations complicated by the complex interactions of a large number of components (Antimova et al. 2012, 10; Baggio 2008; Hsiao et al. 2015; Olya and Al-ansi 2018). Regarding the complexity of PEBIs (Kollmuss and Agyeman 2002; Krajhanzl 2010; Lucas et al. 2008), the proposed configurational model is crafted and evaluated based on the key tenets of complexity theory. As shown in Figure 1, demographic variables and indicators of TPB and VBN theory were combined and presented as configurations for predicting high and low PEBIs scores. In accordance with Klöckner (2013), predictive configurations are classified and labeled as values, beliefs, and norms and attitudes. Venn diagrams are used to demonstrate the complexity of indicators’ interactions in the conceptual configurational model.

In Figure 1, arrow A represents a combination of demographic variables—age, gender, education level, marital status, and income level—and the frequency (time) of marine turtle site visits, which were used to explore causal models leading to PEBIs and their negation. The configuration of values to indicate PEBIs is constructed based on biospheric, altruistic, and egoistic values, indicated by arrow B1. The demographic variables and these three value factors were combined to explore causal models to predict high and low PEBIs scores, indicated by arrow B2 [pebi = f(ag, gen, ed, incl, mar, vt, biv, auv, egv)]. As indicated by arrow C1, four antecedents (nep, adcon, asres, pbvct) of beliefs are configured as ingredients of causal recipes for simulating PEBIs. A combination of beliefs, values, and demographics are indicated by arrow C2 that represents the complex interactions of these factors to predict high and low PEBIs scores (Figure 1).

Arrow D1 in Figure 1 indicates causal models for predicting PEBIs. Personal norms, subjective norms, and attitude toward behavior are selected as the ingredients of the norms and attitudes configuration. The combination of all four configurations—demographics, values, beliefs, and norms and attitudes—is represented by arrow D1 and suggests causal recipes for simulating high PEBIs levels of marine turtle tour attendees. This empirical study focuses on exploring the causal models indicated by arrows A–D1. We also calculate other possible causal recipes indicating PEBIs, such as the configuration of beliefs, norms and attitudes, and their combinations. The results of the fsQCA are presented in Table II, Appendix A.

Place Figure 1 here.

Methodology

A systematic process is applied to conduct this empirical study in three major phases. In the first phase, after reviewing relevant studies, survey instruments were prepared; thereafter, a letter of permission for data collection was submitted to the management of the Society for Protection of Turtles and Sea Turtle Conservation and Monitoring Project via the Underwater Research and Imaging Center. A pilot study with 10 samples was conducted to check the understandability of the questionnaire items and the survey procedure (e.g., good timing). In the second phase, a research team was positioned at Alagadi and Iskele beaches to directly distribute the paper-based questionnaires to visitors. These two beaches are important marine turtle nesting sites in proximity to the Mediterranean Sea.

In the third phase, the collected data were screened and digitized to conduct data analyses using SPSS, AMOS, and fsQCA software (Olya et al. 2018; Ragin, Drass, and Davey 2006). After measurement model testing, cross tabulation analyses were performed to identify occurrences of contrarian cases. fsQCA software (available at fsQCA.com) facilitates asymmetric modeling based on Ragin's (2010) guidelines. The application of this software has gained more attention in recent years, especially in tourism- and travel-related journals (Ferguson, Megehee and Woodside 2017; Olya and Al-ansi 2018; Olya and Gavilyan 2017; Olya et al. 2017; Papatheodorou and Pappas 2017; Pappas and Papatheodorou 2017; Sukhu, Bilgihan, and Seo 2017). The fsQCA results were assessed using key tenets of complexity theory (Woodside 2014). Finally, the predictive validity of the research model was checked (Gigerenzer and Brighton 2009; Olya and Altinay, and De Vita 2018). The following subsections contain detailed explanations of each phase.

Data and procedure

An *IN SITU* structured survey was administrated from August 1, 2016 to September 15, 2016 when several marine turtle tours were conducted based on reservations. The marine turtle tour activities include releasing turtles into the Mediterranean Sea and participating in a video-based educational program. Based on the results of the pilot study, there was no ambiguity or inconveniency in the procedure. We attempted to follow Podsakoff, MacKenzie, Lee, and Podsakoff's (2003) guidelines for reducing potential common method bias by applying several procedural remedies. For example, on the cover page of the questionnaire, we stated that the outcomes of this study are for research purposes, that respondents' information would be anonymous, and that data will remain confidential. To check the "yea- and nay-saying" style of responding to the questions, four reverse-coded items of the NEP were embedded within the scale items (Podsakoff et al. 2003, 879). Another procedural remedy was the diversification of items anchors considered in the measurement design. In the second part of the questionnaire, study variables (i.e., indicators of values, beliefs, norms and attitudes, and PEBIs) were presented. The third part of the questionnaire was dedicated to the demographic variables.

Measurement

In terms of the operationalization of scale items, a set of well-constructed questions was extracted from relevant studies. Six items were adapted from studies by Ajzen (2005, 1991), Dolnicar and Grun (2009), Miller, Merrilees, and Coghlan (2015), and Stern et al. (1999) to measure PEBIs. Four items for subjective norms, three items for perceived behavioral control, and four items for attitude toward the behavior were taken from Ajzen (1991, 2005). The biospheric value was gauged with four items adapted from Stern (2000) and Stern et al. (1999). Four items for altruistic values, four items for egoistic values, and four items for personal norms were extracted from Stern et al. (1999). To measure NEP, 10 items were obtained from Dunlap, Van Liere, Mertig, and Jones (2000) and Hawcroft and Milfont (2010). Three items used to gauge adverse consequences for valued objects were taken from Harland, Staats, and Wilke (2007) and Stern et al. (1999), and three items for ascribed responsibility were taken from De Groot and Steg (2009) and Stern et al. (1999). All items were measured using a seven-point Likert scale, and their anchor labels are outlined in Table I, Appendix A.

Respondents' profiles

A total of 150 tourists who visited Alagadi and Iskele beaches during the period of the study were invited to participate in the survey. A total of 130 agreed to complete the questionnaire; after screening, 112 valid questionnaires were extracted for data analysis. Eighty-nine tourists (79%) reported this was their first visit to a marine turtle-nesting site, while 23 (21%) had visited two or more times. In terms of age, three visitors (3%) were under 18 years old, 36 (32%) were 18–29 years old, 52 (46%) were 30–49 years old, and 21 (19%) were older than 50. The sample includes 51 (46%) males and 61 (54%) females. The average monthly income of 34 respondents (30%) was less than 1,000 USD, which of 25 respondents (22%) was 1,000–2,999 USD, that of 47 respondents (42%) was 3,000–6,000 USD, and that of 6 respondents (5%) was more than 6,000 USD. Forty visitors (36%) were single, while 72 (64%) were married. Regarding the educational level of the tourists, 28 (25%) had high school education, 31 (28%) had an associate's degree, 29 (26%) had a trade/technical/vocational degree, 20 (18%) had an undergraduate, and four (4%) had a postgraduate degree.

Data analyses

The psychometric properties of scale were checked using a rigorous set of reliability and validity tests. The Cronbach's alpha and composite reliability (CR) were calculated to test the internal consistency of constructs (i.e., reliability). As this is the first empirical study to test a proposed configurational model with data collected from marine turtle tour visitors in Cyprus, both exploratory—using a principle component method with varimax rotation—and confirmatory—using a maximum likelihood estimator—factor analyses were performed to check the composition and structure of scale items (Anderson and Gerbing 1988; Bagozzi and Yi 1988; Fornell and Larcker 1981; Hair, Anderson, Tatham, and Black 1998).

A number of fit indices (e.g., X^2/df, incremental fit index, parsimony comparative fit index, and root mean square error of approximation) were calculated to test the fit validity of the measurement model using empirical data (Hurley, Scandura, Schriesheim, Brannick, Seers, Vandenberg, and Williams 1997). To ascertain occurrences of contrarian cases, cross-tabulation analyses and a Cramér's V test were conducted. Cross-tabulation analyses revealed asymmetric relationships between PEBIs and its indicators, which corroborates the existence of heterogeneity issues in the eco-friendly behavior of tourists/visitors. Cramér's V test indicated the association of predictor (e.g., egoistic value) with the outcome (PEBIs) (Olya and Gavilyan 2017). Composite scores and standard deviations of both items and variables were calculated. These descriptive statistics might be useful for practitioners in the implementation of study implications.

A three-step fsQCA analysis was performed to test the proposed configurational model using fsQCA software (Ragin 2008). In the first step, seven-point scale data were calibrated into a fuzzy set score, which is referred to as the data calibration. In the second step, fuzzy truth table algorithms were created that presented a list of indicators' conditions leading to high and low PEBIs scores. In the third step, counterfactual analyses were applied to refine consistent and sufficient causal recipes for predicting high PEBIs scores. Coverage (the relative importance of different paths to an outcome) and consistency (the proportion of observed cases that is consistent with the pattern) are two probabilistic criteria for selecting consistent and sufficient causal recipes emerging in the fuzzy truth tables. Formulas for calculating the coverage and consistency measure are as follows

$$\text{Coverage:} (X_i \leq Y_i) = \sum\{min(Xi, Yi)\}/\sum(Yi)) \qquad \text{(Formula 1)}$$

$$\text{Consistency:} (X_i \leq Y_i) = \sum\{min(Xi, Yi)\}/\sum(Xi)) \qquad \text{(Formula 2)}$$

In these equations, Xi denotes case i’s membership score in set X and Yi denotes case i’s membership score in the outcome condition (Ragin 2008). To compare asymmetric with symmetric approaches, “coverage” and “consistency” in configurational modeling are similar to “coefficient of determination” (i.e., r^2) and “correlation” in conventional methods, respectively. As recommended by Ragin (2008), 1 and .8 are considered acceptable levels of frequency and consistency measures. This process was repeated for calculating causal algorithms leading to PEBIs negation. Apart from fit validity, the sample was divided into two subsamples and the causal models of subsample 1 were compared with the data of subsample 2 to test the predictive validity (Gigerenzer and Brighton 2009). Finally, fsQCA results were evaluated using key tenets of complexity theory.

Results and discussion

Results of preliminary tests

The Cronbach's alpha and the CR were calculated for all constructs to check the reliability of the measures. The Cronbach's alpha coefficient results are provided in Table I, Appendix A and show that alpha values are larger than .7, which is the common recommended cut-off for reliability (Cortina 1993). As also shown in Table 1, the CR results confirm internal consistency among study scales; the magnitudes of CR are greater than .7 (Bagozzi and Yi 1988; Fornell and Larcker 1981). Rigorous factor analyses were performed to test measurement model validity. The results of the exploratory factor analysis (EFA) are presented in Table I, Appendix A. Two items from NEP and one item of adverse consequences for valued objects were dropped during the EFA. The items were then properly loaded under desired factors at an acceptable level (λ>.4). The eigenvalue for all factors was more than 1.00. According to the results of Harman's single factor test, no single factor with a large variance percentage emerged, thus reducing the possible threat of common method bias (see % of variance in Table I, Appendix A) (Podsakoff et al. 2003).

Means and standard deviations of all items were calculated and are presented in Table I, Appendix A. A confirmatory factor analysis (CFA) was conducted to confirm the EFA results and the fit validity of the measurement model (Table 1). The CFA results show that all items significantly loaded under assigned factors, and the values of factor loading satisfied the recommended level (SFL>.5, P<.001) (Anderson and Gerbing 1988; Hair et al. 1998). The model fits tolerably well with the empirical data (X^2=1299.035, df =610, X^2/df=2.130, IFI=.883, PCFI =.674, RMSEA=.902). As shown in Table 1, the value of average variance extracted (AVE) is larger than .5 and smaller than the CR for the given component, which is evidence of the convergent validity of the study measures (Hair et al. 1998). Regarding discriminate validity, the magnitude of the AVE for all factors was greater than the maximum shared squared variance (MSV) and the average shared square variance (ASV) (Table 1) (Anderson and Gerbing 1988; Fornell and Larcker 1981).

Place Table 1. here

Results of cross-tabulation analyses

The results of the cross-tabulations analyses showed asymmetric associations between PEBIs and its predictors. Two examples of heterogeneity in indicating PEBIs are presented in Table 2. According to the cross-tabulation tests, 26 (23%) visitors were only minimally concerned, and 35 (31%) visitors were neutral about egoistic values but still exhibited high PEBIs (Table 2, a). These results are in line with the findings of Steg et al. (2014) and Zhang et al. (2014), who introduced egoistic value as a negative and non-significant factor in predicting PEBIs, respectively. In contrast, there are many studies that have found that egoistic value plays a significant and positive role in PEBIs models (e.g., Stern et al. 1993).

Another example of the occurrence of contrarian cases is the relationship of NEP to PEBIs; the results of the cross-tabulation and Cramér's V tests are presented in Table 2b. Twenty-two visitors (20%) reported a low rate of NEP, and 28 (25%) were undecided about NEP but intended to behave in a more eco-friendly way (i.e., high PEBIs). These results are in accordance with the findings of Goh et al. (2015), who reported NEP and PBC have no significant or positive effects on the PEBIs of national park visitors. The results of Cramér's V tests results revealed a significant medium effect size for both examples (Cohen 1977). In terms of heterogeneity issues in the simulation of PEBIs, Lee (2009) also reported that attitude did not significantly and positively relate to PEBIs. Such heterogeneities prove that models for predicting PEBIs must be analyzed based on an asymmetric approach rather than a symmetric one. The next subsection provides the fsQCA results that effectively explain the occurrences of heterogeneity. In other words, the role of each antecedent (positive, negative, or neutral) depends on the attribute of other indicators in the given causal recipes.

Place Table 2. here

Results of model testing

The results of the fsQCA, indicated by arrows A–D2 in Figure 1, for the modeling of PEBIs are outlined in Tables 3 and 4. The fsQCA functions are based on the Quine–McCluskey technique to calculate causal models for simulating conditions leading to both high and low PEBIs scores. The fsQCA for arrow A in Table 3, which is for demographics as indicators [pebi = f(ag, gen, ed, incl, mar, vt)], shows that three causal recipes (M1–M3) led to a high PEBIs score (coverage = .769, consistency = .985). For example, M1 shows high PEBIs scores achieved when visitors are young, female, married, and have a low-income level. According to M2 (gen*ed*incl*mar), educated, married, and rich female visitors reported high PEBIs.

According to M3 (M3. ag*gen*~ed*mar*~vt), older, less educated, and married females who were first-time visitors expressed high PEBIs. This is similar to the results of Olya and Gavilyan (2017), who found that older, married, and less educated people had higher intentions of supporting sustainable tourism development. Unlike conventional methods that offer one model for predicting PEBIs, this innovative approach offers one or more causal models for simulating PEBIs. In a symmetric approach model, existence of a low PEBIs score is simply considered as a mirror opposite of a model for high PEBIs. However, the results of asymmetric modeling show that the condition for PEBIs negation (~A: M1. gen*~ed*~incl*mar*~vt) is not a mirror opposite of causal models leading to high PEBIs scores (Table 3. A: M1–M3).

Place Table 3. here

The fsQCA results for value configuration reveal that visitors with high biospheric and altruistic values had high levels of PEBIs (Table 3. B1: M1. biv*auv) and that visitors with egoistic values had lower PEBIs (Table 3. ~B1: M1. egv). This is in line with the findings of Steg et al. (2014). Regarding the belief configuration (C1), three models are suggested for obtaining high PEBIs (coverage= .869, consistency= .979). M1 indicates that a combination of ascribed responsibility and perceived behavioral control provides a condition whereby visitors express high PEBIs. In M2 and M3, regardless of the role of NEP and adverse consequences for valued objects, those visitors who had higher perceived behavioral control had higher PEBIs. In contrast, a causal recipe that includes a low level of perceived behavioral control (Table 3. ~C1: M1. ~nep*adcon*~asres*~pbvct) leads to PEBIs negation.

The fsQCA results are supported by the findings of several studies, such as those by de Leeuw et al. (2015), Han (2015), Hsu and Huang (2012), Kim and Han (2010), and López-Mosquera and Sánchez (2012), which unanimously agree about the significant and positive role of perceived behavioral control in predicting PEBIs. In terms of norms and attitudes, tourists with a higher attitude toward the behavior expressed higher PEBIs (Table 3. D1: M1. atb). This is in accordance with the results of Han (2014; 2015), Hsu and Huang (2012), and Kim and Han (2010). In contrast, tour participants with a low level of attitude toward the behavior, personal norms, and subjective norms are less likely to have high PEBIs (Table 3. ~D1: M1. ~pern*~sn*~atb). Similarly, López-Mosquera and Sánchez (2012) found that attitudes toward the behavior did not have a positive relationship with PEBIs.

The fsQCA results of the combination of demographics and value configurations (arrow B2) offered seven causal recipes for attaining high PEBIs. For example, M1 represents first-time visitors who are young, married females with lower incomes, and higher biospheric and altruistic values led to higher PEBIs (Table 3. ~D1: M1. ~ag*gen*~incl*mar*~vt*biv*auv). The other six causal algorithms for achieving high PEBIs and one causal model predicting PEBIs negation are indicated by B2 and ~B2, respectively (Table 3).

Arrow C2 represents a combination of demographics, values, and belief; the fsQCA results are presented in Table 4. There are 10 causal recipes that describe sufficient and consistent conditions for predicting PEBIs (coverage = .507, consistency = .999). For instance, M3 indicates that older, educated, married females with low income levels and egoistic value, as well as high biospheric and altruistic values, NEP, adverse consequences for valued objects, ascribed responsibility, and perceived behavioral control reported high PEBIs (Table 4. C1. M3: ag*gen*ed*~incl*mar*biv*auv*~egv*nep*adcon*asres*pbvct). Using a combination of demographics, values, and belief antecedents, three causal recipes were explored for PEBIs negation (coverage = .653, consistency = .488).

Place Table 4. here

The augmentation of more causal configurations of the proposed model illuminates the complexity of PEBIs and the complex interactions of the predictors. Considering all configurations (i.e., demographics, values, beliefs, and norms and attitudes) for predicting PEBIs, the 12 causal recipes explain under which conditions marine tour attendees have high intentions to behave in a more environmentally friendly way (Table 4. D1: M1–M12). For example, M11 states that first-time visitors who are older, female, less educated with a high income, who cared less about egoistic values and had high levels of biospheric and altruistic values, NEP, adverse consequence for valued objects, ascribed responsibility, perceived behavioral control, personal norms, subjective norms, and high attitude toward the behavior received a higher PEBIs score (Table 4. D1: M11. ag*gen*~ed*incl*mar*~vt*biv*auv*~egv*nep*adcon*asres*pbvct*pern*sn*atb).

According to the fsQCA results for the negation of PEBIs with all antecedents, one causal recipe found that first-time female visitors who are young and less educated with a low-income level and low levels in NEP, ascribed responsibility, perceived behavioral control, personal norms, and high levels of biospheric, altruistic, and egoistic values, adverse consequence for valued objects, subjective norms, and attitude toward behavior demonstrated low PEBIs scores (Table 4. ~D2: M1.

~ag*gen*~ed*~incl*mar*~vt*biv*auv*egv*~nep*adcon*~asres*~pbvct*~pern*sn*atb). These results confirm the heterogeneity and complexity of the interactions of PEBIs indictors that can be explained by complexity theory. According to complexity theory, a combination of the indicators describes the conditions for predicting outcomes (e.g., PEBIs), and the role of each indicator depends on the performance/attributes of other ingredients in a causal recipe.

A detailed explanation of the complexity of PEBIs is given in the complexity theory evaluation subsection. There are other possible combinations, such as the combination of values and beliefs (E), values and norms and attitude (F), beliefs and norms and attitude (G), and value, beliefs, and norms and attitude (H); their fsQCA results were calculated and are presented in Table II, Appendix A. These results might be helpful for researchers who are keen to know how to combine PEBIs indicators in order to predict conditions leading to both high and low PEBIs scores.

Predictive validity

The evidence of predictive validity is provided in Table 5. The study sample was split into two subsamples (i.e., subsamples 1 and 2). The causal models for subsample 1 are provided in Table 5. The fuzzy XY plots for two causal models are depicted, demonstrating the asymmetric association of PEBIs and its causal model. These two causal recipes (M1 and M2) were tested using subsample 2. As shown in the XY plots of the two models using subsample 2, the two models have high levels of coverage and consistency that prove their predictive validity (Gigerenzer and Brighton 2009). As recommended by many scholars (Hsiao et al. 2015; Olya and Gavilyan 2017; Wu et al. 2014), the prediction ability of the proposed model's use of another sample is significant.

Place Table 5. here

Complexity theory evaluation

The fsQCA results were assessed using key tenets of complexity theory. As shown in Table 6, the results provide support for Tenet 1, it is rare that an antecedent alone, models high/low PEBIs scores; instead, a combination of antecedents explains the conditions leading to high/low PEBIs scores (Tenet 2: The recipe principle). According to the fsQCA results, ascribed responsibility, as a single antecedent, is insufficient to predict PEBIs, while its combination with perceived behavioral control can describe a solution for PEBIs (See Table 3, C1: M1. asres*pbvct). Contrariwise to the symmetric approach offering one predictive model, fsQCA with complexity theory illustrates that a high/low PEBIs score can be achieved based on one or more causal models (Tenet 3: The equifinality principle). As shown in Table 4 (D2), there are 12 alternative models for simulating high PEBIs conditions.

In conventional methods of PEBIs modeling, models for the negation of PEBIs are simply considered as mirror opposites of models leading to high PEBIs. Complexity theory posits that causal models for PEBIs negation are unique and different than mirror opposites of recipes for high PEBIs (Tenet 4: The causal asymmetry). For example, seven causal recipes can result in a high PEBIs score (Table 3: B2), while one causal model leading to a low PEBIs score is not a mirror opposite of any of those seven recipes for high PEBIs (Table 3: ~B2). The fsQCA results provide evidence of Tenet 5. Specifically, indicators of PEBIs (e.g., egoistic value and NEP) can contribute both positively and negatively in predicting PEBIs, depending on the features of the other antecedents in the model (c.f. Table 4. D2: M9 and M10). The XY plots of asymmetric relationships between causal recipes and high PEBIs are sketched and are presented at the bottom of Table 5. The value of coverage for the cases with high PEBIs is less than 1.00. Therefore, Tenet 6 is also supported (Woodside 2014; Wu et al.

2014). These results show that PEBIs must be modeled using fsQCA and complexity theory due to the inherent complexity of PEBIs and the interactions of a large number of predictors.

Place Table 6. here

Based on the arguments above, it is advised to consider equifinal situations when planning or designing an interpretive program. For example, studies that counted on the "net effect" of a simple indicator (e.g., NEP or attitude toward behavior) for indicating the PEBIs of tourists (e.g., Goh et al. 2017) simply disregard the complexity of human behavior. As subjective norms are insufficient but necessary parts of a condition that is itself unnecessary while there are multiple paths that are sufficient for the occurrence of the effect in nature (Mackie 1974), these equifinal situations will only turn into PEBIs when reaching a certain "tipping point" level, considering the complex interaction of antecedents (Gladwell 2000).

Conclusion and implications

This empirical study deepened the current knowledge of PEBIs by proposing complexity theory as a sufficient and necessary theoretical basis for a PEBIs predictive model. The existent theories (such as TPB and VBN theory) are necessary but insufficient. This lack encouraged scholars to modify, extend, or combine those theories to support their proposed conceptual models. This empirical study addressed this gap by providing supportive evidence for the application of complexity theory in modeling PEBIs. Complexity theory well explained the complex interactions of TPB and VBN indicators that have non-linear associations.

Complexity theory offers a theoretical justification for occurrences of contrarian cases—something that was overlooked in previous research. In other words, the results of cross-tabulation analyses revealed that marine turtle tour attendees who have low levels of egoistic value and NEP achieved high PEBIs scores. Complexity theory explains the heterogeneity issues in the modeling of PEBIs by determining the role of each antecedent (e.g., NEP) along with the feature of other antecedents in a given causal recipe. Therefore, indicators such as NEP can act both positively and negatively in modeling PEBIs. This means we can provide causal conditions in which people with low NEP and egoistic values engage in more PEBIs. The fsQCA results were supported by six key tenets of complexity theory, and we can conclude that the PEBIs of marine turtle tourists are very complex. Therefore, it is naïve to prescribe a simple recipe and ignore the complexity of individual intentions regarding environmental action.

This empirical study provided methodological advances by applying fsQCA, which is a set theoretic approach for modeling complex social phenomena such as PEBIs. Different from the symmetric method, asymmetric modeling explores causal models for predicting PEBIs negation, which is different than the mirror opposites of models for high PEBIs. This is an important implication for managers and decision makers in terms of providing preventive conditions that match with the causal models leading to PEBIs negation (see ~B, ~C, and ~D in Tables 3 and 4).

Interestingly, fsQCA calculates one or more causal recipes as predictive models for simulating high/low PEBIs. As explained above, exploring one or more causal recipes not only addresses the complexity of PEBIs caused by heterogeneity in the interactions of a large number of indicators but also provides a guideline for practitioners to attune the conditions to achieve high levels of PEBIs. According to the results, 12 causal alternative models can achieve a high level of PEBIs, including all configurations (Table 4: D2).

Importantly, fsQCA in combination with complexity theory enables us to include demographic variables as a key configuration for indicating PEBIs, which only a few related empirical studies have considered. The causal models that use demographics as antecedents can be applied as an action plan for target marketing. Marine turtle tour organizers/marketers can target specific segments–based on tourists' age, gender, education, income level, and visit experience–in that a combination of demographics fits the causal recipes explored by fsQCA (see A in Table 3).

This is the first empirical study that models the PEBIs of those participating in marine turtle tours. Considering the importance of such interpretive tours, which can have a positive or negative impact on the extinction trend of endangered turtle species, destination management organizations (DMOs) in Cyprus must contribute to the operation of these tours from targeting specific tourism segments to establishing strong customer relationship management (CRM). Interpretive tours should ensure visitors have a meaningful experience that raises their awareness of the environment and adjusts their behaviors to promote wildlife conservation. These interpretive programs create opportunities to improve environmental values, beliefs, norms, and attitudes minimize the adverse impact of tourism, and maximize the benefits through donations for protecting wildlife.

This study found that individuals' behaviors are strongly affected by their confidence in their ability to perform the behavior. Non-governmental organization (NGO) decision makers and tour operators must influence the perspective on tourists' abilities and design programs by engaging tourists in conservation activities. Specifically, in a marine turtle setting, decision makers can use the help of educated visitors in the process of nest hatching and excavation and observing volunteers, which will increase their belief that they can master similar activities. We advise tour leaders/volunteers and operations staff to provide constructive feedback. Tour leaders can strongly influence tour participants via subjective norms, and decision makers should therefore ensure tour leaders receive proper training and have excellent PEBs themselves.

Planners can also design beach-cleaning events that emphasize the link between marine debris and the probability of marine turtles' survival. Policymakers should consider running campaigns that endeavor to strengthen PEBs by communicating the long-term benefits of sustainability to future generations. People are more likely to help if they will feel more personal responsibility for reducing distress. Using social media, NGOs can help increase these feelings by posting photos/videos of endangered species in need, such as photos illustrating how human have impacted the lives of marine creatures. Community-based management of marine turtle tours is another implication for the sustainable operation of such activities. Communities play a key role in achieving visitors' pro-environmental behavior through sending strong normative messages to the visitors regarding the importance of wildlife conservation.

The study was limited to one outcome: PEBIs. As complexity theory with fsQCA has the capability of predicting a configuration of outcomes, future studies should go beyond the behavioral intentions. Such studies should consider the intention-behavior gap to recognize the pre-contact, contact, and post-contact stages of information by conducting longitudinal studies to assess the actual effects based on pro-environmental behaviors in the long term. The results of this study are limited to the PEBIs of visitors to two marine turtle nesting sites in Cyprus with a very limited capacity based on the number of nests, hatchlings, and turtle releases in each season. Therefore, more empirical studies of other interpretive tours of endangered marine species with larger sample size are recommended to ensure the generalization of this study's findings. This study included components of TPB and VBN theories and demographic information in the crafting of the proposed configurational model. As we based the modeling of PEBIs on complexity theory, it enables researchers to add more configurations or extend proposed configurations (e.g., values, beliefs, norms, and attitudes) in simulating PEBIs. Further studies on PEBs should consider the tipping point—the point when rapid and dramatic changes in behavior occur. Another pathway for future research is to investigate the behavioral spillover effects of PEBIs vis-à-vis the complex nature of human behaviors. Studies of this kind in different settings and with different complex configurations may deepen our knowledge of PEBIs as an outcome. This study was limited to a demand-side view (i.e., marine turtle tour attendees) of PEBIs. Further research might focus on the supply side (e.g., the government, tour planners, DMOs) in terms of ethics and moral pressure relating to organizing marine turtle tours.

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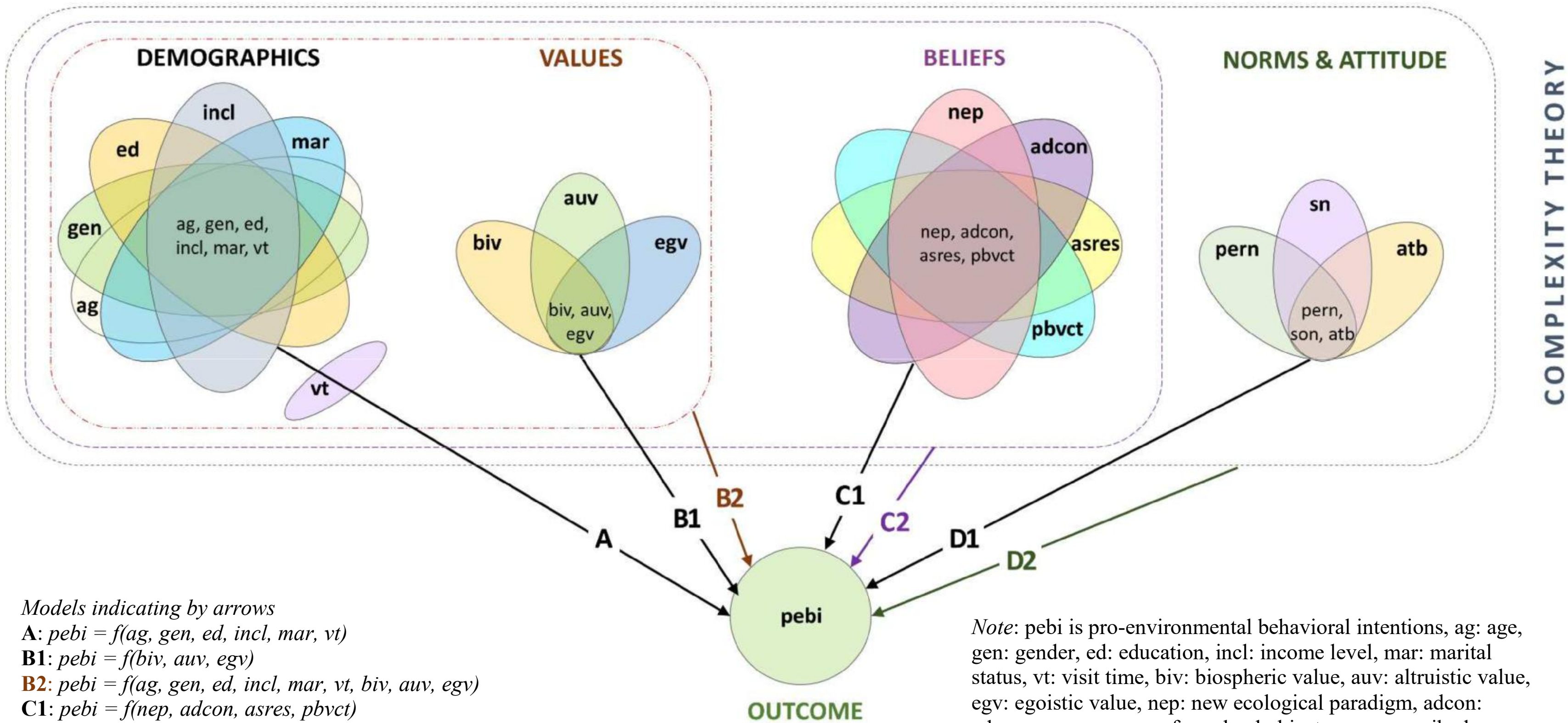


Models indicating by arrows
A: *pebi = f(ag, gen, ed, incl, mar, vt)*
B1: *pebi = f(biv, auv, egv)*
B2: *pebi = f(ag, gen, ed, incl, mar, vt, biv, auv, egv)*
C1: *pebi = f(nep, adcon, asres, pbvct)*
C2: *pebi = f(ag, gen, ed, incl, mar, vt, biv, auv, egv, nep, adcon, asres, pbvct)*
D1: *pebi = f(pern, sn, atb)*
D2: *pebi = f(ag, gen, ed, incl, mar, vt, biv, auv, egv, nep, adcon, asres, pbvct, pern, sn, atb)*

Note: pebi is pro-environmental behavioral intentions, ag: age, gen: gender, ed: education, incl: income level, mar: marital status, vt: visit time, biv: biospheric value, auv: altruistic value, egv: egoistic value, nep: new ecological paradigm, adcon: adverse consequences for valued objects, asres: ascribed responsibility, pbvct: perceived behavioral control, pern: personal norm, sn: subjective norm, atb: attitude towards the behavior.

Figure 1: Proposed configurational model

Table 1. Results of CFA, CR, and descriptive statistics of study variables

Item	SFL	AVE	MSV	ASV	CR	Item	SFL	AVE	MSV	ASV	CR
Pro-environmental Behavior Intentions (M=6.159, SD=.694)						*New Eco. Paradigm* (M=4.391, SD=1.093)					
PBI1	.687	.531	.360	.143	.849	NEP1	.754	.453	.005	.056	.814
PBI2	.637					NEP2	.469				
PBI3	.738					NEP3	.861				
PBI4	.720					NEP4	.819				
PBI5	.914					NEP5	.570				
PBI6	.761					NEP6	.742				
PBI7	.729					NEP7	.667				
PBI8	.603					NEP8	.317				
Biospheric Value (M=6.272, SD=.668)						*Altruistic Values* (M=6.217, SD=.607)					
BV1	.809	.545	.462	.170	.690	AV1	.515	.445	.384	.126	.706
BV2	.761					AV2	.587				
BV3	.782					AV3	.916				
BV4	.579					AV4	.575				
Egoistic Values (M=4.321, SD=1.576)						*Personal Norm* (M=5.942, SD=.788)					
EV1	.767	.725	.462	.105	.713	PN1	.794	.660	.423	.195	.703
EV2	.798					PN2	.810				
EV3	.976					PN3	.892				
EV4	.849					PN4	.748				
Attitude toward the Behavior (M=6.174, SD=.735)						*Subjective Norm* (M=5.482, SD=1.042)					
ATT1	.819	.651	.423	.169	.707	SN1	.735	.754	.384	.161	.748
ATT2	.857					SN2	.918				
ATT3	.723					SN3	.938				
ATT4	.823										
Perceived Behavioral Control (M=5.967, SD=.718)						*Ascribed Responsibility* (M=5.289, SD=1.233)					
PBC3	.709	.644	.230	.105	.730	AR1	.918	.684	.084	.058	.730
PBC2	.985					AR2	.904				
PBC1	.677					AR3	.625				
Adverse Consequences for Valued Objects (M=5.263, SD=1.020)						*Measurement model Fit statistics:*					
AC1	.725	.663	.397	.155	.800	x^2 =1299.035, (*df*=610, *p*<.001), x^2/df=2.130,					
AC2	.895					IFI=.883, PCFI =.674, RMSEA=.902.					

Note: SFL: standardized factor loading; **: SFL is significant at the .001 level; AVE: average variance extracted; MSV: maximum shared squared variance; ASV: average shared square variance; CR: composite reliability; M: composite score of items of each factor; SD: standard deviation; IFI: incremental fit index; PCFI: parsimony comparative fit index; RMSEA: root mean square error of approximation.

Table 2. Results of cross-tabulation analyses of PEBIs with egoistic value (a) and NEP (b)

Negative contrarian cases (26 cases =23%) indicating ~A O

(A) egoistic value (Cramer's V= .297, *P*<.05)		PEBIs					Total
		Slightly disagree	Undecided	Slightly agree	Agree	Strongly agree	
Extremely unimportant	Count	0	0	1	3	1	5
	% within PEBI	.0%	.0%	8.3%	5.6%	2.6%	4.5%
	% of Total	.0%	.0%	.9%	2.7%	.9%	4.5%
Not very important	Count	0	0	0	2	6	8
	% within PEBI	.0%	.0%	.0%	3.7%	15.4%	7.1%
	% of Total	.0%	.0%	.0%	1.8%	5.4%	7.1%
Somewhat unimportant	Count	0	1	2	4	7	14
	% within PEBI	.0%	20.0%	16.7%	7.4%	17.9%	12.5%
	% of Total	.0%	.9%	1.8%	3.6%	6.3%	12.5%
Neutral	Count	0	1	5	21	9	36
	% within PEBI	.0%	20.0%	41.7%	38.9%	23.1%	32.1%
	% of Total	.0%	.9%	4.5%	18.8%	8.0%	32.1%
Somewhat important	Count	0	0	1	9	4	14
	% within PEBI	.0%	.0%	8.3%	16.7%	10.3%	12.5%
	% of Total	.0%	.0%	.9%	8.0%	3.6%	12.5%
Important	Count	1	1	3	11	8	24
	% within PEBI	50.0%	20.0%	25.0%	20.4%	20.5%	21.4%
	% of Total	.9%	.9%	2.7%	9.8%	7.1%	21.4%
Extremely important	Count	1	2	0	4	4	11
	% within PEBI	50.0%	40.0%	.0%	7.4%	10.3%	9.8%
	% of Total	.9%	1.8%	.0%	3.6%	3.6%	9.8%
Total	Count	2	5	12	54	39	112
	% within PEBI	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	1.8%	4.5%	10.7%	48.2%	34.8%	100.0%

Negative contrarian cases (22 cases =20%) indicating ~A O

(B) NEP (Cramer's V= .335, *P*<.01)		PEBIs					Total
		Slightly agree	Undecided	Slightly agree	Agree	Strongly agree	
Strongly disagree	Count	0	0	0	0	4	4
	% within PEBI	.0%	.0%	.0%	.0%	10.3%	3.6%
	% of Total	.0%	.0%	.0%	.0%	3.6%	3.6%
Disagree	Count	0	0	0	3	5	8
	% within PEBI	.0%	.0%	.0%	5.6%	12.8%	7.1%
	% of Total	.0%	.0%	.0%	2.7%	4.5%	7.1%
Slightly agree	Count	0	0	0	2	8	10
	% within PEBI	.0%	.0%	.0%	3.7%	20.5%	8.9%
	% of Total	.0%	.0%	.0%	1.8%	7.1%	8.9%
Undecided	Count	2	5	2	21	5	35
	% within PEBI	100.0%	100.0%	16.7%	38.9%	12.8%	31.3%
	% of Total	1.8%	4.5%	1.8%	18.8%	4.5%	31.3%
Slightly Agree	Count	0	0	8	20	9	37
	% within PEBI	.0%	.0%	66.7%	37.0%	23.1%	33.0%
	% of Total	.0%	.0%	7.1%	17.9%	8.0%	33.0%
Agree	Count	0	0	2	7	4	13
	% within PEBI	.0%	.0%	16.7%	13.0%	10.3%	11.6%
	% of Total	.0%	.0%	1.8%	6.3%	3.6%	11.6%
Strongly Agree	Count	0	0	0	1	4	5
	% within BI	.0%	.0%	.0%	1.9%	10.3%	4.5%
	% of Total	.0%	.0%	.0%	.9%	3.6%	4.5%
Total	Count	2	5	12	54	39	112
	% within BI	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	1.8%	4.5%	10.7%	48.2%	34.8%	100.0%

Note: Underlined number represents 35 visitors (31%) expressed neutral about importance of egoist values and 28 (25%) undecided about NEP, but intended to behave in a more eco-friendly way (i.e., high PEBIs).

Table 3. Configural models PEBIs and its negation (Models A, B1, B2, C1, D1 and its negations)

Models for predicting high score of outcome (*pebi*)	RC	UC	C	Models for predicting the negation of outcome (*~pebi*)	RC	UC	C
A: *pebi = f(ag, gen, ed, incl, mar, vt)*				~**A**: *~pebi = f(ag, gen, ed, incl, mar, vt)*			
M1. ~ag*gen*~incl*mar	.438	.197	.974	*M1*. gen*~ed*~incl*mar*~vt	.516	.044	.700
M2. gen*ed*incl*mar	.467	.220	.998	*Solution coverage: .675*			
M3. ag*gen*~ed*mar*~vt	.262	.062	1.00	*Solution consistency: .368*			
Solution coverage: .769							
Solution consistency:.985							
B1: *pebi = f(biv, auv, egv)*				~**B1**: ~pebi = f(biv, auv, egv)			
M1. biv*auv	.957	.957	.970	*M1*. egv	.974	.974	.217
Solution coverage: .957				*Solution coverage: .974*			
Solution consistency: .970				*Solution consistency: .217*			
C1: *pebi = f(nep, adcon, asres, pbvct)*				~**C1**: *~pebi = f(nep, adcon, asres, pbvct)*			
M1. asres*pbvct	.792	. 213	.978	*M1*.~nep*adcon*~asres*~pbvct	.705	.705	.730
M2. ~nep*~adcon*pbvct	.271	. 004	.997	*Solution coverage: .705*			
M3. nep*adcon*pbvct	.632	.062	.999	*Solution consistency: .730*			
Solution coverage: .869							
Solution consistency: .979							
D1: *pebi = f(pern, sn, atb)*				~**D1**: *~pebi = f(pern, sn, atb)*			
M1. atb	.963	.963	.964	*M1*. ~pern*~sn*~atb	.689	.689	.854
Solution coverage: .963				*Solution coverage: .689*			
Solution consistency: .964				*Solution consistency: .854*			
B2: *pebi = f(ag, gen, ed, incl, mar, vt, biv, auv, egv)*				~**B2**: *~pebi = f(ag,gen,ed,incl,mar,vt,biv,auv,egv)*			
M1.~ag*gen*~incl*mar*~vt*biv*auv	.333	.038	.979	*M1*.gen*~ed*~incl*mar*~vt*biv*auv*~egv	.572	.572	.452
M2.~ag*gen*~ed*~incl*mar*biv*auv*egv	.256	.025	.998	*Solution coverage: .572*			
*M3. ag*gen*incl*mar*~vt*biv*auv*~egv*	.254	.042	1.00	*Solution consistency: .542*			
M4. ~ag*gen*ed*mar*vt*biv*auv*~egv	.073	.020	1.00				
M5. ~ag*gen*ed*mar*~vt*biv*auv*egv	.295	.019	.980				
M6. ag*gen*ed*incl*mar*biv*auv*egv	.262	.027	1.00				
M7.ag*gen*~ed*mar*~vt*biv*auv*~egv	.199	.003	1.00				
Solution coverage: .643							
Solution consistency: .985							

Note: M stands for Model; RC: Raw Coverage; UC: Unique Coverage; and C: Consistency. pebi: pro-environmental behavioral intentions; ag: age; gen: gender; ed: education; incl: income level; mar: marital status; vt: visit time; biv: biospheric value; auv: altruistic value; egv: egoistic value; nep: new ecological paradigm; adcon: adverse consequences for valued objects; asres: ascribed responsibility; pbvct: perceived behavioral control; pern: personal norm; sn: subjective norm; atb: attitude toward the behavior. Gender, marital status, and visit time are dummy variables: 0 used for “men”, “single”, and “first time visit”, while 1 used for “women”, “married”, and “second/more time visits, respectively.

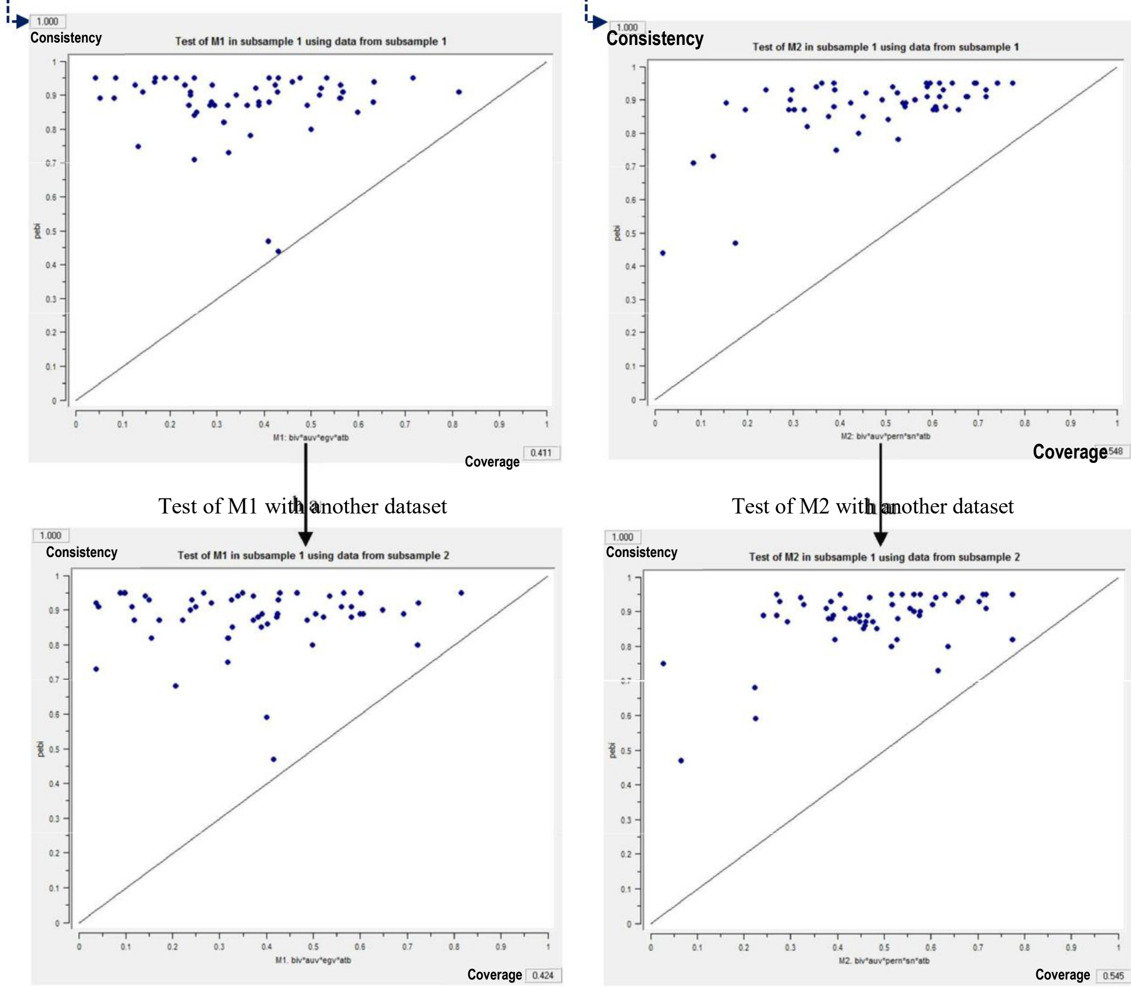
Table 4. Casual recipes for predicting PEBIs with all antecedents

Models for predicting high score of pebi (C2 & D2) and its negation of (~C2 & ~D2)	RC	UC	C
C2: *pebi = f(ag, gen, ed, incl, mar, vt, biv, auv, egv, nep, adcon, asres, pbvct)*			
M1. ~ag*gen*~incl*mar*~vt*biv*auv*nep*adcon*asres*pbvct	.261	.044	.998
M2. ~ag*gen*ed*~incl*mar*~vt*biv*auv*~egv*adcon*asres*pbvct	.179	.007	1.00
M3. ~ag*gen*ed*~incl*mar*biv*auv*~egv*nep*adcon*asres*pbvct	.214	.008	1.00
M4. ag*gen*ed*incl*mar*~vt*biv*auv*~nep*adcon*asres*pbvct	.185	.013	1.00
M5. gen*ed*incl*mar*~vt*biv*auv*egv*~nep*adcon*asres*pbvct	.186	.009	.998
*M6.*ag*gen*~ed*~incl*mar*~vt*biv*auv*~egv*nep*adcon*~asres*pbvct	.105	.009	1.00
M7. ~ag*gen*~ed*~incl*mar*vt*biv*auv*egv*~nep*adcon*asres*pbvct	.043	.009	1.00
M8.~ag*gen*ed*incl*mar*vt*biv*auv*~egv*~nep*adcon*asres*pbvct	.049	.010	1.00
M9. ag*gen*~ed*incl*mar*~vt*biv*auv*~egv*nep*adcon*asres*pbvct	.150	.029	1.00
M10. ag*gen*ed*incl*mar*vt*biv*auv*egv*nep*adcon*asres*pbvct	.058	.018	1.00
Solution coverage: .507			
Solution consistency: .999			
~**C2**: *~pebi = f(ag, gen, ed, incl, mar, vt, biv, auv, egv, nep, adcon, asres, pbvct)*			
M1.~ag*gen*~ed*~incl*mar*~vt*biv*auv*egv*~nep*adcon*~asres*~pbvct	.492	.000	.780
M2.~ag*gen*~ed*~incl*mar*~vt*biv*auv*egv*~nep*~adcon*asres*pbvct	.585	.078	.629
M3. ~ag*gen*ed*incl*mar*~vt*biv*auv*egv*nep*adcon*~asres*pbvct	.484	.051	.601
Solution coverage: .653			
Solution consistency: .488			
D2: *pebi = f(ag, gen, ed, incl, mar, vt, biv, auv, egv, nep, adcon, asres, pbvct, pern, sn, atb)*			
M1. ag*gen*ed*~incl*mar*~vt*biv*auv*~egv*adcon*asres*pbvct*pern*sn*atb	.179	.007	1.00
M2. ~ag*gen*ed*~incl*mar*biv*auv*~egv*nep*adcon*asres*pbvct*pern*sn*atb	.214	.008	1.00
M3. ~ag*gen*~incl*mar*~vt*biv*auv*egv*nep*adcon*asres*pbvct*pern*sn*atb	.216	.037	.998
M4. ag*gen*ed*incl*mar*~vt*biv*auv*~nep*adcon*asres*pbvct*pern*sn*atb	.184	.013	1.00
M5. gen*ed*incl*mar*~vt*biv*auv*egv*~nep*adcon*asres*pbvct*pern*sn*atb	.186	.009	.998
M6.~ag*gen*~ed*~incl*mar*~vt*biv*auv*egv*~nep*~adcon*asres*pbvct*pern*~sn*atb	.108	.006	1.00
*M7.*ag*gen*~ed*~incl*mar*~vt*biv*auv*~egv*nep*adcon*~asres*pbvct*pern*sn*atb	.104	.009	1.00
M8. ~ag*gen*~ed*~incl*mar*vt*biv*auv*egv*~nep*adcon*asres*pbvct*pern*sn*atb	.043	.009	1.00
M9. ~ag*gen*ed*incl*mar*~vt*biv*auv*egv*nep*adcon*~asres*pbvct*pern*sn*atb	.111	.007	1.00
M10. ~ag*gen*ed*incl*mar*vt*biv*auv*~egv*~nep*adcon*asres*pbvct*pern*sn*atb	.049	.010	1.00
M11. ag*gen*~ed*incl*mar*~vt*biv*auv*~egv*nep*adcon*asres*pbvct*pern*sn*atb	.150	.032	1.00
M12. ag*gen*ed*incl*mar*vt*biv*auv*egv*nep*adcon*asres*pbvct*pern*sn*atb	.587	.018	1.00
Solution coverage: .487			
Solution consistency: .999			
~**D2**: *~pebi = f(ag, gen, ed, incl, mar, vt, biv, auv, egv, nep, adcon, asres, pbvct, pern, sn, atb)*			
M1.~ag*gen*~ed*~incl*mar*~vt*biv*auv*egv*~nep*adcon*~asres*~pbvct*~pern*sn*atb	.479	.479	.837
Solution coverage: .479			
Solution consistency: .837			

Note: M stands for Model; RC: Raw Coverage; UC: Unique Coverage; and C: Consistency. pebi: pro-environmental behavioral intentions; ag: age; gen: gender; ed: education; incl: income level; mar: marital status; vt: visit time; biv: biospheric value; auv: altruistic value; egv: egoistic value; nep: new ecological paradigm; adcon: adverse consequences for valued objects; asres: ascribed responsibility; pbvct: perceived behavioral control; pern: personal norm; sn: subjective norm; atb: attitude toward the behavior.

Table 5. Results of predictive validity

Models from subsample 1	Raw coverage	Unique coverage	Consistency
Subsample 1: *pebi = f(biv, auv, egv, pern, sn, atb)*			
M1. biv*auv*egv*atb	.579	.035	.979
M2. biv*auv*pern*sn*atb	.841	.297	.995
Solution coverage: .876			
Solution consistency: .984			



Note: The XY plots revealed an asymmetric relationship between PEBIs and its causal models.

Table 6. Evaluation of fsQCA results with key tenets of complexity theory

No.	Tenet[*]	Supporting evidence
1	Tenet 1: A simple antecedent condition may be necessary, but a simple antecedent condition is rarely sufficient for predicting high or low scores in an outcome condition.	In belief configuration (C1), attribute to the behavior acts as a simple antecedent for predicting PEBIs, which is rare. For other causal models (A, B, D), a simple indicator is not sufficient for simulating high/low PEBI scores (see Table 3 and 4).
2	Tenet 2: *The recipe principle*: A complex antecedent condition of two or more simple conditions is sufficient for a consistently high score in an outcome condition.	As shown in Table 3 (B1: value configuration), two antecedents in M1 (*biv*auv*) offer a sufficient and consistent condition for simulating high outcome scores. While to achieve a same outcome (i.e., high PEBI), a combination of 13 antecedents used to formulate a casual recipe which appeared in M6 (Table 4. D2).
3	Tenet 3: *The equifinality principle*: A model that is sufficient is not necessary for an outcome having a high score to occur.	Regarding demographic configuration (Table 3. A), M1 is a sufficient model for predicting high PEBI, but it is not necessary. Because there are two other alternative models (M2 and M3) that sufficiently explain conditions leading to a high PEBI. As shown in Table 4 (D2) there are 12 alternative models for simulating high PEBI conditions.
4	Tenet 4: *The causal asymmetry*: Recipes indicatingasecondoutcome(e.g., rejection) are unique and not the mirror opposites of recipes of a different outcome (e.g., acceptance) principle.	As shown in Tables 3 and 4, the causal recipes for high PEBI scores (A, B, C, and D) are not the mirror opposites of the causal models for PEBI negations (~A, ~B, ~C, and ~D).
5	Tenet 5: An individual feature (attribute or action) in a recipe can contribute positively or negatively to a specific outcome depending on the presence or absence of the other ingredients in the recipes.	Egoistic value and NEP are two examples of heterogeneity the roles of which in the causal recipes are defined by features of other indicators in the given recipe. A comparison of M9 and M10 in Table 4 (D2) shows that egoistic value and NEP act as both positive and negative antecedents in the models, respectively, the action of which depends on the attributes of other antecedents.
6	Tenet 6: For high Y scores, a given recipe is relevant for some but not all cases; coverage is less than 1.00 for any one recipe.	As clearly illustrated in the XY plots in Table 6, coverage for the causal models is less than 1.00.

Note: [*] source of tenets (Woodside 2014, 2497–2500).

Appendix A

Table I. Results of EFA, alpha coefficient, and descriptive statistics of scale items

Scale Item		λ (%of variance)	α (Mean)	Eigenvalue (SD)
Pro-environmental Behavioral Intention *(Ajzen 1991; 2005; Dolnicar & Grun 2009; Miller et al. 2015; Stern et al. 1999)* [b]		**11.857**	**.902**	**12.811**
BI4	I would buy "eco-" or "organic-" products when possible.	.788	5.795	1.179
BI8	I would try to protect local resources as much as I could i.e. I would voluntarily stop visiting a famous spot if it needed to recover from environmental damage and I would not disturb any creatures and vegetation, for example, feeding fish and birds or picking flowers.	.787	6.505	.631
BI5	I would buy products in eco-friendly packaging when possible i.e. avoid plastic shopping bags, plastic bottles and try to reuse bottles and bags.	.754	6.072	.951
BI1	I'm willing to help to reduce my footprint from the nature.	.721	6.205	.850
BI3	I would prefer to buy local products.	.707	6.054	1.030
BI7	I would try to dispose garbage properly if possible i.e. sort my garbage into separate containers for paper, plastic, glass, etc.	.703	6.214	.832
BI2	I plan to act green in the future.	.700	6.223	.856
BI6	I would try to learn about the recycling facilities and actions of the locals.	.677	6.205	.807
New Ecological Paradigm *(Dunlap et al. 2000; Hawcroft & Milfont 2010)* [b]		**10.039**	**.865**	**5.666**
NEP1	When humans interfere with nature it often produces disastrous consequences	.841	*4.563*	*1.587*
NEP6	The balance of nature is very delicate and easily upset.	.808	*4.705*	*1.563*
NEP4	The so-called "ecological crisis" facing humankind has been greatly exaggerated.*	.759	*3.643*	*1.785*
NEP3	The balance of nature is strong enough to cope with the impacts of modern industrial nations.*	.723	*4.009*	*1.722*
NEP5	Humans were meant to rule over the rest of nature.*	.653	*4.027*	*1.727*
NEP2	Plants and animals have as much right as humans to exist .	.652	*5.081*	*1.215*
NEP7	Humans will eventually learn enough about how nature works to be able to control it.*	.605	*3.750*	*1.574*
NEP8	If things continue on their present course, we will soon experience a major ecological catastrophe.	.411	*5.357*	*.919*
Personal Norm *(Stern et al. 1999)* [b]		**9.521**	**.889**	**3.930**
PN3	I feel that it is important to be environmentally friendly, reducing the harm to the community and its environment while visiting marine turtle's sites.	.663	*5.955*	*.864*
PN1	I feel an obligation to act pro-environmentally by choosing eco-friendly activities while visiting marine turtle's site.	.653	*5.857*	*1.056*
PN2	Regardless of what other people do, because of my own values/principles, I feel that I should behave in an environmentally friendly way while visiting marine turtle's site.	.621	*5.901*	*.842*
PN4	I feel it is important that marine turtles' visitors in general behave in an eco-friendly manner during their visits.	.703	*6.054*	*.879*
Biospheric Value *(Stern et al. 1999; Stern 2000)* [a]		**7.691**	**.817**	**2.572**
BV4	Protecting the environment, preserving nature	.713	*6.455*	*.746*
BV3	Unity with nature, filling into nature	.672	*6.089*	*.973*
BV1	Preventing pollution, conserving natural resources	.439	*6.295*	*.779*
BV2	Respecting the earth, harmony with other species	.432	*6.250*	*.811*
Egoistic Values *(Stern et al. 1999)* [a]		**7.317**	**.912**	**2.343**
EV3	Authority, the right to lead or command	.917	*4.313*	*1.644*
EV4	Influential, having an impact on people and events	.882	*4.696*	*1.692*
EV1	Social power, control over others, and dominance	.778	*3.884*	*2.039*
EV2	Wealth, material possessions, money	.763	*4.393*	*1.684*
Attitude toward the Behavior *(Ajzen 1991; 2005)* [c]		**6.922**	**.885**	**1.939**
ATT2	To me, behaving pro-environmentally while visiting the marine turtle's site is wise	.805	*6.188*	*.822*
ATT3	To me, behaving pro-environmentally while visiting the marine turtle's site is pleasant	.794	*6.223*	*.824*

ATT4	To me, behaving pro-environmentally while visiting the marine turtle's site is beneficial	.792	*6.071*	*.937*
ATT1	To me, behaving pro-environmentally while visiting marine turtle's site is good	.646	*6.214*	*.821*
Perceived Behavioral Control *(Ajzen 1991; 2005)* [b]		**6.158**	**.800**	**1.865**
PBC2	I am confident that if I want, I can behave pro-environmentally while visiting marine turtle's site.	.832	*6.018*	*.820*
PBC1	Whether or not I behave pro-environmentally is completely up to me.	.766	*5.910*	*.745*
PBC3	I have resources, time, and opportunities to behave pro-environmentally while visiting marine turtle's site.	.610	*5.973*	*.967*
Ascribed Responsibility *(De Groot & Steg. 2009; Stern et al. 1999)* [b]		**5.688**	**.846**	**1.703**
AR2	I feel that every visitor is jointly responsible for the environmental deteriorations caused by tourism activities.	.872	*5.295*	*1.480*
AR1	I believe that every visitor is partly responsible for the environmental problem caused by the tourism industry.	.853	*5.232*	*1.329*
AR3	Every visitor must take responsibility for the environmental problems caused during their visits.	.562	*5.339*	*1.418*
Altruistic Values *(Stern et al. 1999)* [a]		**5.623**	**.743**	**1.322**
AV3	Social justice, care for the weak	.718	*6.179*	*.762*
AV2	A world at peace, free of war, and conflict	.677	*6.455*	*.770*
AV1	Equality, equal opportunity for all	.643	*6.232*	*.805*
AV4	Helpful, helping others	.513	*6.000*	*.890*
Subjective Norm *(Ajzen 1991; 2005)* [b]		**4.305**	**.873**	**1.155**
SN3	People whose opinions I value would prefer that I try to protect marine turtles and its environment.	.840	*5.541*	*1.189*
SN2	Most people who are important to me would want me to try to protect marine turtles and its environment.	.790	*5.473*	*1.139*
SN1	Most people who are important to me think that I should try to protect the marine turtles and its environment.	.585	*5.438*	*1.184*
Adverse Consequences for Valued Objects *(Harland et al. 2007; Stern et al. 1999)* [b]		**4.281**	**.790**	**1.113**
AC1	Tourism can generate huge environmental impacts on the environment.	.582	*5.357*	*1.030*
AC2	Visitors can cause environmental deteriorations of the host community such as wastes and excessive use of energy/water/fuel.	.571	*5.171*	*1.213*

Note: * indicates reverse coded items; λ is factor loading coefficient. Items were measured by seven Likert scale. α is Cronbach's alpha representing internal consistency (reliability). M stands for mean; SD is standard deviation. Kaiser-Meyer-Olkin (KMO) measure with .784 and Bartlett's test of Sphericity of 4209.293 was significant (P<.001). The sources of the scale items are presented in parenthesis. All items gauged by 7-pint Likert scale ranging from extremely unimportant (1) to extremely important (7) [a]; or strongly disagree (1) to strongly agree (7) [b]; foolish, unpleasant, harmful, bad (1) to wise, pleasant, beneficial, and good (7) [c].

Appendix A

Table II. Causal recipes for combination of values, beliefs, norms and attitudes and their negations

for predicting high score of outcome (*pebi*)	RC	UC	C	Models for predicting the outcome negation (~*pebi*)	RC	UC	C
E: *pebi = f(biv, auv, egv, nep, adcon, asres, pbvct)*	.630	.061	.99	**~E**: *~pebi = f(biv, auv, egv, nep, adcon, asres, pbvct)*			
M1. biv*auv*nep*adcon*pbvct	.508	.015	.984	*M1*. biv*auv*egv*~nep*adcon*~asres*~pbvct	.699	.699	.734
M2. biv*auv*egv*asres*pbvct	.723	.083	.990	*Solution coverage: .699*			
M3. biv*auv*adcon*asres*pbvct	.254	.004	.997	*Solution consistency: .734*			
M4. biv*auv*egv*~nep*~adcon*pbvct							
Solution coverage: .822							
Solution consistency:.986							
F: *pebi = f(biv, auv, egv, pern, sn, atb)*	.578	.035	.982	~**E**: ~pebi = f(biv, auv, egv, pern, sn, atb)			
M1. biv*auv*egv*atb	.838	.296	.992	*M1*. biv*auv*egv*~pern*atb	.834	.834	.700
M2. biv*auv*pern*sn*atb				*Solution coverage: .834*			
Solution coverage: .874				*Solution consistency: .700*			
Solution consistency: .983							
G: *pebi = f(nep, adcon, asres, pbvct, pern, sn, atb)*	.601	.045	.999	~**G**: *~pebi = f(nep, adcon, asres, pbvct, pern, sn, atb)*			
M1. nep*adcon*pbvct*pern*sn*atb	.562	.009	.999	*M1*.~nep*adcon*~asres*~pbvct*~pern*sn*atb	.675	.029	.827
M2. nep*asres*pbvct*pern*sn*atb	.690	.140	.994	*M2*. nep*~adcon*asres*pbvct*~pern*~sn*atb	.774	.129	.776
M3. adcon*asres*pbvct*pern*sn*atb	.177	.002	.996	*Solution coverage: .804*			
M4. ~nep*~adcon*asres*pbvct*pern*~sn*atb	.201	.004	1.00	*Solution consistency: .758*			
M5. ~nep*~adcon*~asres*pbvct*pern*sn*atb							
Solution coverage: .774							
Solution consistency: .993							
H: *pebi = f(biv, auv, egv, nep, adcon, asres, pbvct, pern, sn, atb)*				~**H**: *~pebi = f(biv, auv, egv, nep, adcon, asres, pbvct, pern, sn, atb)*			
M1. biv*auv*nep*adcon*pbvct*pern*sn*atb	.600	.045	.999	*M1*.biv*auv*egv*~nep*adcon*~asres*~pbvct*	.572	.572	.452
*M2. biv*auv*adcon*asres*pbvct*pern*sn*atb*	.688	.139	.994	~pern*sn*atb			
M3. biv*auv*egv*~nep*~adcon*asres*pbvct*pern*~sn*atb	.135	.001	.995	*M2.biv*auv*egv*nep*~adcon*asres*pbvct*~pe*	.772	.128	.785
M4. biv*auv*egv*~nep*~adcon*asres*pbvct*pern*~sn*atb	.170	.002	.996	*rn*~sn*atb*			
*M5. biv*auv*egv*~nep*~adcon*~asres*pbvct*pern*sn*atb*	.194	.008	1.00	*Solution coverage: .802*			
Solution coverage: .762				*Solution consistency: .766*			
Solution consistency: .993							

Note: **E** indicates casual recipes by combinations of antecedents of values and beliefs, **F**: values and norms & attitudes, **G**: beliefs and norms & attitudes, **H**: values, beliefs and norms & attitudes, **RC:** Raw Coverage, **UC:** Unique Coverage, **C:** Consistency.

Author Bio

Hossein Olya is a member of Oxford Brookes Business School at Oxford Brookes University, Oxford, UK. Dr Olya's main areas of research expertise are 'tourism marketing' and 'tourism climate' with a particular interest in 'destination management'. He is one of the pioneers in application of complexity theory and Qualitative Comparative Analysis to tourism and hospitality research. He is highly skilled in applied statistics, quantitative research methods, and GIS. Dr Olya has effectively contributed to multidisciplinary projects as both PI and a member of the research team. He is regularly invited to speak in Italy, South Korea, the Middle East and the UK.

Arash Akhshik is a graduate research assistant at Tourism Faculty, Eastern Mediterranean University in Cyprus. His research focus on interdisciplinary sustainable conservation and social-ecological systems using complexity theory, fuzzy-set Qualitative Comparative Analysis. He has worked in the tourism industry in different positions since 2003. He has developed an educational programme about critically endangered hawksbill turtles in the Persian Gulf in 2010 which raised his interest in marine wildlife and ever since he has been working in academia.