CLIMATE CHANGE AND ENVIRONMENTALLY RESPONSIBLE BEHAVIOR ON THE GREAT BARRIER REEF, AUSTRALIA

Jee In Yoon
Department of Recreation, Park, and Tourism Sciences
Texas A&M University
jeeinyoon@tamu.edu

Gerard Kyle
Texas A&M University

Carena J. van Riper
Texas A&M University

Stephen G. Sutton
James Cook University

Abstract.—This study explored the relationship between Australians' perceptions of climate change, its impact on the Great Barrier Reef (GBR), and predictors of environmentally responsible behavior (ERB). Our hypothesized model suggested that general attitudes toward climate change, social pressure for engaging in ERBs (subjective norms), and perceived behavioral control (PBC) over ERB would be positively related to intentions to engage in ERB. We hypothesized that attitude, subjective norms, and PBC would negatively influence the constraints of ERB, intention to engage in ERB, and actual ERB. We used data from a survey of Australian residents on the impacts of climate change and individual human ERB on the GBR to test our hypotheses. The most important predictor of intention to engage in ERB was perception of one's control over the behavior. For both residents and nonresidents, attitudes toward climate change were negatively associated with constraints impinging on their ability to adopt ERBs – although this effect was much more pronounced for nonresidents. By emphasizing the accessibility/easiness of environmental behaviors, GBR marine park managers can reinforce perception of individual control over behaviors and reduce the constraints to engaging in ERBs.

1.0 INTRODUCTION

Australia's Great Barrier Reef (GBR), the largest coral reef in the world, provides diverse tourism and recreation opportunities. Increased water temperature and ocean acidification associated with global climate change have already caused coral bleaching and threatened existing species that live in GBR ecosystems. Because of this, the Great Barrier Reef Marine Park Authority (GBRMPA) has become increasingly interested in understanding climate change, its contributing factors, and Australians' attitudes toward and engagement in environmentally responsible behaviors (ERB). A growing body of literature has noted that people's attitudes toward environmental degradation, such as climate change, are strongly related to their intention to negotiate constraints that impede environmentally responsible behavior (Dunlap and Van Liere 1978, Grob 1995, Schahn and Holzer 1990).

Ajzen's (1985, 1991) theory of planned behavior (TPB) assumes that three attitudinal variables (attitude toward behavior, subjective norm, and perceived behavioral control) contribute to predicting behavioral intention, the most important indicator of actual behavior. This framework has been widely used by many researchers to understand how attitudes toward behavior contribute to predicting behavioral tendencies. In this study, we used the TPB model as a theoretical framework to understand the adoption of environmentally responsible behavior. Also, it has been reported in the constraint literature (Frey 1988, Tanner 1999) that internal and/or external conditions can hinder behavior, even when someone has a positive attitude toward the behavior. Thus, we also explored the mediating role of constraints on the relationships between respondents' attitudes toward behaviors that have been reported to influence climate change and their actual ERBs.

Based on the tenets of TPB, we tested a model where three dimensions of respondents' attitudes toward climate change and associated behaviors (i.e., attitudes toward climate change, subjective norms, and perceived behavioral control) were hypothesized to have a positive influence on respondents' intentions to adopt ERBs. The attitude dimensions were also hypothesized to be negatively associated with respondents' perceptions of constraints to engaging in ERB. Intention was hypothesized to positively influence respondents' reported ERB whereas constraints were hypothesized to be negatively associated with intention to adopt ERBs and actual reported ERBs.

We tested the model using data from two groups of survey respondents—residents living near the GBR and residents of other states across Australia—in order to explore the effect of residential proximity (a surrogate of personal relevance) on the relationships in our model.

2.0 LITERATURE REVIEW

2.1 Environmental Attitude and Behavioral Tendency

Research by social psychologists has consistently found a positive relationship between attitude and behavior (Ajzen 2005; Bagozzi and Burnkrant 1979; Fazio and Zanna 1978, 2006; Fishbein and Ajzen 1975). Attitude has been reported to be a prepared psychological state, a kind of mind-set that is already formulated before one behaves (Fishbein and Ajzen 1975). Some social psychologists (Fazio et al. 1983, Fishbein and Ajzen 1975) believe that an attitude toward an object/behavior is significantly related to behavioral tendencies.

In accordance with traditional social psychology, environmental social psychologists have also examined the relationship between environmental attitudes or concern and behavioral intentions to engage in environmental behavior (Dunlap and Van Liere 1978, Staats 2003, Taylor and Todd 1995). In general, two environmental attitudes have been used to predict environmental behavior: attitude toward environment (or environmental concern), and attitude toward environmental behavior (Hines et al. 1986, Olsen 1981). Taylor and Todd (1995) tested the TPB to predict intention to engage in recycling and composting. They found that respondents' intention to recycle and compost was positively affected by two of the attitudinal variables in the TPB: attitude toward recycling/compositing, and their perceived behavioral control (PBC) over these behaviors.

The relationship between positive attitude toward nature and pro-environmental behavior has also been consistently supported by previous research. Some researchers (Becker et al. 1981, Carrus et al. 2005, Kals et al. 1999) investigated the emotional and attitudinal aspects of pro-environmental behavior. These studies found that a positive attitude or emotional affinity for the natural environment increased the possibility of engaging in environmentally responsible behaviors.

2.2 Subjective Norms

In the TPB framework, subjective norms depict the perceived social pressure to perform a behavior or the recognition of what ones significant others expect him or her to do. For instance, the chance of adopting ERBs would be higher when people who are close to an individual (e.g. parents, friends, or siblings) expect the individual to participate in a certain behavior and when s/he is motivated to adapt to their expectation.

Some authors (Herberlein and Black 1976, Stern and Dietz 1994) have noted the importance of subjective norms for the prediction of behavioral intention or actual environmental behavior. For environmental behaviors, Schwartz (1968) and Schwartz and Howard (1981) asserted that behaviors depend on the activation of a moral norm rather than on the influence of general environmental concern. Their results indicate that people feel more responsibility for engaging in environmental behaviors when they are aware of the negative consequences that come from nonparticipation.

2.3 Perceived Behavioral Control

Perceived behavioral control refers to a person's belief that they have the ability to carry out a particular behavior (Ajzen 1988). To strengthen the prediction of behavior, PBC was added to Fishbein and Azjen's (1975) theory of reasoned action (TRA), which had only two attitudinal variables (i.e., subjective norm and attitude toward behavior) for predicting behavioral intention. The necessity of including the PBC construct in the TPB model is supported by many studies (Ajzen and Driver 1992, Dzewaltowski et al. 1990, Wankel et al. 1994). For example, using data collected from a national survey of Canadians' perceptions of well-being and intention to engage in fitness activity, Wankel et al. (1994) reported that TRA has a 15 percent predictability rate (R-square) while TPB has a 30 percent rate. In addition, they noted that perceived behavioral control is the most influential factor in actual behavior.

Research on PBC suggests that the probability of engaging in ERB would increase when people actually believe that they can bring a positive change to the natural environment by engaging in the behavior. Environmental researchers have observed that individuals are more likely to engage in pro-environmental behavior if they believe they have the ability to solve environmental problems through their behavior (Grob 1995, Huebner and Lipsey 1981).

2.4 Constraints to Engaging in Environmentally Responsible Behavior

Even when people maintain a positive attitude, they still may not engage in a behavior due to lack of opportunities (Tanner 1999). Previous research has found that constraints may keep environmental concerns or a positive attitude toward the environment from being expressed in one's behavior (Hines et al. 1986, Stern 1992, Tanner 1999, Vining and Ebreo 2006). Gardener and Stern (1996) noted that pro-environmental attitudes are more likely to be associated with pro-environmental behaviors when the barriers or constraints to action are low. Kaiser et al. (1999) commented that the inconsistency between environmental attitudes and behavior is due to inadequate measures of attitudes and behaviors or the lack of consideration of behavioral constraints on a target behavior.

In summary, previous constraints research on pro-environmental behavior has illustrated that positive attitudes toward a behavior may fail to lead to a behavioral action due to the meditational role of constraints on the attitude-behavior relationship. Thus, in our hypothesized model (Figure 1) we have attitude toward climate change, subjective norm, and perceived behavioral control each predicting behavioral intentions as well as constraints to engaging in ERB. In turn, behavioral intention and constraints predict the actual environmental behavior.

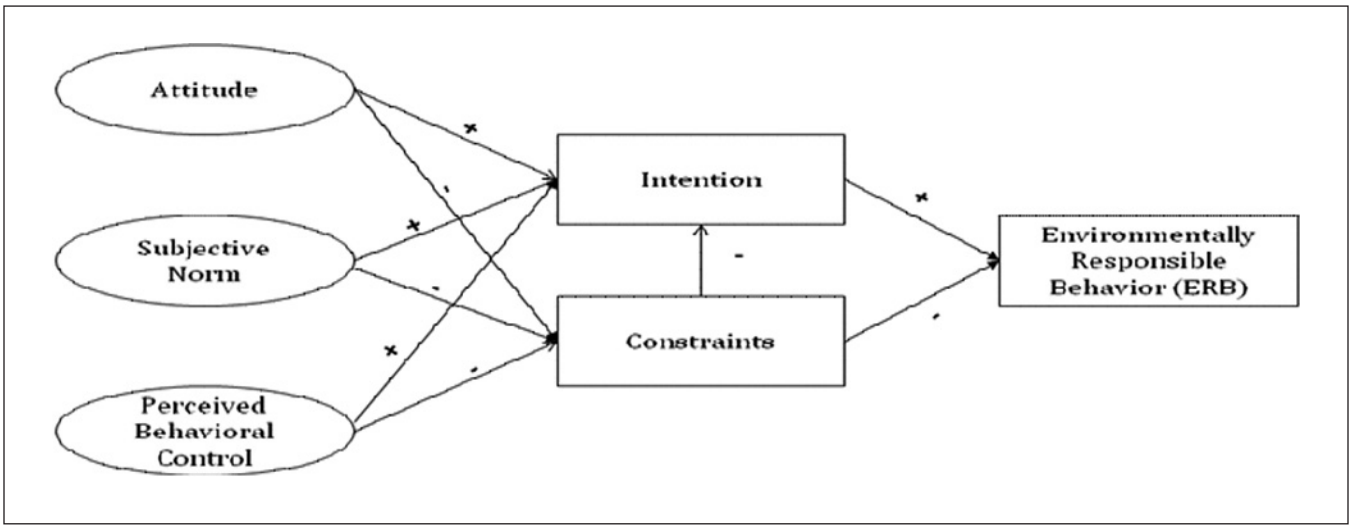

Figure 1.—Hypothesized model.

2.5. Residential Proximity

Previous work has shown that people who live in an area are more concerned about its environmental condition than people who reside outside of the area (Liu and Var 1986, Tremblay and Dunlap 1977). For instance, Tremblay and Dunlap (1977) noted that residential status (e.g., local or distant) determined residents' level of concern about pollution and attitude toward environmental changes. Liu and Var (1986) found that residents regarded environmental protection as a more important priority than tourism development, even when the latter would bring economic benefits to the area. Since residential proximity somewhat determines one's concern for the local environment, we assumed that environmental concern, attitudes, and intention to engage in ERB would be different for those who reside outside of GBR area. Thus, we tested whether residential status (Australian residents living near the GBR and those living further away from the GBR area) moderated the relationships tested in our model.

3.0 METHODS

3.1 Sampling and Measures

Our sample was drawn from five regions of northern Queensland located within 50 km of the Great Barrier Reef Marine Park Coastline plus the cities of Brisbane, Melbourne, and Sydney in Australia. A marketing company telephoned 10,057 randomly selected households to conduct a survey about people's environmental attitudes, thoughts, and behaviors. This yielded 1,623 complete surveys including approximately 200 individuals from each of the eight sample regions. The survey asked respondents to indicate their attitudes toward climate change (7 items), subjective norms (3 items), and perceived behavioral control (2 items) using a 5-point Likert scale (see Table 1). These items were adapted from Ajzen's (1991) measures to fit the present study although some of the items from the original scale were removed because of low factor loadings. For attitude toward climate change, we asked

Table1.—Descriptive analysis

Variables	Items	α	λ	M	SD
Attitude toward climate change (7 items)	Climate change will increase the overall health and beauty of the GBR, the amount of coral on the GBR, the ability to support recreation populations, sustainable fisheries or tourism, and visitors' enjoyment	.87	.63-.76	3.86	.75
Subjective Norm (3 items)	I'd feel guilty if climate change had a negative impact on the GBR/ People should do everything they can to reduce the impact of climate change on the health of the GBR/I feel personally obligated to help reduce the impact of climate change on the GBR	.76	.57-.75	2.47	.96
Perceived Behavioral Control (2 items)	If everyone takes action, we could reduce the impact of climate change on the GBR/ I have the ability to reduce the impact of climate change on the GBR	.67	.56-.69	2.25	1.02
Behavioral Intention to engage in ERB (sum of 38 items)	Use public transport/drive less (walk)/recycle/use solar energy/spread awareness/reduce electricity usage/become more educated about climate change/become involved in environmental organizations/turn lights off/plant trees/use environmentally friendly products, etc.	Manifest variables		1.13	1.04
Constraints on ERB (sum of 7 items)	I don't have time/I don't know what to do/I don't understand the climate change problem/Too much money required/I don't believe I can reduce the impact/My family or friends would not approve/I have other important priorities in my life	Manifest variables		2.78	1.39
Environmentally Responsible Behavior (ERB) (sum of 21 items)	Similar items to Behavioral Intention: measured actual engagement of ERB	Manifest variables		2.33	1.54

the respondents to indicate the extent to which they thought environmental changes around the GBR area had been the result of climate change. For subjective norms, we asked respondents to indicate the extent to which they felt a social obligation to engage in ERB. For PBC, we asked them to indicate the extent to which they felt they had control over their engagement in ERBs. Specific questions about behavioral intention (38 items), constraints (7 items), and actual behavior (21 items) related to engaging in ERBs were measured using a dichotomous response scale (yes or no) (see Table 1).

4.0 ANALYSES AND FINDINGS

4.1 Descriptive Analyses

Our model includes three latent variables (attitude toward climate change, subjective norm, and perceived behavioral control). The remaining variables (behavioral intention to engage in ERB, constraints of ERB, and actual ERB) were measured by summing responses (1=yes, 0=no) to develop single respondent scores. For instance, we specifically asked whether respondents were participating in actual ERB with 21 items. They checked 0 if they were not participating and 1 if they were.

Table 2.—Summary of model testing procedure

Model	χ^2	df	RMSEA	NNFI	CFI
Measurement Model	751.50	90	.07	.94	.95
Structural Model	593.25	84	.06	.95	.96

4.2 Model Testing

We used a covariance structure analysis in LISREL to examine the measurement and structural properties of our hypothesized model. For the pooled sample, both the measurement (chi-square=751.51, df=90, RMSEA=.07 NNFI=.94, CFI=.95) and the structural model (chi-square=593.25, df=84, RMSEA=.06 NNFI=.95, CFI=.96) displayed good fit (Table 2). Our findings illustrated that both attitude toward climate change (beta= -.14, p<.001) and perceived behavioral control (beta= -.17, p<.001) had negative effects on constraints for engaging in ERB, accounting for 6 percent of the variance. Further, perceived behavioral control (beta=.16, p<.001) had a positive impact on intention to engage in ERBs, accounting for 4 percent of the variance. While behavioral intention (beta=.09, p<.001) had a positive effect on actual ERBs, constraint (beta= -.09, p<.001) showed a negative impact on ERBs, accounting for 2 percent of its variance. Finally, subjective norms were not a statistically significant predictor of either behavioral intention or constraint.

The moderating effect of residential proximity was examined by splitting the sample into resident/non-resident groups and testing the model simultaneously for each group. The invariance tests are shown in Table 3. The purpose of invariance tests was to examine whether the factor structure, factor loadings, factor variance/covariance, and beta weights were significantly different among the two groups. For the fourth hypothesis (see Table 3), we were interested in examining the difference in beta coefficients across the two groups since this provides information about

Table 3.—Invariance tests

Model		χ^2	df	RMSEA	NNFI	CFI
H_1	Equality of structure	1278.48	180	.09	.90	.91
H_2	Equality of factor scaling	1192.39*	177	.08	.90	.93
	Final model H_2a	1104.86	168	.08	.91	.93
H_3	Equality of factor variance/covariance	1244.08*	177	.08	.90	.92
	Final model H_3a	1112.19	172	.08	.91	.93
H_4	Structural paths[3]	1135.37*	178	.08	.91	.92
	Final model H_4a	1113.46	176	.08	.91	.93

* p <.001

which paths are significantly different from each other. Beta coefficients were constrained to be invariant across the two groups (residents and nonresidents of GBR area), and then conclusions were drawn as to whether or not the imposition of the constraint significantly affected the model fit. Our findings indicated that there was significant difference between these two groups with regard to the beta coefficients ($\Delta\chi^2$=1135.37; Δdf=178, RMSEA=.08, NNFI=.91, CFI=.92). Specifically, we observed that the path from attitude to constraints was significantly stronger (beta= -.21, p<.001) for nonresidents compared to residents (beta= -.10, p<.001). Also, while residents' constraints (beta= -.16, p<.001) had a negative impact on their intention to adopt ERBs, the relationship was not significant for nonresidents. Instead, nonresidents' constraints had a negative impact on the actual behavior.

5.0 DISCUSSION

These findings provide further insight into how attitudinal variables contribute to the prediction of environmentally responsible behavior. Based on hypothesized model testing for the pooled sample, the most important predictor of behavioral intention and constraints on ERB was perceived behavioral control. This information may be useful for GBR managers who can emphasize to the public that individual actions have a collective impact on the Great Barrier Reef. In addition, efforts to promote ERB can communicate the ease and accessibility of pro-environmental behavior (e.g., the way to reduce energy consumption or recycling), which may enhance people's confidence in their ability to make a difference.

However, in general, two attitudinal variables (attitude toward climate change and perceived behavioral control) accounted for a relatively small amount of variance in our model and the third TPB variable, subjective norm, had no impact on behavioral intention or constraints of ERB. We tentatively conclude that attitudinal variables related to climate change are not sufficient predictors of respondents' intentions, constraints, and actual performance of ERBs. Thus, for future research, continued exploration of the factors influencing people's ERB will assist our understanding of the drivers of action. For example, it is still unclear how elements such as people's environmental worldviews, values, and their attachments to natural landscapes influence the relationships among the constructs tested in our model.

Finally, while our model may have general relevance for the broader Australian population, our testing did not explore variation among segments within the population. Education programs aimed at increasing the adoption of ERBs will need to be sensitive to the preferences and tendencies of segments within the population. Given that little is known about the nature of this variation, the immediate priority for our future research will be to refine our understanding beginning with indicators of respondents' attitudes toward and attachments to natural landscapes.

6.0 LITERATURE CITED

Ajzen, I. 1985. **From intentions to actions: a theory of planned behavior.** In: Kuhl, J.; Beckman, J., eds. Action-control: From cognition to behavior. Heidelberg: Springer: 11-39.

Ajzen, I. 1988. **Attitudes, personality and behavior. 1st ed.** Berkshire, England: Open University Press.

Ajzen, I. 1991. **The theory of planned behavior.** Organizational behavior and human decision processes. 50(2): 179-211.

Ajzen, I. 2005. **Attitudes, personality and behavior. 2nd ed.** Berkshire, England: Open University Press.

Ajzen, I.; Driver, B. 1992. **Application of the theory of planned behavior to leisure choice.** Journal of Leisure Research. 24(3): 207-224.

Bagozzi, R.; Burnkrant, R. 1979. **Attitude organization and the attitude-behavior relationship.** Journal of Personality and Social Psychology. 37(6): 913-929.

Becker, L.; Seligman, C.; Fazio, R.; Darley, J. 1981. **Relating attitudes to residential energy use.** Environment & Behavior. 13(5): 590-609.

Carrus, G.; Bonaiuto, M.; Bonnes, M. 2005. **Environmental concern, regional identity, and support for protected areas in Italy.** Environment and Behavior. 37(2): 237-257.

Dunlap, R.; Van Liere, K. 1978. **Environmental concern: a bibliography of empirical studies and brief appraisal of the literature.** Monticello, IL: Vance Bibliographies.

Dzewaltowski, D.; Noble, J.; Shaw, J. 1990. **Physical activity participation: social cognitive theory versus the theories of reasoned action and planned behavior.** Journal of Sport & Exercise Psychology. 12(4): 388-405.

Fazio, R.; Powell, M.; Herr, P. 1983. **Toward a process model of the attitude-behavior relation: accessing one's attitude upon mere observation of the attitude object.** Journal of Personality and Social Psychology. 44(4): 723-735.

Fazio, R.; Zanna, M. 1978. **Attitudinal qualities relating to the strength of the attitude-behavior relationship.** Journal of Experimental Social Psychology. 14(4): 398-408.

Fazio, R.; Zanna, M. 2006. **On the predictive validity of attitudes: the roles of direct experience and confidence.** Journal of Personality. 46(2): 228-243.

Fishbein, M.; Ajzen, I. 1975. **Belief, attitude, intention and behavior: an introduction to theory and research.** Reading, MA: Addison-Wesley.

Frey, B. 1988. **Ipsative and objective limits to human behavior.** Journal of Behavioral Economics. 17(4): 229-248.

Gardner, G.; Stern, P. 1996. **Environmental problems and human behavior.** Needham Heights: Allyn and Bacon. 300 p.

Grob, A. 1995. **A structural model of environmental attitudes and behaviour.** Journal of Environmental Psychology. 15(3): 209-220.

Herberlein, T.; Black, J.S. 1976 **Attitudinal specificity and the prediction of behaviour in a field setting.** Journal of Personality and Social Psychology. 33: 474-479.

Hines, J.; Hungerford, H.; Tomera, A. 1986. **Analysis and synthesis of research on responsible environmental behavior: a meta-analysis.** Journal of Environmental Education. 18(2): 1-8.

Huebner, R.; Lipsey, M. 1981. **The relationship of three measures of locus of control to environment activism.** Basic and Applied Social Psychology. 2(1): 45-58.

Kaiser, F.; Wölfing, S.; Fuhrer, U. 1999. **Environmental attitude and ecological behaviour.** Journal of Environmental Psychology. 19(1): 1-19.

Kals, E.; Schumacher, D.; Montada, L. 1999. **Emotional affinity toward nature as a motivational basis to protect nature.** Environment and Behavior. 31(2): 178.

Liu , J.C.; Var, T. 1986. **Resident attitudes toward tourism impacts in Hawaii.** Annals of Tourism Research. 13: 193-214.

Olsen, M. 1981. **Consumers' attitudes toward energy conservation.** Journal of Social Issues. 37(2): 108-131.

Schahn, J.; Holzer, E. 1990. **Studies of individual environmental concern: the role of knowledge, gender, and background variables.** Environment and Behavior. 22(6): 767.

Schwartz, S. 1968. **Words, deeds, and the perception of consequences and responsibility in action situations.** Journal of Personality and Social Psychology. 10(3): 232-242.

Schwartz, S.; Howard, J. 1981. **A normative decision-making model of altruism.** In: Rushton, J.P.; Sorrentino, R.M., eds. Altruism and helping behaviour: social, personality, and developmental perspectives . Hillsdale, NJ: Erlbaum: 189-211.

Staats, H. 2003. **Understanding proenvironmental attitudes and behavior: an analysis and review of research based on the theory of planned behavior.** In: Bonnes, M.; Lee,T.; Bonaiuto, M., eds. Psychological theories for environmental issues. Burlington, VT: Ashgate: 171-201.

Stern, P. 1992. **What psychology knows about energy conservation.** American Psychologist. 47(10): 1224-1232.

Stern, P.; Dietz, T. 1994. **The value basis of environmental concern.** Journal of Social Issues. 50(3): 65-84.

Tanner, C. 1999. **Constraints on environmental behaviour.** Journal of Environmental Psychology. 19(2): 145-157.

Taylor, S.; Todd, P. 1995. **Understanding information technology usage: a test of competing models.** Information Systems Research. 6: 144-176.

Tremblay, K., Jr.; Dunlap, R. 1977. **Rural-urban residence and concern with environmental quality: a replication and extension.** Rural Sociology. 43(3): 474-91.

Vining, J.; Ebreo, A. 2006. **Predicting recycling behavior from global and specific environmental attitudes and changes in recycling opportunities.** Journal of Applied Social Psychology. 22(20): 1580-1607.

Wankel, L.; Kerry Mummery, W.; Stephens, T.; Craig, C. 1994. **Prediction of physical activity intention from social psychological variables: results from the Campbell's survey of well-being.** Journal of Sport and Exercise Psychology. 16: 56-69.