Coastal Management, 41:457–469, 2013

ISSN: 0892-0753 print / 1521-0421 online
DOI: 10.1080/08920753.2013.841354

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Testing the Effects of Constraints on Climate Change–Friendly Behavior among Groups of Australian Residents

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This study explores the relationship between Australian's attitudes toward climate change impacts on the Great Barrier Reef (GBR) and environmentally responsible behavior (ERB). We hypothesize that general attitudes toward climate change, subjective norms, and perceived behavioral control predict intended and reported behavior, and that attitude negatively influences constraints on adopting ERB. The moderating effect of residential condition (urban vs. rural contexts) was tested across these hypothesized relationships. We randomly selected 200 individuals from eight regions: Five within 50 km of the GBR Coastline and three from the Statistical Metropolitan Areas in Australia. We yielded 1,623 surveys by telephone interviews. Findings confirm our hypotheses and suggest the most important predictor of intentions is perceived behavioral control. The two groups of respondents (urban vs. rural) illustrate different relationships. This study offers insight on how managers of the GBR can effectively shape residents' behavioral tendencies that minimize human impacts on the natural environment.

Keywords constraints on environmental behavior, environmental behavior, Great Barrier Reef, perceptions of climate change

Introduction

Australia's Great Barrier Reef (GBR) is the largest coral reef system in the world. The GBR is rich in biodiversity, provides an array of ecosystem services (e.g., production of food and water, control of climate, nutrient cycles, spiritual and recreational benefits), and is a major driver of the local economy (e.g., tourism and fishing industries). Like many ecosystems throughout the world (Parmesan and Yohe 2003), global climate change

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is threatening the health of the reef system (e.g., coral bleaching and the destruction of habitat for marine life). Increased water temperature and ocean acidification associated with global climate change has already threatened existing species that live within GBR ecosystems. Consequently, the Great Barrier Reef Marine Park Authority (GBRMPA), which tries to protect the GBR from damaging activities, has become increasingly concerned with its contributing factors. Although climate change is a global phenomenon, GBRMPA recognizes that Australian residents have a role to play in minimizing carbon emissions and reducing human impacts on the GBR. In addition to industry-related factors, GBRMPA is concerned with the consumptive activities that Australians undertake throughout their day-to-day lives and strive to ensure that unnecessary impacts are minimized (Johnson, Marshall, and Authority 2007). In this investigation, we explored factors contributing to Australian residents' adoption of actions that are relatively beneficial for environment, in general, and reduce the potential for climate change more specifically.

Past research (e.g., Carrus, Bonaiuto, and Bonnes 2005; O'Connor, Bord, and Fisher 1999) has explored the adoption of environmentally responsible behaviors (ERB), including the relationship between people's attitudes toward environmental issues and the corresponding behaviors that potentially minimize or exacerbate these issues. To guide previous investigations of the intimate association between attitude and behavior, the theory of planned behavior (TPB) (Ajzen 1985, 1991) has extensively applied across a variety of contexts. This theory posits that behavioral intention can be predicted using three components: (a) general attitude toward the behavior, (b) personal compulsion to behave in a specific way (i.e., "subjective norm"), and (c) perceived control over the specific behavior. In turn, behavioral intentions are thought to indicate actual behavior.

In this article, we drew on the tenets of TPB to hypothesize that three dimensions of respondents' attitudes toward climate change (general attitudes, subjective norms, and perceived behavioral control) would positively influence Australian residents' intentions to adopt ERB (see Figure 1). As an extension of this model, we introduced "constraints" as a mediator of the relationship between attitudes and behavior, because internal and/or external conditions can prevent the expression of attitudes in actual behavior (Tanner 1999). We tested whether the three TPB dimensions would be negatively associated with perceived

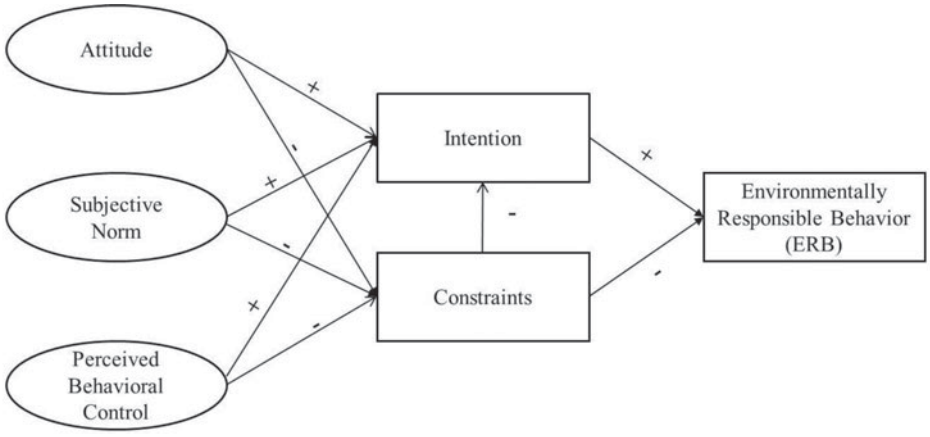

Figure 1. Hypothesized model linking Environmentally Responsible Behavior to intentions, constraints, attitudes, norms, and perceived behavioral control (Direction of influence is indicated by + and –).

constraints, which would in turn have a negative relationship with engagement in ERB. Our model was tested between two groups of residents: rural residents (individuals living in five rural cities within 50 km of the GBR) and urban residents (individuals from three metropolitan areas in Australia: Brisbane, Melbourne, and Sydney). Given that the surroundings in which they live or distance to a particular resource such as the GBR might influence residents' engagement in behaviors that benefit the environment in question, this comparison was conducted on the attitude–behavior relationship (Tremblay Jr and Dunlap 1978).

Predictors of Behavioral Intentions

Previous research focused on understanding ERB has been grounded in the TPB framework described above. The three tenets of TPB—general attitudes, subjective norms, perceived behavioral control—are hypothesized to shape behavior that contributes to climate change–related impacts on the GBR. People are more inclined to act favorably toward a behavioral object such as the GBR when they: (a) hold a positive attitude toward behavior, (b) perceive stronger social support for enacting a behavior, and (c) see potential to control the behavior and associated outcome. The first major contributor to an individual's engagement in ERB and concern over environmental degradation is general attitudes (Becker et al. 1981; Carrus, Bonaiuto, and Bonnes 2005; Kals, Schumacher, and Montada 1999; O'Connor, Bord, and Fisher 1999). A positive attitude toward or emotional affinity with the natural environment increases the possibility that an individual will undertake an action. For example, Carrus, Bonaiuto, and Bonnes (2005) found that individuals' attitudes toward parks mediated the relationship between environmental concern and support for specific parks. O'Connor, Bord, and Fisher (1999) also found that general environmental beliefs, risk perceptions, and knowledge of climate change were significant predictors of environmental behavior. However, others have reported weak associations owing to the lack of specificity reflected in measures of environmental attitude (Corral-Verdugo and Frías-Armenta 2006; Fransson and Gärling 1999). In other words, a favorable attitude toward nature does not always equate to behavior that benefits the environment when generic indicators are used to capture broad sentiments toward nature (Scott and Willits 1994; Taylor and Todd 1997).

The second major predictor of behavioral intention within the TPB model is subjective norms (Cordano et al. 2011), which refers to perceived social pressure to comply with others' opinions about engaging in a behavior (Ajzen and Driver 1992). Social pressures can come from significant others (e.g., friends and family) (Ajzen, 1991) and/or the general public (e.g., peers and neighbors) (Conner and Norman 2005; Kim, Lee, and Hur 2012). Previous research suggests that people will be more inclined to act favorably toward a behavioral object such as the GBR when they perceive strong social support (Cordano et al. 2011). For instance, the likelihood of adopting ERB would be higher if the individual felt inclined to support others' expectations and was motivated to comply. Cordano and Frieze (2000) found that subjective norms influenced the likelihood that workers would comply with environmental regulations, thus, engaging in environmentally friendly actions in a work setting. Heberlein and Black (1976) also indicated that subjective norm was a strong predictor of respondents environmentally friendly behavior (i.e., lead-free gasoline purchase behavior), reinforcing the notion that behavioral intention was increased when subjective norms toward a behavior are apparent.

The third predictor of behavioral intention explored in this article is perceived behavioral control (PBC), which is one's "belief as to how easy or difficult performance of the

behavior is likely to be" (Ajzen and Madden 1986, 457). Empirical support for the inclusion of PBC within the TPB model has been reported in many studies (Ajzen and Driver 1992; Dzewaltowski, Noble, and Shaw 1990; Madden, Ellen, and Ajzen 1992; Wankel et al. 1994). Individuals are more likely to engage in ERB if they believe their participation will reduce environmental problems (Bamberg 2003; Grob 1995). Previous research has pointed out that people have difficulty engaging in ERB because individual efforts can be considered ineffective, leaving the person feeling they have little influence over environmental events (O'Riordan 1971; Rankin 1969). Thus whether an individual feels that he/she has control over behavior may affect willingness and actual involvement in ERB. Bamberg (2003) found that general attitudes (environmental concerns) alone, did not directly predict ERB. The author suggested that situation-specific cognitions, such as PBC or subjective norms, also determined willingness to perform a specific behavior. In his study, the PBC construct had a direct effect on intentions to engage in ERB, which in turn affected actual participation among individuals with higher levels of environmental concern. Thus, one's intention to engage in ERB is more likely to be influenced by perceptions of control.

Constraints on Environmentally Responsible Behavior

Predictions of behavioral intentions can be limited by factors that undermine the influence of positive attitudes on corresponding behavior. Although attitudes toward specific behavioral objects may be consistent, a positive attitude–behavior relationship can be disturbed by influences beyond one's control (Kaiser, Wölfing, and Fuhrer 1999). These factors are often called "constraints." There is a strong need to consider the role of constraints in attitude–behavior relationships because despite an awareness of the importance of ERB for individuals and nature, interventions occur through (a) subjective constraints—issues germane to the individual or situation and (b) objective constraints—physical-, structural-, or societal-level inhibitors (Sutton and Tobin 2011; Tanner 1999). For example, Tanner (1999) reported that even though their respondents had concerns about environmental problems and a positive attitudes toward nature, the attitude–behavior relationship was not always positive. Sutton and Tobin (2011) also reported that although respondents showed high levels of cognitive and affective engagement in climate change reduction, behavioral engagement (e.g., recycling) was somewhat limited due to objective constraints such as lack of time and financial resources.

Urban versus Rural Residents

Previous work has reported that there is a difference between urban and rural residents' environmental knowledge and actions in general. For example, Tremblay Jr. and Dunlap (1978) proposed the "residence hypothesis," which posited that residential status (e.g., urban vs. rural) determined levels of concern over pollution and attitude toward detrimental environmental change. Urban residents were thought to be more concerned with environmental problems than rural residents because they had more exposure to pollutants. Rural residents on the other hand may be less concerned with environmental protection because they are more dependent on the natural environment through occupations such as farming, logging, and mining (Van Liere and Dunlap 1980). When predicting environmental behaviors from environmental attitudes, Berenguer, Corraliza, and Martín (2005) insisted that it is necessary to consider the sociostructural factors and/or socialization experiences, which can be influenced by the society/surroundings individuals belong to. With this assumption, the authors compared environmental values, attitudes, and behaviors of individuals living

in urban and rural areas. They found a weaker association between environmental attitude and behavior among those living in cities. However, individuals in the rural context displayed a more positive attitude to environmental responsibility and greater consistency in attitude–behavioral intention relationship.

Finally, in this article, we hypothesized that constraints on engaging in ERB that can help curb the negative effects of climate change would mediate the attitude–behavior relationship across two groups defined by residential area: residents in urban and rural contexts.

Methods

Sample and Study Context

Our data were collected via telephone interviews from a sample drawn from eight regions in Australia. Households residing in five regions within 50 km of the Great Barrier Reef (GBR) coast (Cape York, Far Northern, Northern, Central, and Southern Queensland) and three Statistical Metropolitan Areas of Sydney, Melbourne, and Brisbane were contacted by Roy Morgan Research (Brisbane, Australia) to ask their attitudes and behaviors regarding climate change and the GBR. Approximately 200 individuals were randomly selected from each region. To conduct the telephone interview, a random sample of telephone numbers from within each region was drawn from the electronic white pages and from a database of active household telephone numbers maintained by Roy Morgan Research. Following six unsuccessful attempts to contact each identified phone number, surveyors proceeded to the next number. This continued until survey administrators had 200 completed surveys, each lasting approximately 20 minutes. Collectively, telephone surveys were administered to 10,057 households and yielded 1,623 complete surveys (response rate: 16.0%).

Measures

With the exception of constraints to ERB, our measures were designed to operationalize each of the variables reflected in the TPB. Specifically, three types of attitude were measured: general attitude toward climate change (7 items), subjective norms (3 items), and perceived behavioral control (2 items). All were measured along a 5-point Likert-type scale (see Table 1). These items were adapted from Ajzen (1991) TPB scale and modified to fit the current study context. To measure attitudes toward climate change, respondents were asked to rate the impact of climate change on the health and use of the GBR. For subjective norms, we asked respondents to indicate the extent to which they felt a social obligation to help protect the GBR from climate change impacts. For PBC, we asked respondents to indicate the extent to which they felt they had control over their ability to reduce the impact of climate change on the GBR. Constraints were measured using 7 items (5-point Likert-type scale) that examined the extent to which respondents encountered obstacles to engaging in ERB. Respondents were asked to report their level of agreement with a list of constraints (e.g., no time, participation costs too much money, less support from significant others) on a scale from 1 (strongly disagree) to 5 (strongly agree). Measures of behavioral intention (38 items) and actual behavior (21 items) related to engaging in ERB were presented to respondents on a dichotomous response scale: "yes" or "no." Respondents were asked, "Over the past 12 months, have you taken any action to reduce the impact of climate change?" If yes, then they were asked an open-ended question about the actions undertaken.

Table 1
Items of attitude, subjective norm, perceived behavioral control, constraints, behavioral intention, and actual ERB

Variables	Items
Attitude (7 items)[1]	Climate change will decrease: the overall health, the beauty of the GBR, the amount of coral on the GBR, the ability to support recreation populations, sustainable fisheries, sustainable tourism, and visitors' enjoyment
Subjective Norm (3 items)[1]	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
Perceived Behavioral Control (PBC) (2 items)[1]	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
Behavioral Intention (38 items)[2]	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.
Constraints (7 items)[1]	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
Environmentally Responsible Behavior (21 items)[2]	Similar items to Behavioral Intention: measured actual engagement of ERB

[1]Items measured on a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).
[2]Items measured on a dichotomous choice scales including 0 (no) and 1 (yes).

Item Parceling

We conducted manifest variable regression using LISREL 8.70. A manifest variable is an indicator that has been directly observed (Jöreskog and Sörbom 2004). Item parceling was performed by summing up item scores for all of the manifest variables associated with all six constructs to create new variables reflecting each construct (Hall, Snell, and Foust 1999). The use of item parcels instead of individual items was beneficial for improving the ratio of sample size to the number of variables, especially given the large number of estimated parameters in the study (Hall, Snell, and Foust 1999).

Results and Discussion

Descriptive Analyses

For the pooled sample, respondents' attitudes toward climate change was moderate to high ($M = 3.79$, $SD = .72$), whereas the means for subjective norm ($M = 1.53$, $SD = .39$) and PBC ($M = 1.08$, $SD = .27$) were comparatively low (see Table 1). Respondents' perceptions of constraints to engaging in ERBs ($M = 2.76$, $SD = 1.39$) were moderate. Intended and actual reported ERBs were summed and each respondent was assigned a score. For both behavioral intention ($M = 2.76$, $SD = .51$) and actual involvement in ERBs ($M = 1.12$, $SD = 1.04$), the aggregated number of ERBs were low.

As shown in Table 2, we compared the mean of each variable between urban residents and rural residents in Australia. There were significant differences between the two groups' attitudes toward climate change ($t = –5.02$, $p = .000$) and actual ERBs ($t = –3.07$, $p = .001$). Urban residents displayed greater concern for climate change compared to rural residents. However, rural residents ($M = 1.14$, $SD = 1.05$) were more likely to engage in actual ERBs ($M = 1.09$, $SD = 1.02$). No significant differences between the two groups were observed for subjective norm, constraints, and behavioral intentions.

Predictors of Behavioral Intentions

Our findings provided insight on how three predictors of behavioral intention (attitude, subjective norm, and PBC) affected residents' engagement with ERB, as well as the mediation effects of perceived constraints on this relationship. We tested our hypothesized model in LISREL. The assessment of model fit was based on the root mean square error of approximation (RMSEA) (Steiger and Lind 1980), the nonnormed fit index (NNFI) (Bentler and

Table 2

Means, standard deviations, and *t*-values for predictors of behavioral intention, measures of behavior, and constraints to engaging in ERBs reported by pooled sample, rural (GBR) residents, and urban (non-GBR) residents

	M (SD)			
Variables	Pooled sample	Rural residents	Urban residents	T-value (Rural versus Urban residents)
Attitude (7 items)[1]	3.79 (.72)	3.72 (1.02)	3.91 (.68)	–5.02***
Subjective Norm (3 items)[1]	1.53 (.39)	1.53 (.40)	1.53 (.39)	Not significant
Perceived Behavioral Control (PBC) (2 items)[1]	1.08 (.27)	1.08 (.28)	1.10 (.25)	Not significant
Behavioral Intention (38 items)[2]	2.33 (1.39)	2.23 (1.28)	2.49 (1.52)	Not significant
Constraints (7 items)[1]	2.76 (.51)	2.79 (.53)	2.78 (.49)	Not significant
Environmentally Responsible Behavior (21 items)[2]	1.12 (1.04)	1.14 (1.05)	1.09 (1.02)	–3.07***

***$p < .001$.

[1]Items measured on a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

[2]Items measured on a dichotomous choice scales including 0 (no) and 1 (yes).

Table 3
Good-of-fit indices of path model for pooled sample

Model	χ^2	df	RMSEA	NNFI	CFI
Path Model	5.18	2	.03	.97	.99

Bonett 1980), and the comparative fit index (CFI) (Bentler 1990) (see Table 3). The path model displayed good fit to the data ($\chi^2 = 5.18$, $df = 2$, RMSEA = .03, NNFI = .97, CFI = .99). Behavioral intentions were positively predicted by subjective norms (ß = .12, $p < .001$) and negatively predicted by constraints on ERB (ß = –.09, $p < .001$), explaining 3% of the variance. This suggests that respondents' perceived social pressure to engage in ERBs was the most important determinant of their intention to act in an environmentally friendly way. However, if respondents felt constraints on their ERBs, they were less likely to hold an intention to undertake action.

These results imply that individual intentions to become involved in ERB are influenced by others' expectations. A number of researchers have investigated the role of normative factors in TPB and the theory of reasoned action frameworks, and have found that subjective norms do not always serve as the strongest predictors of intentions/behavior (Cordano and Frieze 2000; Madden, Ellen, and Ajzen 1992). However, others (Fishbein and Ajzen 1975; White et al. 2009) have argued that the relative influence of attitudes and norms on behavioral tendencies can vary across particular behaviors and populations, thereby explaining diverse predictive power. For instance, White et al. (2009) examined the inclusion of diverse types of norms (e.g., descriptive norm, personal injuctive norm, social injunctive norm) in the TPB model to determine whether norms performed well in predicting recycling behaviors among college students in Brisbane, Australia. The authors found that students were likely to recycle at home when they held positive attitudes toward recycling, perceived they had control over the behavior, had expectations that they ought to recycle (i.e., personal injuctive norm), and felt that others believed it was important for them to recycle (i.e., descriptive norm).

Constraints on Environmentally Responsible Behavior. Constraints on ERB were negatively influenced by attitudes toward climate change (ß = –.17, $p < .001$), subjective norms (ß = –.07, $p < .01$), and PBC (ß = –.08, $p < .01$). The constructs explained 6% of the variance in constraints. As respondents' concerns about climate change, expectations from others to engage in ERB, and their perceived ease of ERB increased, they were less likely to feel constrained.

A limited body of literature on environmental behavior has explored the relationship between environmental attitude/concern and constraints on ERB. Research has tended to focus more on the environmental attitude–behavior relationship alone (Kaiser et al., 1999; Tarrant and Cordell 1997). In this regard, our findings (e.g., the negative relationship between attitudes toward climate change and constraints) illustrate the role of constraints on ERB within the environmental attitude and ERB relationship. Further research should examine how different sets of constraints are associated with environmental attitudes as well as ERB.

Actual engagement in ERB was positively influenced by behavioral intentions (ß = .08, $p < .01$) and negatively predicted by constraints (ß = –.57, $p < .001$), accounting for 23% of the variance (see Table 4). These findings suggested that as respondents' intentions to engage in ERB increased and their perceived constraints related to ERB decreased,

Table 4
Regression coefficients for pooled sample

Predictor	Dependent variable	β	t-value	R^2
Subjective Norm	Behavioral Intention	.12	4.00***	.03
Constraints	Behavioral Intention	.09	−3.52***	
Attitude	Constraints	−.17	−7.36***	.06
Subjective Norm	Constraints	−.07	−2.85**	
Perceived Behavioral Control	Constraints	−.08	−3.15**	
Behavioral Intention	Environmentally Responsible Behavior	.08	3.08**	.23
Constraints	Environmentally Responsible Behavior	−.57	−4.96***	

**$p < .01$, ***$p < .001$.

they were more likely to participate in environmental behavior. Behavioral intention and constraints accounted for 23.1% of the variance.

The relationship between the three predictors and reported behavior was mediated by intentions and constraints. The three attitudinal dimensions of TPB negatively impacted constraints, which in turn, showed a negative and relatively stronger influence on actual ERB than did behavioral intentions. Consistent with past research, our results point to the necessity of considering the types of barriers that may impede one's participation in ERB (Sutton and Tobin 2001; Tanner 1999). A stronger understanding of individuals' attitudes and perceived constraints will ultimately shed light on tendencies (i.e., behavioral intention and actual behavior) related to climate change reduction strategies.

Urban versus Rural Residents. We examined the moderating effect of residential area (urban and rural) on the linear relationships by splitting the sample into two groups consisting of those living in rural areas (within 50 km of the Great Barrier Reef Marine Park coastline) and those residing in urban settings (residing in the Sydney, Melbourne and Brisbane Statistical Metropolitan Areas), and then testing the model simultaneously for each group. The purpose of the invariance testing was to examine whether the beta weights were significantly different between the two groups. Beta coefficients were constrained to be equal (invariant) across the two groups. Results showed that the imposition of this constraint significantly impacted model fit ($\Delta\chi^2 = 49.18$, $\Delta\text{df} = 4$, $p < .001$), suggesting the linear associations tested in our path model differed among rural and urban residents.

The results of our model testing revealed that four paths ($\beta 41$, $\beta 43$, $\beta 45$, $\beta 51$) were significantly different across urban and rural groups (i.e., attitude-behavioral intentions, PBC-behavioral intentions, attitude-constraints, and constraints-behavioral intentions) (see Table 5). Specifically, there was no relationship between attitudes toward climate change and behavioral intentions to engage in ERB for rural residents. However, urban residents' attitudes toward climate change ($\beta = –.10$, $p < .05$) had a negative impact on behavioral intentions. Also, while PBC ($\beta = .15$, $p < .001$) had a positive impact on urban residents' behavioral intentions, there was no relationship between the two variables for the rural resident group. Contrary to the existing literature, these findings showed that urban residents' concern about climate change has negative impact on behavioral intention. However, their intentions were more likely to be influenced by perceived ease/difficulty of engaging in

Table 5
Summary of invariance tests

Model	χ^2	Df	RMSEA	NNFI	CFI
Multigroup structural model	12.15	9	.02	.98	.99
Invariant regression coefficients	55.52	13	.06	.88	.94
Final model[a]	12.15	9	.02	.98	.99

$^{***}p < .001$.
[a]The flowing parameters were permitted to be freely estimated across groups: beta coefficients—$\beta 41$, $\beta 43$, $\beta 45$, $\beta 51$.

ERB. In addition, the path from attitude to constraints was significantly stronger ($\beta = -.26$, $p < .001$) for urban residents ($\beta = -.14$, $p < .001$). Last, while rural residents' constraints ($\beta = -.16$, $p < .001$) had a negative impact on their intention to adopt ERB, the relationship was not significant for urban residents.

Our group analysis indicated that urban residents' attitudes toward climate change had a stronger negative impact on constraints to engaging in ERBs compared to rural residents. For people residing in the distant cities, increased concern about climate change was associated with more pronounced constraints in the ability to engage in ERB. Although rural residents' concerns over climate issues were associated with increased perceived constraints, they felt less inhibited in their ability to take action to reduce impacts. To the authors' knowledge, no previous studies have explored the relationship between environmental attitude and constraints on ERB in a comparison between residents and non-residents. Our findings imply that convenience or accessibility of ERB may be more important for people in cities because they feel more constrained though hold concerns about climate change. Further investigation is needed to unveil the similarities and differences between individuals living in rural and urban environments.

Another difference that emerged in the group comparison was that urban residents' constraints did not influence their intentions to engage in ERB. We also observed that the perceived difficulty of being engaged with ERBs was the strongest determinant of behavioral intention for urban residents. These findings suggest there is a strong need to show that individual action for those residing in urban areas has a collective impact. Efforts to communicate the ease and accessibility of ERBs (e.g., ways to easily reduce energy consumption or recycling) will enhance their confidence to behave in environmentally friendly ways. Continued exploration of the factors influencing people's ERB should develop a stronger understanding of the drivers of action that shape responses to environmental issues such as climate change.

Management Implications

Public engagement in ERB is critical to decreasing human contributions to changing environmental conditions in places such as the GBR (Hughes et al. 2003). To effectively activate behavioral responses to issues such as climate change, research and practice must understand individual attitudes and identify external factors that influence the likelihood individuals will undertake ERB. The results from this research explore the attitude–behavior relationship and shed light on several of these external factors such as constraints that intervene in behavioral engagement and proximity to resources that are susceptible to environmental degradation. Specifically, we tested the mediating effect of constraints on the environmental attitudes and behavior relationship reported by two groups of Australian residents.

With regard to the implications for the GBR, two issues emerge from our findings that pertain to the content of the messages agencies can use in their media that might assist with shifting behavior in the desired direction. First, the path model we tested represents a process that is ultimately manifested in individual behavior. Statistically significant associations highlight points within the process where an agency might intervene to achieve a desired outcome or mitigate an undesirable effect. These findings suggest that messages that help to crystalize and make salient normative expectations for the engagement in ERBs will be most effective in shaping behavior. Second, the issue of constraints was also a significant deterrent to the adoption of ERBs. Constraints related to money and supports from family/friends were the most salient constraining factors of ERBs. Each of these items is a matter of perception open to influence. While some activities (e.g., installation of solar panels) require some substantive capital outlay, many ERBs require a degree of mindfulness. Water consumption, recycling behavior, energy consumption, are often activities that don't require additional financial resources; just a degree on thoughtfulness that over time can become mnemonic. Like starting a car, ERBs can also be automated—embedded in the cognitive scripts that govern many of our day-to-day routines. The support, or lack thereof, from family/friends also speaks to the normative component of ERB. Clearly there remain many skeptics of climate change and their impact on others' thinking and behavior remains considerable. Agencies need to be consistent and constant in their message to the public; embracing ERB has local, regional and global implications; they are accessible and, to a large extent, have few economic barriers.

Awareness of the earth's changing climate is widespread. Reports show that the majority of Americans are cognizant of this issue (Pew Research Center 2007) and believe climate change is a "very serious problem" (GlobeScan 2006). More than half of Australian residents also believe that human activity has a large impact on the earth's climate, and almost half express concern about the issue (Nilsson, Sutton, and Tobin 2010). However, high levels of awareness are not the sole ingredient of a climate change–friendly society. More research is needed to unveil the intricacies of environmental attitudes given that positive attitudes are a pre-requisite to behavioral engagement (Dunlap and Van Liere 1978; Scott and Willits 1994). What is more, a variety of external influences need to be better understood to more accurately predict ERBs, maximize agencies' abilities to effectively communicate with their public constituents and elicit public responses to policies and regulations that minimize climate change impacts.

Guided by the TPB framework, our results indicate that Australian residents do not always act in environmentally friendly ways due to constraints and residential areas. It may be that Australian residents are skeptical about the execution of environmental policies (Blake 1999). Factors such as limited time and/or interest or lack of trust in authorities may serve as barriers between environmental concern and action. To resolve this, environmental managers should aim to convince the public of the efficacy of environmental policies and emphasize the benefits of involving them in local-level environmental behaviors such as recycling or reducing power use at home. Residential area (urban vs. rural) is another important factor that should be considered in future management of climate change behavior. Although urban residents express concern about the effect of climate change on the GBR, rural residents are more inclined to participate in ERBs. For urban residents in the metropolitan areas, it might be helpful for managers to promote accessibility to ERBs and reinforce individuals' perceived abilities to control behavior. The benefit of engaging in ERB will also be manifested locally. The degree of control for engaging environmental behaviors can be increased by using communication (e.g., website, interpretive media) that emphasizes the accessibility of pro-environmental behavior (e.g., the way to reduce energy consumption or recycling). There are some simple things that people can do throughout the

course of their day that simply require a degree of mindfulness (e.g., switching the light off in unattended rooms).

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