Knowledge, Morality, and Threat Perception: A Juxtaposition of Internal Influences on Climate Change–Related Behavioral Intentions in Nigeria

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ABSTRACT

As part of efforts to mitigate the consequences of environmental degradation resulting from negative human activities, the focus of social–scientific studies on human–nature relationships has expanded in the last two decades to include research on the behavioral dimensions of global climate change. Current research findings make it apparent that sociopsychological influences play a highly significant role in the cognitive processes that underlie environmental behaviors. Factors such as awareness, moral responsibility, and threat perception have been identified as some of the most important influences on positive climate change–related behaviors in many Western societies. However, to date very few studies of this nature have been conducted in African contexts. Hence, in this study, we attempt to help fill this gap by comparing the effects of three models of behavior: (1) awareness, (2) moral responsibility, and (3) threat perception, as frameworks of climate change–related behavior among a sample of Nigerian urbanites. Analysis of our data, generated by a questionnaire survey, revealed that the threat perception model explained the largest amount of variance in behavioral intentions ($R^2 = 0.23$). The differences in the performances of the models are discussed together with the implications of our findings for climate change advocacy efforts in the region.

Key Words: environmental awareness, threat perception, norm activation, Nigeria, climate change, behavioral intentions.

INTRODUCTION

It is well known that human activities and behavior often have severe negative impacts on ecological systems in the natural environment (Maloney and Ward 1973;

Ehrlich and Ehrlich 1990; Oskamp 2000), and in the last few decades substantive efforts have been directed at understanding the complex interactions between humanity and nature (Kollmuss and Agyeman 2002; Saunders 2003; Clayton and Myers 2009). Based primarily on social scientific studies of the industrialized societies of Europe and North America, it has been determined that environmentally relevant behaviors are largely a result of the combined influence of intrapersonal, interpersonal, and contextual factors including values, beliefs, norms, economic incentives, and sociodemographic characteristics (Guagnano *et al.* 1995; Stern 2000; Clayton and Myers 2009).

In the current era of global climate change, psychological inquiry into the antecedence and impacts of public environmental behaviors has been broadened to include an investigation of the behavioral aspects of anthropogenic climate change. In this regard, environmental psychologists have tasked themselves with the challenge of addressing the climate change phenomenon by identifying the psychological drivers of negative climate change—related behaviors, measuring public understanding of climate change risks, assessing the ways in which people cope with, and adapt to climate change impacts, identifying the psychological barriers to climate change action, and developing accurate models of climate change–related behavior based on rigorous empirical measurement and analysis (Gifford 2008; Swim *et al.* 2009).

Unfortunately, the current literature on environmental behavior research, including that related to climate change, reflects a clear gap in the geographical scope of studies in this domain. While significant progress has been made in understanding environmental behavior among Western societies, much less is known about citizens of developing nations, particularly those of sub-Saharan Africa. In response to this shortfall, the current article is an effort toward filling this gap by exploring the basis of climate change–related behavior among a sample of Nigerian urbanites using three prominent frameworks of environmental behavior.

Literature Review

Even though it is generally accepted that the determinants of pro-environmental behavior are too complex and intricate to be analyzed within a single framework (Kollmuss and Agyeman 2002), the larger proportion of the literature on environmental behavior research is devoted to an analysis of the effects of internal factors, such as values, attitudes, beliefs, and emotions, as determinants of environmental behavior (Kaiser *et al.* 1999; Dietz *et al.* 2005). Drawing on such research, multiple frameworks have been advanced that seek to explain environmental behaviors in relation to theories of awareness, altruism, empathy, morality, and threat perception (Kollmuss and Agyeman 2002). Based on pertinence and contextual relevance, three of these behavioral frameworks were selected for analysis in this study.

Environmental awareness (or knowledge deficit)

The earliest psychological models proposed a linear relationship between awareness, concern, and pro-environmental behavior. According to these models, knowledge or awareness of environmental problems stimulate environmental concern, which in turn motivates people to engage in pro-environmental behaviors (Kollmuss and Agyeman 2002). However, these models have since been discarded as

overly simplistic as they fail to account for the myriad other factors that affect peoples' performance of pro-environmental behaviors such as economic constraints, social pressures, and ease of, or even opportunities for, performing particular environmental behaviors (Hines *et al.* 1986/87). Nonetheless, employing a similar paradigm, many climate change advocacy groups and other environmental organizations continue to attempt to induce changes in public environmental behavior by simply increasing peoples' awareness of environmental problems.

Moral responsibility and pro-social behavior

Adopting a different perspective, other researchers have tried to explain pro-environmental behaviors from a moral-altruistic viewpoint. On this basis, it has been argued that positive environmental behaviors qualify as a special case of moral or pro-social action as they often afford benefits to individuals other than those actually engaging in the particular behavior (De Groot and Steg 2009). As a result, models of pro-social behavior such as the Norm Activation Model (NAM; Schwartz 1977) have been applied in the study of environmental behavior.

According to the NAM, pro-social actions arise from personal norms that are "feelings of moral obligation to perform or refrain from specific actions" (Schwartz and Howard 1981, p. 191 cited in De Groot *et al.* 2008). Personal norms are activated by an awareness of the negative consequences (AC) of not acting pro-socially for others, and ascribing responsibility (AR) for these consequences to oneself. Hence, the logic of the NAM is that if an individual's personal norms prescribe action, their likelihood of performing pro-social behaviors increases as their awareness of the negative consequences of not doing so, and their acceptance of responsibility increase in intensity.

The NAM has been successfully applied in the study of various environmental behaviors including willingness to pay for environmental protection (Guagnano *et al.* 1994), recycling (Bratt 1999), participation in a green electricity program (Clark *et al.* 2003), and general pro-environmental behavior (Schultz *et al.* 2005). The NAM has also been used in cross-cultural studies of environmental behavior, where it has been shown to explain a considerable amount of variance in target behaviors with an acceptable level of statistical reliability, even across populations with widely differing social values (Cordano *et al.* 2011). Hence, the applicability of the model for studying environmental behavior in traditional non-Western societies such as those of sub-Saharan Africa is justified.

Environmental threat perception

People often exhibit strong affective responses to potentially harmful or dangerous phenomena and, in such mental states, are generally inclined to seek ways of removing or coping with the threat or danger. For this reason, politicians, health officials, advertisers, religious officials, and terrorists regularly attempt to influence public behavior by creating, or inducing feelings of, a threat of harm and danger (Tanner *et al.* 1991; Floyd *et al.* 2000; Marquit 2008). Drawing on previous research on the use of fear appeals in promoting positive health-related behaviors (Rogers 1975, 1983; Alagna and Reddy 1984; Rippetoe and Rogers 1987), environmental psychologists have also been able to show that threat perception has a significant effect on environmental attitudes and behavior (Baldassare and Katz 1992; Vaughan

1993; Vining and Ebreo 2002), especially those related to climate change (Reser and Swim 2011; Doherty and Clayton 2011). Research findings on this subject indicate that individuals with stronger perceptions of danger from environmental threats exhibit higher inclinations to perform mitigating behaviors (Fisher *et al.* 1991; Abdalla *et al.* 1992; O'Connor *et al.* 1999), and more importantly, links have also been found between public knowledge, perceived vulnerability, and willingness to address climate change risks (O'Connor *et al.* 1999).

However, the influence of threat perception on behavior may be significantly moderated by emotional factors such as fear and concern (Folkman *et al.* 1979; Lazarus and Folkman 1984). In this regard, behavioral responses to environmental threats, including climate change, appear to be largely determined by interactions between people's cognitive and affective psychological mechanisms. Evidence of this has been observed among inhabitants of flood-prone regions in the Netherlands, where research findings indicate that individuals' flood preparedness behaviors are considerably influenced by the combined effects of feelings of dread evoked by the likelihood of flooding, and rational considerations of vulnerability and trust in the mitigating capacity of contingency arrangements (Terpstra 2011). Studies of climate change–related attitudes and behavior also show that emotional responses such as fear, worry, concern, anger, or powerlessness have a significant influence on the relationship between engagement in mitigating behaviors and public perceptions of climate change as a threat (Moser 2007; Swim *et al.* 2009).

ADDRESSING THE PROBLEM OF CLIMATE CHANGE IN NIGERIA

With more than 123 gas flaring sites in its Niger-Delta region, Nigeria accounts for roughly 17.2% of global gas flaring, and is rated as one of the highest emitters of greenhouse gases in the world (Akinro *et al.* 2008; Nzeadibe *et al.* 2011). A number of large urban centers in the western part of the country are also home to several coal-fired power stations, and contain high densities of industries and automobiles (Asiyanbi 2012). In recent years, extreme weather events such as erratic changes in temperature, increased frequency and intensity of storms and flooding occurring in the country, together with a rise in sea levels, have been attributed to anthropogenic climate change (Okali 2004). It is speculated that through its impacts on agriculture, infrastructure, and social welfare, the consequences of climate change will have considerable negative impacts on food security and economic growth, and jeopardize efforts toward poverty reduction and sustainable development in Nigeria.

At present, public awareness of climate change in Nigeria is generally low (FME 2009; Oruonye 2011). Among many communities, including business owners in the private sector, individuals are yet to make the connection between the causes and effects of climate change (Cooke *et al.* 2010), and even in areas where people have been adapting to climate change impacts with indigenous techniques for years, many individuals still have no conceptual knowledge of the phenomenon (Nzeadibe *et al.* 2011). This implies that the larger proportion of society inadvertently continues to engage in practices that aid the proliferation of climate change in both private and public spheres of socioeconomic activity.

To address this situation, the Nigerian government has recently developed a detailed climate change mitigation plan with the support of several local and international collaborators. This plan includes an intention to improve the capacity of affected Nigerians to adapt to the negative impacts of climate change through public advocacy and sensitization programs drafted to suit local patterns of ideological dissemination and social change (FME 2009). Other aspects of the plan include enforcement of legislation aimed at controlling the activities of polluting industries, development of a low carbon economy, and promotion of environment friendly energy sources such as bio-diesel and cassava ethanol (FME 2009).

Conceptual Framework of the Current Study

The primary objective of the study was to compare three different models of environmental behavior in order to determine which best explains pro-environmentalism in an African context. The three models adopted for this purpose were selected on the basis of their relevance. In the current campaign for climate change mitigation in Nigeria, increasing public awareness as a means to garnering public support for climate action has been identified as a major objective (Okali 2004). However, the extent to which awareness of environmental issues relates to positive attitudes and behavior among Africans is yet to be established. So far, research conducted on samples of Nigerian society suggests that the link between environmental knowledge and behavior is neither strong nor direct, and may be subject to the influence of several factors including competing socioeconomic challenges, the spatial immediacy of environmental challenges, and the availability of observable local evidence of environmental problems (Ogunbode and Arnold 2012; Ogunbode, 2013).

Studies of Western populations have found that simply increasing public knowledge of environmental problems rarely results in behavior change (Schahn and Holzer 1990; Finger 1994; McKenzie-Mohr 2000; Schultz 2011). However, among Nigerians, research findings indicate that mere encounter with environmental information, regardless of the level to which it is understood, has a significant influence on dispositions toward the environment (Ogunbode and Arnold 2012). This observation forms the basis of our exploration of alternative determinants of environmental concern and behavior in Nigeria.

As the natural environment constitutes a commons in which the consequences of individual actions are shared by the wider world, moral considerations have often been deployed as arguments for engaging in pro-environmental behavior. Overarching, high impact environmental issues such as anthropogenic climate change have figured significantly in this domain due to the severity of the projected implications for populations that have benefited little from the drivers of the phenomenon. In this regard, the moral discourse of climate change and environmentalism in general has centered on changing social values to emphasize social justice, biospheric altruism, an appreciation of the intrinsic values of nature, and an acknowledgment of the biological limits on the growth of human society (Lee 1994; Stern 2000; Dunlap *et al.* 2000; Webber 2011). Such rhetoric has been used to advocate the extension of cross-national nature protection efforts, and impositions of greenhouse gas emission cutbacks at national, regional, and global levels of polity.

At the level of individuals, morality has also been applied to personal sphere climate related behaviors such as household energy use and support for mitigation policies. Focus on the behavioral orientations of individuals is particularly important as they relate to the effectiveness of interventions aimed at managing green-house gas emission rates and natural resource consumption within countries (Swim *et al.* 2009). Research in this area has revealed that altruistic orientations, involving moral values and personal norms, often have significant influence on individuals' inclination to perform pro-environmental behaviors. However, in most African societies, citizens typically have little opportunity to make personal pro-environmental choices (Adeola 1998; Ogunbode and Arnold 2012) and this constitutes a fundamental limitation to the invocation of personal morality in such context. Nonetheless, issues such as attitudes toward forest conservation, climate change activism, and support for climate change mitigation policies are stages for private sphere environment related behaviors that represent relevant prospects for the application of moral values. On this basis, an investigation of the effect of personal morality and responsibility as influences on climate change–related behaviors was deemed prime for inclusion in the current study.

Additionally, previous research in Western cultural contexts has shown that perceptions of environmental risks to the self and/or valued social interests can translate into environmental concern among individuals, depending on factors such as personal experience, source and framing of information, and the use of imagery (Slovic 2000; Ruiter *et al.* 2001; Leiserowitz 2005; Fitzpatrick-Lewis *et al.* 2010). Such affective responses following an appraisal of the nature and severity of the potential threat/danger may result in the formation of adaptive attitudes and behavior (Tanner *et al.* 1991). Consequently, we hypothesized that environmental threat perception may constitute a major motivation for engagement in positive climate action and other environmental behaviors among Nigerians.

Therefore, as a step towards distilling an accurate framework for explaining the antecedence of pro-environmental attitudes and environmental behaviors in Nigeria, and perhaps sub-Saharan Africa in general, the current study was conceived to make a comparison of the effects of environmental knowledge/awareness, morality, and environmental threat perception as influences on climate change–related behavioral intentions. Behavioral intentions were tested in this study due to the difficulty of identifying generally applicable and contextually relevant climate change–related behaviors. Previous research has shown that behavioral intentions are strongly correlated with actual behavior (Ajzen 1985, 1991; Hungerford and Volk 1990; Kollmuss and Agyeman 2002), and as such were deemed adequate for our purpose. Hence, further reference to climate change–related behavior among the surveyed population in relation to the findings of the study should be understood as meaning "behavioral intentions."

METHODS

Data Collection: Study Locations and Sample Characteristics

Data for the study were collected between October 2011 and January 2012 in Akure (n = 184), Ibadan (n = 138), and Omoku (n = 218) (Figure 1). Akure is a
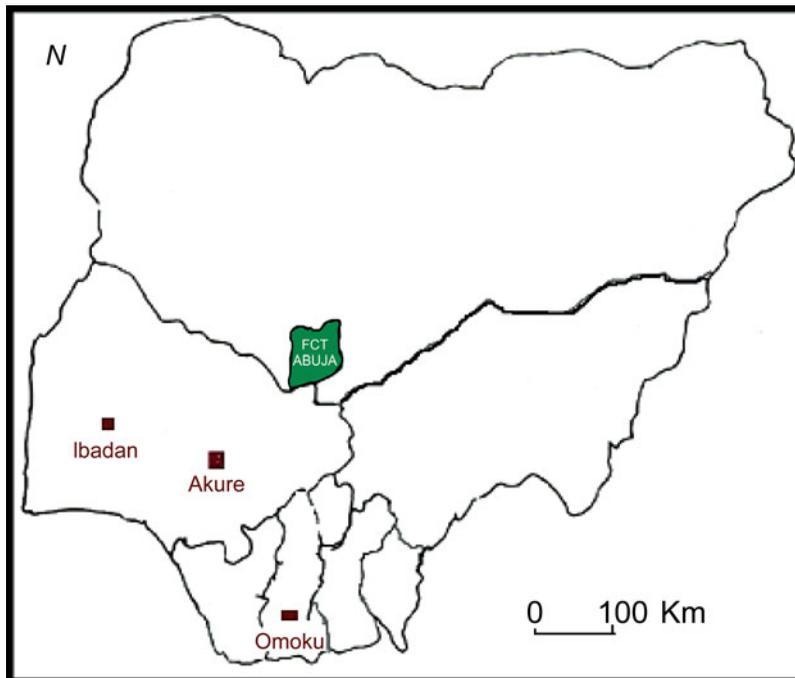
Figure 1. Map of Nigeria showing locations of surveyed areas. (Color figure available online.)

mid-sized city with a population of approximately 387,000 individuals (NBS 2006), and is the capital of Ondo State in southwestern Nigeria. The city is an important center of trade in food and cash crops that are produced in the surrounding area. Ibadan is a larger city with more than 1.3 million inhabitants (NBS 2006), and is the capital of Oyo State in south-western Nigeria. A sizeable proportion of Ibadan inhabitants are employed in the agricultural and public sector (Fourchard 2003), while others engage in trading, unskilled labor and other aspects of the informal sector. Omoku is a bustling town in Rivers State, southern Nigeria, and is located at the heart of the oil-rich Niger-Delta. The town is home to more than 300,000 inhabitants (Wikipedia), and is surrounded by extensive oil-fields currently being mined by a number of multi-national oil companies including Shell petroleum, Total, and the Nigerian Agip Oil Corporation (NAOC). Many citizens of Omoku and the surrounding area have been trained as skilled workers, and are partially or fully employed by these oil companies and other organizations involved in oil exploration activities in the area.

In Akure, questionnaire administration was conducted around the Alagbaka Government Reserved Area in the Akure-South Local Government Area. Questionnaire administration in Ibadan was restricted to the residential and commercial areas bordering the University of Ibadan (Ojoo, Bodija, Sango), and in Omoku to the immediate environs of the Ogba/Egbema/Ndoni local government council offices and the Federal College of Education, Omoku. In total, 540 survey questionnaires were successfully administered at the three locations to voluntary participants that

were randomly drawn from the membership records of local social groups such as school alumni, parent–teacher associations, and libraries. Volunteers were solicited by phone and direct verbal interaction, and inclusion was determined on the basis of individuals' willingness to participate. Questionnaires were administered to respondents at their homes or places of work. The sample obtained comprised 53% male respondents, 87% individuals with a minimum of 12 years of formal schooling, and 69% individuals in tertiary education. The mean age of respondents was 26.4 years.

Survey Design

The survey instrument was a structured questionnaire composed of 47 items divided into 10 sections. The first section contained questions regarding respondents' demographic characteristics, while the remaining items were designed to measure conceptual and factual knowledge of climate change, rate of encounter with climate change–related information, awareness of the general impacts of climate change, personal norms regarding climate change mitigation, level of concern for local and global impacts of climate change, ascription of responsibility for climate change mitigation, rating of climate change impacts as a threat to personal (lifestyle, health, livelihood) and social interests (family, community, country), and climate change–related behavioral intentions.

The items constituting the behavioral intentions measure were specifically focused on intentions to be involved in climate change activism and willingness to sacrifice time, physical effort, and financial resources for climate change mitigation. Selection of scale items for the measures of awareness of consequences, personal norms, acceptance of responsibility and threat perception was guided by the use of validated measures described in published papers (Roser-Renouf and Nisbet 2008; Schultz 2001). Respondents' rate of encounter with climate change information and concern for climate change were measured using single questions answered with a graduated series of options with increasing magnitude, while the knowledge measure was an *ad hoc* scale structured with emphasis on contextual relevance and parsimony. Face and content validity of all the questionnaire items was determined by the first author (CAO). Responses to the questionnaire items were based on a 5 point Likert scale (1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = mildly agree, 5 = strongly agree). The first draft of the questionnaire was administered to 23 members of the Nigerian Youth Service Corps in Omoku to determine the clarity of the survey items and factor analysis was used to assess the dimensionality of measurement scales. Cronbach's alpha tests were used to determine the reliability of the scales included in the final version of the questionnaire and the results of these are presented in Table 1.

Data Coding and Analysis

The initial coding and collation of data was carried out on Microsoft Excel spreadsheets. The gender variable was coded as 1 = Male, 2 = Female, while Age categories were represented by 1 = [18–25], 2 = [26–35], 3 = [36–45], 4 = [≥46], and the SES variable was derived by combining respondents' occupation and level of education (N = 497, r_s = 0.487, $p < .001$) with factor analysis (the factor obtained accounted for 69.2% variance in both original measures). Responses to knowledge,

Table 1. Reliability statistics for the scales used with number and examples of constituent items.

Scale	Number of items	Example of item	A
Knowledge of climate change	6	Would you agree that climate change is caused by excessive sunshine and volcanic eruptions	0.69
Awareness of consequences (AC)	5	Climate change affects the spread of diseases and ill-health	0.73
Personal norms	5	I don't feel that I must take any action to address the problem of climate change (reverse coded)	0.71
Ascription of responsibility (AR)	5	I feel a personal responsibility to take actions to address the impacts of climate change	0.73
Perceived threat (PT)	6	The negative impacts of climate change are a potential threat to my means of livelihood	0.83
Behavioral intentions (BI)	7	I would volunteer my time and resources to aid the sensitization of the public regarding climate change issues	0.70

awareness of consequences, acceptance of responsibility, personal norms, perceived threat and behavioral intentions scale items were reversed where necessary, and were first coded as 0 = strongly disagree, disagree, and undecided, 1 = agree and strongly agree. After which item scores were summed for each scale and constituted as continuous variables for statistical analyses. Correlations, ANOVA, and regression analyses were used to test the relationships among variables. All statistical tests were conducted with SPSS 17. For the purpose of this study, the measured variables were classified as (1) sociodemographic—gender, age, and socioeconomic status (SES); (2) informational—rate of encounter with climate change information (Encounter), and measured knowledge of climate change (Knowledge); (3) psychological—awareness of consequences (AC), ascription of responsibility (AR), personal norms (Norms), perceived threat (PT), and concern for climate change (Concern).

RESULTS

Sociodemographic characteristics often have significant effects as predictors of environmental attitudes and behavioral intentions (Kemmelmeier *et al.* 2002; Cordano *et al.* 2011). They have also been found to exert considerable influence on the psychological antecedents of pro-environmentalism such as values, awareness, and concern (Zelezny *et al.* 2000; Vaske *et al.* 2001). Hence, in all our analyses of the psychological models, sociodemographic factors were retained as control variables.

Table 2.   Correlation matrix of measured variables.

	Age	SES	Encounter	Knowledge	AC	Norms	AR	PT	Concern	BI
Gender	.02	−.00	−.11*	−.14**	−.08	−.13**	.05	−.11**	−.12**	−0.06
Age		.63***	.22***	−.02	.00	−.02	−.13**	−.12**	.04	0.08
SES			.21***	−.00	.05	.08	.02	−.03	.09*	0.16***
Encounter			1	.11*	.07	.06	.07	.04	.13**	0.14***
Knowledge				1	.46***	.38***	.42***	.25***	.13**	0.12**
AC					1	.44***	.50***	.29***	.18***	0.24***
Norms						1	.44***	.40***	.30***	0.29***
AR							1	.43***	.31***	0.32***
PT								1	.38***	0.36***
Concern									1	0.34***

Cell entries are standardized regression coefficients. $*p < .05$, $**p < .01$, $***p < .001$. SES = Socioeconomic status, AC = awareness of consequences, AR = ascription of responsibility, PT = perceived threat, and BI = behavioral intentions.

The sociodemographic factors were significantly related to rates of encounter with climate change–related information among the respondents (Table 2). However, they differed in their degree of relatedness to other variables. Gender alone was related to knowledge and personal norms regarding climate change, while age alone correlated with ascription of responsibility, and only SES was directly related to behavioral intentions. Gender and age alone were related to perceived threat, while only gender and SES were related to concern for climate change.

As might be expected, respondents' rate of encounter with climate change information was positively related to their knowledge of climate change (Table 2). Encounter with information was also related to behavioral intentions and concern for climate change, though, surprisingly, it was unrelated to the other psychological variables. Knowledge, on the other hand, had strong positive relationships with behavioral intentions and all of the psychological factors.

The three norm activation variables, AC, AR, and Norms were all strongly correlated with one another and with PT, concern, and behavioral intentions. However, it is noteworthy that concern and PT had slightly stronger relationships with behavioral intentions than any of the norm activation variables. There was also a strong relationship between PT and AR, which could be considered evidence that supports previous indications of relatedness between morality and environmental risk perception (Sjörberg 2000).

Multiple regression analyses helped to further illuminate the strengths of the selected models as influences on behavioral intentions (Table 3). Regressing behavioral intentions on the full array of measured variables yielded an explained variance of 26%. Interestingly, while none of the sociodemographic variables appeared to have a statistically significant effect, removing them from the regression model reduced the explained variance to 20%. The sociodemographic factors alone accounted for 3% of variance in behavioral intentions (not shown) and we interpret this as evidence of the indirect effects of the sociodemographic factors as underlying influences on behavioral intention. Only encounter, AR, PT, and concern were significant factors in the full regression model. Rate of encounter with environment

Table 3. Behavioral intentions regressed on awareness, norm activation, and threat perception.

Variables	All variables	Awareness	Norm activation	Threat perception
Gender	−.03 (.43)	−.06 (.15)	−.06 (.15)	−.02 (.15)
Age	.23 (.12)	.12 (.12)	.11 (.12)	.19 (.12)
SES	.07 (.18)	.11 (.10)	.13 (.10)	.10 (.09)
Encounter	.18** (.07)	.14* (.07)	.22** (.07)	.14* (.07)
Knowledge	−.10 (.07)	.09 (.06)		
AC	.05 (.06)		.02 (.06)	
Norms	.06 (.06)		.18 (.06)	
AR	.23** (.07)		.37*** (.07)	
PT	.18*** (.04)			.24*** (.04)
Concern	.35*** (.08)	.60*** (.08)		.42*** (.08)
Constant	1.74***	3.08***	1.45**	2.29***
F	15.80***	15.16***	14.10***	22.70***
R^2	0.26	0.16	0.18	0.23

Cell entries are unstandardized regression coefficients with standard error in parentheses.
$^*p < .05$, $^{**}p < .01$, $^{***}p < .001$; all two tailed tests. SES = Socioeconomic status, AC = awareness of consequences, Norms = personal norms, AR = ascription of responsibility, and PT = perceived threat.

related information has previously been found to be significantly related to environmental concern and behavior among Nigerians (Ogunbode and Arnold 2012), and it is intuitive that the formation of a psychological disposition towards the environment must be based on relevant information obtained by direct experience or vicarious knowledge. For this reason, encounter was also included as a constant variable in the analyses of the psychological models.

All the psychological models produced significant F statistics at $p < .001$, however, not all the variables included showed significant effects. The awareness model explained 16% of variance in behavioral intentions, although curiously, only encounter (t = 2.044, $p = .042$) and concern (t = 7.676, $p < .0001$) showed significant effects while knowledge and the sociodemographic variables were insignificant. The norms (t = 2.819, $p = .005$), encounter (t = 3.255, $p = .001$), and AR variables (t = 5.242, $p < .001$) were significant in the norm activation model that explained 18% of variance in behavioral intentions, while awareness of consequences and the sociodemographic variables showed no significant effects. In the threat perception model, encounter (t = 2.160, $p = .031$), PT (t = 6.348, $p < .001$), and concern (t = 5.229, $p < .001$) showed significant effects and the model explained 23% of variance in behavioral intentions.

To further explore the interactions between all the variables measured and their impacts on behavioral intentions, the full regression model was entered into stepwise regression analyses (Table 4). This revealed that PT (t = 8.637, $F = 74.6$, $p < .001$) individually accounted for 14% of variance in behavioral intentions, and combined with concern (t = 5.724, $p < .001$) explained 19% of variance, which made them

Table 4. Stepwise regression of behavioral intentions on sociodemographic, informational, and psychological predictors.

Variable	B (S.E)	F	R^2
PT	.312***(.04)	74.60***	0.14
Constant	2.69***		
PT	0.23***(.04)	56.20***	0.19
Concern	.46***(.08)		
Constant	3.01***		
PT	.24***(.04)	43.01***	0.22
Concern	.45***(.08)		
Age	.33***(.09)		
Constant	2.45***		
PT	.20***(.04)	36.28***	0.24
Concern	0.40***(.08)		
Age	.35***(.09)		
AR	.22***(.06)		
Constant	2.01***		
PT	.19***(.04)	30.87***	0.25
Concern	.37***(.08)		
Age	.29**(.09)		
AR	.24***(.06)		
Encounter	.17**(.06)		
Constant	1.59***		

Cell entries are unstandardized regression coefficients with standard error in parentheses.
$^{**}p < .01$, $^{***}p < .001$; AR = ascription of responsibility.

the two most powerful predictors of behavioral intentions among the variables measured. Ultimately, with the addition of age, AR and encounter, a highly significant model was produced that explained 25% of variance in behavioral intentions.

Finally, comparisons of the measured factors were also made across the three locations from which the sample was drawn, and significant differences were found in rates of encounter with climate information ($F_{(2, 519)} = 9.43$, $p < .001$), knowledge ($F_{(2, 531)} = 10.38$, $p < .001$), awareness of consequences ($F_{(2, 531)} = 24.30$, $p < .001$) and acceptance of responsibility ($F_{(2,531)} = 10.25$, $p < .001$), but not in behavioral intentions ($F_{(2, 531)} = 0.345$, $p = .708$) or any of the other variables.

DISCUSSION

The main objective of the study was to compare the influence of awareness, morality, and threat perception on climate change–related behavioral intentions among Nigerians. Various models of environmental awareness and the morality-based norm activation model have been successfully applied to the study of environmental behavior in Western contexts. Models of threat perception have received comparatively less attention, but are nonetheless equally pertinent on the grounds that perceived vulnerability to the negative consequences of adverse environmental phenomena have been shown to complement general environmental attitudes and beliefs in the

determination of pro-environmental behaviors (O'Connor *et al.* 1999). The application of a threat perception model in the sub-Saharan African context was motivated by the finding that environment related attitudes and concern among a sample of Nigerians appeared not to be significantly influenced by environmental knowledge (Ogunbode and Arnold 2012), but by mere encounter with relevant messages. It was speculated that, here, environmental behaviors may be primarily motivated, not by a rational understanding of environmental problems, but by affective responses following an awareness of threatening environmental issues. This idea was supported by the results of the current study that show that the threat perception model explained a higher amount of variance in climate change–related behavioral intentions than the awareness and norm activation models.

All three models tested in this study included sociodemographic variables together with rate of encounter with climate change–related information. The awareness and threat perception models had concern about climate change impacts as a common variable. However, the awareness model also included knowledge of climate change as an additional predictor of behavioral intentions while the threat perception model included perceptions of climate change impacts as a social threat as its' defining variable. The norm activation model included awareness of consequences, personal norms, and ascription of responsibility as defining variables. However, while all of the models were highly significant, they varied in their ability to explain the variance in behavioral intentions.

Sociodemographic factors had little influence on behavioral intentions when the psychological variables were included in the regression, although socioeconomic status was positively related to inclinations to undertake voluntary actions aimed at climate change mitigation. In this regard, the results conform to findings from other studies that have shown that relatively high levels of education and financial security often have a positive effect on individuals' dispositions toward environmental issues (Herrera 1992; McMillan *et al.* 1997). However, unlike Western societies, male respondents appeared to be slightly better informed, more threatened by, and more actively concerned about climate change impacts than females (see Bord and O'Connor 1997; Zelezny *et al.* 2000; McCright 2010; Ogunbode and Arnold 2012). Overall, however, the performance of the sociodemographic variables in this study appears to echo previous observations that social characteristics may be of limited importance in the study of contemporary environmentalism within societies (O'Connor *et al.* 1999).

Also in line with previous findings in Nigeria (Ogunbode and Arnold 2012), personal rates of encounter with climate change information were shown to exert a significant influence on knowledge, concern, and behavioral orientations. While there was no strong indication that individuals with higher rates of encounter with climate change information necessarily had a better understanding of climate change issues, the significance of encounter in all of the models tested suggests that mere encounter with environmental messages actively generates an awareness of climate change issues that may engender concern and positive behavioral intentions subject to the individual's personal interpretations. This finding is particularly relevant in the Nigerian context where, unlike in Western societies, citizens are not regularly exposed to environmental messages from governmental, non-governmental, media, and private commercial organizations. In this case, individual differences in

social contexts based on occupation, education, wealth and other aspects of social status have a much stronger influence on the frequency of exposure to environmental messages that people receive and may ultimately moderate their motivation to form positive environmental attitudes and perform appropriate pro-environmental behaviors.

The knowledge-based awareness model explained a reasonable amount of variance in behavioral intentions, though this was mainly due to the effects of the encounter and concern variables. Our findings indicate that knowledge as characterized by a factual awareness of climate change issues may have an indirect influence on behavioral intentions in the African context. Though the significance of the encounter and concern variables indicates the relevance of an information and affect based framework as a foundation for positive behavioral intentions, the importance of knowledge within this framework is undermined by the fact that an understanding of environmental issues does not independently motivate personal action even if it affords individuals an awareness of the problem and appropriate mitigating behaviors.

The norm activation model also had a similar weakness to the awareness model insofar that the awareness of consequences variable, which is fundamentally related to factual knowledge, had no significant effect in the multiple regression analyses. Nonetheless, the impact of this result on the explanatory power of the model was offset by the strength of the AR, encounter, and norms variables. The underlying theory of the norm activation model primarily attributes individuals' inclinations to perform positive environmental behavior to the content of their personal norms. Other studies of environmental behaviors involving an application of the norm activation model have often found the norms variable to be a powerful predictor of pro-environmentalism (Widegren 1998; Cordano *et al.* 2011). However, among our sample, its influence as a predictor of behavioral intentions was superseded by that of acceptance of responsibility. We attribute this finding to the contextual dissimilarity of Nigerian society, in which environmental consciousness is generally low and specific personal norms regarding climate change and most environmental issues may rarely be formed. Given that the effect of personal norms are subject to invocation by other psychological factors, such as an awareness of adverse environmental circumstances and acceptance of personal responsibility, which may themselves be under-stimulated, it is no surprise that personal norms are relatively less potent motivators of positive behavioral intentions.

The significance of ascription of responsibility as a predictor of behavioral intentions in the current study appears to reiterate previous indications of its high value in the study of pro-environmentalism (Van Liere and Dunlap 1978; Guagnano *et al.* 1995). The AR variable was strongly related to personal norms and awareness of consequences, and to knowledge, perceived threat, and concern for climate change impacts. This relationship among variables implies that the acceptance of personal responsibility for mitigating climate change impacts among individuals is connected not only to related moral influences but also to informational and emotive factors that figure concurrently in individuals' evaluation of the issue of climate change. Equally, in relation to perceived threat, acceptance of responsibility (as a function of morality) may also constitute a cognitive heuristic in the appraisal of the threat of climate change impacts to valued non-personal interests, prior to the formation of behavioral intentions (Slimak and Dietz 2006).

The strength of the variables in the threat perception model partly confirmed our initial speculation that behavioral orientations in the African context may be more strongly influenced by feelings of environmental risk and danger as opposed to other factors such as knowledge or morality. However, the lack of correlation between the PT and encounter variables seems to indicate that threat perception does not follow on directly from encounter with information in a linear fashion. Instead it is seems more plausible that encounter with information creates an awareness of climate change impacts that instigates an evaluation of climate change as a threat, evokes feelings of concern and an acceptance of responsibility, and ultimately motivates the formation of meliorative behavioral intentions.

In some studies general awareness of consequences measures have been used to represent individuals' perceptions of environmental risk (Slimak and Dietz 2006). However, the weakness of the AC variable in the current study compared to PT suggests that both concepts are perhaps not interchangeable. Perceived threat is not the same as awareness of consequences and may consistently be a much stronger predictor of behavioral intentions for two reasons. Firstly, measures of awareness of consequences mainly capture individuals' objective evaluations of the seriousness of environmental problems, while perceived threat measures the individual's evaluation of environmental problems as a risk to which they are actively or potentially subject. Secondly, awareness of consequences measures are structured to obtain a rough evaluation of the respondent's familiarity with the *actual* implications of environmental issues, while perceived threat only represents the respondent's *construal* of the consequences of environmental problems. As a result, the awareness of consequences measure may be much less relevant to individual respondents and only represents their view as far as they share a common knowledge of the specific environmental problem with the questioner. For example, when a sample of residents in Ibadan city, Nigeria, were asked to rate the seriousness of a number of environmental problems in the country, 32% of respondents indicated forest loss, and 20% indicated Ozone depletion as one of the top three most serious issues (Ogunbode, Unpublished data). However, if they had been asked if they felt *threatened* by these problems, they would probably have answered differently. This is because their answer to the original question only reflects their awareness of the significance of these issues for society in general. It does not necessarily reflect the individual's perceived vulnerability, which is a major determinant of affective and adaptive responses (Tanner *et al.* 1991). Of course, on a day to day basis, these problems do not constitute a significant threat to most people in urban Nigeria and attempting to contrive their abstract evaluations of the seriousness of these issues as crucial motivations for their engagement in any relevant behavior is likely to be a gross misjudgment of their responses.

In the past, health and social psychologists have highlighted the significance of threat appraisal and affective responses as drivers of behavioral intentions. In this regard it has been found that emotive reactions may increase belief in, and attention to, persuasive messages; consequently raising the likelihood that the audience will process threat related information long enough to motivate their performance of adaptive behaviors (Folkman *et al.* 1979; Friestad and Thørson 1985; Tanner *et al.* 1991). Popular information sources in Nigeria, such as the television, radio, and print media regularly employ tactics based on a similar ideology by conveying extreme projections of the negative impacts of climate change and portraying images

of adverse climate related occurrences. However, while this may be responsible for the current moderate level of concern among the proportion of the public that is aware of climate change, there is little evidence of corresponding changes in their performance of positive mitigating behaviors.

Studies have shown that people's perception of threats follows an ordered process of appraisal. This begins primarily at the point at which individuals become aware of a threat, which then leads to emotive responses such as fear or concern, and this in turn raises the urgency given to obtaining information about possible ways of coping (Lazarus 1968). However, when adequate efforts are not directed at improving individuals' perceived self-efficacy or perception of the efficacy of recommended coping behaviors, the result might be a change in attitudes toward the threat but not behavior (King and Reid 1989; Liu and Stout 1987). Hence, in the Nigerian context, where climate change information is delivered to the public by under-resourced media agents with a poor understanding of climate change issues (Cooke *et al.* 2010), the result of this may be that the public remains unaware of their capacity to participate in the mitigation of climate change and other environmental issues. As such, they may feel powerless in the face of an overwhelming challenge and may consequently be predisposed to maladaptive coping responses such as fatalism, apathy, and denial.

As observed by Pinker (2002, p. 302): "human thinking and decision-making are biological adaptations rather than engines of pure rationality . . . and these mental systems ultimately serve evolutionary goals such as status and *security* [emphasis added]." In Nigeria as well as other African societies, people are perennially laden with worry and concern regarding potential hazards such as critical food shortages, disease infection, technological disasters, violent civil unrests, environmental challenges, supernatural aggressors, and other sources of insecurity and uncertainty. Efforts to increase public consciousness of climate change and motivate widespread performance of positive mitigating behaviors within this cultural context are therefore faced with gargantuan social and economic competitors that easily thwart the achievement of such goals. Hence, for such efforts to be effective, they must focus more strongly on identifying the psychological resources that make these desired changes possible. The operations of traditional political and religious institutions are a good template for this purpose as these institutions have historically mastered the exploitation of the same impediments to the advancement of their interests and objectives (Ostow 1958; Taringa 2006). However, while some of the methods and strategies of these institutions may be ethically questionable or not directly applicable in the environmental context, the success of religious organizations such as the Pentecostals and Evangelicals in contemporary Africa nonetheless reflects an embodiment of contextually proven psychological maneuverings that those seeking to effectively advance environmental causes will do well to learn from.

CONCLUSION

This study indicates that contact with climate change information and individuals' awareness of climate change impacts play positive, but possibly indirect roles in forming intentions to address climate change impacts among Nigerians. It also

seems the case that individuals' inclination to perform climate change mitigating behaviors is not reduced by the fact that they may be affording benefits to persons other than themselves. However, the most significant inference to be made from our findings is that people may be most strongly motivated to participate in the mitigation of climate change if they feel threatened by its impacts.

Overall, the current study has helped to illuminate the effects of information, moral responsibility, and threat perception as influences on intentions to perform climate change mitigating behaviors in an African context. However, for reasons concerning the availability of respondents and the potential for variability in responses, the study sample is somewhat biased in favor of the younger and more highly educated section of Nigerian society. Hence, in the generalization of our findings, we caution *caveat emptor*. Nonetheless, we believe that climate change educators and information strategists in the region will find this information useful for the design of effective programs aimed at improving public awareness and promoting widespread adoption of appropriate positive behaviors that will culminate in adaption to, and mitigation of, climate change impacts.

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