Predicting Residential Water Conservation Using the Theory of Reasoned Action

Edward E. Marandu*, Nkisang Moeti[1] and Haika Joseph[2]

Faculty of Business, Marketing Department, University of Botswana,
P. O. Box 70243 Gaborone, Botswana
E-mail: *<marandue@mopipi.ub.bw>, [1]<moetin@mopipi.ub.bw>, [2]<haika27@yahoo.com>

ABSTRACT This study investigates the power of the Theory of Reasoned Action in explaining conservation of residential water use in Botswana. Data were obtained from 462 respondents. The findings made three revelations. First, they support existing theory, for the two constructs of the theory (attitudes and norms) were statistically significant predictors of water conservation. Second, the findings support previous research for attitude played a slightly larger role in explaining water conservation behaviour. Third, despite statistical significance, attitudes and norms displayed very low explanatory power. The implication for policy makers is that water conservation communication messages should aim at changing attitudes as well as norms. The findings suggest that water conservation is affected, not just by attitudes and norms, but by a host of other factors.

1. INTRODUCTION

1.1 Background

What makes one person start conserving water after noticing a water conservation campaign and another not do anything at all? This is the broad question which this study seeks to answer. The study proposes to investigate factors that determine conservation of residential water use in Botswana. The study is based on two underlying assumptions: (1) without behavior change, ecologically sustainable water is impossible, and (2) sustainable strategies for conserving water should be oriented toward the use of persuasion rather than coercion.

One may wonder what behavior has to do with water conservation, a technical issue. Effective water protection cannot be restricted to supply side technical solutions such as investing in costly bigger dams and building bigger purifying facilities. It also requires the need to explore alternative policy options, in particular, a policy of demand side management or 'de-marketing' of water. Promoting changes in consumer behavior is a central component in water conservation strategies. Supporters of water demand management maintain that such a policy would have significant financial (Naidoo 1999), environmental (McKay 2000) and social benefits. Critics of demand management argue that it results in money being diverted from more permanent solutions such as dam building and fixing leaks. This study is there-fore being undertaken within the framework of marketing-related approaches in a non-profit setting, often referred to as "social marketing." Basically, social marketing makes use of marketing techniques to improve social well-being by changing attitudes and behavior in regard to a specific product, idea or concept.

Water is a resource used in many different ways around the home: for drinking, in food preparation, for sanitation (cleaning people, clothes and the home itself) and to maintain lawns and gardens. Water has other uses including industrial, commercial, transportation, hydroelectric power, and agricultural uses. The overall quality of life for humans, animals and plants is therefore linked to the quality and quantity of water resources (Wisconsin Extension 2002). The world's supply of fresh water is shrinking and according to a UN report (WWDR 2003) decreasing supplies could lead to epidemics and international conflicts. To avoid rationing and provide for a growing population, it is necessary for everyone to use water wisely.

Research on explaining and predicting water conservation behavior by residents in their homes is timely because Botswana is facing unprecedented situation. Although water has always been scarce, officials say that recent years have been the worst on record. According to one official (G. Mudanga, Deputy CEO Water Utilities), the Gaborone dam reached a low in July 2007 when it contained water to last only four months (SABC News 2007). In the immediate term, he added, communities will be

educated in water conservation and in the longer term recycled water would be mixed with dam water.

It is expected that as a dry semi-desert country residents of Botswana generally possess reasonable basic knowledge about the cardinal importance of water and its declining supply sources and would therefore use it wisely. Contrary to common expectation, several research findings show that higher levels of knowledge do not necessarily translate into substantially higher levels of behavioral activities (Schultz no date; Rosenthal et al. 1990; Richard and van der Plight 1991). This study aims at exploring the reasons for the observed discrepancy between knowledge and behavior by searching for the important predictors of residential water conservation behavior in Botswana.

1.2 Problem Statement

About 70 percent of the Earth's surface is covered by water (Emerging Global Water Issues 2005); it is plentiful. However, 97.2% (Table 1) of the water is found in oceans and this water is too salty to use for most purposes and the salt is very costly to remove. Only 2.8% is fresh water needed by humans and other creatures to survive (WWDR 2003: 8); but most is locked in the polar icebergs and glaciers (EPA 1997: 1). Only about 0.5% of the Earth's freshwater is accessible in lakes, rivers and groundwater aquifers, but this vital 0.5% is constantly in motion, flowing in rivers or evaporating, falling from the sky as rain or snow or filtering slowly through the earth to emerge somewhere else. Fortunately it is a renewable resource (except some groundwater). The availability of clean water varies greatly around the world, from more than 500,000 cubic meters per person in French Guiana and Iceland, to less than 100 cubic meters in Kuwait and the Gaza Strip (WWDR 2003).

Water stress for a river basin is defined as the degree of annual water use (water withdrawn from a surface or groundwater source for human purposes) as a percentage of the total water resources available in that basin. Water stress begins when withdrawals of freshwater rise above 10 percent of renewable resources. Medium stress is when water use exceeds 20 percent of available supply. Countries experience high water stress when the ratio of water use to supply exceeds 40 percent. At such levels, the

pattern of use may not be sustainable and water scarcity is likely to become the limiting factor to economic growth.

Table 1: Total salt and fresh water supply

Ocean (saltwater)	97.2%	Icecaps and glaciers	2.3%
Fresh water	2.8%	Groundwater	0.4%
		Surface water	0.07%
		Water in air (precipitation)	0.03%
Total water on earth	100.0%	Total fresh water on earth	2.8%

Source: Adapted from (EPA 1997: 4)

The major portion of the water drawn for human needs is taken from freshwater resources, mainly rivers. Although the total volume of water conveyed annually by the world's rivers is about 43,000 km^3 most of this occurs as floods, the normal river flows make up only about 19,000 km^3 (Shiklomanov 1997). Of this, about 12,500 km^3 can be accessed and present levels of withdrawal account for about 4,000 km^{3,} implying a global medium stress level of about 32% (4,000/12,500). Withdrawals are anticipated to reach 5,500 km^3 per year by 2025. Despite this relative lack of freshwater, most people use water with scant regard for conservation. However, as the world's population increases, water consumption increases, making conserving water important to assure supply of water for future generations.

Botswana is a semi-arid and drought prone country. Only about 10% is cultivable land (FAO 1995), the rest is dominated by the Kalahari Desert. Apart from the perennial rivers and wetlands in the north (Zambezi and the Okavango) and the east (the Limpopo), Botswana suffers from a lack of surface water and development relies heavily on groundwater. Water is a scarce resource in Botswana. The currency is named the "pula" or "raindrop" because the commodity is so valuable to the country. This undoubtedly requires good planning which should take into consideration both short and long-term effects of water use. Botswana is already experiencing 'water stress' (UNEP 1999). Botswana not only suffers from a lack of surface water, but the major surface resources are located far from the areas of the demand, imposing high costs on the exploitation of existing surface water resources. At the current rates of abstraction, it is estimated that Botswana's water reserves will be exhausted between 2028 and 2035 (Strzepek et al. 1998).

Thus, water forms a serious constraint for the nature and size of human activities in Botswana, making it necessary to conserve it. Botswana is curently working to *change attitudes* towards its scarce water resources in order to ensure sufficient water in the future for a growing population. *"Save water, save life, save money"* is one of the key slogans used by the utility (Water Utility Corporation 2010). Despite the campaign, some residents act as if the country has an unlimited supply of water for one can see leaking water pumps and pipes, and toilets where the water runs all day and night (Pendley 2010).

1.3 Methods of Water Conservation

Several policy tools can help influence   water use and conservation. Regulation, pricing, awareness campaigns are such tools. In awareness campaigns policy makers aim for behavioral changes based on new attitudes and social norms towards water use.

It is hard to imagine that one person can make a difference in conserving water supplies on this planet, but each individual can really help. The following behaviors can help conserve water by reducing the amount of water a person uses and save money too: turning the water off during brushing teeth; turning off the tap while washing vegetables; turning the shower off while soaping in; starting the machine only when it is full to save water, and repairing leaks or reporting them to landlords. Other methods include replacing shower heads and faucet aerators with water efficient models; use a water-filled milk jug or plastic bottle in toilet tanks to displace water - this allows the toilet to operate using less water; use a broom instead of water to clean driveways or garage and putting a spray nozzle on the end of a hose for car washing and plant watering to prevent the hose from continually releasing water and to control the amount of water used.

1.4 Objectives

Most studies about water in Botswana have focused on identifying water resources (Els and Rowntree 2005) and forecasting pressure on the resource (Strzepek et al. 1998). Few studies have examined residential water conservation behaviour and no study known to us has applied the Theory of Reasoned Action. The objective of this study is to identify, using the Theory of Reasoned Action factors that predict actual and intention to conserve water in the home. More specifically the study shall address the following objectives:
1. Review the literature on Theory of Reasoned Action in the context of conservation and water in particular.
2. Explore the explanatory and predictive power of the Theory of Reasoned Action and the relative importance of the constructs in water conservation.
3. Suggest interventions that would promote water conservation.

1.5 Study Significance

This study is significant from both a practical and theoretical standpoint. In *practical* terms the importance of protecting water resources to the economy and environment cannot be overstated. Without water all economic activities would cease. In environmental terms, water is the lifeblood of the planet. Without a steady supply of clean, fresh water, all life, including human, would cease to exist. In theoretical terms, this study carries with it the potential to contribute to the advancement of knowledge. This study is an application of the Theory of Reasoned Action in a developing country environment. The outcome may, when compared with studies in advanced countries, reveal differences, if any, in the predictors of water conservation behavior between the two environments. This may enhance cross-cultural understanding of water conservation behavior.

2. LITERATURE REVIEW

2.1 Conceptual Literature

A review of the conceptual literature is very revealing. As the name implies, the Theory of Reasoned Action is based on the assumption that human behavior is a result of rational thinking. Its roots come from a number of conceptual developments in the field of social psychology seeking, among other things, to explain how and why attitude impacts behavior.
Attitude Influences Behavior: The first serious study of how attitude influences behavior is thought to have begun in 1872 with Charles

Darwin when he defined attitude as the physical expression of an emotion. In Darwin's language attitude is an emotion or thought with a motoric (behavioral) component. Attitude was thought to have a "directive or dynamic influence on individual response to all objects and situations". This behavior could be verbal or non-verbal (such as body language). The modern version of this theory is the tri-component model that says that attitude consists of three major components: the *cognitive*, the *affective* and the *conative.* The cognitive component suggests that to develop an attitude towards any product or issue one must have *knowled*ge (also called *beliefs*) about it. The affective component is the consumer's evaluation of the *beliefs* or *knowledge* about a product; it is about feelings or emotions about a product - it is the extent to which an individual rates the object as "favourable" or "unfavourable," "good" or "bad".

The *conative* component is the tendency, given the beliefs and evaluations of them, that an individual will undertake a specific action or behave in a particular way with regard to the product in question. In business, it is the likelihood of a consumer purchasing a product or behaving in a certain way. In summary the prevailing view among the early social psychologists was that attitude and behavior were positively correlated.

In the 1930s a second generation of attitude research began when one seminal study (La Piere 1934) found contradictory evidence on attitude as predictor of behavior. Disillusionment with these findings led to a third generation of research in the 1960s (Festinger 1964; Wicker 1969). Researchers departed from asking the question *"is there an association between attitudes and behavior?"* to *"when do attitudes predict behavior?"* in recognition that it is not always that a clear relationship between attitudes and behavior exists (Alwitt and Berger 1993). Perhaps the Theory of Reasoned Action provided the first satisfactory answer to the question: *when does attitudes guide behavior?* The theory posits that *intention* to perform a behavior is influenced by the *attitude* that the individual holds toward the behavior and the *subjective norm*. This theory provides a good explanation why under some conditions people show behavior that is not consistent with their attitude, for example, when the subjective norm component weighs more heavily.

Changing Attitudes to Change Behavior: Another major development was the recognition that, behavior usually, but not always, reflects established attitudes (Ford- Martin 2001: 1). It is presumed that a person who believes strongly in the effectiveness of conservation of water will most likely conserve it consistently. Advertising and political campaigns are all built on the premise that behavior follows attitude. The concept of "social marketing" utilizes commercial marketing techniques to encourage or discourage behaviors by changing the attitudes that cause them. In effect, social marketing is "selling" attitudes and ideally influencing the associated behavior.

Changing Behavior to Influence Attitudes: Several years ago a clinical psychologist (Kelly 1955) introduced the idea that while adult behaviour generally follows from held attitudes, for children, attitudes are often shaped by observed behaviour. From a very young age children copy the actions of others and to a degree build their attitudes from this behaviour. As children grow into adolescence, the behaviour of their peers can have a significant impact.

The Theory of Reasoned Action: The introduction of the Theory of Reasoned Action was seminal for it extended the simple *attitude-behavior* model into a more comprehensive set of factors that lead to better explanation and prediction of behavior. Like the tri-component theory, the Theory of Reasoned Action incorporates the cognitive, the affective and conative components; however, these are arranged in a different pattern (Fig. 1). The main contribution of the Theory of Reasoned Action is the proposition that attitude does not determine behavior directly; instead attitude is seen as one of two antecedent factors, attitudes and subjective norms, that determine intention, which in turn determines behavior (Ajzen and Madden 1986).

Attitudes and Norms: Thus, the Theory of Reasoned Action identifies two conceptually independent determinants of intention. The first one is a personal factor called attitude and refers to the degree to which a person has a positive or negative evaluation of the specific behavior in question. If a person perceives that performing a behavior is positive, she will have a positive attitude toward performing that behavior. The opposite can also be stated if the behavior is thought to be negative.
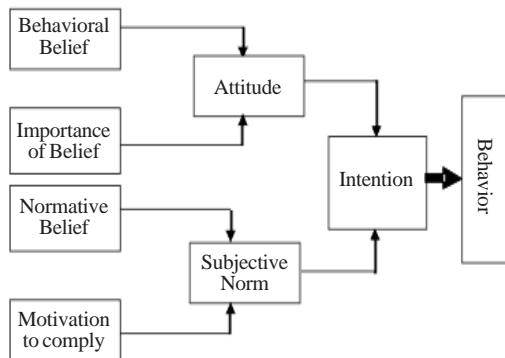
Fig. 1. Theory of reasoned action

The second predictor of intention is a social factor, subjective norms; it refers to a person's perception of the social pressure exerted upon her to perform or not perform the behavior being contem-plated. If a person perceives that these significant others (such as family, friends, co-workers) see performing the anticipated behavior as positive, then a positive norm might be expected and vice versa.

Behavioral and Normative Beliefs: In addition, the two predictors are determined as follows: Attitude is a function of *behavioural belief* or salient information, which is the perceived likelihood that performing the particular behaviour will lead to certain outcomes, weighted by the extent to which these outcomes are *valued.* Subjective norm is a function of *nor-mative belief* which is the perceived pressure from specified referents to perform the target behaviour, weighted by the *motivation to comply* with these people one cares about.

Intention and Behaviour: Intention is the cognitive representation of a person's readiness to perform a given behavior and is considered to be the immediate antecedent of behavior. Behavior is the translation of intention to action.

The main hypothesis of the Theory of Reasoned Action is that there is one immediate determinant of behavior, namely the person's intention to perform or not perform it. This intention is itself, in turn, viewed as determined by two things: attitude and subjective norms toward the specific behavior. More specifically, the Theory of Reasoned Action attempts to provide an account of the way in which ATTITUDE, NORMS and INTENTIONS combine to predict BEHAVIOR. It is now clear that attitude is not linked to behavior as directly as intention is;

this puts intentions in a powerful position. Because of its strong relationship to behavior, many studies that use the Theory of Reasoned Action, measure behavioral INTENTIONS and forego the more difficult measurement of behavior. In this study it was possible to measure behavior directly and thus there was no need to use intention as a proxy for behavior.

2.2. Empirical Literature

A review of the empirical literature suggests that although the Theory of Reasoned Action has been utilized successfully to analyze various types of behavior, it has received limited and differing amounts of attention in the conservation literature (Vining and Ebreo 2002). Within the conservation literature itself, compared to waste reduction (Bagozzi and Dabholkar 1994; Goldenhar and Connell 1992-1993; Jones 1990), water (Kantola et al. 1983) is given even lesser attention. This may be due to the conditions in the developed countries in which most of the conservation behavior research has been conducted. Water is at the moment relatively plentiful so perhaps there is not yet a sense of urgency about this resource. Landfill space is however relatively scarce so waste reduction has received greater attention.

Despite the paucity of literature on conservation, yet a number of interesting findings are emerging:

(1) Consistent with prediction of the Theory of Reasoned Action, attitudes toward water conservation and subjective norms over water use have all been found to be related to respondents' intentions to conserve water.

(2) Comparison between the relative importance of the predictor variables which derive from reasoned action theory suggest that in general attitude exerts more powerful influence than subjective norm in predicting intention.

(3) There is an increasing realization that application of the Theory of Reasoned Action in the environmental arena intro-duces a level of complication, because the benefits to be derived from behavior change are, derived by the community as a whole rather than the individual making the change, thus providing less motivation for individual change.

Despite the predictive success of the Theory

of Reasoned Action in a wide range of social marketing behaviors in Western societies, not much has been done to test the relative importance of the predictors in different social-economic environments. The founders of the theory (Fishbein and Ajzen 1975) themselves said that the relative importance of the predictors is an empirical question, varying with the target behavior and population in question. This implies that water professionals should understand the social and economic contexts in which people are likely to conserve water.

Synthesis: A glimpse at the conceptual and empirical literature reveals that the Theory of Reasoned Action appears to have a unifying power in the sense that it fits well with knowledge that has already been learned, and integrates it into a few constructs.

3. METHODOLOGY

This section describes the methods by which the primary data were obtained and converted into information. Specifically, it deals with research design, study sites, subjects, development of instrument, procedures and data analysis.

3.1 Research Design

The research design was *descriptive* rather than exploratory or experimental, and *quantitative* rather than qualitative. The design is descriptive as opposed to exploratory because the author has much prior knowledge about the phenomenon being studied and as such the study rested on a number of specific hypotheses that would guide the research in a specific direction. A quantitative rather than a qualitative design was chosen because the researcher elected to conduct a study that would demonstrate a high degree of objectivity. It was therefore, decided to carry out a survey rather than a case study. Since many cases are involved in a survey as a result the analysis used techniques adapted to mass data. The advantage of a survey lies in the objectivity with which the analysis can be made. Averages and percentages can be computed. This permits one to make more accurate generalizations. The tendency in case studies is to jump to general conclusions from a few sample cases that may or may not be typical of the universe under investigation. A properly selected sample for a survey study, since it

involves more cases, is apt to be typical of the universe.

3.2 Study Sites

The study sites were located in Gaborone, the capital of Botswana, that has a population of 186,007 people (2001 Census). The study was conducted at a time when Gaborone had just been confronted with a severe water supply shortage resulting from a prolonged drought. During the drought there had been restrictions on outdoor water usage and extensive media coverage of the need to conserve water. Though water restrictions were not in effect when this study was being undertaken, rain forecasts at that time were not encouraging and there was a likelihood that restrictions may be re-introduced. Data were collected mainly from customers who were queing to pay water bills at the Botswana Water Utility Collection Points in Gaborone (Riverwalk, Ministry of Water and Energy, BBS Mall), the surrounding neighbourhoods (Mogoditsane, Molopolole, Ramotswa, Phakalane and Mochudi), and in offices.

3.3 Subjects and Procedures

Adult customers standing in a queue waiting to pay their water bills were asked by research assistants if they would be willing to fill out a short questionnaire concerning water - an issue of concern to Gaborone residents. The data were collected from 462 subjects. The questionnaire was designed for participant self-administration; however, its completion was done under the overall supervision of the trained assistants who can provide additional guidance or needed clarification as and when requested by respondents. On ethical considerations, a self-explanatory note stating the procedures and purposes of the study would be given to the participants before obtaining their personal consent to participate in the study. The questionnaire contained no personal identifiable information such as name of the participant to ensure that answers to these questions will remain confidential.

3.4 Development of Instrument

It is a requirement by the Theory of Reasoned Action that investigators should interview a

sample of the group under investigation to determine the salient outcome beliefs and identify significant others that are relevant to that group. It was thus important to conduct a pilot study intended to ensure that the questionnaire to be developed would be relevant to water conservation in a home setting. An open-ended interview with 10 adults in 10 different homes was undertaken. Based on the responses in the interviews, items that emerged consistently were identified and included in the draft questionnaire. In addition, items salient in past research, but absent in the pilot study, were also included in the draft questionnaire. A reliability check was conducted with a class of marketing students at the University of Botswana to determine the final items on the questionnaire.

The questionnaire used was divided into two types of questions. Type one questions were introductory, seeking to establish rapport with respondents and solicit data useful in classifying the respondents into sub-groups on the basis of demographic variables such as gender, income and education. Type two questions sought to solicit responses aimed at tackling the main research issues, guided mainly by constructs in the Theory of Reasoned Action. The questions were highly structured, using mainly Likert-type scales, incorporating fill-ins. The high structure provided comparable responses, which facilitated coding and analysis. The draft questionnaire was pre-tested on a few respondents in Gaborone that resulted in a discovery of a few mistakes of editorial, typographical errors and readability nature.

The final questionnaire version included 13 questions that captured knowledge and behaviour in regard to water conservation techniques, 7 behavioural belief strength statements and 7 outcome evaluation statements, 5 normative beliefs, 5 motivation to comply statements, and 1 intention statement.

3.5 Measurement of Theory of Reasoned Action Variables

Knowledge and Behavior: Knowledge of water conservation was measured by asking respondents if they know a number of measures that need to be taken up in order to conserve water (requiring No, Yes responses). The extent of practicing this technique (behavior) was measured on a 7-point unipolar scale ranging from never to always.

Intention: The strength of intent to conserve water, in the near future, was measured on a 7-point unipolar scale. The endpoints of the scale were labelled Definitely No - Definitely Yes.

Attitude: A person's attitude toward behavior can be directly measured using the affect component of the tricomponent model. A direct measure gives overall favorability towards a behavior in a single statement such as *"My saving water in the future would be good"*. This direct measure permits explanation and prediction of behavior at a general level. To understand the underlying factors that contribute to a person's overall attitude it is useful to look behind and consider the factors that led to that attitude. For example this overall good attitude may be attained by a person weighing a very positive feeling that saving water would "prevent future water rationing" and a negative feeling that "my garden would dry up". This study took indirect measures of attitude for they are more revealing. Each salient outcome belief statement identified in the pilot study was measured against a 7-point bipolar scale ranging from Strongly Disagree to Strongly Agree regarding their agreement with the particular behavioral belief and a similar 7-point scale unipolar measure of the evaluation of the importance they attribute to each belief (endpoints Not Important - Very Important).

Subjective Norm: Subjective norm can also be measured directly by asking the person's overall feelings as to whether he thinks *"most people who are important to him think he should / should not save water"*. As with attitude, one can get behind the global subjective norm to the underlying factors that are likely to produce the norm. As with attitude the study took indirect measures of subjective norm. The normative beliefs were measured by ask-ing subjects to rate the likelihood that each of the different normative referents would approve of the person performing water conservation in the future using a 7-point bipolar scale with endpoints labelled Strongly Disapprove – Strongly Approve. Motivation to comply regarding each of the social referents was measured on a similar 7-point, but unipolar scale, with end-point being Not at all – Always.

4. DATA ANALYSIS

4.1 Sample Characteristics

Table 2 shows the demographic characteristics of the respondents surveyed in this study. It should be helpful in enabling the reader to reflect on the general features of the respondents who were used in arriving at the findings and conclusions of this study. As can be seen from the 462 respondents who accepted to be surveyed, they were well distributed among the geographical areas of the city as well as among the income groups. Most respondents were female (54%) and relatively young, aged between 21 to 34 years (54%).

Table 2: Respondent profile

Profile	Frequency	Percent
Gaborone west	140	30
Gaborone north	118	26
Gaborone east	101	22
Gaborone south	103	22
Total	462	100
Sex:		
Male	203	46
Female	236	54
Total	439	100
Age:		
Under 20	21	5
21 – 34	242	54
35 – 44	139	31
45 – 54	40	9
55 – 64	7	2
65 or more	3	1
Total	452	100
Income:		
Under P2000	94	22
2000 – 4000	53	12
4001 – 6000	76	18
6001 – 10000	83	19
Above 10000	125	29
Total	431	100

Note: Totals may be less than 462 as some respondents did not complete all questions.

4.2 Data Preparation and Analysis

Data preparation ready for analyses involved three main steps: scoring the responses, data transformation into new variables and testing the new variables for multicollinearity.

Scoring the Responses: Scoring of the response choices ranged from -3 to +3 for the behavioural and normative beliefs (bipolar). If a statement was written in positive terms, the response was scored as strongly disagree as -3 and strongly agree as +3. If a statement was written in negative terms, the response scoring was reversed. The importance of a behavioural belief and motivation to comply with significant others was scored on a unipolar scale ranging from 1 to 7. This is in accordance with recommendation by Fishbein and Ajzen (1975: 57) that a belief is bipolar and its evaluation or importance is unipolar.

Data Transformation: The aim of data transformation was to create variables in the Theory of Reasoned Action. The transformation involved grouping variables measuring similar constructs into a single variable. For example the 13 items used to measure BEHAVIOR were consolidated into a single variable by taking the sum of the items within each scale (Table 3).

The variable ATTITUDE was obtained by summing the products of the strengths of the beliefs (bi) and the evaluations (ei) of these beliefs about the behaviour. The central equation of the theory can be expressed as follows:

$$A = \sum_{i=1}^{n} b_i e_i$$

Where A = Attitude,
b_i = the belief i about the behaviour,
e_i = the evaluation of the belief i, and
n = the number of beliefs.

A single measure of Perceived Norms (N) was obtained by summing the products of the normative beliefs (*ni*) on the significant others and the motivation to comply (*ci*) with the significant others. The equation for Perceived Norms can be expressed as follows:

$$N = \sum_{i=1}^{n} n_i c_i$$

Where N = Perceived Norms,
n_i = normative belief i about the behaviour
c_i = motivation to comply with the normative belief i, and
n = the number of normative beliefs.

Testing for Multicollinearity: One of the assumptions of the linear regression model is that there is no multicollinearity among the explanatory variables included in the model. Multicollinearity refers to a situation in which some or all of the explanatory variables are highly intercorrelated. If this happens, it would mean that attitudes and subjective norms (or whatever causes each of them) affect each other. What are the consequences of multicollinearity? The problem with multicollinearity is that when some or all variables are highly collinear one

Table 3: Grouping of variables

New variable	Number of items grouped	Grouping statistic	Type of variable
Behaviour	13	Sum	Criterion
Attitude	7	Sum of (Behavioural beliefs x Importance)	Explanatory
Perceived norms	5	Sum of (Normative beliefs x Motivation to comply)	Explanatory

cannot isolate their individual influence on the criterion variable.

Collinearity is often suspected when cor-relation is high, say, between 0.7 and 1.0 (Gujarat 1978: 181). The Pearson correlation coefficients among the two explanatory factors show that the inter-correlations between Attitude and Norms is medium low, at 0.413, suggesting that the collinearity is not a serious problem in this data (Table 4). After these data preparation steps, we now turn to the bi-variate and multi-variate analyses.

Table 4: Pearson correlation coefficient

	Attitude	Norms
Attitude	1	
Norms	0.413	1

Data Analysis: To examine the Theory of Reasoned Action a series of analyses were performed that follow one another on a chain of increasing analytical complexity, with bi-variate analyses giving way to multivariate analyses. The bi-variate analysis consist of a series of simple regressions of each independent variable on behavior. The multivariate analysis is basically similar to the bi-variate analysis but this time the multiple regression equations include two or three independent variables simultaneously to predict behavior. The multiple regressions help produce an assessment of the relative importance of the factors in explaining behavior.

5. FINDINGS

5.1 Knowledge and Behaviour: The Gap

What is the level of knowledge and behavior Gaborone consumers have on water saving?

Table 5 shows the percentages of knowledge (awareness), actual behavior, as well as the differences between the two in regard to each water saving technique. The proportion of those who were *aware* ranged from 23% for "placing a water-filled plastic bottle in toilet flushing system" to 98% for "turning tap water off during brushing teeth". The total mean percentage of the 13 items measured is 84% suggesting that, in all, a vast majority of the respondents were aware of the water conservation techniques.

The percentage for actual behavior ranged from 23% for "placing a water-filled plastic bottle in the toilet flushing system" to 88% for "repairing leaking pipes or reporting them to landlords"; averaging 62% for all 13 behaviors studied.

On the basis of this analysis we find that the *the level of knowledge is not equal to that of actual behavior practiced for water saving.* Consumers' knowledge is higher than what is practiced for all thirteen water saving techniqes except in regard to "placing a water-filled plastic bottle in the toilet flushing system" where the two measures are equal. This finding is consistent with earlier studies that concluded that "contrary to common expectation, several research findings show that higher levels of knowledge do not necessarily result in sub-stantially higher levels of behavior (Rosenthal et al. 1990; Richard and van der Plight 1991). The following sections aim at exploring the reasons for the observed discrepancy between knowledge and behavior by searching for the important explanatory and predictors of water saving behavior among Gaborone residents in Botswana.

5.2 Attitude, Subjective Norms and Behavior

Bi-variate Analysis: The bivariate analysis employed simple regression (predictor variables entered one at a time) to evaluate the predictive power of the constructs contained in the TRA. The F Value is the test statistic used to decide whether the regression equation as a whole has statistically significant predictive capability. Some analysts recommend ignoring the probability value for the individual regression coefficient if the overall F ratio is not statistically significant. The regression coefficient or beta indicates the direction and strength of influence

Table 5: Knowledge and behavior

		Knowledge (K) %	Behavior (B) Score %	Gap (B-K) %
(1)	Turning tap water off during brushing teeth	98	78	-20
(2)	Repairing leaking pipes or reporting them to landlords	97	88	-9
(3)	Use water in a glass during brushing teeth.	94	52	-42
(4)	Turning the shower off while soaping	93	69	-24
(5)	Save water when washing a car: by using a bucket or putting a spray nozzle on the end of your hose to prevent the hose from continuously releasing water.	92	76	-16
(6)	Doing the washing at once, instead of washing individually	92	78	-14
(7)	Washing vegetables using water put in a basin or sink rather than under flowing tap water	90	69	-21
(8)	Using water sprinkler (or equivalent) to water plants	86	55	-31
(9)	Reusing water: for example, watering plants with used water	86	48	-38
(10)	Collecting rain water for uses around the house	86	45	-41
(11)	Watering gardens or plants during the evening or night	81	56	-25
(12)	Flush sparingly; for example after urinating one does not have to do the whole flush.	73	64	-9
(13)	Placing a water-filled plastic bottle in the toilet tank to make it operate using less water	23	23	0
Aggregate Average score		84	62	-22

Note: (1) Knowledge was measured as percentage of those aware of a water saving technique. ● (2) Behavior was measured on a 7-point semantic differential with end-point being "Always=7 and Never=1". The mean score was converted into a %tage so that behavior and knowledge will be on the same scale for comparison.

of the predictor variable, *Attitude* or *Subjective Norm,* in explaining *Conservation Behavior.* The R^2 is the squared correlation coefficient, also called coefficient of determination, which is the proportion of variance explained by the regression equation. The T statistic tests the hypothesis that a population regression co-efficient is 0 when the predictor variable is in the model. The T probability tells whether the predictor variable has statistically significant predictive capability. The findings (Table 6) reveal the following:

- First, the F significance level shows that each of the two simple regression equations produced have statistically significant predictive capability thus making it worth studying the other aspects of the equations.
- Second, the beta coefficients for attitude and norms were positive and very low (both were 0.067) suggesting a weak positive relationship between Attitude, Subjective Norms and Water Conservation Behavior.
- Third, the R^2 values tell that the simple regression equations had low explanatory power for Attitude or Norms each explained only about 6% of the variation in Conservation Behavior.

   Fourth, although the beta coefficients and R^2 *are small*, however, each of these results was *statistically significant* and thus consistent with

theory, in the sense that Attitude and Norms contributed positively and significantly to the prediction of Water Conservation Behavior.

Multi-variate Analysis: Joint Influence of Factors: This section is concerned with seeking answers to the question: what is the relative importance of Attitudes and Norms in predicting Behavior? To answer this multiple regression analysis was conducted on the variables in the Theory of Reasoned Action. Intention was regressed on attitude and subjective norm with the two variables entered simultaneously into the analysis. The multiple regression analysis produced several interesting findings (Table 7):

- First, like in the simple regression, the F ratio significance level shows that the multiple regression as a whole has significant predictive capability, thus making it worth studying the other aspects of the equation.
- Second, like the simple regressions, the beta coefficients were low (less than 0.06 for both Attitude and Norms), corroborating the observed weak positive relationship between Attitude, Subjective Norms and Conservation Behavior.
- Second, like simple regressions analysis, the R^2 value tell that the multiple regression equations had low explanatory power for Attitude and Norms explained only about 8% of the variation in Water Conservation Behavior.

Table 6: Simple regression – predicting conservation behaviour

Predictor	F-value	F-Prob.	Intercept	Beta	R Square	T- Value	T-Prob.	Predicted
Attitude	26.148	0.000	35.118	0.067	0.056	5.113	0.000	Water conservation
Subjective norms	25.945	0.000	33.381	0.067	0.058	5.094	0.000	Water conservation

- Third, despite the low beta coefficients and low low explanatory power or R^2, as expected both Attitude and Subjective Norms contributed significantly to the prediction of Water Conservation Behavior.
- Finally, Attitude was more powerful than Norms in explaining Water Conservation Behavior. The T statistic provides some clue regarding the relative importance of each variable in multiple regressions (SPSS 1998: 209). The T values suggest that compared to Norms, Attitude contributed more than 1.5 times to the explanation of Conservation Behavior.

6. DISCUSSION

The conclusion so often found in the extant literature is that attitude performs better than subjective norms in explaining behavior (e.g. Farley et al. 1981; Fishbein and Ajzen 1975) is evident in this study as well. Specifically, previous research found that most multiple regression analyses resulted in larger attitude beta weights than the normative ones, although the normative ones were often also statisti-cally significant (Trafimow and Finlay 1996). These findings led to the obvious conclusion that most people are primarily under attitudinal control and only a minority of people is under normative control. However, in a study of condom use in Botswana (Marandu 2008) found that *subjective norms* played a relatively larger role than *attitudes* in explaining behavior. The findings of the collective studies and our review of the literature suggest that there is a number of potential moderators on the role of attitudes and subjecive norms in explaining behavior, namely: type of behavior, differences in culture and situational factors.

6.1 Type of Behavior

Although no studies known to us have systematically examined the *relative importance* of attitudes and subjective norms on behaviour, theory or intuition suggest that the nature of the relationship varies with different types of behaviour. For example, the concept of shame provides a good explanation of the psychological and societal aspects in regard to condom use and water conservation. HIV-AIDS is a terminal disease and the victim suffers from shame that comes form a feeling of stigmatization, condemnation, embarrassment, dishonor, disgrace, inadequacy, humiliation or chagrin (Wikipedia 2008a) by society. In addition vicarious shame refers to the experience of shame on behalf of another person who is already feeling shame; suggesting that significant others (family and friends) also feel ashamed. Thus in a behavior such as whether to use or not use the condom, in which the risk of shaming is high (personal or vicarious), normative considerations would increase in significance. On the other hand, failure to conserve water is much less stigmatic because it is not an offense leading to terminal penalty. In addition since most water conservation activities are performed inside and around the house it is unlikely to be seen by friends or community; hence shaming is of lesser significance. Thus personal attitude, not societal norms is likely to play a larger role in the decision to conserve or not conserve water.

6.2 Cultural Differences

Most consumer behaviour theories have been developed and tested in the West (Chan and Lau 1998) and have roots in the field of psychology which, in turn, is influenced heavily by cultural

Table 7: Multiple regression – predicting conservation behaviour

Predictors	Intercept	Beta	Predicted	R square	F-value	F-prob.	t- value	t- prob.
Attitude	29.656	0.057	Water con-servation	0.078	17.414	0.000	3.827	0.000
Subjective norms		0.053					2.509	0.013

values (Schiffman and Kanuk 1994; Triandis 1982). Some critics (Lee and Green 1991; Albaum and Peterson 1984) have observed that relatively little attention has been devoted to investigation of the validity of these theories under other cultural contexts.

Edward T. Hall (1976) provided a description of cultures that helps in understanding why behaviour under the Theory of Reasoned Action may vary by culture. He classified cultures into two broad categories: "high context" and "low context". High context refers to societies where people have close connections over a long period of time. Many aspects of cultural behavior are left unsaid, because most members know what to do from years of interaction with each other. High Context cultures have a strong sense of tradition and history, and change little over time. High context cultures are more common in the eastern cultures than in western, and in countries with low racial diversity (Wikipedia 2008b). Most Asian countries are classified as high-context cultures. In these cultures the group is valued over the individual.

On the other hand Low Context refers to societies where people are more diverse. In these societies, cultural behavior needs to be spelled out explicitly because those in a low context culture have a wide variety of backgrounds. North America and northern European countries, are classified as low-context. In these cultures the individual is valued over the group.

In Low Context, Western cultures where individualist freedom is emphasized, behavior is generally expected to be determined by personal attitudes. In the collectivist Eastern cultures, behavioral intention would be determined mainly societal attitudes or norms. The African extended family culture is closer to the collectivist culture and thus behavioral intention would be determined mainly by attitudes of important others.

6.3 Situational Factors

The relative importance of attitudes and norms also depends on the situation where the behavior takes place. Thus, a consumer might have a favourable attitude toward having a drink before dinner at a restaurant. However, the actual ordering of the drink will be influenced by the consumer's beliefs about the appro-

priateness of the action in the current situation (with friends for a fun meal, or on a job interview) and her motivation to comply with those normative beliefs.

6.4 Implications

On the basis of the conclusions and discussions the following implications for public policy formulation and theory development emerge.
1. There is need for public policy makers concerned with residential water conservation strategies to develop communications intended to change water use behavior, focus on changing attitudes of the consumers, but at the same time pay attention on factors emanating from the social environment. Subjective norms, though slightly less powerful than attitude were nevertheless significant in explaining water conservation behavior. Attention should focus on changing attitudes of the targeted individual water consumer as well as those of significant others.
2. The point is that there is a need to direct attention on changing attitudes of individuals as well as those of significant others (opinion leaders - highly visible, respected people), family members and outside the family whose influence is important in influencing water conservation. In this way promotion of water conservation use could be focused on using influential members of the community, households, friends and colleagues to disseminate conservation messages. If the process gains a critical mass, norms change and with them behavioral patterns.
3. Policy makers should note that the relative importance to be placed on attitudes and norms in order to achieve an effective water conservation campaign is not static. The appropriate weight is *contingent* upon the type of behavior in question, the cultural context and the situation upon which the behavior takes place.

7. CONCLUSION

The findings of the study conform to existing theory and empirical research that have been conducted in western society contexts in two respects:

1. First, the findings support existing theory, for the two TRA explanatory factors (attitude and subjective norms) were statistically significant predictors of water conservation behaviour. This implies that the conceptualization of water conservation behaviour as a function of attitude and subjective norm may be appropriate in the context of Botswana as well.

2. Second, these findings, to some extent, support previous empirical research for attitude played a larger, though slightly, role in explaining behaviour. This implies that factors affecting water conservation behaviour may be *universal.*

3. Finally, despite statistical significance, attitudes and norms displayed very *low explanatory power* for these factors individually or taken together at best explained only about 8% of the variation in water conservation behaviour. The beta coefficients were positive and very low, suggesting a weak positive relationship between attitude, norms and behaviour. This suggests that water conservation behaviour is likely to be affected, not just by attitude and subjective norms, but by a host of other factors.

8. DIRECTIONS FOR FUTURE RESEARCH

During the course of this research, several directions for additional research were indicated. Some of them are as follows:

1. A potentially useful research direction would be to answer the question: to what extent does the Theory of Reasoned Action apply to conservation behaviour in other cultures? More specifically the research could be designed to investigate the relative importance of attitudes and subjective norms on water conservation behaviour in low and high context cultures.

2. The Theory of Reasoned Action explained a very low proportion of the variation in water conservation behavior. There is need to conduct studies uncovering other important explanatory factors. As expected, later investigators have added other variables to the basic model of reasoned action. Ajzen (1988) himself revised the Theory of Reasoned Action, by incorporating per-

ceived behavioral control as a new determinant of intention on a par level with attitude and subjective norm. The extended version is called the Theory of Planned Behavior. A useful starting point would therefore be to investigate whether the additional construct suggested by its immediate extension the Theory of Planned Behavior is effective in increasing its explanatory power.

REFERENCES

Ajzen I, Madden TJ 1986. Prediction of goal-directed behavior: Attitudes and perceived behavioral control. *Journal of Experimental Social Psychology*, 22: 453-474.

Ajzen I 1988. *Attitudes, Personality, and Behavior.* Chicago: The Dorsey Press.

Albaum G, Peterson RA 1984. Empirical research in international marketing: 1976-1982. *Journal of International Business Studies*, 15:: 161-73.

Alwitt LF, Berger IE 1993. Understanding the link between environmental attitudes and consumer product usage: measuring the moderating role of attitude strength. *Advances in Consumer Research,* 20: 189-194.

Bagozzi RP, Dabholkar PA 1994. Consumer recycling goals and their effect on decisions to recycle: A means-end chain analysis. *Psychology and Marketing,* 11: 313-340.

Chan RY, Lau L 1998. A test of the Fishbein-Ajzen behavioral intentions model under Chinese cultural settings: Are there any differences between PRC and Hong Kong consumers? *Journal of Marketing Practice: Applied Marketing Science*, 4(3): 85-101.

Els AJE, Rowntree KM 2005. Water Resources in the Savanna Regions of Botswana. From http: //www.savannas.net/botswana/ruhydro.htm (Retrieved on 16 July 2005).

Emerging Global Water Issues 2005. Emerging Global Water Issues: The Looming Water Crisis. from http: //www.adb.org/Documents/Reports/Water/emerging global.asp (Retrieved on 6 July 2005).

EPA 1997. *Water Pollution Prevention and Conservation Pollution Prevention (P2) Education Toolbox Tools for Helping Teachers Integrate P2 Concepts in the Classroom.* United States Environmental Protection Agency. EPA-905-F-97-011.

FAO 1995. Food and Agriculture Organization of the United Nations. Land and Water Division: Irrigation in Africa in figures, Water Reports 7. From http: //www.fao.org/docrep/V8260B/V8260B0g.htm (Retrieved on 20 April 2008).

Farley JU, Lehmann DR, Ryan MJ 1981. Generalizing from imperfect replication. *Journal of Business*, 54: 597-610.

Festinger L 1964. *Conflct, Decision, and Dissonance.* Stanford: Stanford University Press.

Fishbein M, Ajzen I 1975. *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research.* Reading, Massachussetts: Addison-Wesley Publishing Company.

Ford-Martin P 2001. Attitude and behavior. From http: //www.findarticles.com/cf_dls/g2699/0003/2699000381/p1/article.jhtml (Retrieved on 16 June 2005).

Goldenhar LM, Connell CM 1992-1993. Understanding and predicting recycling behavior: An application of the theory of reasoned action. *Journal of Environmental Systems*, 22: 91-103.

Gujarati D 1978. *Basic Econometrics*. San Francisco: McGraw-Hill Book Company.

Hall ET 1976. *Beyond Culture*. New York: Doubleday.

Jones RE 1990. Understanding paper recycling in an institutionally supportive setting: An application of the theory of reasoned action. *Journal of Environmental Systems*, 19: 307-321.

Kantola SJ, Syme GJ, Nesdale AR 1983. The effects of appraised severity and efficacy in promoting water conservation: An informational analysis. *Journal of Applied Social Psychology*, 13: 164-182.

Kelly GA 1955. *The Psychology of Personal Constructs: A Theory of Personality*. New York: W.W. Norton and Company.

La Piere RT 1934. Attitudes vs. actions. *Social Forces,* 13: 230-237.

Lee C, Green RT 1991. Cross-cultural examination of the Fishbein behavioral intentions models. *Journal of International Business Studies*, 22(2): 289-305.

Marandu EE 2008. *Testing the Theory of Reasoned Action and its Extensions: Predicting Intention to Use Condoms.* Organisation for Social Science Research in Eastern and Southern Africa (OSSREA), Research Monograph, Addis Ababa Ethiopia: OSSREA.

McKay TJM 2000. Constraints to sustainable urban water demand management. *Paper presented the Local Agenda 21 Indaba*, University of Cape Town, 17th May.

Naidoo D 1999. An integrated approach to efficient water management and use in South Africa. *Paper presented at the Gauteng Water Cycle Management Conference*, Midrand, 12-13 October.

Pendley C 2010. Botswana adopts new water policy. From http://www.cowi.com/menu/news/newsarchive/2004/Pages/botswanaadoptsnewwaterpolicy.aspx (Retrieved on 3 August 2010).

Richard R, Van der Plight 1991. Factors affecting condom use among adolescents. *Journal of Community and Applied Social Psychology,* 1: 105-116.

Rosenthal DA, Moore SM, Brumen I 1990. Ethnic group differences in adolescents' response to AIDS. *Australian Journal of Social Issues,* 25: 220-239.

SABC News 2007. Botswana may ration water as drought empties dam. From http://www.sabcnews.co.za/africa/southern_africa/0,2172,107946,00.html (Retrieved on 9 July 2007).

Schiffman LG, Kanuk LL 1994. *Consumer Behavior*. Englewood Cliffs, NJ: Pearson Prentice-Hall.

Schultz G (no date). Examining the Effects of Recycling Outreach on Recycling Behavior in Residence Halls at the University of California, Berkeley. From http://ist-socrates.berkeley.edu/~es196/projects/2002final/Schultz.pdf (Retrieved on 15 July 2005).

Shiklomanov IA 1997. Assessment of Water Resources and Water Availability in the World. *Report prepared for the Comprehensive Assessment of Freshwater Resources of the World*. United Nations: St. Petersburg.

SPSS 1998. *SPSS Base 8.0: Applications Guide,* United States of America.

Strzepek KM, Hellmuth M, Holt A, Mladenov N 1998. *Water resources system modeling*. International Institute for Applied Systems Analysis IIASA.

Trafimow D, Finlay KA 1996. The importance of subjective norms for a minority of people: Between-subjects and within-subjects analyses. *Personaliry and Social Psychology Bullettin*, 22: 820-828.

Triandis HC 1982. Dimensions of cultural variation as parameters of organization theories, *International Studies of Management and Organization*, 12(4): 139-69.

UNEP 1999. United Nations Environmental Programme. *Global Environmental Outlook 2000*. London: Earthscan Publications.

Vining J, Ebreo A 2002. Emerging theoretical and methodological perspectives on conservation behavior. In: R Bechtel, A Churchman (Eds): *New Handbook of Environmental Psychology*. New York: Wiley, pp. 541-558.

Water Utility Corporation 2010. *Save Water, Save Life, Save Money*. In Botswana Telecommunications Corporation Phone Book 2010.

Wicker AW 1969. Attitudes vs. actions: The relationship of verbal and overt behavioral responses to attitude objects. *Journal of Social Issues*, 22: 41-78.

Wikipedia 2008a. Shame. *Wikipedia, the Free Encyclopedia*. From http://en.wikipedia.org/wiki/Shame (Retrieved on 15 November 2008).

Wikipedia 2008b. High context culture. *Wikipedia - the Free Encyclopedia*. From http://en.wikipedia.org/wiki/High_context_culture (Retrieved on 10 November 2008).

Wisconsin Extension 2002. Water Issues in Wisconsin. *Extension Publications*, G3698-1. I-02-99-2M-250 as quoted in Application Form 2004-05 TWRI Mills Fellowship Program. from http://twri.tamu.edu/news/category/mills/ (Retrieved on 16 November 2008).

WWDR 2003. *World Water Development Report. Water for People Water for Life - Executive Summary*. World Water Assessment Programme. Paris: United Nations.