

## Using the Theory of Plan Behavior and Norm Activation Model to Understand Individual Energy Conservation Behavior in Karachi, Pakistan

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**Abstract:** The environmental problems are considered as a serious threat to the future of humanity. The adoption of sustainable behaviors is considered a necessary step to deal with the environmental challenges. Energy conservation behavior is an environment friendly behavior that has been promoted in many societies. Researchers have been studying the determinants of energy conservation behavior for many years, in western countries. However, energy conservation behavior of individuals in the house has not received attention of researchers in Pakistan. In this study, theory of planned behavior and norm activation model are used to study energy conservation behavior of 1250 college and university students in Karachi. Our results show that attitudes, subjective norms, awareness of consequences, ascription of responsibility and personal norm, all have a positive relation with energy conservation behavior. Socio-demographic variables had no statistically significant relation with energy conservation. It is believed that electronic and social media and religious scholars can play a key role in raising awareness of environmental issues and encouraging the adoption of environment friendly behaviors in Pakistan.

**Keywords:** Energy conservation behavior, global climate change, theory of planned behavior, norm activation model.

### Introduction

Environmental problems are one of the most serious threats to the future of human civilization (Boström and Davidson, 2018). Global climate change, depleting natural resources, increasing ground, marine and air pollution are few environmental problems that pose a serious risk to human health, livelihoods and global peace and stability (Ehrlich and Ehrlich, 2013; Oskamp 2000). There is little doubt in the scientific community that environmental problems are a result of unsustainable human behavior (Vlek and Steg, 2007). Humans have always made changes to their environment for individual or collective benefits (e.g., cutting down trees), however, the magnitude and pace of human-induced environmental changes in the last two centuries are unprecedented (Stern, 2000). Therefore, without any change in human behavior that negatively influences the environment (e.g., consumption of electricity that is produced by burning fossil fuels, excessive use of water and waste generation). It is difficult to reduce and stop environmental degradation.

The realization that human activities are causing serious environmental problems first spread in the second half of the twentieth century (Carson, 1962; Hardon, 1968). Almost five decades ago, social scientists started to call for studying the factors that underlie behaviors that are harmful to the environment (Catton and Dunlap, 1978). The research on the social, psychological and demographic determinants of environmentally significant behaviors like energy consumption, recycling and water conservation, started first in the United States and then similar research started in Europe and Australia (Becker, 1978; McGuinness et al.,

1977). More recently, scholars in Asia, Africa, and South America have also started to pay attention to environmentally significant behavior (Corral-Verdugo, et al., 2003; Feng, et al., 2011). One environmentally significant behavior, that has received a lot of attention of scholars in western societies is energy consumption behavior (Barr et al. 2005; Das, et al., 2018; Pothitou et al., 2016). Energy consumption is one of the most significant causes of the rapid increase in the emission of greenhouse gases, and these gases are a major cause of global climate change (Schandl et al., 2016). In economically developed societies, for many years, individuals have been encouraged to reduce the amount of energy they use. The societies that do not face energy shortage, usually promote energy conservation by highlighting its social, environmental and economic benefits.

Pakistan does not have an abundant supply of energy, and a major reason for individuals to conserve energy is to keep the monthly expenditure on energy in control. Energy conservation is promoted in Pakistan, like the rich western countries, but a major difference from the western countries is that people are encouraged to conserve energy because the energy production and transmission are inadequate. The environmental benefits of energy conservation are rarely highlighted in energy conservation campaigns.

The use and demand for energy is expected to grow in urban households in Pakistan and already it is rapidly increasing (Ali and Nitivattananon, 2012). The general public remains oblivious of the connection between day-to-day energy use and global climate change (Rasool and Ogunbode, 2015). There is a growing need to study the factors that influence energy consumption

behavior of individuals in Pakistan. These studies can facilitate the formulation of policies and awareness campaigns that will aim to encourage individuals to consider the environmental impacts of their actions in daily lives.

The current policy approach to curb energy usage in Pakistan is to make it costly or to suspend energy supply for a few hours daily. This policy is not used primarily for environmental reasons. Factors like the price of oil in international markets and the gap between demand and supply, have generally been used to determine the price and supply of energy. One limitation of policy that uses electricity pricing to control energy use is that when incomes increase or electricity becomes cheaper, the demand suddenly grows. This suggests that attitudes and norms about energy use need to change in Pakistan. So, individuals do not conserve energy only when it is costly, but conserve it regardless of price, considering the positive social and environmental impacts.

However, in Pakistan, there is not a great deal of scholarly work on everyday behaviors that have a potential to positively or negatively influence the environment such as energy conservation behavior (Rasool, 2013). There are few studies that have investigated the correlates of energy consumption behavior of individuals in Pakistan (Aslam and Ahmad, 2018). Considering the expected rise of energy consumption, research is needed to advance our understanding of what drives energy use of Pakistani consumers. The influence of social, psychological, and demographic variables on energy conservation behavior of Pakistani consumers has also not been widely studied. There is an existing gap in the current research literature on energy conservation behavior. This gap is the limited number of studies that have been conducted in countries like Pakistan on energy conservation behavior. Consequently, little is known about what are the possible antecedents of energy conservation behavior in developing countries, and are they similar to or different from western societies.

In this paper, a study conducted in Karachi on the determinants of electricity conservation behavior of individuals in the house is reported. Scholars in the west, when studying electricity conservation in the household, have usually preferred using the word energy, instead of electricity. In this paper, we have used the words energy and electricity interchangeably. Households are direct and indirect consumers of energy (Abrahamse and Steg, 2009). Energy conservation actions in the house are small but very important actions to mitigate environmental problems. Present study is timely for at least two reasons. Firstly, around 29% of Pakistan's population is between the ages of 15 to 29 years and 64% are below the age of 30 (Kundi, 2018). Individuals in this age category are the future leaders. It is important to investigate the environmentally significant behavior like energy conservation by this age group. This will ensure that necessary actions are taken to make sure that future parents, teachers and leaders are

environmentally responsible citizens. Secondly, the experience of western societies has shown that when the economy grows, standard of living with improved energy consumption increases. Future economic growth, in Pakistan, can also give rise to excessive energy use. It appears rational that social scientists and policymakers in Pakistan deal with energy consumption behavior proactively rather than reactively. A proactive response will be to develop policies and campaigns that are based on the findings of scholarly research. Thus, scholars should study energy consumption now and not wait for the time, when energy consumption has risen to alarming levels.

For this study, variables from the theory of planned behavior have been used (Ajzen 1991) and norm activation model (Schwartz 1977) have been used. Two popular theories were used in this study on individual energy conservation in the house as independent variables. The age, gender, education and family income are the socio-demographic predictors of our dependent variable of individual electricity conservation behavior in the house.

Energy conservation behavior is influenced by social, psychological, demographic, and contextual factors (Frederic's, et al., 2015). Energy conservation actions can be divided into at least two categories. One category, usually referred to as curtailment behavior includes actions like turning off lights when they are not needed. The other category, generally labeled as efficient behavior includes investing in devices that are energy efficient. The relationship of socio-demographic variables with energy conservation behaviors is not very consistent. Scholars have found that socio-demographic factors can be significantly and insignificantly related to energy conservation.

### **Socio-demographic Variables and Energy Conservation**

Several studies have examined the association between age and energy consumption behavior. Age has been found to have a positive relationship with electricity consumption (Das et al., 2018), but other studies have found that there is no statistically significant relationship between age and electricity consumption (Santin, 2011). Aslam and Ahmad (2018) found that in Pakistan younger people are likely to consume more electricity. A possible reason for this can be that older individuals grew up in an era, where there were not many electronic devices that were considered absolutely necessary to fulfill daily needs. Moreover, the use of mobile phones, laptops, air conditioners were not common twenty years ago in Pakistani society.

Like age, the relationship between energy conservation and gender has been found to be inconclusive. Permana et al. (2015) found that energy conservation is at its highest in the household, when it is controlled by females. However, males and females may not significantly differ in their energy conservation actions

and gender may not be a significant factor in explaining the energy conservation behavior of individuals (Sardianou, 2007).

Education is another variable that has received attention

et al. (2002) found no relationship between education and energy consumption.

Income can have a positive relation with electricity consumption, as with the increase in income, the

Table 1. Measurement Variables.

Variable	Mean	Sd	Cronbach Alpha
AC (four items)	22.54	3.79	.79
Electricity production causes environmental problems.	5.27	1.56	
Pollution and other environmental problems resulting from production of electricity are a problem for my city.	5.76	1.06	
Pollution and other environmental problems resulting from production of electricity are a problem for my country.	5.72	1.12	
If I conserve electricity, it will help in reducing environmental problems stemming from electricity production.	5.77	1.02	
R (four items)	22.94	3.73	.76
My contribution to the environmental problems stemming from electricity production is negligible.	5.61	1.34	
I feel responsible for conserving electricity.	5.90	1.05	
Government and industries are responsible for controlling environmental problems stemming from electricity production, not me.	5.65	1.33	
I'm equally responsible for environmental problems stemming from using electricity.	5.78	1.14	
PN (four items)	23.18	3.55	.72
I feel I should conserve electricity even if others do not conserve it.	5.98	1.11	
I feel guilty when I do not conserve electricity.	5.54	1.37	
It is a sign of a good individual to conserve electricity.	5.94	1.14	
People like me should do everything to conserve electricity.	5.73	1.16	
AT (three items)	17.72	3.77	.85
It is not important for me to try to conserve electricity.	5.7	1.60	
I do not want to play a role in protecting the environment by conserving electricity.	5.98	1.33	
I think trying to conserve electricity is a waste of time.	6.00	1.38	
SN (three items)	18.56	3.03	.84
People who are important to me think that I should give importance to conserving electricity.	6.23	1.06	
People who are important to me want me to learn how to conserve electricity.	6.16	1.16	
People who are important to me think that I should try to conserve electricity.	6.16	1.25	
PBC (three items)	18.70	2.99	.80
I could use less electricity if I wanted to.	6.28	1.10	
For me conserving electricity is easy.	6.08	1.40	
I'm aware of the ways to conserve electricity.	6.35	0.92	
ECB (six items)	22.30	3.00	.65
Switch off the lights in empty rooms.	3.80	0.85	
Switch off the power button of electronic devices when you are not using them.	3.79	0.80	
Use energy efficient bulbs.'	3.81	0.75	
Put electronic devices like computer and television on standby.	3.61	0.83	
Switch off the fans in empty rooms.	3.82	0.76	
Turn off, or lower the air- condition when the room becomes cooler.	3.49	0.93	

Note: AC = awareness of consequences of electricity conservation, R = sense of responsibility to conserve electricity, PN = personal norm to conserve electricity, at = attitude towards electricity conservation, SN = subjective norm about conserving electricity, PBC = perceived behavioral control, ECB = energy conservation beliefs.

as a possible determinant of electricity conservation behavior. The studies have not fully confirmed the view that education should have a positive relationship with electricity conservation. Educated people are likely to be more aware of environmental issues and as a result, are believed to take environment friendly actions. However, the research suggests that education is not always positively related to electricity conservation. Like age and gender, researchers have found that the relationship between education and energy conservation can be positive and it can be insignificant. Das et al. (2018) and Mills and Schleich (2012) found education to be related with energy conservation, but Gatersleben

affordability of electricity rises. But income also makes it possible for individuals to invest in energy efficiency options. Research has found support for the positive relationship between income and electricity use (Abrahamse and Steg, 2011; Gatersleben et al., 2002).

The socio-demographic variables do not consistently explain energy conservation behavior. Researchers have also studied attitudinal, moral and social factors as possible determinants of energy conservation behavior. For studying these factors, researchers have mainly used two popular models of human behaviors, the theory of

planned behavior (Ajzen, 1991) and the norm activation model (Schwartz, 1977).

## Materials and Methods

### Sampling

A questionnaire was used to gather data from 1250 college and university level students in Karachi. The data were collected from students of University of Karachi, Bahria University Karachi campus, Shaheed Zulfikar Ali Bhutto Institute of Science and Technology and Aga Khan Higher Secondary School because students from different levels of socio-economic backgrounds study in these institutions. The participation of students was voluntary and they were not offered any type of incentive to participate in this study. The data collection started in late 2014 and it concluded in 2016. The distribution of the sample was based on 350 students from AKHS, 150 from SZABIST, 150 from BUKC and 600 from Uok. The mean age of the sample was 20.06; 564 males and 686 females took part in this survey.

The methodology of non-probability was sampling specifically, using convenience sampling. Non-probability sampling methods have few limitations, but the fact that sample size was large and quite diverse, so that choice of sampling technique does not compromise the results of present study.

### Measurement of Variables

Present study used gender, age, education and family income as its four socio-demographic independent variables. Gender was measured using a single question that provided two response categories of male or female to respondents. For data analysis, male as 0 and female as 1 were coded. The age was measured by requesting respondents to write the year of their birth. The age respondents were calculated, using their birth year for example, we entered 19 in the statistical software, for a respondents born in 1995 and filling the questionnaire

with a range of income categories and they were requested to select an appropriate category. Education was measured by asking the current qualification.

The theory of planned behavior and norm activation model constructs were measured using items model on the items used by Steg et al. (2005) and Abrahamse and Steg (2009, 2011). Awareness of consequences (measured using four items), sense of responsibility (measured using four items), personal norm (measured using four items), attitude (measured using three items), subjective norm (measured using three items), and perceived behavioral control (measured using three items), were measured using the seven-point Likert scale, where 1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = unsure, 5 = somewhat agree, 6 = agree, and 7 = strongly agree. Where necessary, the items were reverse coded, so the higher number indicated a higher level of endorsement with the item. The items designed to measure energy conservation used the word electricity instead of energy. As discussed earlier, in studies conducted in the West, the term energy is more commonly used. In Karachi, the term electricity is more popular and understandable, and since the use of transport and natural gas was not considered in the study, use of electricity made more sense considering the local context. A five-point, six-item Likert type scale, was used to measure electricity conservation behavior. Where 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = very often. The descriptive statistics of items used to measure independent variables, dependent variable, along with Cronbach Alpha reliability statistics (Table 1).

To test hypothesis about the relationships of socio-demographic variables with electricity conservation behavior independent sample T-test was used. Pearson correlation were used and one way analysis of variance (ANOVA). To test the association of variables of the theory of planned behavior, and the norm activation model multiple linear regression was used prior to this analysis various diagnostic tests were performed to confirm that assumptions of our statistical analysis have

Table 2. Regression of electricity conservation behavior on theory of planned behavior and norm activation model.

Predictor	<i>B</i>	<i>se</i>	<i>Beta</i>	<i>t</i>	R-square
(Intercept)	11.43**	0.730		15.65***	
at	0.063	0.025	.08	2.50*	
SN	0.121	0.028	.12	4.21***	
PBC	0.055	0.028	.06	1.95	
AC	0.084	0.024	.11	3.48***	
R	0.054	0.024	.07	2.23*	
PN	0.144	0.026	.17	5.37***	
					$R^2 = .1693^{**}$

Note: AC = awareness of consequences of electricity conservation, R = sense of responsibility to conserve electricity, PN = personal norm to conserve electricity, at = attitude towards electricity conservation, SN = subjective norm about conserving electricity, PBC = perceived behavioral control over electricity conservation, ECB = electricity conservation behavior. N = 1250,  $p < .05$ ,  $p < .01$ ,  $p < .001$ .

in 2014. The age was used as a continuous variable in analysis. The mean age of the sample was 20.06. To measure family income, respondents were provided

been satisfied (Field et al., 2012). R version 3.52 (R core team, 2018), to data analysis.

## Results and Discussion

To find out that electricity conservation behavior of males and females is similar or dissimilar, independent sample T-test was used. Results indicated that there was no statistically significant difference in electricity conservation behavior of males ( $M = 22.20$ ,  $SD = 3.03$ ,  $n = 564$ ), and females ( $m = 22.46$ ,  $SD = 2.95$ ,  $n = 686$ ),  $t(1248) = -1.48$ ,  $p > .05$ .

To examine the relationship between age and electricity conservation behavior, the Pearson correlation was used. Results suggested that there was no correlation between age and electricity conservation behavior ( $r = 0.01$ ,  $p > .05$ ).

To examine the influence of education on electricity conservation behavior, one-way ANOVA was used. Results showed that education had no influence on electricity conservation behavior,  $f(2,1247) = 1.95$ ,  $p > .05$ . To examine how family income influences electricity conservation behavior, one-way ANOVA was used. Results revealed that electricity conservation behaviors were not statistically different across income categories,  $f(6,1243) = 1.04$ ,  $p > .05$ .

To test the explanatory powers of variables in the theory of planned behavior, and norm activation model, to explain electricity conservation behavior, we performed multiple linear regressions (Table 2.). Data reveal attitude towards electricity conservation, subjective norm about electricity conservation, awareness of consequences of electricity conservation, the ascription of responsibility, and personal norm, all had a positive relationship with electricity conservation behavior,  $f(6,1243) = 43.43$ ,  $p < .01$ . Attitude, subjective norm, awareness of consequences, the ascription of responsibility, and personal norms, accounted for approximately 17 per cent of the variance in energy conservation behavior. The hypothesis about perceived behavioral control having a relationship with electricity conservation was not supported. Overall, our results show that variables from the theory of planned behavior and norm activation model, can be a significant predictor of electricity conservation behavior in a Pakistani context. These findings are similar to prior research, conducted in other countries (Chen, 2016; Sapci and Considine, 2014; Testa, et al., 2016; Werff, et al., 2013).

Present study examined the relationship of socio-demographic factors and variables from the theories of planned behavior and norm activation model with energy conservation behavior. In this study the socio-demographic factors were not found to have any impact on energy conservation behavior. Bearing in mind that study was on a student-based sample and was conducted in Karachi. Further research is required in other cities before understanding the true nature of the influence of social and demographic factors on environmental friendly behaviors in a Pakistani context. It was found that all the variables in the norm activation model had a

positive association with energy conservation, and perceived behavioral control as the only variable in the theory of planned behavior that did not correlate with energy conservation behavior.

For few decades now, there has been a gap in electricity supply and demand in Karachi. To manage this gap, electricity supply to residential and commercial users is discontinued for a few hours daily. Many households in Karachi, as a response to electricity shortage, have bought generators or uninterrupted power supply device (UPS). It is likely that during the time when there is no electricity supply, individuals try to limit the use of electricity consuming devices, such as bulbs, so that the battery of UPS lasts longer or the generator does not use too much fuel. It can be argued that continuous power outages have promoted favorable attitudes towards electricity conservation in Karachi.

The association of subjective norms and variables of norm activation model with energy conservation behavior can at least be explained by two factors. Firstly, families are likely to motivate every individual living in the house to consider careful use of electricity to control the expenditure on meeting the energy related demands of the households. Secondly, daily power outages have cultivated habits and norms that have made electricity conserving actions an everyday behavior. In view of the lower levels of awareness of global climate change, two main reasons for electricity conservation in Karachi are high cost of electricity and electricity shortage. Most of the individuals living in Karachi are not interested in conserving electricity solely because of environmental reasons. The environmentally friendly dimension of energy conservation needs to be promoted in mega cities like Karachi. This is because if and when there is no gap between electricity supply and demand and it is affordable, people will use it as much as they want, and the environment will not be a factor in their decisions about energy use.

This research had some limitations this study was based on college and university level students only to find household energy conservation behavior. Present study like with all quantitative research, social desirability or failure to comprehend our survey items may have been a potential problem. Furthermore, the energy conservation behavior should continue to be investigated in Pakistan in different cities with a different sample, using both qualitative and quantitative methodology.

It is believe that different policies are required for different socioeconomic groups in Pakistan. For individuals in the upper social class of society, economic incentives are not likely to be fruitful. Raising awareness of global climate change and the greenhouse gas emissions of everyday actions may prove effective in triggering a behavioral change. Children of the upper socioeconomic group generally receive education in well-reputed institutions. These institutions can be used

to encourage attitudinal changes in energy conservation. The upper social class can also invest in energy efficient devices and through targeted campaigns, they can be motivated to purchase such devices, by highlighting their societal, and personal benefits. The middle social class in Pakistan already tries to conserve energy as much as possible, but it can be argued, that these efforts are not made for environmental considerations. The motive to keep in control the expenditure on satisfying energy-related needs is perhaps the main driving force behind energy conservation actions. This segment of society is most likely to respond to policies that aim to bring an attitudinal and normative change about energy use and not to changes in the price of energy.

The electronic media, and in particular, social media can also be used to promote a culture of energy conservation actions (Wang et al., 2018). Social media use has rapidly grown in Pakistan. Environmental information, if spread on social media in Pakistan, can reach and potentially influence thousands of individuals. Celebrities who tend to have many followers on social media can be requested by the government and other organizations working for the environment to occasionally send messages to their followers on social media about doing environmental friendly actions like energy conservation. Religious scholars also enjoy significant persuasive powers in Pakistani society. Islam encourages followers to protect the environment. Therefore, religious scholars, in their speeches, can talk about the environmental ethics of Islam and this is likely to result in positive changes in day-to-day environmentally significant behaviors of individuals.

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