

Green Affinity : Evaluating the Perceptions of Youth on Climate Change and Renewable Energy

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Abstract

Climate change is one of the most critical global challenges of our times. With the drastic consequences visible worldwide, it is the need of the hour to combat this crisis and a large scale adoption of renewable energy is one of the promising solutions. In this fight against climate change, the youth play a vital role since they are the next generation and inherit the responsibility to build a sustainable future. Research in the area of youth and specifically students' conceptions regarding geo-science phenomena is lacking in India. Hence, the present study aimed to examine the students' awareness about climate change and renewable energy. It also intended to analyze the key factors that influence their intention to use renewable energy. The study sample consisted of 124 students from SRM University in Kancheepuram District, Tamil Nadu. The research findings showed that a majority of the respondents were aware of climate change and renewable energy technology; but it was superficial. However, 30% of the respondents were willing to use renewable energy in the future. The results revealed that awareness, perception of usefulness and ease of using technology, and behavioural control were important factors affecting respondents' intention to adopt renewable energy. Based on these findings, we make certain recommendations to foster knowledge and enthusiasm among the younger generation to make them more participative in the fight against climate change.

Keywords : Climate change, renewable energy, students, intention to use, awareness, usefulness, ease of use, behavioural control

JEL Classification: M31, Q20, Q54

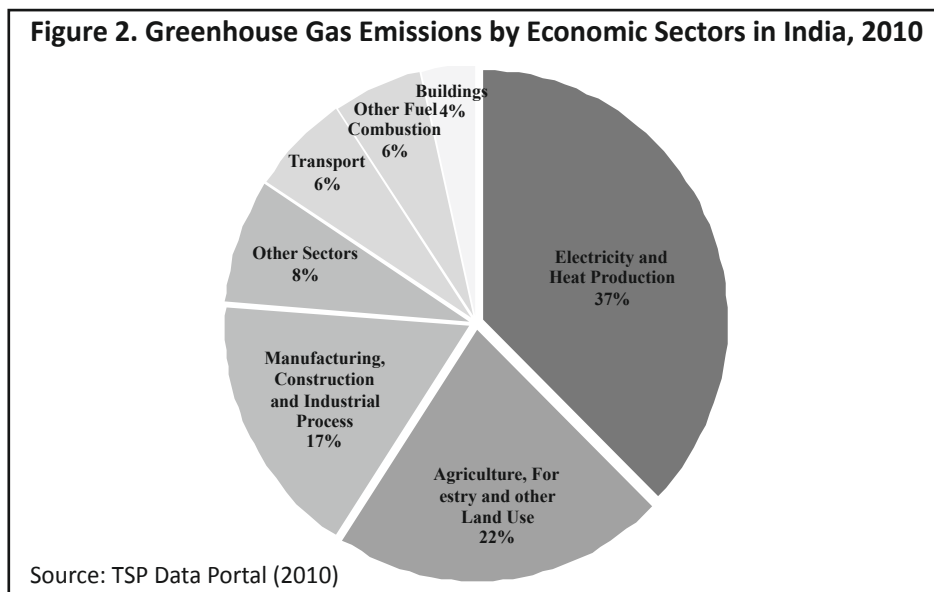
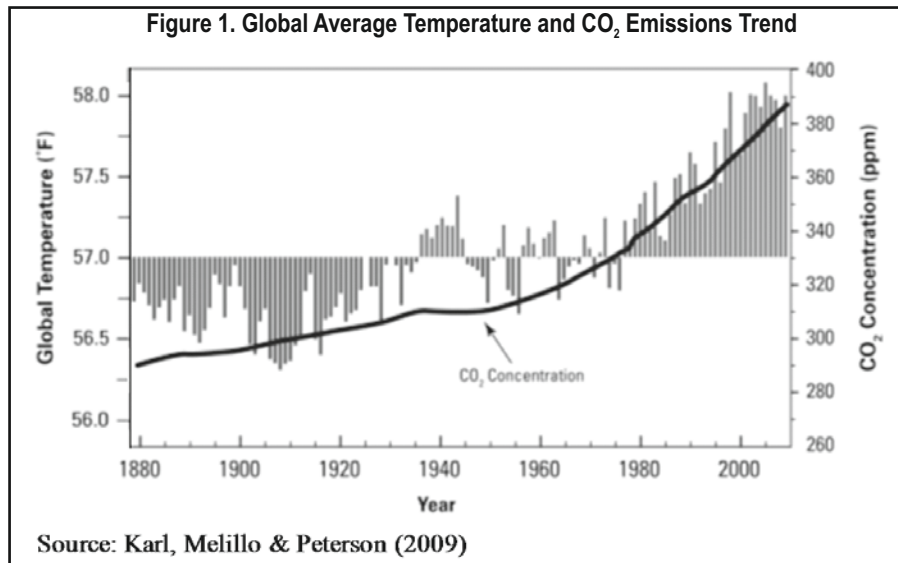
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The climate is a common patrimony of all humanity and everyone's responsibility. It is the shared global responsibility of people from all countries and levels to fight climate change. Climate change is one of the gravest threats to mankind, but is not a new occurrence. The earth's climate and temperature have changed over millions of years; however, the current changes are different from the past and largely instigated by human behaviour (Gifford, Kormos, & McIntyre, 2011). The most drastic change has been observed in the average global temperature which has increased in the past 150 years by 0.76 [0.57 to 0.95]°C and is expected to rise in coming decades (IPCC, 2007). Specifically, in India, the average temperature has enhanced by about 1 to 1.1°C with frequent extreme temperature events and heat waves in the recent past (Dash, Jenamani, Kalsi, & Panda, 2007).

The other consequences are melting ice caps, rising sea levels, changing weather patterns, destabilizing ecosystem and extinction of species (Bellard, Bertelsmeier, Leadley, Thuiller & Courchamp, 2012 ; Gleditsch, 2012 ; Krishna Murthy, 2012 ; Mehta, 2010). Climate change also affects water and food quality, sanitation, disease patterns, human shelter and settlements eventually leading to health problems. It leads to under nutrition

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and food insecurity increasing mortality rate, especially in infants (Costello, Abbas, Allen, Ball, Bell, Bellamy, Friel, Groce, Johnson, Kett & Lee, 2009). Thus, climate change has become an increasing threat to the world's environmental, social and economic stability (Kilinc, Stanisstreet & Boyes, 2008 ; Tara & Singh, 2014).

Since the Third Assessment Report by Intergovernmental Panel on Climate Change (IPCC), policy makers and scientific community around the world have turned their attention towards impacts of climate change and termed them as 'dangerous' with all the indicators crossing critical thresholds (Karl, Melillo & Peterson, 2009). Figure 1 shows the global average temperature and CO₂ emissions trend over the past century.

It is the need of the hour to restrict the fall-outs of climate change which is possible by changing the human behaviour causing it. The root cause is the green house gas (GHG) emitting human activities that have increased significantly following the industrial revolution. The harmful GHGs are carbon dioxide (CO₂), methane and nitrous oxide produced primarily through the burning of fossil fuels and industrial processes (Gifford, Kormos, & McIntyre, 2011; Krishna Murthy, 2012). According to the fourth assessment report by IPCC (2007), persistent

emissions of GHG at or above current levels (455 ppm CO₂-eq) would result in more global warming and cause changes in the global climate that will be severe compared to those observed in the past century. India is the third highest GHG emitter in the world contributing to 6.2% of the total emissions after China (24%) and U.S.A. (16.3%). Figure 2 shows the distribution of GHG emissions in India by economic sectors.

Out of the total GHG emissions, 37% and 17% are caused by electricity/heat generation and industrial processes while burning fossil fuels like coal, natural gas and oil. As highlighted by Krishna Murthy (2012), increased generation and consumption of electricity through exploitation of fossil fuels is the major source of GHG. To combat this, switching to renewable energy sources in large scale is one of the most viable options to decarbonize energy generation and satisfy the growing energy demand (Ghorude, 2011; Krishna Murthy, 2012; Yazdanpanah, Komendantova, Shirazi, & Bayer, 2015). Apart from the technological availability and economic feasibility of renewable energy, its adoption is dependent on human acceptance and decision making. Human behaviour has direct and indirect impacts on the environment and personal well being (Jackson, 2005). Hence, it is essential to study human responses such as their attitude, behaviour and intentions to adopt renewable energy and mitigate climate change (Howell, 2011; Wüstenhagen, Wolsink, & Bürer, 2007; Whitmarsh, 2009). It is increasingly recognized that building positive perceptions and favorable intentions is inevitable to promote renewable energy (Rayner & Malone, 1998).

This research focuses on youth and specifically students, an exclusive group rather than wider public base since it is assumed that they are the future decision makers on energy solutions in the society and especially in their households (Yazdanpanah, Komendantova, Shirazi & Bayer, 2015). Also, they are more adaptable, progressive and can swiftly change to low-carbon behaviour and lifestyles (Pandve, Deshmukh, Pandve & Patil, 2009). Hence, it would be worthwhile to explore Indian students' awareness about climate change and their intentions to use renewable energy which has not been focused much by earlier researchers.

Literature Review

Renewable energy is obtained from natural replenishable resources on earth using advanced technology to reduce the global warming problems by substituting conventional energy solutions (Azhar, Rashid, Omar & Alam, 2014). A number of studies have been carried out to explore the factors influencing the attitude and intentions of people to adopt renewable energy technology in western countries. These factors can be broadly categorized as external or contextual, psychological and personal factors (Ben Cheikh, Abdellatif & Bakini, 2014; Jackson, 2005; Peattie, 2010). External factors refer to social norms, institutional constraints and government or regulatory incentives that can either promote or constrain renewable energy adoption (Jackson, 2005). These can also be categorized as social, technical and political/regulatory factors (Wüstenhagen, Wolsink & Bürer, 2007). External factors can sometimes limit consumers' choice to exercise pro-environment behaviour despite personal willingness which is termed as 'lock-in' (Press & Arnould, 2009). Intrinsic or psychological factors refer to personal capabilities, habits, attitude (Claudy, Peterson & O'Driscoll, 2013), knowledge (Press & Arnould, 2009), experience, perceived effects, environmental and political values. Personal factors include the demographic and socioeconomic characteristics such as age, gender, education, social class and income (Ben Cheikh, Abdellatif, & Bakini, 2014).

There are various theories that incorporate these factors to predict human behaviour like theory of reasoned action, theory of planned behaviour, technology acceptance model, health belief model, diffusion of innovations theory, social learning/cognition theory, etc. Out of these, theory of reasoned action (TRA) and theory of planned behaviour (TPB) are commonly applied (Peattie, 2010) that view behaviour as a result of intentions which are driven by attitude towards that behaviour, subjective norms reflecting social beliefs and perceived behavioral control (Ajzen, 1991). There are multiple studies which adapted TPB directly or modified to include variables relevant to their research objectives. Certain studies intended to analyze users' intentions to go green and adopt

renewable energy technologies, where TPB has been adopted along with socio-demographic variables affecting attitude, subjective norms and behavioural control which in turn affects behavioural intention (Han, Hsu & Sheu, 2010; Feng, 2012; Rezai, Teng, Mohamed & Shamsudin, 2013). These studies incorporated additional variables like acceptance of innovation (Feng, 2012) and perception of green movements and campaigns (Rezai, Teng, Mohamed & Shamsudin, 2013).

The other theories used to study behavioral intentions are technology acceptance model (TAM) and diffusion of innovation (DOI). Originally based on TRA, TAM is one of the leading theories used to explain user acceptance of new innovations or hi-tech products, especially using intrinsic perception factors rather than extrinsic environmental factors (Feng, 2012). The main predictors in TAM are perceived ease of use and perceived usefulness that affect the attitude which in turn affects the intention to use and ultimately the actual use (Davis, Bagozzi & Warshaw, 1989). Thus, users will adopt new technology if they perceive that it is simple to use and has value. Similar to TAM, the DOI model (Rogers, 2003) states that innovation characteristics i.e. relative advantage, complexity, compatibility, observability, and triability are the prime determinants of the innovation adoption process (Alam, Hashim, Rashid, Omar, Ahsan & Ismail, 2014 ; Feng, 2012).

There are studies which analyzed the intention to use renewable energy with a mix of variables from TAM, DOI and TPB selected based on their need and research objectives. Alam, Hashim, Rashid, Omar, Ahsan and Ismail (2014) used relative advantage, perceived ease of use and behavioural control based on theories along with awareness and cost as additional explanatory variables. Memar and Ahmed (2012) incorporated variables like attitude, green subjective norms, demographic, environmental laws and guidelines, green knowledge and willingness to pay for green products and green brand strength. Ahmad, Rashid, Omar and Alam (2014) used a combination of variables based on previous studies like awareness, benefit-cost, ease of use, behavioural control and relative advantage influencing the intention to use renewable energy through attitude acting as a mediator. The Health Belief Model (HBM) commonly used to study behaviour during health decision making was adopted by Yazdanpanah, Komendantova, Shirazi and Bayer (2015) to examine youth perceptions of renewable energy. They retained HBM variables such as perceived benefits, perceived barrier, general concern, cues to action, self-efficacy, etc; but adapted measurement scales from literature relevant to research.

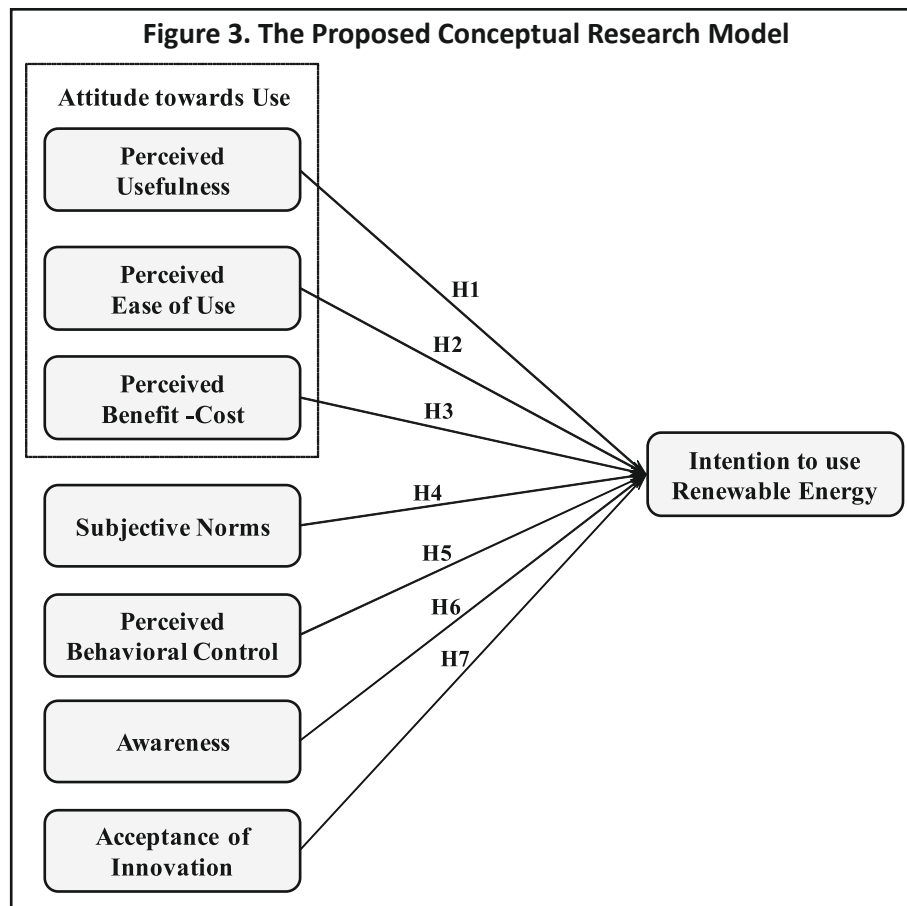
Although many researchers have mostly used behavioural models separately to study the determinants of the individual's acceptance or intention, few of them used a subjective mix of variables based on their impact in previous studies; while very few have combined these theories and able to obtain greater specificity and explanatory power (Azhar, Rashid, Omar & Alam, 2014; Gillenson & Sherrell, 2002; Hsu & Chiu, 2004; Pavlou & Fygenson, 2006). With this inspiration, the present research intends to create a new conceptual model through an effective combination of above-mentioned theories.

Objectives of the Study

- (i) To assess the knowledge and awareness about climate change and renewable energy among college students who represent the educated youth; and
- (ii) To find the key determinants of their intention to use renewable energy technology.

The Proposed Research Model

One of the research objectives of this study is to find the key determinants of students' intention to use renewable energy. To accomplish this, the TPB has been used as the base model since it is one of the most widely used and accepted theories to predict human behavioral intentions (Peattie, 2010). The second theory used in this study is the TAM that has been embedded into the TPB. The TAM has been infused in the theoretical structure of this



research since it is one of the pioneer models used extensively by innovators to test the rate of acceptance of a new technology, and this best fits the research purpose of predicting intention to use a new energy alternative. Figure 3 presents a visual representation of the conceptual research model constituted for this study.

According to the TPB, attitude is one of the key determinants of intentions to use renewable energy which indicates the degree of an individual's favorable assessment of particular behaviour (Ajzen, 1991). To capture attitude in a more comprehensive manner, two components of TAM have been included i.e. perceived usefulness and perceived ease of use. According to TAM (Davis, Bagozzi, & Warshaw, 1989), users show favorable attitude and are willing to use a new technology based on its level of usefulness and ease of use. Perceived usefulness represents the users' belief regarding the renewable energy usability and safety of both humans and environment (Feng, 2012). Perceived ease of use represents the users' opinion regarding installation, maintenance and convenience in using renewable energy devices (Ahmad, Rashid, Omar, & Alam, 2014). Thus, better perception of usefulness and ease of using renewable energy technology are hypothesized to positively influence the intention to use this technology.

➤ **H1:** Higher perceived usefulness has a positive effect on the intention to use renewable energy.

➤ **H2:** Higher perceived ease of use has a positive effect on the intention to use renewable energy.

Perceived benefit-cost represents the overall value of the new technology, i.e. the benefits obtained in return for the price paid. Previous studies have highlighted the negative influence of high installation and maintenance costs of renewable energy devices on the users' willingness to pay and use (Faiers & Neame, 2006 ; Venkatraman

& Sheeba, 2014). The higher the cost of the technology, lower is its rate of adoption (Alam, Hashim, Rashid, Omar, Ahsan & Ismail, 2014). Thus, the perception of higher benefit to cost ratio is hypothesized to positively influence the intention to use this technology.

✦ **H3 :** Higher perceived benefit-cost has a positive effect on the intention to use renewable energy.

According to TPB, subjective norm is a social aspect that signifies the perceived social pressure on a person to perform the behaviour or not (Ajzen, 2002). It is the influence of an individual's family, friends and society on his behaviour. The more social pressure perceived by an individual, the more likely he or she will behave in the manner that is socially acceptable (Feng, 2012; Memar & Ahmed, 2012). Thus, subjective norms that favor the use of alternative energy is hypothesized to positively influence one's intention to use the same.

✦ **H4:** Favorable subjective norms have a positive effect on the intention to use renewable energy.

The TPB incorporates perceived behavioural control which indicates the perception of ease or difficulty experienced in performing the behaviour (Ajzen, 2002). It represents an individual's actual control over the decision regarding the purchase of the new technology based on one's power, ability, knowledge and resources available (Ahmad, Rashid, Omar, & Alam, 2014). The more control an individual has in taking the decision of adopting renewable energy, the more likely he or she is willing to use (Alam, Hashim, Rashid, Omar, Ahsan, & Ismail, 2014). Thus, higher perceived behavioural control is hypothesized to positively influence the intention to use renewable energy.

✦ **H5:** Greater perceived behavioural control has a positive effect on the intention to use renewable energy.

Renewable energy awareness is the concept where a person can gather and access essential information about renewable energy in relation to its basic use, financial value and environmental impact (Sidiras & Koukios, 2004). Thus, awareness is an indication of prospects' conscious knowledge and response to renewable energy. Awareness helps public to make informed decisions and improves acceptance and adoption of the new technology (Mirza, Ahmad, Harijan & Majeed, 2009). A higher level of awareness affects the intention of using renewable energy technology (Azhar, Rashid, Omar & Alam, 2014 ; Venkatraman & Sheeba, 2014) and hence is included as a positive determinant.

✦ **H6:** Higher awareness has a positive effect on the intention to use renewable energy.

Apart from awareness, an individual's intrinsic nature also affects his behaviour of adopting a new technology. Inspired by this notion, the acceptance of innovation variable has been incorporated in this research which is defined as the degree of favorable behaviour towards new technologies (Feng, 2012). Thus, more enthusiastic and curious an individual is towards innovative ideas and products, the more likely he or she is to use the same.

✦ **H7:** Higher acceptance of innovation has a positive effect on the intention to use renewable energy.

Thus, a combination of psychological, social and contextual factors has been used in the proposed conceptual model to analyze the intention to use renewable energy technology. Since the study focuses on a specific target group of youth, i.e. college students, the socio-demographic factors may not be much relevant and hence not included in the research model.

Research Methodology

The primary objective of this research is to analyze the key determinants of students' intention to use renewable energy. The descriptive research design has been employed since the study intends to describe and assess the current state of knowledge, awareness and intention to use renewable energy among students. Since the study uses statistical techniques to analyze the primary data, this is a quantitative research (Saunders, Lewis & Thornhill, 2009).

(1) Instrument : The structured questionnaire has been used as the data collection instrument. Based on the research objectives and the conceptual framework, the questionnaire has been designed consisting of closed end questions derived from reviewing related literature. The questionnaire consists of 10 multiple-choice questions to assess the students' awareness about climate change and renewable energy, and 31 statements of validated scales to measure the eight variables used in the research model.

(2) Measurement Scale : The scales used to measure the variables in the research model have been adopted from previous studies to ensure construct and content validity (Yazdanpanah, Komendantova, Shirazi & Bayer, 2015). The scales for the variables were adopted from Feng (2012), Ahmad, Rashid, Omar, and Alam (2014), and Alam, Hashim, Rashid, Omar, Ahsan, and Ismail (2014). Each item was measured using a 5-point likert scale (1 - *strongly disagree* to 5 - *strongly agree*) which is reliable and widely used in opinion research (Kothari, 2004).

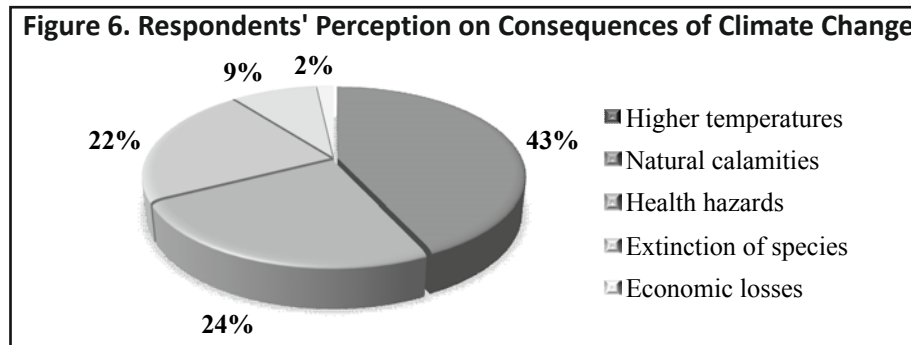
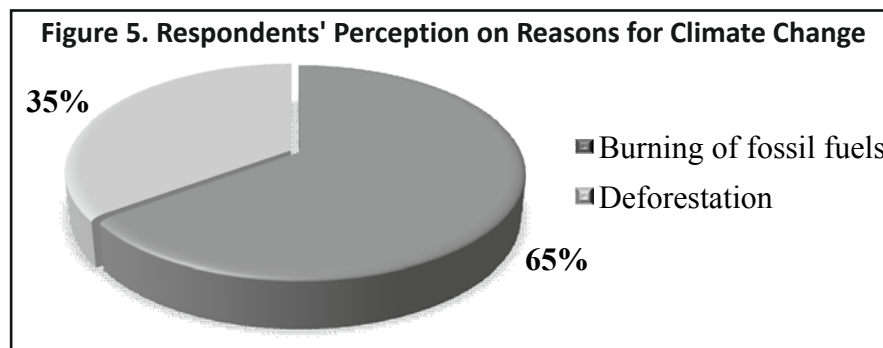
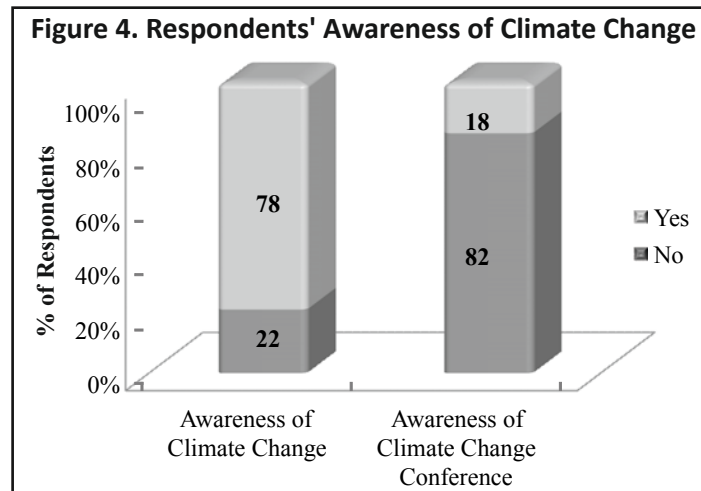
(3) Sample : Since the use of renewable energy is still in a nascent stage in India, knowledge of renewable energy is limited to a smaller fraction of people. Hence, the target population for this study was students who constitute the educated youth population and are future decision makers on energy solutions (Yazdanpanah, Komendantova, Shirazi & Bayer, 2015). The convenience sampling technique has been used for data collection where respondents were selected based on their convenient accessibility and proximity to the researcher (Bryman & Bell, 2015). The questionnaire was administered to a sample of 216 students from SRM University, Kattankulathur campus near Chennai during October - December 2015. Out of this, 124 responses obtained were considered valid with a response rate of 57%.

Analysis and Results

The data was analyzed using SPSS 20 statistical software. Descriptive statistics and regression analysis were used for analyzing the data. The distribution of respondents based on their gender and education level has been presented in the Table 1. The gender distribution in the sample was not biased, with 53% males and 46% female

Table 1. The Gender and Educational level of Respondents

Variables	Frequency	%
Gender		
Male	66	53.2
Female	58	46.8
Education		
UG	78	62.9
PG	46	37.1
Total	124	



respondents. Based on their education, the sample comprised of 62% respondents pursuing under graduation and 37% pursuing post graduation.

(1) Respondents' Awareness of Climate Change : The distribution of respondents based on their awareness about climate change has been presented in Figure 4. The results show that 78% of the respondents are aware of climate change and global warming. However, only 18% of them are aware of the Climate Change Conference recently held in Paris during Dec 2015. With respect to the reasons for climate change as presented in Figure 5, 65% of the respondents believe that burning of fuels is the primary reason followed by 35% who claim deforestation as the main reason.

With respect to the consequences of climate change as presented in Figure 6, 43% of the respondents perceive high temperature as the major consequence, while 24% of the respondents claim natural calamities, followed by

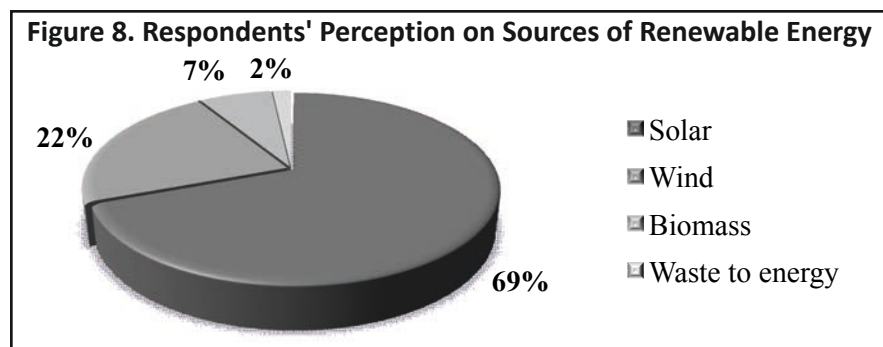
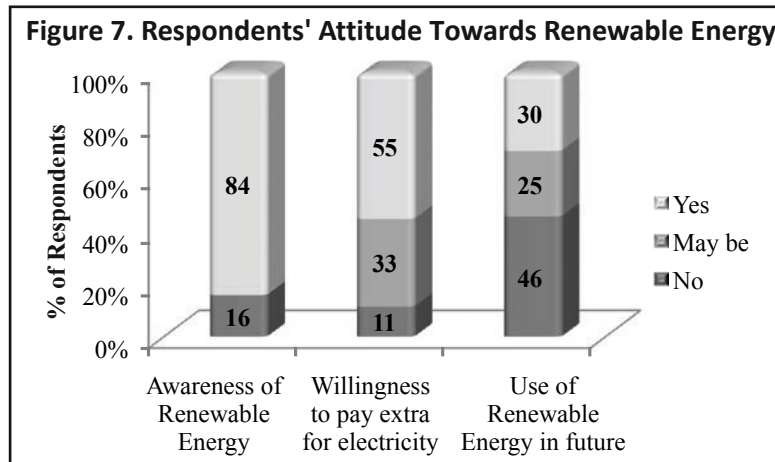


Table 2. Reliability Analysis

Variables	No. of Items	Cronbach's Alpha	Internal Consistency
Intention to Use	3	0.778	Acceptable
Perceived Usefulness	4	0.702	Acceptable
Perceived Ease of Use	4	0.658	Questionable
Perceived Benefit-Cost	4	0.759	Acceptable
Subjective Norms	4	0.715	Acceptable
Perceived Behavioural Control	4	0.788	Acceptable
Awareness	4	0.911	Excellent
Acceptance of Innovation	4	0.752	Acceptable

22%, 9%, and 2% of the respondents for whom health hazards, extinction of species and economic losses are the major consequences of climate change.

(2) Respondents' Attitude Towards Renewable Energy : The distribution of respondents based on their awareness and attitude towards renewable energy has been presented in Figure 7. The results show that 84 % of the respondents are aware of renewable energy. The study also reveals that more than half of the respondents, that is, 55% of them are willing to pay more in order to obtain 24 hours electricity. The results show that nearly one third of the respondents, that is, 30% are willing to replace conventional energy with renewable energy in near future.

Table 3. Regression Model Output

Model Coefficients			
	Beta	Std. Beta	Sig
Constant			0.899
Awareness	0.260	0.266	0.023
Perceived Usefulness	0.266	0.218	0.024
Perceived Ease of Use	0.294	0.216	0.008
Behavioural Control	0.219	0.208	0.050
Model Fit Statistics			
Adj. R^2	0.633		
F-Value	49.627**		

Note: ** Significant at the 1% level ($p < 0.01$)

Dependent variable: Intention to Use

With regard to the sources of renewable energy as shown in Figure 8, 69% of the respondents believe solar energy is the major source of renewable energy, followed by 22% and 7% of them who consider wind energy and biomass as the major source of renewable energy.

(3) Key Determinants of Intention to Use Renewable Energy : Prior to validating the proposed conceptual model, the initial step was assessing the reliability of the adopted scales used to measure the variables in the model using cronbach alpha reliability coefficient. The higher the Cronbach alpha, the more reliable the generated scale is (Santos, 1999). Coefficient value of 0.7 and above is treated as an acceptable score, but lower thresholds have been used by researchers in the past (Nunnally, 1978). The reliability assessment of the eight variables used in the conceptual model is presented in the Table 2.

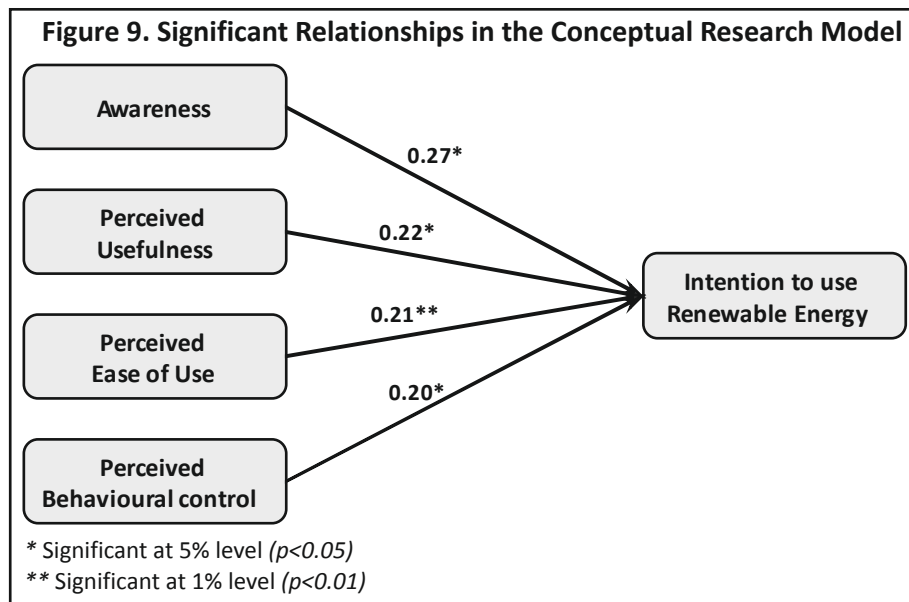
The reliability coefficients of all variables are above 0.7 except perceived ease of use (0.658) which is minimally acceptable; especially when the number of items in the scale is below five (Hair, Black, Babin, Anderson & Tatham, 2006 ; Sharma & Petosa, 2012). Thus, the scales used to measure all variables in the study can be considered reliable.

Following the confirmation of reliability, the multiple linear regression was employed to find the main factors influencing the intention of the respondents in using renewable energy. The respondents' intention to use renewable energy is the dependent variable and the seven predictors as conceptualized in the research model are the independent variables, i.e. awareness, acceptance of innovation, perceived usefulness, perceived ease of use, perceived benefit-cost, subjective norms and behavioral control. The regression output with the model coefficients and fitness measures have been presented in the Table 3.

The regression results show that the model built to determine the key determinants of intention of respondents in using renewable energy shows a good fit with an adjusted R^2 of 0.63 and F-value of 49.6 significant at one percent level which indicates that the observed R^2 is reliable and not a spurious result (Kutner, 1996). The model results show that out of the seven independent variables conceptualized in the research model, four of them are found to be significant predictors of intention to use renewable energy.

As hypothesized in H1, perceived usefulness is found to have significant coefficient ($\beta = 0.218, p < 0.05$). Thus, better perception of benefits positively impacts the intention to use renewable energy and hence, hypothesis H1 is accepted.

As conceived in hypothesis H2, perceived ease of use also has a significant effect ($\beta = 0.216, p < 0.05$) which implies that an improved perception of easy and convenient usage positively affects the intention to use. Thus, hypothesis H2 is accepted.



In line with hypothesis H5, perceived behavioural control is found to have a significant coefficient ($\beta = 0.208$, $p < 0.05$). This establishes support to the contention that the higher the control an individual has on his/her decision making regarding purchase and use of renewable energy technology, the greater is his/her usage intention. Thus, hypothesis H5 is accepted.

As theorized in hypothesis H6, awareness is found to be statistically significant ($\beta = 0.266$, $p < 0.05$) which means that higher awareness and knowledge has a positive impact on the intention to use renewable energy. Thus, the hypothesis H6 is accepted.

However, contrary to the hypotheses H3, H4, and H7, perceived benefit-cost, subjective norms and acceptance of innovation do not have significant coefficients ($p > 0.05$). This implies that the perception of benefit to cost ratio i.e. the cost factor does not affect the respondents' intention to use renewable energy. Hence, hypothesis H3 is rejected. Also, societal norms and influence do not have a significant impact on the intention to use renewable energy. Hence, hypothesis H4 is rejected. Similarly, respondents' nature to accept innovation and new technology does not influence their usage intention. Hence, hypothesis H7 is rejected.

The Figure 9 presents the conceptual research model with the standardized coefficients of significant variables driving intention to use renewable energy.

Discussion

There is a dearth of comprehensive research on factors affecting youth perceptions of climate change and renewable energy. This study is one of its kinds to investigate students' knowledge and intention of using renewable energy technology in India using a unique model with a combination of relevant theories. This research has contributed to the growing body of literature by formulating a combination of TPB and TAM models in behavioral decision making to use renewable energy technology.

This study revealed some interesting findings about students' perceptions of climate change and renewable energy devices. A majority of the respondents surveyed, that is, 78% are aware of climate change and global warming ; 65% of them perceive that burning of fossil fuels is the main reason for climate change followed by deforestation. According to 43% of the respondents, the major consequence of climate change is rise in temperature followed by natural calamities (24%) and health hazards (22 %).

While 84% of the respondents are aware of renewable energy, 69% perceive solar energy as the main source of renewable energy, and only 22% of the respondents regard wind as the main source. These findings are similar to Marcom Capital Group (2011) survey results; which is startling given that 67% of the renewable energy production in India in 2014 was from wind power with only 7% energy from solar power. More than half of the respondents i.e. 55% reveal a favorable attitude towards spending more money in obtaining continuous electricity. In case of intention to adopt, 30% of the respondents are willing to use renewable energy which is consistent with the results from India Renewable Energy Awareness Survey by Marcom Capital Group (2011) where 28% of the respondents plan to adopt renewable energy in future.

Researchers like Alam, Hashim, Rashid, Omar, Ahsan, and Ismail (2014) and Ahmad, Rashid, Omar, and Alam (2014) conducted studies to explore the possible factors which influence user intentions to adopt renewable energy and found that awareness, perceived ease of use, perceived behavioural control and relative advantage lead to increased intention. In a similar study, Feng (2012) identified perceived usefulness, perceived ease of use and acceptance of innovation as key motivators for adopting renewable energy. Consistent with these extant studies, this research reveals that awareness has a significant relationship with the intention of using renewable energy. Thus, a higher level of awareness and knowledge influences a person's intention to use the technology (Alam, Hashim, Rashid, Omar, Ahsan, & Ismail, 2014). The present research has also identified perceived usefulness and ease of use as significant factors affecting usage intention. The more optimistic a user's belief regarding the usability, benefits gained, convenience and satisfaction from the renewable energy technology, the better is his/her adoption intention (Feng, 2012).

Researchers like Rezai, Teng, Mohamed, and Shamsudin (2013) and Han, Hsu, and Sheu (2010) applied the Theory of Planned Behaviour to explain the users' intention to adopt green behaviour where attitude, subjective norms and perceived behavioural control are found to be predictors of behavioural intention. In concordance with these studies, the present research has identified that perceived behavioural control has a significant relationship with the respondents' intention to use renewable energy. Thus, despite willingness, if an individual has little control over carrying out his/her behaviour due to certain constraints, his/her behavioural intentions will be lower (Han, Hsu, & Sheu, 2010).

Alongside these similar results, the present study has revealed that variables like acceptance of innovation, perceived benefit-cost and subjective norms do not have a significant relationship with the respondents' intention to use renewable energy. One reason might be because the respondents are students who are too young to interpret societal norms and evaluate the value of renewable energy technology in terms of its benefit-cost. The findings of this research are an impression of students' knowledge and attitude towards climate change and renewable energy adoption.

Research Implications

The research offers implications for renewable energy advocates, policy makers and researchers. It has provided an impetus to the existing literature by investigating perceptions of a specific target group i.e. students using fusion of behavioural models and relevant variables. The crucial observation is that there is awareness about climate change and renewable energy among the respondents, but is quite superficial. Another finding worthy to note is that apart from 30% respondents willing to adopt renewable energy in the future, 25% responded that they might do so. These results indicate that a huge percentage of respondents might or definitely support renewable energy solutions if provided proper direction and opportunities.

The findings also provide an indication for the policy-makers that focusing on determining factors such as awareness, usefulness and easy usage is the key to stimulate the consumption of renewable energy technology. According to Jackson (2005), government activities play a strong functional and symbolic role in social learning processes. The government and corporate sector need to adopt the 'triple bottom line' approach in lieu to achieve

economic, social and environmental performance to attain sustainable development (Tara & Singh, 2014) and focus their efforts to improve public awareness through better pro-environmental propaganda and marketing campaigns. Youth education is one of the most effective means to battle climate change (Pandve, Deshmukh, Pandve & Patil, 2009).

Apart from promoting usage of renewable energy through educational seminars and exhibitions, including climate change education in school and university curriculum will go a long way in raising students' awareness on adoption of renewable energy (Yazdanpanah, Komendantova, Shirazi & Bayer, 2015). To radically improve the perception of its usefulness and easy usage among students, they should be able to directly witness its practical implementation which is possible through strict regulations like mandatory renewable power installations at educational institutions and government undertakings. Such promotional strategies will help convince and motivate the youth to adopt renewable energy as a promising energy alternative to fight climate change.

Limitations of the Study and Scope for Further Research

The study was conducted on a small sample of college students in a limited geographical area and hence the results cannot be generalized. The study has considered important variables in the context of analyzing adoption of renewable energy, but adopted validated measurement scales from previous studies of different countries. A comprehensive qualitative study and content analysis can be undertaken to find new variables and develop better, indigenous scales suiting Indian conditions for new valuable findings.

Also, apart from the commonly used behavioural theories like the TPB and TAM, other models like health belief model, social learning, etc. need to be explored for better understanding of adoption behaviour of renewable energy. Given these findings, future research may focus on a wider demographic profile to study differential perceptions and intentions that may help in targeting the right prospects for renewable energy technology. These small feats in research in the field of climate change and renewable energy undertaken till date can be composed to form a comprehensive archive and guide for future researchers and decision makers.

References

- Ahmad, A., Rashid, M., Omar, N. A., & Alam, S. S. (2014). Perceptions on renewable energy use in Malaysia: Mediating role of attitude. *Jurnal Pengurusan*, 41, 123-131.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50 (2), 179-211.
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, 32 (4), 665-683.
- Alam, S. S., Hashim, N. H. N., Rashid, M., Omar, N. A., Ahsan, N., & Ismail, M. D. (2014). Small-scale households' renewable energy usage intention: Theoretical development and empirical settings. *Renewable Energy*, 68, 255-263.
- Bellard, C., Bertelsmeier, C., Leadley, P., Thuiller, W., & Courchamp, F. (2012). Impacts of climate change on the future of biodiversity. *Ecology Letters*, 15 (4), 365-377.
- Ben Cheikh, A., Abdellatif, T., & Bakini, F. E. (2014). *The social acceptance of renewable energy : An approach based customer orientation*. DOI : <http://dx.doi.org/10.2139/ssrn.2583515>

- Bryman, A., & Bell, E. (2015). *Business research methods* (4th ed.) Oxford, United Kingdom: Oxford University Press.
- Claudy, M. C., Peterson, M., & O'Driscoll, A. (2013). Understanding the attitude-behavior gap for renewable energy systems using behavioral reasoning theory. *Journal of Macromarketing*, 33 (4), 273-287. DOI: 10.1177/0276146713481605
- Costello, A., Abbas, M., Allen, A., Ball, S., Bell, S., Bellamy, R., Friel, S., Groce, N., Johnson, A., Kett, M., & Lee, M. (2009). Managing the health effects of climate change. *The Lancet*, 373 (9676), 1693-1733.
- Dash, S. K., Jenamani, R. K., Kalsi, S. R., & Panda, S. K. (2007). Some evidence of climate change in twentieth-century India. *Climatic Change*, 85 (3-4), 299-321.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35 (8), 982-1003.
- Faiers, A., & Neame, C. (2006). Consumer attitudes towards domestic solar power systems. *Energy Policy*, 34 (14), 1797-1806.
- Feng, H. Y. (2012). Key factors influencing users' intentions of adopting renewable energy technologies. *Academic Research International*, 2 (2), 156-168.
- Ghorude, K. N. (2011). Electricity management in Maharashtra: An introductory exposition. *Prabandhan: Indian Journal of Management*, 4 (2), 28-33. DOI: 10.17010/pijom/2011/v4i2/62093
- Gifford, R., Kormos, C., & McIntyre, A. (2011). Behavioral dimensions of climate change: Drivers, responses, barriers, and interventions. *Wiley Interdisciplinary Reviews : Climate Change*, 2 (6), 801-827.
- Gillenson, M. L., & Sherrell, D. L. (2002). Enticing online consumers: An extended technology acceptance perspective. *Information & Management*, 39 (8), 705-719.
- Gleditsch, N. P. (2012). Whither the weather? Climate change and conflict. *Journal of Peace Research*, 49 (1), 3-9.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis* (Vol. 6). Upper Saddle River, NJ: Pearson Prentice Hall.
- Han, H., Hsu, L. T. J., & Sheu, C. (2010). Application of the theory of planned behavior to green hotel choice: Testing the effect of environmental friendly activities. *Tourism Management*, 31 (3), 325-334.
- Howell, R. A. (2011). Lights, camera... action? Altered attitudes and behaviour in response to the climate change film *The Age of Stupid*. *Global Environmental Change*, 21 (1), 177-187.
- Hsu, M. H., & Chiu, C. M. (2004). Internet self-efficacy and electronic service acceptance. *Decision Support Systems*, 38 (3), 369-381.
- Intergovernmental Panel on Climate Change (2007). *Climate change 2007: The physical science basis: Summary for policy makers*. Retrieved from <http://repository.icse.utah.edu/dspace/bitstream/123456789/9951/1/ClimateChange2007-1.pdf>
- Jackson, T. (2005). *Motivating sustainable consumption: A review of evidence on consumer behaviour and behavioural change: A report to the Sustainable Development Research Network*. Centre for Environmental Strategy, University of Surrey. Retrieved from http://www.sustainablelifestyles.ac.uk/sites/default/files/motivating_sc_final.pdf

- Karl, T.R., Melillo, J.M., & Peterson, T.C. (2009). *Global climate change impacts in the United States*. New York : Cambridge University Press.
- Kilinc, A., Stanisstreet, M., & Boyes, E. (2008). Turkish students' ideas about global warming. *International Journal of Environmental and Science Education*, 3 (2), 89-98.
- Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Delhi: New Age International.
- Krishna Murthy, I. (2012). A causal study between electricity consumption and CO2 emissions in India. *Prabandhan: Indian Journal of Management*, 5 (7), 43-52. DOI: 10.17010/pijom/2012/v5i7/60235
- Kutner, M. H. (1996). *Applied linear statistical models* (Vol. 4). Chicago: Irwin.
- Mehta, J. F. (2010). Economic development and climate change-An Indian perspective. *Prabandhan: Indian Journal of Management*, 3 (2), 16-18. DOI: 10.17010/pijom/2010/v3i2/61010
- Memar, N., & Ahmed, S. A. (2012). *Determinants which influence the consumers' green purchasing intention* (Master's Thesis). Mälardalen University, Västerås, Sweden. Retrieved from <http://www.diva-portal.org/smash/get/diva2:538647/FULLTEXT01.pdf>
- Mercom Capital Group. (2011). *India renewable energy awareness survey*. Retrieved from: <http://mercomcapital.com/MercomIndiaREAwarenessSurvey.pdf>
- Mirza, U. K., Ahmad, N., Harijan, K., & Majeed, T. (2009). Identifying and addressing barriers to renewable energy development in Pakistan. *Renewable and Sustainable Energy Reviews*, 13 (4), 927-931.
- Nunnally, J. (1978). *Psychometric theory*. New York: McGraw-Hill.
- Pandve, H. T., Deshmukh, P. R., Pandve, R. T., & Patil, N. R. (2009). Role of youth in combating climate change. *Indian Journal of Occupational and Environmental Medicine*, 13 (2), 105. DOI: 10.4103/0019-5278.55130
- Pavlou, P. A., & Fygenson, M. (2006). Understanding and predicting electronic commerce adoption: An extension of the theory of planned behavior. *MIS Quarterly*, 30 (1), 115-143.
- Peattie, K. (2010). Green consumption: Behavior and norms. *Annual Review of Environment and Resources*, 35 (1), 195-228.
- Press, M., & Arnould, E. J. (2009). Constraints on sustainable energy consumption: Market system and public policy challenges and opportunities. *Journal of Public Policy & Marketing*, 28 (1), 102-113.
- Rayner, S., & Malone, E. L. (1998). *Human choice and climate change: An international assessment*. Columbus, OH: Battelle Press.
- Rezai, G., Teng, P. K., Mohamed, Z., & Shamsudin, M. N. (2013). Going green: Survey of perceptions and intentions among Malaysian consumers. *International Business and Management*, 6 (1), 104-112.
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.) New York: Free Press.
- Santos, J. R. A. (1999). Cronbach's alpha: A tool for assessing the reliability of scales. *Journal of Extension*, 37 (2), 1-5.
- Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students* (5th ed.) Harlow, Essex: Pearson Education.

- Sharma, M., & Petosa, R. L. (2012). *Measurement and evaluation for health educators*. Burlington, MA: Jones & Bartlett Publishers.
- Sidiras, D. K., & Koukios, E. G. (2004). Solar systems diffusion in local markets. *Energy Policy*, 32 (18), 2007-2018.
- Tara, K., & Singh, S. (2014). Green banking: An approach towards environmental management. *Prabandhan: Indian Journal of Management*, 7 (11), 7-20. DOI: 10.17010/pijom/2014/v7i11/59258
- TSP Data Portal. (2010). *GHG emissions across sectors 2010*. Retrieved from <http://www.tsp-data-portal.org/TOP-20-emitter-by-sector#tspQvChart>
- Venkatraman, M., & Sheeba, M. U. (2014). A study on customer's attitude towards solar energy devices. *International Research Journal of Business and Management*, 5, 53-57.
- Whitmarsh, L. (2009). Behavioural responses to climate change: Asymmetry of intentions and impacts. *Journal of Environmental Psychology*, 29 (1), 13-23.
- Wüstenhagen, R., Wolsink, M., & Bürer, M. J. (2007). Social acceptance of renewable energy innovation: An introduction to the concept. *Energy Policy*, 35 (5), 2683-2691.
- Yazdanpanah, M., Komendantova, N., Shirazi, Z. N., & Bayer, J. L. B. (2015). Green or in between? Examining youth perceptions of renewable energy in Iran. *Energy Research & Social Science*, 8, 78-85.