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Pro-Environmental Behaviors and Ecological Responsibilities: An Evaluation of Pakistani University Students' Behavioral Intentions towards Climate Change

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Abstract

Rapid and devastating changes in climate and environment have affected individuals from all around the globe to indulge in climate change mitigation and adaptation. The aim of this research is to evaluate the role of students in climate change mitigation and adaptation by analyzing their behavioral intentions. We incorporated the theory of planned behavior in evaluating the environmental knowledge among university students in Pakistan. The results implicated that the attitudes, societal norms and perceived behavioral control contributes significantly in an individual's pro-environmental behavioral intentions. Additionally, education was found to be contributing merely in building attitudes towards pro-environmental behaviors. However the societal norms and individual's perceived behavioral control were found to be less influenced by the educational background of individuals.

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This research provides strategic policy suggestions in face of formulating encouraging engagement in deliberative discussions, interaction with scientists, and formulation of community projects to induce education, resources and opportunities which can be beneficial in changing behaviors of individuals on a larger scale in society.

Keywords: Behavioral Intentions; Climate Change; Education; Pro-Environmental Behaviors; Policies.

1. Introduction

Environmental, climatic and ecological issues are a growing concern in the field of socio-scientific research. Therefore, research in these areas cannot exclusively be focused on acquisition of environmental knowledge, since sole focus on environmental education has caused increasing gap between knowledge and action [1,2,3,4]. There has been a significant amount of studies which tried to fill the gap between environmental knowledge and pro-environment actions. Some of the studies have focused largely on students' role in environmental crisis and expressed specific interest in promoting students as problem-solvers of environmental [5,6,7,8,9,10].

In order to promote sustainable lifestyle and develop environmental consciousness, it is of paramount importance that actions are taken, pro-environmental actions nonetheless. Environmental degradation and changes in climate have been labelled as one of the nine primary dangers to our planet with potentially irretrievable consequences [11]. There is a call for major changes in behavior and lifestyle on not just national and institutional level but individual level as well. The mitigation and adaptation of climate change is not a simple task, and it involves development of strategic ways through the means of students [12,13,14,15,16,17,18], specifically raising the intention towards pro-environment actions. However, majority of the research has been concentrated on middle and high school students with rudimentary environmental knowledge, leaving a wide gap on evaluating the impact of university students' on climate change adaptation and mitigation. There is scant research on investigating the role of students in developing methods, approaches and strategies in mitigating and adapting to climate change and environmental degradation.

This research evaluates the university students from several institutes in Pakistan. The reason for choosing Pakistan as the base of this research is that Pakistan is one of the top ten countries severely influenced by climate change and environmental degradation. As the development of industry is rising, the effects of climate change has increased in Pakistan in the past decade [19]. Pakistan's population is ranked sixth in the world, whereas it is the 36th largest country. The congestion in the country is forcing urban development which is also causing climate change and environmental degradation [20].

An evaluation of the scientifically literate population is essential for development of innovative methods and techniques in socio-scientific area of research. This population is expected to make improved and influential assessments about their consumption, utilization, disposition, and investment [21]. Professional education has always played a key role in the world, specifically in underdeveloped countries. The universities can have a crucial and vital contribution in cultivating student's mindset in perceptions about climate change and environmental degradation. It is safe to assume that a large sum of students currently enrolled in the universities

belong to “climate change generation”. The generation, which had access to extensive information through digital networks, is still lacking scientific certainty about principles of climate change and environment degradation [22,23,24]. Most of the previous literature has been focused on developed countries such as US, UK and Germany [16,18,25]. The findings of most of these studies indicated that there is a wide range of misbeliefs and misunderstandings related to basic climate change knowledge and concerns.

Since climate change and environmental degradation is a rising concern and holds significant theoretical and practical implications, misconceptions about these issues is worrisome. The present crop of students enrolled in universities will be the legislators and policymakers of the future and will require to make complex and influential decisions about climate change mitigation and adaptation. Therefore, the role of university students in climate change mitigation and adaptation has never been more important. Previous studies indicate a higher percentage of misconceptions regarding climatic changes, its causes and effects [26,27,28]. These misconceptions and lack of environmental knowledge causes variations in behavioral intentions towards pro-environmental actions. The students are required to gain fundamental knowledge about the progressiveness of environmental degradation, concerns related to climate change, attitudes towards mitigation, and approaches for adaptation of climate change [18].

The main objective of this research is to evaluate the level of perceived knowledge of climate change and environmental degradation among university students. In order to achieve said objective, an analysis of behavioral intentions of students is necessary. The intentions towards specific behaviors are associated generally with attitudes, beliefs, societal norms, subjective norms, perceived control, moral obligations, and various personality traits [29,30]. Since students are the key contributors in the development of a country, the research employs various means to determine their role in climate change mitigation and/or adaptation. This research will examine the role of education and environmental knowledge in conducting pro-environmental actions. In order to accomplish research objectives, this research will evaluate the attitudes and beliefs, societal norms and sense of perceived control according to basic environmental knowledge. Subsequently, research will suggest several methods, strategic techniques, and policies which can facilitate an increase in the behavioral intentions of university students towards climate change mitigation and/or adaptation.

2. Fundamentals of Climate Change and Theoretical Background

The world has seen numerous effects of climate change over the past decades including temperature rise, health problems, lifestyle alteration, resource scarcity, and irregular weather pattern [31]. With the acceleration of these effects, a change in individual behavior is crucial. Understanding the environmental knowledge of students can be an indicator of possible strategic policies which lead to pro-environmental actions. There is a need for strategic measures and policy implications in order to provide the country with mitigation and adaptation solutions. Extant literature has indicated various emitters of harmful gases which are causing change in climate, depletion of ozone layer, and environmental degradation. Pollution form transport and logistics, misuse of energy resources, overgrazing, urban expansion, and industrial waste management has been cited as a leading cause of climate change [32,33,34].

Transportation is one of the leading causes of climate change and environment degradation. Pollution and emissions of harmful gases from transport are increasing annually [35]. In many countries, it is perceived that transportation is the leading cause of pollution and in turn causes climate change. The foremost concern in developing and underdeveloped countries is harmful emissions from road traffic [36]. As a country's foremost goal is economic development, lack of importance and implementation of adequate rules and regulations has created an impact over the climate [37]. The impact of industrial development in residential areas and smaller cities not just indicates lack of planning and management from municipal authorities, but also signifies the monetary losses, health problems and environmental effects [38].

Similar to urban expansion and development, the depletion of natural resources and misuse of energy sources throughout the world has been linked with annual elevation of temperature, steady rise in water levels and irregular weather patterns [39]. The mutation of ecosystem and biodiversity was found to be the prime effects of over usage of natural resources [13,40]. The improper management of waste significantly contribute in environmental degradation as well. The carbon footprints left through the development of infrastructure of urban areas, and the lack of attention towards rural areas has led to amplified waste disposal into urban regions [18]. The population shift has indirectly been causing improper management of resources, as well as, improper waste management which has prominently been labelled as a contributor of climate change [41,42].

2.1. Theoretical Background

In order to evaluate and understand the influence of students on environmental solutions, their intentions towards action must be discussed. Theory of planned behavior (TBP) expresses the relation between beliefs and attitudes which leads to desired action. In previous studies, TPB has been implemented into healthcare and medical sector largely [30]. In the field of education and environmental studies, this theory has been subject of mere few studies [43]. The current research tries to evaluate the process of pro-environment behaviors exercised by university students and propose several strategic policies which can aid in increases pro-environment behaviors.

The theory of planned behavior (TBP) elucidates that individuals themselves control their behavior and attitudes, whereas societal/subjective norms and perceived control determine their behavioral intentions. According to Ajzen (1985), theory of planned behavior can convincingly be associated with any rational behavior of the individuals. Hence, the behavioral intentions are dependent upon internal factors (e.g. psychology) and external factors (e.g. environment) [44].

Attitudes can be defined as psychological evaluation of set of beliefs towards certain behavior and depending on individual's emotions and beliefs, can either be positive or negative [45]. Attitudes towards certain behaviors tend to express possible outcomes and consequences of said behaviors [29]. There is a positive correlation between attitudes towards pro-environmental behaviors and pro-environmental actions [46] which means that if an individual has a positive attitude towards taking actions against climate change and environmental degradation then the individual is more likely to perform pro-environmental actions.

Subjective/societal norms can be defined as socially understood customs towards certain behavior. The norms can be a motivator in indulging towards certain behaviors in accordance with the society and culturally accepted behaviors [45]. Subjective norms express willingness of individuals to perform actions depending upon the behaviors of individuals that are important to him/her. However, societal norms indicate the widely understood traditions and behaviors of individuals in relation to certain behaviors [47]. There is a significant influence of societal norms and pressure upon pro-environmental actions [48] which means that the behavior of an individual is dependent over the collective behavioral intentions and pro-environmental actions.

Perceived behavioral control can be defined as an individual's knowledge and actionable belief towards certain behavior. An individual's behavior and intention towards certain actions is derived from an understanding of the behavior and probable solution in face of resources and opportunities [44]. Perceived behavioral control was included in TPB since it undertakes the possible outcomes of the behavior. It explicitly measures the resources and opportunities required to perform certain behavior [29]. The behavior of an individual is stated to be dependent upon behavioral intentions, and perceived behavioral control has a strong impact over behavioral intentions. This behavioral control of an individual is an important construct when evaluating pro-environmental actions [49] which means that in order to fully understand the individual's behaviors towards pro-environmental actions, assessment of perceived behavioral control is essential.

The framework of theory of planned behavior (TBP) provides an explanation of the intentions of an individual through the assessment of behavior (attitudes), the societal influence of the behavior (norms), and the actionable knowledge of the behavior (control). The TPB model perfectly examines the behavioral intentions which can lead to pro-environmental actions. The conceptual model of TPB is displayed in Figure 1.

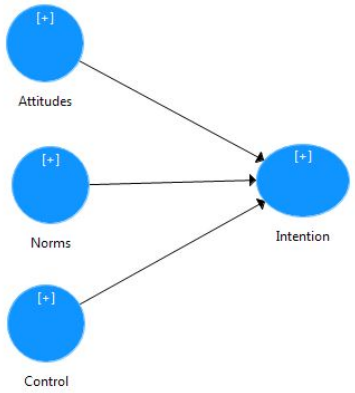

Figure 1: The model of theory of planned behavior [29]

3. Research Methodology

The present research can be divided into two components. Firstly, the perceived environmental knowledge of university students is analyzed through the incorporation of TPB model. According to Husssain and his colleagues (2018), the factors that are strongly influencing climate change in Pakistan are transportation, industrialization, urbanization, energy, waste, agriculture, forestry, and livestock [34]. The behavioral intentions

of university students in Pakistan are deeply incorporated with the elementary environmental knowledge. An assessment of environmental knowledge with attitudes, norms and control towards pro-environmental behaviors will present the current situation of environmental knowledge among university students. Lastly, from the evaluated and presented situation of environmental knowledge, some strategic methods and policies will be suggested which can accelerate the expansion of environmental knowledge across the country. The strategic methods and policies can be a constructive tool for policymakers for further development of climate change mitigation/adaptation techniques.

3.1. Sampling and Data Collection

This research will take advantage of both, primary and secondary data for a dense evaluation of climate change. The primary research was conducted through a questionnaire-based survey which was generated through widely available online tool (i.e., GoogleForms) while staying in accordance with the principles (relevance, logic, clarity, and non-induction) of survey-design by Savita, Dominic and Ramayah (2016) [50]. The focus of the questionnaire was to understand and determine the level of environmental knowledge of university students through understanding the effects and causes. The behavioral intentions were evaluated through attitudes, norms, and control over environmental knowledge. As for secondary research, online viable and relatable data was used with the help of Web of Science, Science Direct, Google Scholar, and USTC's online library in order to attain previous literature over climate change and environmental issues. The study originally targeted 1,500 university students from all major provinces and regions across Pakistan. A pilot study was conducted with the efforts of lab mates which included 25 students consisting of undergraduate students, graduate students, doctoral candidates and postdoc researchers. The aim of conducting a pilot study was to determine the relevancy and adequacy of the research. Out of the originally sent 1,500 questionnaires, 381 were rejected on the basis of lack of completion, falsifying answers and lack of motivation. The remaining 1,119 responses were evaluated to achieve research objectives and their demographic statistics are presented in Figure 2.

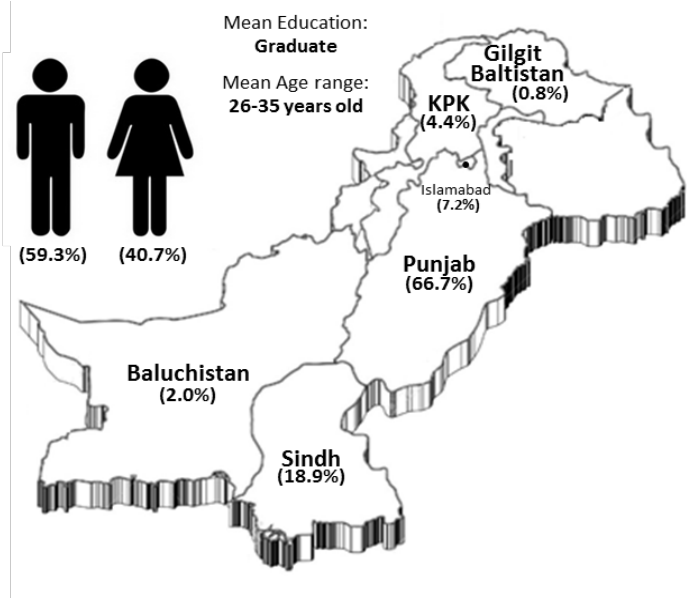

Figure 2: Classifications of demographic sample

3.2. Research Measurements and Tools

This research adapted a quantitative approach with deductive reasoning in evaluating the pro-environmental behavioral intentions. To conduct structural modeling and evaluate the role of latent variables (i.e., attitude, norms, and control), data was analyzed through Structural Equation Modeling (SEM) with SmartPLS 3. The SEM model analyses directional (regression) and unidirectional (correlation) relationships between latent variables and a set of indicators [51,52]. Whereas to evaluate the relationship between level of education and latent variables, the data was analyzed through IBM SPSS 22. Other analysis included frequency and descriptive analysis, reliability analysis, and regression analysis.

The authors analyzed the pre-defined constructs of behavioral intentions in accordance with the climate change and environmental prospect. Previously conducted studies have identified unique methods to evaluate the behavioral intentions towards pro-environmental behaviors [30,43,51,53]. The constructs of attitude, norms, and control were expressed in terms of basic environmental knowledge of various factors influencing climate change [34]. The attitude based statements referred to basic understanding of climate change phenomenon. The norms based statements referred to current situation of climate change in the country. The control based statements referred to possible actions against climate change. The behavioral intentions conveyed the message about responsibility of taking actions against climate change. The list of constructs and their measurement questions are shown in Table S1.

4. Data Analysis & Results

4.1. Demographic Samples

Pakistan is an underdeveloped country with a threat of rising population. Currently, Pakistan stands sixth in world's most populous countries and the growth rate is accelerating annually [54]. The climate change effects experienced by the population in Pakistan are severe and increasing gradually. Since the target sample of the research was university students, over 66% of the sample was from Punjab province (the most populous province in the country). Similarly, 19% from Sindh, 7% from the capital Islamabad, and remaining 8% from other provinces including Khyber Pakhtunkhwa, Baluchistan and Gilgit Baltistan.

The majority of respondents belonged to the age group of 15-25 years old which contributed to approximately 69% of the total sample.

The second largest age group with a percentage of 21% belonged to 26-35 years old age bracket. The statistical analysis of education level indicated that 60% of the respondents were graduate students, 24% were postgraduate students and around 12% passed high school.

The remaining 4% of the respondents expressed that they either acquired technical education, basic primary education or no formal education at all. Further, there were 59% of male respondents and 41% female respondents that took part in this research. The complete frequency statistical results are mentioned in Table 1.

Table 1: Demographic sample profiles of respondents

Variable	Type	Number (n)	Percentage (%)	Mean	Std. Dev.
Area				**1.73**	**1.396**
	Punjab	746	66.7%		
	Sindh	212	18.9%		
	Khyber Pakhtunkhwa	49	4.4%		
	Baluchistan	22	2.0%		
	Gilgit Baltistan	9	0.8%		
	Islamabad	81	7.2%		
Age				**2.44**	**0.900**
	Below 15	7	0.6%		
	15 – 25	781	69.8%		
	26 – 35	235	21.0%		
	36 – 45	60	5.4%		
	46 – 55	12	1.1%		
	56 – 65	12	1.1%		
	66 – 75	8	0.7%		
	Above 75	4	0.4%		
Education				**4.12**	**0.706**
	None	8	0.7%		
	Primary	5	0.4%		
	Intermediate	139	12.4%		
	Graduate	672	60.1%		
	Postgraduate	279	24.9%		
	Technical	16	1.4%		
Gender				**1.41**	**0.491**
	Male	664	59.3%		
	Female	455	40.7%		

4.2. Environmental Knowledge Assessment

The environmental knowledge among the respondents was accessed through investigating basic environmental

awareness, importance, and knowledge situation. This research conducted environmental knowledge assessment was conducted by examining environmental education background among respondents, change in weather pattern observation, pro-environmental action background, and placing importance towards climate change and environmental issues (Figure 3). The results indicated that over 62% of the students have never received any formal education of climate change issues, whereas merely a 37% of students were part of environmental education programs. The findings indicated that approximately 74% of the students have observed continuous and accelerating changes in weather pattern remaining 26% did not discern any major change in weather pattern. Around 73% of the students have never taken necessary actions to fight against climate change while merely 27% of the students have indulged in pro-environmental actions. The findings reveal that 63% of the sample believed that climate change is an extremely important issue, 26% reported climate change as an important issue, 6% expressed that climate change is an unimportant issue, whereas 5% were inconclusive about climate change importance.

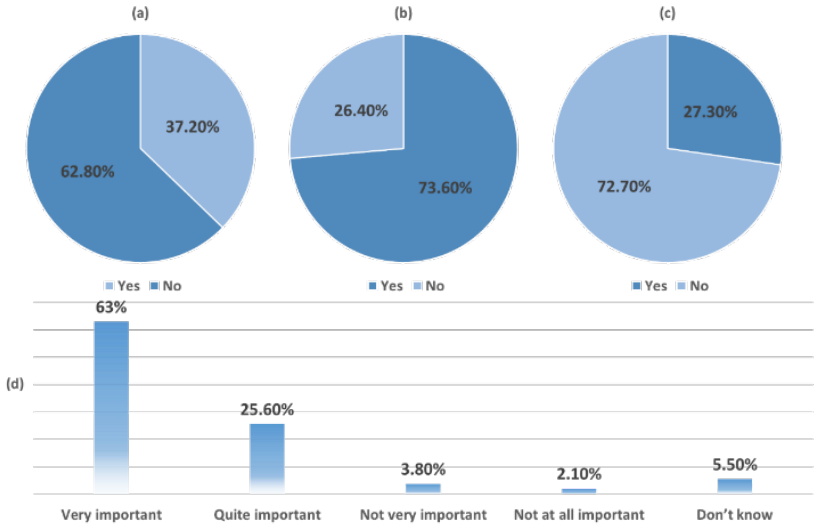

Figure 3: Assessment of environmental knowledge background; (a) Have you ever studied environment or any other related field; (b) Do you feel that the pattern of weather is generally changing year by year?; (c) Have you ever taken, or do you regularly take, any action out of concern for climate change?; (d) Have you ever taken, or do you regularly take, any action out of concern for climate change

4.3. Structural Model Analysis

This research primarily investigated the structural power of TPB framework in order to evaluate the pro-environmental knowledge and behaviors of students. The structural analysis shown in Table 2 explains the overall statistical model measurements to achieve best relevance towards the research objectives. The structural model analysis was conducted through SmartPLS bootstrapping mechanism to define the path coefficients (T-value) and significance (P-value) of the model. According to Hair and his colleagues the ideal p-value for achieving a high significance is 0.01 or below, a medium significance is 0.05 or below, and a low significance is 0.1 or below. Nonetheless, a positive t-value indicates a positive relation and negative specifies a negative relation [55]. Furthermore, in order to test that there is no multicollinearity issue, the value of variance inflation

factor (VIF) was calculated. The optimal value of VIF is estimated to be 5 or smaller [56].

Table 2: Path coefficients of TPB structural model

Variables	Std. Dev.	T-value	P-value	VIF
Attitudes -> Intentions	0.038	1.73	0.084*	2.010
Norms -> Intentions	0.041	2.97	0.003***	1.729
Control -> Intentions	0.036	1.89	0.058*	2.120

(*p<0.1; **p<0.05; ***p<0.01)

The results obtained from structural model analysis implicated a direct and positive relation between the four variables. The attitudes of an individual contributed positively towards individuals' intentions of conducting pro-environmental behaviors (p=0.084, t=1.73). Similarly, the societal norms around the individual had a positive contribution in pro-environmental behaviors (p=0.003, t=2.97).

The perceived control of individuals contributed confidently towards individuals' intentions towards pro-environmental behaviors (p=0.058, t=1.89). This means that attitudes, norms and control of individuals' can certainty wield an influence upon their ability to indulge in pro-environmental behaviors and take actions themselves which can aid in climate change mitigation and/or adaptation.

4.4. Measurement Model

In order to achieve optimal quality of measurement data, various tests were applied to evaluate the validity and mode-fit of the data as shown in Table 3. Understanding the quality, appropriateness, and explanatory power of measurement model can be an adequate way of calculating fitness of data [57].

The acceptability of model fits and reliability of the data can be expressed further more through these indicators: (1) Cronbach Alpha, to test the overall reliability and validity of the variables. The recommended value of cronbach alpha is estimated to be 0.7 or greater [58]. (2) Rho_A, to calculate the correlation between variables. The value of rho_a is estimated to be between +1 (positive correlation) to -1 (negative correlation), with value of 0 indicating no correlation [59]. (3) Composite Reliability (CR), to measure the reliability of the model. The recommended value of composite reliability is estimated to be 0.9 or greater [56]. (4) Average Variance (AVE), to estimate the validity of the model.

The recommended value of average variance is estimated to be 0.5 or greater [56]. (5) Normed-fit Index (NFI), to determine the model fitness. The recommended value of normed-fit index is estimated to be between 0 (unfit completely) and 1 (ideally fit) [60]. And (6) Standardized Root Mean Square Residual (SRMR), to express the goodness-of-fit of the model. The recommended value of SRMR is estimated to be 0.8 or smaller [61].

Table 3: Fit indices of measurement model

Measurements	Values
Cronbach's Alpha (α)	0.865
Rho_A (r_s)	0.899
Composite Reliability (CR)	0.888
Average Variance (AVE)	0.535
Normed-fit Index (NFI)	0.832
Standardized Root Mean Square Residual (SRMR)	0.085

Since the structural integrity of TPB model is satisfied, we can express that the constructs and latent variables presented in this research are valid and are existent in nature. Yet evaluating the significance of education over the behavioral intentions requires analyzing path coefficients of education related to attitudes, norms and control variables.

4.5. Impact of Education on TBP constructs

4.5.1. Pro-Environmental Attitudes and Impact of Educational Background

The findings of pro-environmental attitudes revealed that approximately 62%-69% respondents agreed that urbanization is the leading cause of climate change, urban development is causing agricultural devastations, urban transport is causing environmental degradation, migration to urban areas lead to resource imbalance, and unplanned industrial expansion causes changes in climate. On the contrary, nearly 13%-16% disagreed to these facts whereas almost 17%-25% of the respondents remained neutral. The detailed evaluation of pro-environmental attitudes are presented in Figure 4.

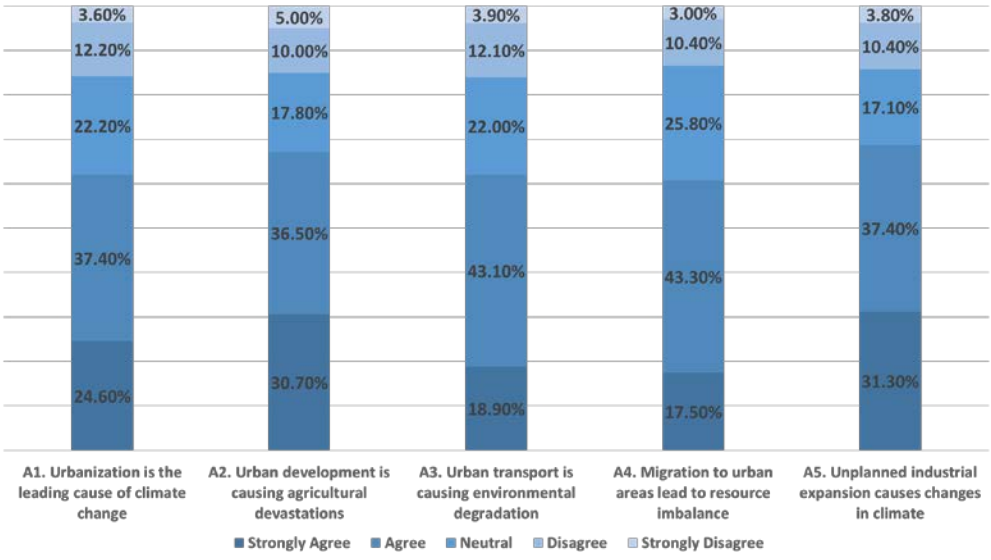

Figure 4: Evaluation of pro-environmental attitudes

With the aim of assessing the impact of educational background over pro-environmental attitudes, the research incorporated bootstrapping and results of education's impact over attitudes towards pro-environmental behaviors indicate that the attitudes of an individual are positively related with higher education. According to Table S2, out of the five measurement constructs used to explain pro-environmental attitudes, three (A1, A2, and A3) were highly significant and exerted a positive impact over the attitudes (p=0.003, t=2.897; p=0.004, t=2.824; and p=0.008, t=2.632 respectively). The remaining two (A4 and A5) indicted a low significant impact over individual's pro-environmental attitudes (p=0.069, t=1.815; and p=0.061, t=1.870 respectively).

4.5.2. Societal Norms and Impact of Educational Background

The findings of climate change societal norms revealed that around 54%-75% respondents agreed that transport and climate change awareness is lacking, forest reduction is triggering temperature elevation, deforestation is harming cities and villages alike, eco-friendly energy appliances are required, and agricultural damages are due to lack of knowledge and literacy. Conversely, almost 11%-19% disagreed to these facts whereas about 14%-26% of the respondents remained neutral. The detailed evaluation of climate change societal norms are displayed in Figure 5.

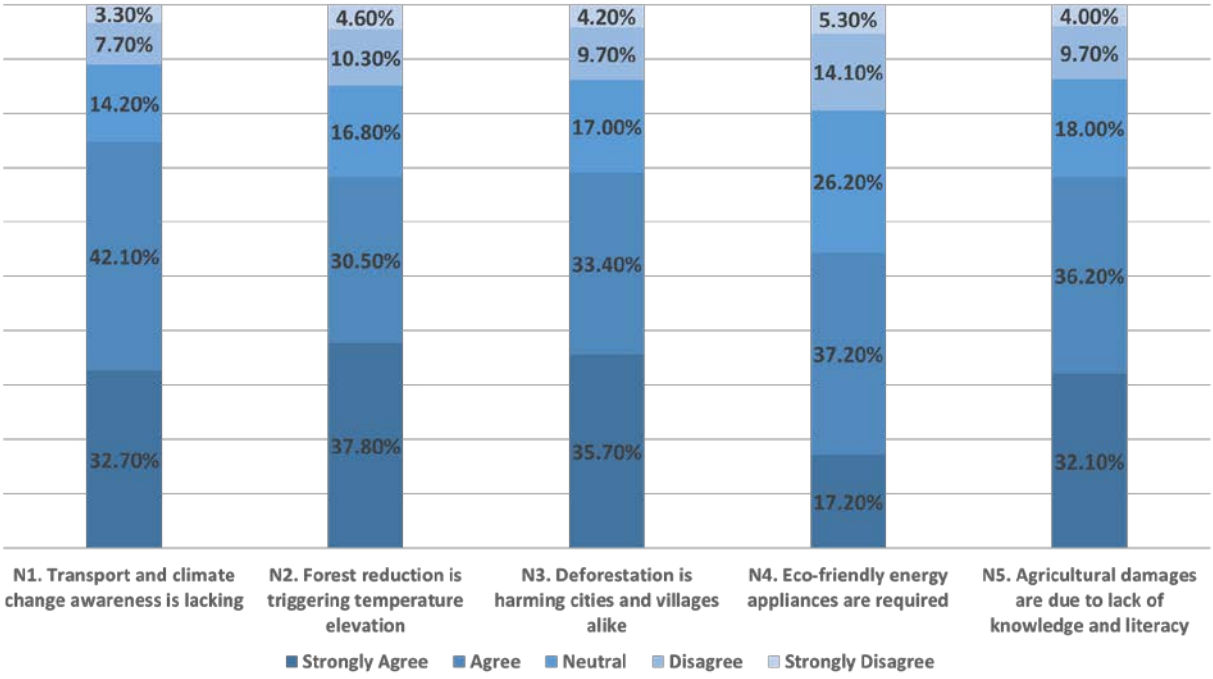

Figure 5: Evaluation of climate change societal norms

In order to measure the impact of educational background over societal norms, the research adopted bootstrapping and the statistical results of education's impact over societal norms towards pro-environmental behaviors indicate that the societal norms around the individuals are positively related with higher education. However all five constructs did not exert a significant correlation, according to Table S3, out of the five measurement constructs used to explain pro-environmental norms, only one (N1) was moderately significant and exerted a positive impact over the norms (p=0.040, t=2.057). Another construct (N4) displayed a low

significant impact over individual's pro-environmental norms (p=0.061, t=1.874). The remaining constructs of societal norms surrounding an individual were deemed as not significant towards pro-environmental behaviors.

4.5.3. Perceived Behavioral Control and Impact of Educational Background

The findings of perceived behavioral control revealed that about 66%-68% respondents agreed that green belts should be preserved and protected, environment friendly practices and techniques should be adopted, necessary plantation regulations should be implemented, industries should be outbound of residential areas, and fossil fuel consuming vehicles should be reduced. In contrast, around 14%-16% disagreed to these facts whereas approximately 17%-20% of the respondents remained neutral. The detailed evaluation of perceived behavioral control are presented in Figure 6.

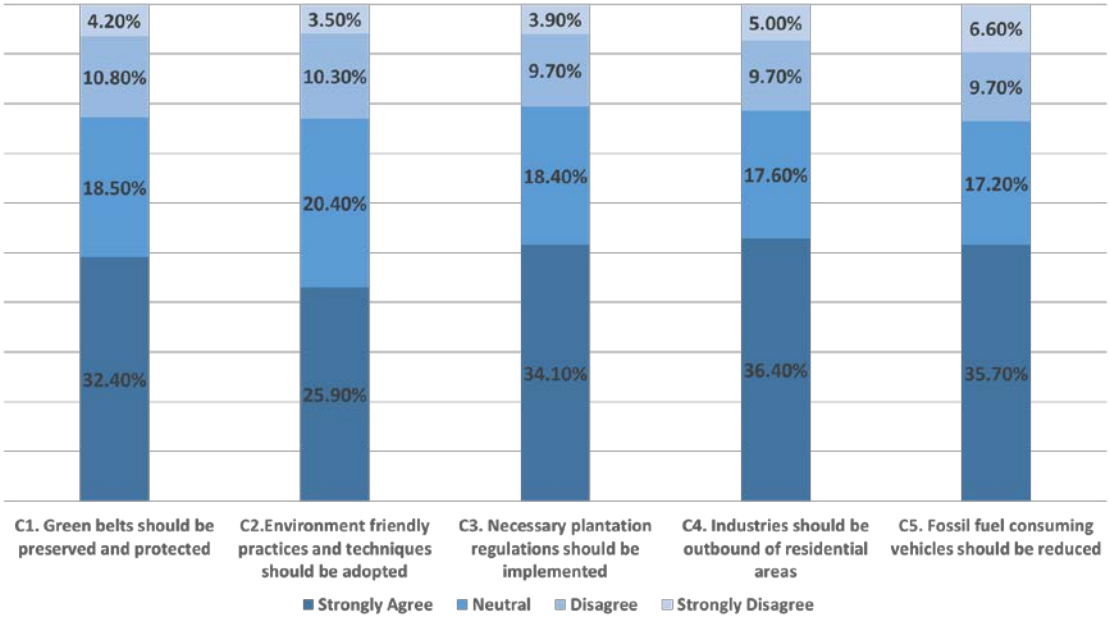

Figure 6: Evaluation of perceived behavioral control

With the purpose of measuring the impact of educational background over perceived behavioral control, the research implemented bootstrapping and he statistical results of education's impact over perceived behavioral control towards pro-environmental behaviors indicate that the individual's perceived control positively related with higher education as well. Even though all five constructs did not reveal a significant correlation, according to Table S4, out of the five measurement constructs to explain pro-environmental control, only one (C4) was exceedingly significant and employed a positive impact over the control (p=0.007, t=2.694). Additional constructs (C1) exhibited a low significant impact over individual's pro-environmental control (p=0.065, t=1.843). The remaining constructs of perceived control of an individual were estimated to be not significant towards pro-environmental behaviors.

5. Discussion & Conclusion

The statistical results of this empirical study lend a verification from framework of TPB for evaluating and

analyzing university student's behaviors and intentions towards climate change and pro-environmental actions as majority of the students have never taken actions concerning climate change (Figure 3). The research signifies that the behavioral intentions of an individual is enrooted in the attitudes of the individual, the societal norms surrounding them, and the level of perceived control they tend to believe they have [29]. We conducted research towards evaluating the said behavioral intentions of students in combating climatic and environmental issues. The purpose of evaluation of behavioral intentions was to determine the impact of education on individuals' behavior and intention. The findings of structural model presented in Table 2 align with the model presented in existing literature [30,43,51,53]. Our theoretical model signifies that the attitudes of university students of Pakistan are completely related to their education (Table S2). However, the findings also revealed that the level of education plays a small role in the societal norms and their perceived behavioral control of pro-environmental behaviors (Table S3 & Table S4). This research aimed at evaluating the impact of level of education and knowledge over pro-environmental behaviors, the findings and results align promptly with the research objectives.

Education plays a vital and substantial role in a country's economic and industrial development but our findings revealed that majority of the students never received any form of environmental education which results in lack of awareness (Figure 3). However, this development comes at a cost of global climate change and numerous countries have initiated programs, grants, and projects to emphasize the need of educating the population on global climate change [40]. In order to understand the effects of education and knowledge over behavioral intentions of students, an evaluation utilizing the TPB framework was required. The present research contributed in evaluating the level of pro-environmental knowledge and education of university students through analyzing their behaviors and intentions. The results indicate that the attitudes of students are most effected by their education and understanding of climatic issues (Table S2) since climate change issue is of a personal importance to majority of the students (Figure 3). The fundamental method of conveying knowledge about environment friendly activities and actions is through intervention in higher education [18]. The results also exerted that attitudes of students towards climate change are built upon basic environmental knowledge. However, the knowledge based on remedial work in shape of climate change mitigation and adaptation does not seems to be extensive. A large population (society) has minimal environmental knowledge or resources to gain said knowledge. The fact that there is a lack of environmental knowledge and awareness despite a change in weather pattern and trend (Figure 3), is extracted from the results where education does not have a strong and significant impact over societal norms and individual's perception of mitigation and adaptation approaches (Table S3 & Table S4).

There can be several reasons behind the lack of education's impact over the normal behavioral in the society such as lack of initiatives, motivation and/or resources available. However, some individuals have a tendency to not contribute in societal norms and bare fruits of labor of other individuals surrounding those [62]. There is a gap between higher knowledge of individuals and the societal norms towards certain behaviors which can be reduced through strategic management of resources and formation of environmental educational policies. Similarly, the absence of education's impact over perceived control of individuals can be based upon the diversity of the society and the societal limitations over them. The perceived behavioral control of an individual can be expressed as the least significant contributing factor towards behavioral intentions [63]. Since not all the

individuals have the same resources, mindset, and opportunities to exert same behavior, the lack of education's impact over individual's perceived control can be understood.

According to the results (Table 3), raising climate change awareness, spreading environmental knowledge and education can provide the mechanisms which can contribute directly to individual's pro-environmental actions. There is a need to predispose the environmental knowledge and awareness among university students since higher education contributes significantly in determining individual's behavioral intentions. From the results, we can summarize that knowledge has contributed at an extensive rate in building pro-environmental attitude. Therefore, in order to raise the wide scale intentions of individuals in the society, i.e. societal norms, and to provide enough resources and opportunities to every individual in the society, i.e. perceived behavioral control, strategic techniques and policies are necessary. The policymakers can utilize the behavioral intentions to form strategic methods which can contribute directly towards fighting climate change.

6. Strategic Suggestions

There are several programs and activities that address and encourage raising beliefs, attitudes, and knowledge about environmental degradation. These programs are aimed at developing essential skills (scientific and social alike) that can be effective in climate change mitigation and adaptation [64]. A program initiated by UNESCO named Climate Change Education for sustainable Development program aims at understanding and evaluating the impacts of climate change in the world and various methods to inspire and encourage changing individual's attitudes and behaviors towards climate change mitigation and adaptation [65]. The current research provides three strategic suggestions which can be utilized by policymakers to form regulations and policies which can directly be aimed at pro-environmental actions. These suggestions include:

(1) Engagement in deliberative discussions

One way of raising climate change knowledge and awareness, and promote pro-environmental actions is through engagement in brainstorming, discussions, conversations and idea sharing between learners of all kind. This method can be utilized in developing deeper understanding, familiarizing with basic concepts, and building social comparisons of climatic situation around the globe. The development of a compulsory course from graduate level with the primary focus on socio-scientific literacy and critique of various global arguments based on environmental degradation is essential. Previous research claimed that students respond strongly when programs were enriched with dense arguments and comparisons and can prove to be an effective tool for student's engagement in global [66]. In order to impact a wide and diverse population towards pro-environmental behaviors, the compulsory course should attract learners from various demographics with the aim of producing productive discussions and encouraging diverse viewpoints. The three most important factors in influencing the pro-environmental mindset of individuals are respecting diverse viewpoints, exchanging information, and learning from other's experiences [67]. Therefore, the compulsory course can influence a wider population and lead towards developing pro-environmental and climate conscious societal norms.

(2) Interaction and collaboration with scientists

The application of information technology and climatic data has proved vital in increasing public environmental knowledge. Academic and interactive sessions with environmentalists, climate change professionals and scientists that promote collaboration between experts and learners is crucial. The interactive sessions can be a means toward conveying scientific knowledge, understanding various measurement methods, building relationships and hypotheses, and discussing future implications [68]. This process of learning can be much influential with laboratories and site visits in order to transfer authentic knowledge and build motivation to change behaviors. In order to promote pro-environmental actions, development of geo-informative applications and public climatic change monitors can further influence the population [69]. These technological tools should be presented in the academic and interactive sessions with the aim of educating individuals to take pro-environmental actions. Therefore, the academic and interactive sessions can establish and develop student's awareness of mitigation and adaptation behaviors, thus raising the perceived behavioral control of individuals.

(3) Implementation of community projects

The establishment of activities and projects outside of classroom as a part of educational intervention will provide learners and contributors to experience issues that are globally challenging. Since these projects are outside the bounds of a classroom setting, they provide extensive opportunities for the population to get involved whereas students can apply their environmental knowledge with real-life situations. The projects involving multi-destination research can provide the members to interact with experts and community members of various regions and engage in advanced learning. The effectiveness of these learning mechanisms can be analyzed and evaluated in order to introduce them in home regions [70].

Even though multi-national projects exert higher influence, the initiation of community projects can build social action awareness among students and provide them with resources and opportunities to perform pro-environmental actions and exercise their leadership skills in practical world.

These projects can involve persuading individuals towards pro-environmental behaviors through production of videos, billboards, and media programs which relay awareness and knowledge about ecological responsibilities of individuals and impacts of their behaviors on the environment [71]. Therefore, community projects can elevate the attitudes and perceived control behavior of the individuals in community through empowering them to develop, plan, and execute environment friendly activities.

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References

[1] Rajecki, D. W. (1982). Attitudes: Themes and advances. Sunderland, MA: Sinnauer.

[2] Posch, P. (1993). Research issues in environmental education. Studies in Science Education, 21, 21–48.

[3] Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behaviour? Environmental Education Research, 8(3), 239–260.

[4] Grace, M. M., & Ratcliffe, M. (2002). The science and values that young people draw upon to make decision about biological conservation issues. International Journal of Science Education, 24(11), 1157–1169.

[5] Jensen, R. (2002). Knowledge, action and pro-environmental behaviour. Environment and Behaviour, 8(3), 325–334Karpiak, C. P., & Baril, G. L. (2008). Moral reasoning and concern for the environment. Journal of Environmental Psychology, 28(3), 203-208.

[6] Öhman, J., & Östman, L. (2007). Continuity and change in moral meaning-making—A transactional approach. Journal of Moral Education, 36(2), 151–168.

[7] Boyes E., Stanisstreet M., & Zhang, Y. (2008). Combating global warming: The ideas of high school students in the growing economy of south east China. International Journal of Environmental Studies, 65(2), 233–245.

[8] Boyes, E., Skamp, K., & Stanisstreet, M. (2009). Australian secondary students' views about global warming: Beliefs about actions, and willingness to act. Research in Science Education, 39(5), 661–680.

[9] Brownlee, M. T., Powell, R. B., & Hallo, J. C. (2013). A review of the foundational processes that influence beliefs in climate change: opportunities for environmental education research. Environmental Education Research, 19(1), 1-20.

[10] Grady-Benson, J., & Sarathy, B. (2015). Fossil fuel divestment in US higher education: student-led organising for climate justice. Local Environment, 21(6), 661-681.

[11] Rockström, J., Steffen, W., Noone, K., Persson, Å., Chaplin, F. S., Lambin, E. F., & Foley, J. A. (2009). A safe operating space for humanity. Nature, 46, 472–475.

[12] Morgan, M. D., & Moran, J. M. (1996). Understanding the greenhouse effect and the ozone shield: An index of scientific literacy among university students. Bulletin of the American Meteorological Society, 1185-1190.

[13] Rajeev-Gowda, M. V., Fox, J. C., & Magelky, R. D. (1997). Students' understanding of climate change: Insights for scientists and educators. Bulletin of the American Meteorological Society, 78(10),

2232-2240.

[14] Andersson, B., & Wallin, A. (2000). Students' understanding of the greenhouse effect, the societal consequences of reducing CO2 emissions and the problem of ozone layer depletion. Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching, 37(10), 1096-1111.

[15] Karpiak, C. P., & Baril, G. L. (2008). Moral reasoning and concern for the environment. Journal of Environmental Psychology, 28(3), 203-208.

[16] Duerden, M. D., & Witt, P. A. (2010). The impact of direct and indirect experiences on the development of environmental knowledge, attitudes, and behavior. Journal of Environmental Psychology, 30(4), 379-392.

[17] Gifford, R. (2011). The dragons of inaction: psychological barriers that limit climate change mitigation and adaptation. American Psychologist, 66(4), 290.

[18] Wachholz, S., Artz, N., & Chene, D. (2014). Warming to the idea: university students' knowledge and attitudes about climate change. International Journal of Sustainability in higher education, 15(2), 128-141.

[19] Abas, N., Kalair, A., Khan, N., & Kalair, A.R. (2017). Review of GHG emissions in Pakistan compared to SAARC countries. Renew Sustainability Energy Review. 80, 990–1016.

[20] Khan, M. A., Khan, A. J., Ali, Z., Ahmad, I., Ahmad, M. N., 2016. The challenge of climate change and policy response in Pakistan. Environmental Earth Science. 75, 1–16.

[21] Lester, B. J., Ma, L., Lee, O., & Lambert, J. (2006) Social activism in elementary science education: A science, technology, and society approach to teach global warming. Int. /. Sci. Educ., 28, 315-339.

[22] Cordero, E. C., Marie-Todd, A., & Abellera, D. (2008). Climate change education and the ecological footprint. Bulletin of the American Meteorological Society, 89(6), 865-872.

[23] Feldman, L., Nisbet, M., Leiserowitz, A., & Mailbach, E. (2010).The climate generation? Survey analysis of the perceptions and beliefs of young Americans, Yale Project on Climate Change and Center for Climate Change Communication, Yale University and George Mason University, 2 March.

[24] Armel, K.C., Yan, K., Todd, A. and Robinson, T. (2011), “The Stanford climate change behavior survey (SCCBS): assessing greenhouse gas emissions-related behaviors in individuals and populations”, Climatic Change, Vol. 109 Nos 3/4, pp. 671-694.

[25] Viscusi, W., & Zeckhauser, R. (2006). The perceptions and valuation of the risks of climate change: a rational and behavioral blend, Climate Change, 77(1/2), 151-177.

[26] Ferguson Patrick, K., Macqueen, S., & Reynolds, R. (2014). Pre-service teacher perspectives on the importance of global education: world and classroom views. Teachers and Teaching, 20(4), 470-482.

[27] Ranney, M. A., & Clark, D. (2016). Climate Change Conceptual Change: Scientific Information Can Transform Attitudes. Topics in Cognitive Science, 8(1), 49-75.

[28] Graffeo, M. (2017). Environmental psychology: Conflicting climate attitudes. Nature Climate Change, 7(5), 314-314.

[29] Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179-211.

[30] Yu, T., & Yu, T. (2017). The Moderating Effects of Students' Personality Traits on Pro-Environmental Behavioral Intentions in Response to Climate Change. International Journal of Environmental Research and Public Health, 14(12), 1472.

[31] Abid, M., Schilling, J., Scheffran, J., Zulfiqar, F. (2016). Climate change vulnerability, adaptation and risk perceptions at farm level in Punjab, Pakistan. Sci. Total Environ. 547, 447–460.

[32] Le Quéré, C., Raupach, M.R., Canadell, J.G., Marland, G., Bopp, L., Ciais, P., Conway, T.J., Doney, S.C., Feely, R.A., Foster, P., Friedlingstein, P., Gurney, K., Houghton, R.A., House, J.I., Huntingford, C., Levy, P.E., Lomas, M.R., Majkut, J., Metzl, N., Ometto, J.P., Peters, G.P., Prentice, I.C., Randerson, J.T., Running, S.W., Sarmiento, J.L., Schuster, U., Sitch, S., Takahashi, T., Viovy, N., Van Der Werf, G.R., and Woodward, F.I., (2009). Trends in the sources and sinks of carbon dioxide. Nat. Geosci. 2, 831–836.

[33] Cochran, F. V., & Brunsell, N. A. (2012). Temporal scales of tropospheric CO2, precipitation, and ecosystem responses in the central Great Plains. Remote Sensing of Environment, 127, 316-328.

[34] Hussain, M., Liu, G., Yousaf, B., Ahmed, R., Uzma, F., Ali, M. U., Ullah, H., and Butt, A. R. (2018). Regional and sectoral assessment on climate-change in Pakistan: Social norms and indigenous perceptions on climate-change adaptation and mitigation in relation to global context. Journal of Cleaner Production, 200, 791-808.

[35] Lin, B., & Ahmad, I. (2016). Energy substitution effect on transport sector of Pakistan based on trans-log production function. Renewable and Sustainable Energy Reviews, 56, 1182-1193.

[36] Ul-Haq, Z., Tariq, S., & Ali, M. (2017). Spatiotemporal assessment of CO 2 emissions and its satellite remote sensing over Pakistan and neighboring regions. Journal of Atmospheric and Solar-Terrestrial Physics, 152-153, 11-19.

[37] Karner, A. (2016). Planning for transportation equity in small regions: Towards meaningful

performance assessment. Transport Policy, 52, 46-54.

[38] Antoci, A., Galeotti, M., & Sordi, S. (2018). Environmental pollution as engine of industrialization. Communications in Nonlinear Science and Numerical Simulation, 58, 262-273.

[39] Zuberi, M. J., & Ali, S. F. (2015). Greenhouse effect reduction by recovering energy from waste landfills in Pakistan. Renewable and Sustainable Energy Reviews, 44, 117-131.

[40] Liu, T., Ma, Z., Huffman, T., Ma, L., Jiang, H., & Xie, H. (2016). Gaps in provincial decision-maker's perception and knowledge of climate change adaptation in China. Environmental Science & Policy, 58, 41-51.

[41] Zarate, M., Slotnick, J., & Ramos, M. (2008). Capacity building in rural Guatemala by implementing a solid waste management program. Waste Management, 28(12), 2542-2551.

[42] Han, Z., Liu, Y., Zhong, M., Shi, G., Li, Q., Zeng, D., Zhang, Y., Fei, Y., & Xie, Y. (2018). Influencing factors of domestic waste characteristics in rural areas of developing countries. Waste Management, 72, 45-54.

[43] Chen, M. (2016). Extending the theory of planned behavior model to explain people's energy savings and carbon reduction behavioral intentions to mitigate climate change in Taiwan–moral obligation matters. Journal of Cleaner Production, 112, 1746-1753.

[44] Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. Action Control, 11-39.

[45] Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. Psychological Bulletin, 84(5), 888-918.

[46] Tonglet, M., Phillips, P. S., & Read, A. D. (2004). Using the Theory of Planned Behaviour to investigate the determinants of recycling behaviour: a case study from Brixworth, UK. Resources, Conservation and Recycling, 41(3), 191-214.

[47] Rivis, A., & Sheeran, P. (2003). Descriptive norms as an additional predictor in the theory of planned behaviour: A meta-analysis. Current Psychology, 22(3), 218-233.

[48] Onwezen, M. C., Bartels, J., & Antonides, G. (2014). Environmentally friendly consumer choices: Cultural differences in the self-regulatory function of anticipated pride and guilt. Journal of Environmental Psychology, 40, 239-248.

[49] Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A comparison of the theory of planned behavior and the theory of reasoned action. Personality and Social Psychology Bulletin, 18,3-9.

[50] Savita, K., Dominic, P. D., & Ramayah, T. (2016). An insight on survey questionnaire design for

Green SCM: Using cognitive interviewing method. 2016 3rd International Conference on Computer and Information Sciences (ICCOINS).

[51] Tikir, A., & Lehmann, B. (2010). Climate change, theory of planned behavior and values: a structural equation model with mediation analysis. Climatic Change, 104(2), 389-402.

[52] Ringle, C. M., Da Silva, D., & Bido, D. D. (2014). Structural Equation Modeling with the Smartpls. Revista Brasileira de Marketing, 13(02), 56-73.

[53] De Leeuw, A., Valois, P., Ajzen, I., & Schmidt, P. (2015). Using the theory of planned behavior to identify key beliefs underlying pro-environmental behavior in high-school students: Implications for educational interventions. Journal of Environmental Psychology, 42, 128-138.

[54] Malik, N., Asmi, F., Ali, M., & Rahman, M. M. (2017). Major Factors Leading Rapid Urbanization in China and Pakistan: A Comparative Study. Journal of Social Science Studies, 5(1), 148.

[55] Hair, J. F., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. G. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. European Business Review, 26(2), 106–121.

[56] Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial Least Squares Structural Equation Modeling: Rigorous Applications, Better Results and Higher Acceptance. Long Range Planning, 46(1–2), 1–12.

[57] Pedersen, K. M., Jöreskog, K. G., Sörbom, D., Pedersen, K. M., Joreskog, K. G., & Sorbom, D. (1981). Advances in Factor Analysis and Structural Models. The Scandinavian Journal of Economics, 83(1), 136.

[58] Lowry, P. B., & Gaskin, J. (2014). Partial least squares (PLS) structural equation modeling (SEM) for building and testing behavioral causal theory: When to choose it and how to use it. IEEE Transactions on Professional Communication, 57(2), 123–146.

[59] Schmid, F., & Schmidt, R. (2007). Multivariate extensions of Spearman's rho and related statistics. Statistics & Probability Letters, 77(4), 407-416.

[60] Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal, 6(1), 1-55.

[61] Barrett, P. (2007). Structural equation modelling: Adjudging model fit. Personality and Individual Differences, 42(5), 815-824.

[62] Lubell, M., Zahran, S., & Vedlitz, A. (2007). Collective Action and Citizen Responses to Global Warming. Political Behavior, 29(3), 391-413.

[63] Kaiser, F. G., & Gutscher, H. (2003). The Proposition of a General Version of the Theory of Planned Behavior: Predicting Ecological Behavior. Journal of Applied Social Psychology, 33(3), 586-603.

[64] Monroe, M. C., Oxarart, A., & Plate, R. R. (2013). A Role for Environmental Education in Climate Change for Secondary Science Educators. Applied Environmental Education & Communication, 12(1), 4-18.

[65] UNESCO (United Nations Educational, Scientific, and Cultural Organization). 2010. The UNESCO Climate Change Initiative: Climate Change Education for Sustainable Development. Paris: UNESCO.

[66] Lambert, J. L., & Bleicher, R. E. (2014). Improving Climate Change Communication Starting with Environmental Educators. Journal of Geoscience Education, 62(3), 388-401.

[67] McNeal, K. S., Hammerman, J. K., Christiansen, J. A., & Carroll, F. J. (2014). Climate Change Education in the Southeastern U.S. Through Public Dialogue: Not Just Preaching to the Choir. Journal of Geoscience Education, 62(4), 631-644.

[68] Faria, F., Klima, K., Posen, I. D., & Azevedo, I. M. (2015). A New Approach of Science, Technology, Engineering, and Mathematics Outreach in Climate Change, Energy, and Environmental Decision Making. Sustainability: The Journal of Record, 8(5), 261-271.

[69] Cox, H., Kelly, K., & Yetter, L. (2014). Using Remote Sensing and Geospatial Technology for Climate Change Education. Journal of Geoscience Education, 62(4), 609-620.

[70] Stapleton, S. R. (2015). Environmental Identity Development through Social Interactions, Action, and Recognition. The Journal of Environmental Education, 46(2), 94-113.

[71] Pruneau, D. R., Gravel, H., Bourque, W., & Langis, J. (2003). Experimentation with a socio-constructivist process for climate change education. Environmental Education Research, 9(4), 429-446.

7. Appendix

Table S1: *Measurement loadings of constructs*

Construct	Factor Loadings	VIF	Measurement Item
Attitudes			Please indicate how much do you agree or disagree with the following statements about climate change:
	0.55	1.47	1. Urbanization (population increase in cities as compared to villages) is the main cause for climate change.
	0.59	1.49	2. Rapid increase in cities area (Urbanization) decreases the cultivation land that ultimately affects agriculture production and climate change.

	0.88	1.43	3. Urban transport is one of the major sources of transport associated with greenhouse gases emissions.
	0.45	1.23	4. Migration to cities or village residents and rural lack of resources contribute to climate change.
	0.80	1.46	5. Unplanned industrial expansion affects the climate change.
Societal Norms			Please indicate how much do you agree or disagree with the following statements about climate change:
	0.29	1.13	1. No attention is given to the villages, small towns, and even small cities for transportation awareness or climate protection.
	0.52	1.44	2. Tree cutting is the main cause of temperature increase in my area.
	0.98	1.48	3. Deforestation is the problem for both cities and villages.
	0.45	1.12	4. In villages, advanced environmental friendly energy appliances are not used.
	0.44	1.35	5. Lack of knowledge/ illiteracy is the cause for usage of harmful pesticides in agriculture.
Perceived Behavioral Control			Please indicate how much do you agree or disagree with the following statements about climate change:
	0.54	1.35	1. Green road belt and plantation spaces should be preserved in urban areas.
	0.83	1.44	2. Increasing the use of energy-saving and environmentally friendly methods in production and consumption can help reduce climate changes.
	0.74	1.60	3. Every industry should be instructed to plant specific number of trees in their areas to reduce the impact of climate change.
	0.63	1.56	4. Industries should be located near their raw material production area but away from the towns and cities etc.
	0.77	1.42	5. Use of bicycle or pedestrian instead of motor vehicle can reduce the impact of climate change
Intentions			At what scale do you think following are responsible for developing plan to slow down climate change
	0.79	1.73	1. Government
	0.64	1.66	2. Businesses

0.78	2.21	3. Area-wise Community Representatives
0.81	2.46	4. City Residents
0.53	1.65	5. Village residents
0.80	2.11	6. Public Individuals
0.71	1.64	7. Myself

Table S2: *Path coefficients of Education over Individual's Attitudes*

Measurement Constructs	**Std. Dev.**	**T-Value**	**P-Value**
A1. Urbanization (population increase in cities as compared to villages) is the main cause for climate change.	0.275	2.897	0.003***
A2. Rapid increase in cities area (Urbanization) decreases the cultivation land that ultimately affects agriculture production and climate change.	0.279	2.824	0.004***
A3. Urban transport is one of the major sources of transport associated with greenhouse gases emissions.	0.283	2.632	0.008***
A4. Migration to cities of village residents and rural lack of resources contribute to climate change.	0.281	1.815	0.069*
A5. Unplanned industrial expansion affects the climate change.	0.284	1.870	0.061*

(*p<0.1; **p<0.05; ***p<0.01)

Table S3: *Path coefficients of Education over Societal Norms*

Measurement Constructs	**Std. Dev.**	**T-Value**	**P-Value**
N1. No attention is given to the villages, small towns, and even small cities for transportation awareness or climate protection.	0.374	2.057	0.040**
N2. Tree cutting is the main cause of temperature increase in my area.	0.392	0.069	0.944
N3. Deforestation is the problem for both cities and villages.	0.270	1.392	0.164
N4. In villages, advanced environmental friendly energy appliances are not used.	0.334	1.874	0.061*
N5. Lack of knowledge/ illiteracy is the cause for usage of harmful pesticides in agriculture.	0.299	1.596	0.111

(*p<0.1; **p<0.05; ***p<0.01)

Table S4: *Path coefficients of Education over Perceived Behavioral Control*

Measurement Constructs	**Std. Dev.**	**T-Value**	**P-Value**
C1. Green road belt and plantation spaces should be preserved in urban areas.	0.287	1.843	0.065*
C2. Increasing the use of energy-saving and environment friendly methods in production and consumption can help reduce climate changes.	0.275	1.404	0.160
C3. Every industry should be instructed to plant specific number of trees in their areas to reduce the impact of climate change.	0.296	0.765	0.444
C4. Industries should be located near their raw material production area but away from the towns and cities etc.	0.342	2.694	0.007***
C5. Use of bicycle or pedestrian instead of motor vehicle can reduce the impact of climate change	0.278	1.306	0.191

(*p<0.1; **p<0.05; ***p<0.01)