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INVESTIGATING CLIMATE CHANGE PERCEPTION AND AWARENESS LEVELS AMONG UNIVERSITY SCHOLARS OF PAKISTAN

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Abstract— The increasing people's awareness on the environmental changes through the education is an imperative measure to influence inhabitants at all levels in the society to play a chief role in extenuating and adapting to the environmental change. Therefore, it is supreme to assess the university scholars' level of awareness and the perception about climate change since it is prone to influence how the university level scholars and instructors conduct information transfer in their classroom. The study in hand is primarily designed to evaluate perception and awareness level about climate change among university scholars from main universities of Pakistan. According to the findings of the study television access, mobile phone access, environmental / agricultural magazine access, newspaper are affecting significantly in accelerating the scholar's awareness about climate change whereas on the other hand radio access and computer / internet access was affecting insignificantly. Potential problems associated with climate change in Pakistan are lacking funds for research on climate change, lack of government policies for this pertaining issue, no environment science courses offered in most of universities, lack of media role and lack of seminars and conferences on this issue. The print and electronic media should raise campaign to aware of the people about the climate change and universities should start degrees regarding environment sciences as well as on climate change. So, in this way university scholars and media can play an imperative role for the betterment of the environment.

Keywords— Climate change policy, Econometrics, University scholars, Environmental policy, ANOVA, Pakistan

I. INTRODUCTION

The climate change comprises one of the 21st century main defies to the development of whole world (United Nations Development Program, 2007). In current scenario, global warming and climate change have become apprehensions of the global concerns. It is evidenced by the spell of campaigns,

conferences, researches and reports on this subject matter. The Climate change is any quantifiable inclination in the global climate towards severe, which is in accumulation to accelerating temperatures globally. It is a long-standing quantifiable change in the components of the climate tending towards severe (Holdren, 2006).

In spite of a few dubious views, there subsists a prevalent consensus among the scientists that climate change is occurring and is being determined by the indefensible actions of the mankind, specially the flaming of the fossil fuels, deforestation, industrial pollution and land use alterations (Canadel et al., 2010; Cook, 2011; Cook et al., 2013; Frank, 2008; Lupo, 2008; IPCC, 2007; Weart, 2010). Consequently many of the authors frequently describe the climate change basically as the anthropogenic modification of the climate system globally through amplified concentration of the greenhouse gases in the environment leading to the global warming (Curry, 2011; Gurung & Bhandari, 2009; Sexton et al., 2001; Weart, 2010). The available scientific research depicts that the earth observed on an average global warming of around about 0.6 degree centigrade during the 20th century (IPCC, 2001) and is forecasted to hot by approximately 2 to 3 degree centigrade by the end of the 21st century (IPCC, 2007). It is a worldwide consent that climate change is the real, swiftly approaching and extensive threat faced by the humanity of this century. The scientists have proved evidences and tested various models to verify this truly frightening reality (Chaudhary and Aryal, 2009). The air temperature near the surface of earth increased up to 0.74 degree centigrade from 1906 to 2005 and the research scholars estimated it could be accelerated as much as 6.4 degree centigrade on average basis during the twenty first century (IPCC, 2007). The temperature observations in from the era 1977 to 1994 depicted a common warming drift and increased with on average temperature was 0.06 degree centigrade annually (Shrestha et. al., 1999). The climate change situation showed the substantial convergence on continued warming with average mean temperature rises of 1.2 degree centigrade and 3 degree centigrade projected by 2050 and 2100 (Shrestha et. al., 1999). The previous emissions are guesstimated to absorb



some inevitable warming even if the atmospheric greenhouse gases concentration remains at the 2000 levels (IPCC, 2007). In similar trend in most Asian countries, the bulk of Pakistan's population is uninformed about climate change but is alarmed about the food insecurity and floods in the country. The climate change is a supplementary strain for Pakistan. According to the findings of a recent published index, Pakistan has been ranked at 12th number on the list of nations most susceptible to the influences of the climate change (Shahid and Piracha, 2010; Shakoor et al., 2011). However, the government of Pakistan is alert of and concerned regarding the climate change as an issue in the development of the country. By the way, the government has been established (GCISC) Global Change Impact Studies Centre in 2002 in order to evaluate the recent and projected future trends regarding climate change, worldwide as well as in Pakistan. This centre is also responsible for evaluating the effects on the main socio-economic sectors in the country along with raising public awareness regarding climate change in the country (Rasul, 2013).

It is progressively more argued that many climate change literature, at the same time as effective in watchful policymakers to the probable impacts of the climate change, have had inadequate usefulness in providing the indigenous level guidance on the adaptation and that the climate change society should learn from their experiences gained in the natural hazards and food security literatures (Richard, 2004). The investigation starts with the identification that susceptibility prevails today, susceptibility that will not vanish on its own and can indeed be increasing and with the wish to make vigorous interventions to decrease the susceptibility (Richard, 2004). The technical knowledge on the effects of the climate change is escalating at all the time as are realistic experiences in retorting to adaptation requirements. This knowledge requires to be exploited.

In Pakistan, there is a lack of research and the authentic evidence on the effects of the climate change is a main issue in this regard. There is narrow understanding about the basic issues as the nature and level of effects of the climate change on the forests, livelihood and governance aspects including the carbon confiscation levels of the different forest ecosystem kinds (Ojha et.al, 2008). Pakistan demonstrates diverse climatic and geo-physical conditions within different areas. As a result, an ideal place to study climate change effects and level of awareness on natural as well as socio-economic spheres. The study would contribute towards the better understanding of the effects and the intensity of climate changes.

Yet, resources are employed together to lessen climate change and its impact, there is also much need to educate and train the people about what the climate change really is and effects on the various stakeholders. Increasing public's awareness on the climate change through proper training and education is an imperative measure to influence people at all the levels in the society to play a chief role in lessening and adjusting to

climate change. Therefore, it is supreme to assess the university scholars' level of awareness and the perception about climate change since it is prone to influence how the university level scholars and instructors conduct information transfer in their classroom. The study in hand is primarily designed to evaluate perception and awareness level about climate change among university scholars from main degree-awarded universities of Pakistan. Currently such no study is available to be used as baseline for policy makers and decision makers at national level.

Therefore, the main objective of this study was to investigate the climate change perception and awareness levels among university scholars of Pakistan. Furthermore, purpose was to analyze the socio-economic characteristics of sampled respondents and to identify the problems faced by selected respondents.

II. MATERIALS AND METHODS

A. Study Area

The study was conducted nationwide thus data were collected from public sector top-ranked universities of all provinces of Pakistan. The public sector top-ranked universities from all over the country were selected as sample which gave better insight and understanding about the university scholar's level of awareness and perception about the climate change in Pakistan.

B. Sample Size and Data Collection

An adequate and scientifically sound sample was essential if a limited investigation had to yield valid results. The study was preceded in two stages. At first stage, 20 main universities were randomly identified from each province of Pakistan. At second stage 15 research scholars from each university were identified for the data collection using random sampling where each and every individual has an equal chance of being selected (Gujrati, 2003). Selection criteria include that university should have at least a department of Natural sciences program or Environmental study program or Climate change program/center; should include the balanced respondents in terms of gender; should have students from various degree level students, for instance, undergraduate and postgraduate. A pre-tested questionnaire was used to collect the data from selected respondents through personal interviews and online of concerned respondents. For this purpose questionnaires were designed for selected university scholars. Data were collected during August to October, 2021.

C. Data Editing and Coding

After data collection the interviewing schedule were properly checked to make sure that all the responses had been recorded accurately. Sequentially all interviewing schedules were numbered in a serial order. After editing the interview schedules, data were transferred from questionnaires to computer.



D. Methodology/Statistical Techniques

Following statistical techniques were used to analyze and interpret data. The methodology includes the regression models and other statistical tools. To analyze the result of present study the simple descriptive statistics used to find out the percentages and frequencies of selected university scholars.

Average was calculated by using following formula:

$$AM = \Sigma X / N \quad (1)$$

Where; AM = Arithmetic mean

N = Total number of observations

ΣX = Total sum of variables

Percentage was calculated using following formula

$$P = F / N * 100 \quad (2)$$

Percentages were calculated in the simple table for the purpose of comparison.

Where; F = Frequency of a class

N = Total number of observations.

Binary Logistic Regression Model

The logistic regression model has been used in many applications due to its mathematical convenience (Greene, 2003); in this research it will be used to test the significance of access to various information and communication technologies (ICTs) on climate change awareness. The formula for binary logit (Field, 2009; Long, 1997) is:

$$Pr(y = 1|x') = \frac{\exp(x'\beta)}{1 + \exp(x'\beta)} = (x'\beta) \quad (3)$$

Equation 3 represents the probability of an event happening, the dependent variable takes a value of 1 given an independent variable (x'). The x' represents vectors of all the independent variables. The explanatory power of the independent variable is explained by the coefficient (β). The dependent variable is the probability of a respondent being aware of climate change. This dependent variable takes two discrete values, which is 1 if the respondent is aware of climate change or 0 if the respondent is not aware of climate change. The model predicts the maximum likelihood of a respondent being aware of climate change versus not being aware of climate change. The coefficient β in the model depicts a relationship of how variations in the independent regressors affect the predicted log of odds of a respondent being aware versus not being aware of climate change. This relationship between the dependent and the independent variable can be depicted using the antilog of β ($\exp\beta$) which is the odds ratio. The formula of the odds ratio is presented below.

$$\frac{P_i}{1-P_i} = \frac{1 + e^{(x'\beta)}}{1 + e^{-(x'\beta)}} = e^{(x'\beta)} \quad (4)$$

Where P_i is the probability of being aware of climate change ($Pr(y=1)$) in equation (3) and $1-P_i$ is the probability of not being aware of climate change. Equation (4) represents the odds ratio in favor of being aware of climate change which is

the ratio of the probability that a respondent is aware of climate change to the probability of not being aware of climate change. An odds ratio that is greater than 1 implies that a unit increase in the continuous variable or discrete change in the categorical variable in the regressors leads to a decrease in the odds of a respondent being aware versus unaware of climate change.

The more general form of model is

$$Y = (P/1-p) \quad (5)$$

$$\text{Log}_e(p/1-p) = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 Z_4 + \beta_5 Z_5 + \beta_6 Z_6 + \epsilon \quad (6)$$

Where;

P = Probability of dependent variable (being aware or not aware of climate change)

$$\text{Ln (Odds)} = \text{Ln } [p/1-p] = \beta_0 + \beta_i \quad (7)$$

P = 1 if university scholar's aware about climate change and 0 otherwise. The specific form of this relationship is given as

$$\text{Ln } [p/1-p] = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 Z_4 + \beta_5 Z_5 + \beta_6 Z_6 + \epsilon \quad (8)$$

Categorical data of given independent variables were collected by using a five point Likert scale (strongly agree=5, agree=4, neutral=3, disagree=2, and strongly disagree=1)

Whereas;

Z_1 = Television access

Z_2 = Mobile phone access

Z_3 = Environmental / Agricultural magazine access

Z_4 = Radio access

Z_5 = News paper

Z_6 = Computer / Internet Access

β_0 is the intercept, β_s are slope coefficients, ϵ is the random error

ln = Natural log

III. RESULTS AND DISCUSSION

The main objective of the research was to evaluate perception and awareness level about climate change among university scholars from main universities of Pakistan. A total of 400 respondents were contacted through electronic mail and face to face interview. Out of 400 we received 300 responses in the provided period of time. Few of them responded without any delay, however, reminders were sent to few respondents for their late replies. Ultimately success rate was above than 75 percent which is a reasonable probability to conduct analysis.

The socio-economic and demographic factors have a significant importance in social and economical research and these variables play an important role in creating the awareness regarding the climate change. The data relating to these aspects presented and discussed as under:

Research findings indicated that 20 percent university scholars were less than 25 years. 43 percent university scholars were found in age range between the 26-35 years and 13 percent were in between 36-45 years. Rest of 24 percent university scholars had more than 45 years old.



Table -1 Distribution of the University scholars according to Age

Age (number of years)	Frequency	Percent
Less than 25	60	20
25-35	130	43
36-45	40	13
Above 45	70	24
Total	300	100

Education of University Scholars

The literacy rate of the university scholars may affect the level of awareness regarding climate change. More and more educated scholar assumed to have more and more knowledge about climate change. The data in table reflects there were

different university scholars that had different education level. 150 (50.0 percent) had graduation, 130 had master or MS level of education whereas almost 7 percent of the selected respondents had Ph.D level or above degree in the study area.

Table -2 Distribution of the University Scholars according to Education Level

Education (Years of Schooling)	Frequency	Percent
Illiterate	0	0.0
Primary	0	0.0
Middle	0	0.0
Matric	0	0.0
Intermediate	0	0.0
Graduation	150	50.0
Master / MS	130	43.3
Ph.D	20	6.67
Total	300	100

Gender of the selected respondents

All the respondents were divided into two groups according to gender. Respondents from both genders i.e. male and female were selected randomly. Results from Table 3 revealed that

300 respondents were selected randomly, out of which 180 were male and 120 were female. Ratio of male was 60 percent while ratio of females stood 40 percent.

Table -3 Distribution of Respondent with Respect to their Gender

Sex	Frequency	Percent
Male	180	60.0
Female	120	40.0
Total	300	100

Family Size

Family size is very important factor. Households with large number of persons supposed to have more and more knowledge about the climate change as compared to families with less number of members. Table 4 describes that 50

percent respondents had small family of 2-3 persons. 41.33 percent were those who belonged to the household with 4-5 persons, while 7.33 percent respondents had 6-7 family members. 1.34 percent respondents belonged to more than 7 members.

Table -4 Distribution of Respondent with Respect to their Family Size

Family Size	Frequency	Percent
2-3	150	50.0
4-5	124	41.33
6-7	22	7.33
More than 7	4	1.34
Total	300	100



Family Background of the University Scholars

Table 5 depicts that there were 80 percent respondents who belonged to urban background as against 20 percent came from rural family background.

Table -5 Distribution of Respondent with Respect to their Family Background

Living Area	Frequency	Percent
Urban	240	80.0
Rural	60	20.0
Total	300	100

Heard or Aware of Climate Change

In order to evaluate that he or she has heard or aware of the climate change dichotomous scale was used to check the responses of university scholars. Out of 300 university

scholars, 270 had heard or were aware about the climate change whereas remaining 30 i.e. 10 percent had no awareness or knowledge about the climate change in the study area.

Table -6 Distribution of the University Scholars Responses according to Hearing or Awareness about Climate Change

Heard or Aware about Climate Change	Frequency	Percent
Yes	270	90.0
No	30	10.0
Total	300	100

Level of Awareness about Climate Change

Out of 300 university scholars, 220 university scholars (73.33 percent) replies that they have low level of awareness regarding climate change, 20 percent had medium level of awareness and 6.67 percent of the selected university scholars have high level of awareness regarding climate change in the study area respectively.

In similar type of study, Adebayo et al. (2013) examined the common level of the awareness of change in climate, effects and the adjustments in the Adamawa state, Nigeria. The primary data used in the research included the socio-economic features of the targeted respondents' viz. age, years of schooling, gender, employment occupation and amount of

income and information on the awareness, effects and adaptation to the environmental change. The chi-square test of the association proved that employment occupation, years of schooling, age influenced the public's level of the awareness and information of the reasons of climate change but sex did not influence on it. The assessment of the respondents about climatic elements in the previous twenty to thirty years consented with the specialists reports. Specifically, temperature was mounting on the other hand rainfall was declining and occurrence and the length of dry spells were also on the enlargement. The water source and the fuel wood were the key domestic actions typically influenced by the climate change.

Table -7 Distribution of the University Scholars Responses according to Level of Awareness about Climate Change

Awareness Level about Climate Change	Frequency	Percent
Low	220	73.33
Medium	60	20.0
High	20	6.67
Total	300	100

Other Indicators

Access to information and communication technologies in the climate change awareness

In this section basically respondents were asked to rate their access to various information and communication technologies in the climate change awareness as television access, mobile phone access, environmental / agricultural

magazine access, radio access, news paper, computer / internet access etc.

Television Access

According to findings of the study, out of 300 respondents 70 respondents constituting 83.3 percent of the total respondents said that they had television access, 250 of the selected



respondents that they had television access constituting percent, percent were neutral, percent of the selected respondents were disagree and only 16.7 percent of the selected university scholars had no access to television in creation of awareness regarding climate change in the study area.

Mobile Phone Access

Out of 300 respondents 270 respondents constituting 90.0 percent of the total respondents explained that they had mobile phone access, 20 selected respondents agreed that they had mobile phone access constituting 6.66 percent, 05 percent were neutral, 05 percent of the selected respondents were disagree and no one of the selected university scholars had no access to mobile phone in creation of awareness regarding climate change in the study area.

Environmental / Agricultural Magazine Access

Out of 300 respondents 86 respondents constituting 90.0 percent of the total respondents said that they had environmental / agricultural magazine access, 20 selected respondents that they had mobile phone access constituting 6.66 percent, 05 percent were neutral, 05 percent of the selected respondents were disagree and 4 percent of the selected university scholars were strongly disagree that that had access to environmental / agricultural magazine in creation of awareness regarding climate change in the study area.

Radio Access

Out of 300 respondents 46 respondents constituting 15.33 percent of the total respondents said that they had radio access, 108 selected respondents said that they had radio access constituting 36.0 percent, 31.33 percent were neutral, 14.66

percent of the selected respondents were disagree and 2.66 percent of the selected university scholars were strongly disagree that that had access to the radio in creation of awareness regarding climate change in the study area.

Newspaper Access

Out of 300 respondents 114 respondents constituting 38.0 percent of the total respondents said that they had newspaper access were strongly agree, 88 selected respondents said that they had newspaper access were agree constituting 29.33 percent, 22.0 percent were neutral, 8.0 percent of the selected respondents were disagree and 2.66 percent of the selected university scholars were strongly disagree that that had access to the radio in creation of awareness regarding climate change in the study area.

Computer / Internet Access

Out of 300 respondents 186 respondents constituting 62.0 percent of the total respondents said that they had computer / internet access were strongly agree, 100 selected respondents said that they had computer / internet access were agree constituting 33.33 percent, 4.66 percent were neutral, no one of the selected respondents were disagree and same no body of the selected university scholars were strongly disagree that that had access to the computer / internet in creation of awareness regarding climate change in the study area.

In Table 8 observation of data, 26 university scholars were replied that they have not been aware of climate change in the study area and predicted model also says that 226 university scholars were told that they have not been aware of climate change in the study area (0 means if university scholar is not aware about climate change). Table 9 shows summary of logistic model and obtained results.

Table -8 Hosmer and Lemeshow Test

Tests	values
Chi-square	1.380
Df	8
Significance	0.995

Table -9 Summary of Logistic Model

Variables	B	Wald	F-Value	Exp(B)
Television access	0.665	3.027	.082**	1.945
Mobile phone access	1.257	3.221	.073**	.584
Environmental / Agricultural magazine access	18.404	4.448	.056*	1.209
Radio access	0.178	.965	.326^{NS}	1.194
News paper	10.539	6.69	.033*	3.869
Computer / Internet Access	2.627	3.919	.589^{NS}	.172
Constant	24.243	.000	1.000	3.37710

Source: Author's own estimation

* = shows 5% level of significance

** = shows 10 % level of significance



NS = means Non-significant

IV.CONCLUSION

The aim of research was to evaluate the level of awareness among university scholars regarding climate change in the study area. Research findings indicated that 20 percent university scholars were less than 25 years. 43 percent university scholars were found in age range between the 26-35 years and 13 percent were in between 36-45 years. Rest of 24 percent university scholars had more than 45 years old. The literacy rate of the university scholars may affect the level of awareness regarding climate change. More and more educated scholar assumed to have more and more knowledge about climate change. The data in table reflects there were different university scholars that had different education level. 150 (50.0 percent) had graduation, 130 had master or MS level of education whereas almost 7 percent of the selected respondents had Ph.D. level or above degree in the study area. Family type of the university scholars also influences the university scholar's perception about climate change. In a joint family system, it is assumed to have more knowledge and awareness about climate change as compared to nuclear type of family system. All the respondents were divided into two groups according to gender. Respondents from both genders i.e. male and female were selected randomly. Results from table 4.4 revealed that 300 respondents were selected randomly, out of which 180 were male and 120 were female. Ratio of male was 60 percent while ratio of females stood 40 percent. Family size is very important factor. Households with large number of persons supposed to have more and more knowledge about the climate change as compared to families with less number of members. Table 4.5 describes that 50 percent respondents had small family of 2-3 persons. 41.33 percent were those who belonged to the household with 4-5 persons, while 7.33 percent respondents had 6-7 family members. 1.34 percent respondents belonged to more than 7 members. There were 80 percent respondents who belonged to urban background as against 20 percent came from rural family background.

The climate change is a discipline that has a dire requirement of publicity to assist the general public makes informed results in its adaptation as well as reduction. Out of 300 university scholars, 165 university scholars constituting the 55.0 percent of the selected university scholars said that the issue of climate change is very important, 5 percent said quite important, 33.33 percent of the selected respondents said that it is not very important and only 6.67 percent of the selected respondents said that it is not at all important respectively. Out of 300 university scholars, 205 university scholars constituting 68.33 percent of the total university scholars thought that climate change is a threat, 13.33 percent gave responses in a neutral way whereas on the other hand 55 targeted university scholars constituting the 18.34 percent of total university scholars said that the climate change is not a threat respectively.

Logit model was used to analyze the impact of variables on the climate change awareness of selected university scholars in the study area. According to findings, value of Cox and Snell R Square was 0.643. Value of Cox and Snell R Square states that 64 percent variation in the model explained by the given variables rests of all variations are explained by other variables. Value of Nagelkerke R Square was 0.886 percent. This value states that 88 percent variations in the given model are explained due to given variables where as rest of all variation in the model is explained by other variables. The value of - 2 LL was 10.585. Value of -2 LL is low, so we can say that the set of independent variables in the proposed model is significant in improving model estimation fit. University scholars also highlighted that there is no course taught on awareness of climate change or environmental course in most of Pakistani universities although this is a major concern for the whole world as well as for Pakistan. Government has not made any effective policies on this issue yet.

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