Behaviour Towards Climate Change – Intentions of The People of Karachi

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Abstract: In Pakistan, climate change is affecting agricultural output, increasing healthcare burden, causing havoc with lives, and damaging properties. Urban flooding has become a continuous issue. But are the people able to make a link between their actions and the impact it may have on causing climate change? Although some climate change mitigation strategies are being implemented by the government and various non-governmental organizations, they are far from being successful. Besides blaming the authorities little is being done by the people towards conservation, a major factor being the lack of interest in climate change. It is important to understand whether the general public recognizes the significance of mitigation strategies, and if so what actions, if any, are they taking. The current research uses primary cross-sectional data of 398 respondents collected using social media platforms in 2022, in order to find the intention of the public behind actions such as energy and water conservation and usage of cloth bags in place of plastic ones. Using logistic regression and qualitative analysis this paper investigates the level of awareness of the residents of Karachi in the context of climate change and their responsiveness regarding the need to take steps to reduce the adverse effects of climate change. The results show that the general behaviour of the people stems from their own preferences instead of concern for climate change, indicating the need for a deeper understanding of behavioural response towards climate change. This study calls for policy actions inducing behavioural change in the citizens, through green nudges.

Key words Climate change, energy conservation, intent-oriented, mitigation, recycling
JEL Classification Q53, Q54, Q38, Q25

1 Introduction

Studies on climate change in South East Asian region, reveal that local people do have an understanding that human activities, like cutting hills,

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deforestation and building infrastructures cause landslides (Ahmed, et al., 2022). However, opinions about the causes vary among the natives. Many believe human actions cause climate change, others recognize mitigation as a joint responsibility of the government to raise public awareness and citizens to show restraint by conserving resources like water and energy (Ahmed, & Atiqul Haq, 2019). The residents of Pakistan, are lacking insight on benefits and self-efficacy; there is a careless attitude towards gasoline use, energy and water consumption at household level, and recycling waste. The higher income and more educated strata are aware of the threats of climate change and are more likely to alter their behaviour and mitigate (Alvi, et al., 2020). Our objective to conduct research on the people of Karachi, their behaviour and intentions towards climate change, came from the gap existing in literature, as specifically the residents of Karachi were not found to be the subject of any study in the context of climate change. Awareness exists in varying degrees in Pakistan, we found literature on urban and rural women of Sindh[1], who are aware of climate change, however their awareness comes from secondary sources and their knowledge about hazards of climate change come from personal experience (Memon, et al., 2022). A study on urban, peri-urban and rural areas of Pakistan shows that the people are not equipped with the awareness of climate crisis nor do they possess knowledge of mitigation and adaptation strategies (Hussain, et al., 2018; and Hussain, et al., 2020). And even if they do have knowledge and may demonstrate the intention, they do not translate it into actual behaviour (Nguyen, Nguyen, & Hoang, 2019; Ceglia, de Oliveira Lima, & Leocádio, 2015; and Hanss, Böhm, Doran, & Homburg, 2016).

More and more governments are making their citizens responsible for climate change at the household level. As lifestyle choice and choosing environment friendly conduct by individuals will bring forth benefits collectively (Kent, 2012). People with more concern for the environment

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[1] Sindh is a province in Pakistan, Karachi is a megalopolis of Sindh

are more likely to practice energy conservation, for instance by consuming energy-efficient light bulbs and other appliances. However, the study of 9 OECD countries shows that motivation to adapt is low when energy-saving investments are of higher costs, and more time consuming in acquiring and implementing (Urban and Scasny, 2012; and Elahi, Khalid, & Zhang, 2022). The higher cost of the product deters people unless they are fully aware of the benefits of the product (Trivedi, Patel, & Acharya, 2018; and Taghikhah, Voinov, & Shukla, 2019). The intention to purchase environment friendly products also depends on demographic variables such as age, gender, income and education (Shuai, Ding, Zhang, Guo, & Shuai, 2014; and Wang, Shen, Springer, & Hou, 2021). It additionally depends on easy and sufficient availability of environmental friendly products (Bonini, & Oppenheim, 2008; and Peattie, 2010).

Individuals do not like to consider their own lifestyles as the cause of climate change; it is much easier for them to blame other industrialised economies for contaminating the earth. Recent research reveals that developed countries too are struggling to make their citizens conscious of the threat climate change poses globally. In order to promote sustainable living, individuals, households, neighbourhoods and community level engagement is needed. It is imperative that all stakeholders opt for both mitigation (reduction of emissions from energy use) and adaptation to environment-friendly lifestyles to avoid the threats climate change poses (IPCC, 2007). Factual information on climate change must be communicated in a manner where the message hits home (Jang, 2013). Simultaneously more and complete information should be provided to the consumers regarding the environmental impact of their actions (Li, Long, & Chen, 2017). Likewise, green product awareness should be increased through concentrated efforts (Sreen, Purbey, & Sadarangani, 2018).

In a society like Pakistan, the role of women and children and that of the marginalized groups must be recognized as they are the potential agents of

change. Making them knowledgeable about the threats of climate change will create a society that will consciously adapt its lifestyle to mitigate GHG emission. Adaptation comes from learning-by-doing (Salman, et al., 2018). Therefore, an all-inclusive view and approach is required to understand Pro-Environmental Behaviours (PEBs) in order to change to a low-carbon society. At a national level, industrial and commercial sectors must have the pro-environmental attitude and at the individual level, people must make a pro-environmental choice. The main reason to adopt or not to adopt PEBs is the cost. Saving, followed by habit and convenience motivate people to switch to PEB. In some economies, rules and regulations are in place thus it is incumbent to follow PEBs, yet in other societies moral values (no wastage of resources) enforce PEBs (Lee, et al., 2013). People in general display more pro-social behaviour when in public. The reason is that being visible to others makes one conscious about being judged; it is the reverse of the Bystander Effect. [2]Actions like displaying a reusable grocery bag motivate the pro-environment actors as it is sending a positive signal to the valued environment friendly group, thus reinforcing responsible behaviour "green to be seen". Thus the social influence shapes green intentions of the people (Wu, & Chen, 2014; and Choi, & Johnson, 2019).

Low carbon lifestyles encompass reduce, reuse and recycle. It includes avoiding or reducing driving and flying, red meat and dairy consumption, material and energy consumption. Low carbon lifestyle means adopting low-carbon and climate-resilient technologies e.g. installing insulation; support for large-scale low-carbon infrastructures e.g., wind farms etc., (Whitmarsh, et al., 2021). Low-carbon lifestyle change will impact tourism as well. Holiday destinations, the transportation system at these tourist locations will cause geographic and seasonal shifts in tourism demand, whereby demand may increase or decrease of specific tourism markets

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[2] Bystanders will come forward to help if they know they are being watched or there is a CCTV camera around.

(Gössling, et al., 2012). Society and science have to work together to ensure the dangers of climate change are understood by all citizens. The two cardinal rules to be followed are, first the rights of the entire global community must be of concern, which is inclusive of developing nations and especially poor nations and second is to ensure sustainable development for future generations (Change, et al., 2006).

Denial of climate change or ignoring the magnitude of grave environmental problems occurring due to climate change, will lead to the breakdown of ecosystems that the earth relies on. Global warming is already creating havoc to the environment, the need of the hour is to acknowledge the situation and work towards securing our future. Ian Lowe, (in his review of Haydn Washington's book, *Climate change denial: Heads in the sand*) says, "*Climate change denial is the biggest single obstacle to achieving a sustainable futu*re". Policy makers, scientists and citizens must be on board to reduce the damage caused by climate change. The proverbial head in the sand where climate change is concerned, does not make our habitat any less vulnerable from the effects of the crisis we are facing. Behaviour change, individual as well as societal, is central to reducing emissions. Collectively, lifestyles will have to change if mitigation is to be achieved. Reducing the effects of climate change not only requires changes in consumer behaviour but communities and organisations have to come forward and play their part. Especially those in positions of political power can impact policies.

Environmentally concerned citizens are divided on how to tackle climate change, some are advocates of individual behaviour change while others advocate collective social action as they blame social structures for causing climate change (Kenis, & Mathijs, 2012). Policy makers are relying on behaviour change regardless of huge investments in clean/renewable energy to reduce carbon emissions. As behaviour change will translate into mitigation. Social media plays a great role in influencing responsible behaviour by promoting low carbon lifestyles (Piccolo, & Alani, 2015).

Creating awareness about the adverse effects of climate change can improve attitudes and behaviour towards mitigation and adaptation. According to IPCC, developing and poor countries are more vulnerable to climate change, and have lower levels of understanding environmental issues as per PEW Global's 2006 research (Masud Al-Amin et al., 2016).

Pakistan's National Climate Change Policy of 2012 and its subsequent updated versions clearly states its intention to conserve energy. In Karachi, K-Electric (electricity distributor) in an attempt to tackle the problem of short supply of electricity started a media campaign of making citizens responsible for energy conservation. But did it have the desired impact? Similarly, the government in an attempt to reduce the consumption of plastic, started a drive in 2021 to decrease usage of plastic. Cloth bags were encouraged but did that change the habits of the citizens? Karachi lacks fresh water supply in most of the areas. Fresh water supply uses energy for processing. There are many times when there is no supply and households resort to buying water from 'Tanker Mafia'[3]. But what are the households doing to conserve water consumption. Are there any specific steps being taken to conserve resources or does the government need to create a more impactful awareness campaign to make the citizens more responsible? These are important questions that this study aims to answer.

This paper seeks to understand the actual meaning behind the actions taken by the people which may result in having an impact on the climate. Intent oriented behaviour is taken here as being the cause behind the action taken which can in turn impact the climate (Stern, 2000; Whitmarsh, 2009). Altruistic people are motivated to demonstrate actions that are environmentally intent oriented (Stern, 2000). Stern describes attitudes and values as important factors influencing environmentally-significant behaviour. The older age group are more likely to adopt environment

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[3] Tanker mafia is a term used to illegal selling of fresh water to households that lack a consistent water supply

friendly actions (Cheng, et al., 2017). Further, the fear of health hazards makes people implement protective measures. Knowledge about climate change and global warming increases the risk perception and people act in self-interest to protect themselves. Since the threat of climate change is portrayed as a global issue, implying that it is more of an external shock, therefore it becomes convenient to blame other countries around the world and their GHG emissions as factors contributing to climate change. Thus the local people absolves themselves to a certain extent and considers their small steps taken towards mitigation as insignificant and as the best they can do (Sharples, 2010).

The contribution to literature in this study is two folds. First, the research in this paper investigates the actions taken by the residents of the city of Karachi and tries to discern if they are taken 'out of concern for climate change' or are 'energy conservation practices'. Thus the aim of this research is to firstly gauge the level of awareness about climate change amongst the population of Karachi, how conscious are households of their own carbon footprint, and what measures are being taken at individual level to become more environment friendly. Hence measuring their values and moral obligation and assessing their association with behaviour that has a significant impact on the environment. To understand this the variables used are described in detail in the data section. Secondly, our study intends to learn whether the citizens connect mitigating the negative effects of climate change at individual level with better quality of air to breathe, better health and general wellbeing. To the best of our knowledge there is no study in the context of Pakistan that has made an attempt to understand these dimensions and thus our study aims to fill this gap in literature. For this purpose, primary data was collected via online survey, the link was shared to school, college and university students, homemakers, and people in the workforce on various social media platforms, who in turn were requested to share the link to the survey with their contacts. The aim was to collect data by snowballing technique. More on this in the data section. With

pervasive digital connectivity and with the Theory of Six degrees of Separation in place, we collected data from as many respondents as consented and were willing. The current study draws from the detailed theoretical foundations provided in Wang, Shen, Springer, & Hou, (2021). The comparison provided of the most popular theories is provided in figure A1 given in the appendix.

2 Contextual Background

Climate change is threatening our ecosystem on earth. Sustainable development goals (SDGs) are designed to encourage stakeholders to take appropriate actions to conserve the planet. Human activities such as manufacturing, energy producing coal-powered plants, fossil fuels etc., are causing a rise in the earth's temperature annually, adversely impacting agriculture, water resources, forests, biodiversity, health, coastal management and causing extreme temperatures leading to melting of glaciers. WWF (New Zealand) states that the main cause of climate change is due to "increased use of fossil fuels". The Intergovernmental Panel on Climate Change (IPCC, the UN Environment Program's climate body) states that there are various evidences to confirm that the planet is slowly warming. This change in the climate has caused not only increased sea levels and melted glaciers but also caused drastic changes in the Earth's climate patterns. At international level IPCC aims to motivate people to help decrease carbon pollution by 2050 to zero.

Pakistan has been having its own share of constantly increasing environmental challenges (Pakistan Economic Survey, 2021-2022). Study by Mani et al. (2018) reveals that the Pakistan's average temperature is already higher than the optimal level required for maximum consumption; further increase in temperatures will negatively impact labour productivity thereby decreasing standard of living. Climate change affects living standards as there is a negative correlation between consumption and rising temperatures. CO_2 emissions from fuel combustion are the largest

contributors of Greenhouse gas (GHG) emissions. GHG emissions in Pakistan have been on the rise since 2015. Sector-wise breakdown of total GHG emissions in 2019 is, Industrial sector 32%, Transport 28%, Electricity 27%, Building sector 11% and Other Energy-related sectors 2% (Climate Transparency Report, 2020).[4] Breakdown of electricity production from various sources in 2015, is given as, oil 37.2%, gas and coal 25.9%, hydroelectric sources 30.7 %, renewable sources 0.8% (excluding hydroelectric), Nuclear sources 4.8% (World Bank Data).

In a span of around four decades, Pakistan has seen an increase in annual mean temperature of 0.9 degrees (World Bank, 2021).[5] Figures for mean monthly temperatures and average monthly rainfall for Pakistan are presented in figures A3 and A4 in the appendix. The data of the last three decades show that there has been increase in temperature and rainfall no longer follows a seasonal pattern. There has also been a significant surge in the number and intensity of heat waves in the province (sub-national) of Sindh where Karachi is located. Figure 1 shows the data of six decades and indicates that the mean temperature has increased over the years in the Sindh province. Climate Risk Country Profile: Pakistan (2021), notes that the rise in daily maximum temperature is more pronounced than the mean temperature increase. It is seen that at high temperatures consumption, as indicator of living standards, decreases. Due to this challenges like health issues, undernourishment and poverty will continue to rise, affecting all provinces with Sindh being most vulnerable (Mani, et al., 2018). The sixty years' data in figure 2 also shows erratic behaviour and a notable increase in the level of precipitation. Thus further indicating that Pakistan and specifically Sindh are being significantly affected by climate change.
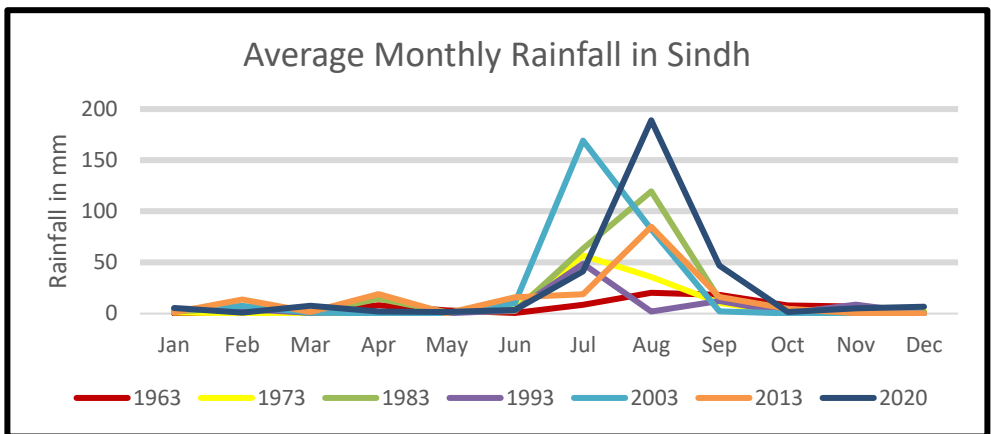*Figure 1*

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[4] For GHG emissions in Pakistan compared to SAARC countries please see appendix figure A2

[5] Climate Change Knowledge Portal for Development Practitioners and Policy Makers
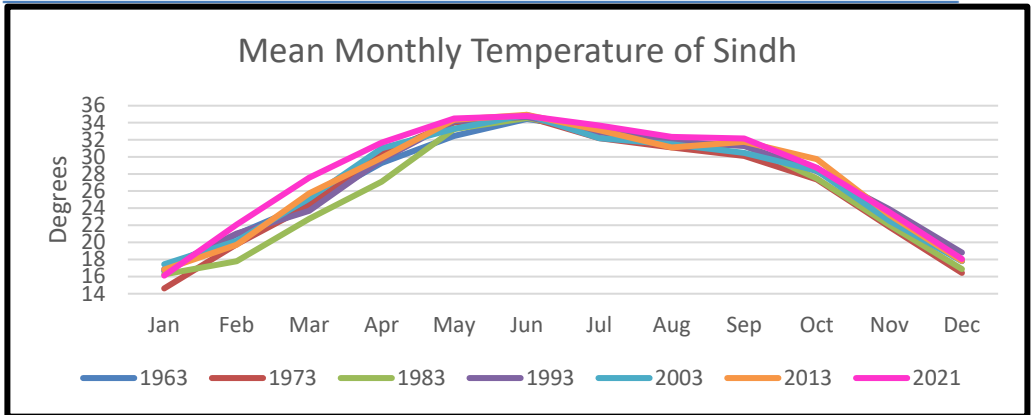
Mean Monthly Temperature of Sindh

Source: World Bank Climate Change Knowledge Portal
Note: This is only for selected years.

Figure 2

Average Monthly Rainfall in Sindh

Source: World Bank Climate Change Knowledge Portal
Note: This is only for selected years.

Energy consumption is used as an indicator by policy makers and research scientists to see if the general public is pursuing the climate change mitigation strategies (Whitmarsh, 2009). It has been observed that energy consumption has increased globally. In terms of Pakistan there is a noticeable steep rise in this consumption. In 2021, Pakistan's Electricity

Consumption rose to a total of 116,816.0 GWh as compared to 108,371.0 GWh in 2020, as reported by the Ministry of Finance of Pakistan. Fossil fuel consumption through coal, rose to 4,875,302.0 Ton of Oil Equivalent (TOE) in 2020 from 2,640,347.0 TOE in 2019. Electricity Consumption in Sindh in 2020 was 20,876.0 GWh. In Karachi, the huge surge in energy demand has mostly been catered by non-renewable energy sources (Civil Society Coalition for Climate Change (CSCCC)).[6] Around 70% of the demand is met by use of natural gas and 28% from oil. Only 8% of the Sindh area has some form of forest resources. Climate change has increased natural disasters including floods (flash floods due to intense monsoon rainfall and melting glaciers); and heat waves. Additionally, there is lack of fresh water supply due to poor water infrastructure in the quickly expanding city of Karachi. Therefore, fresh water scarcity and insufficient supply of energy are the two most serious issues being faced by the citizens. Karachi, as a metropolis of Pakistan, bears burden of being overpopulated and thus is not only susceptible to climate change but also lacks resources to meet the basic needs of half its population! The heat waves and floods that Karachi has endured in the recent few years are evidence of environmental breakdown of the city. Therefore, it is important to understand whether the behaviour of the people is such that it has a significant impact on the environment (Stern, 2000).

3 Data and methodology

The focus of the study is Karachi which is the largest city of Pakistan both in terms of area and population. With a population at 14,916,456 (2017 census), it is estimated to have increased to 16.8 million in 2022. This megacity is also the provincial capital and is an economic magnet. According to estimates of United Nations-World Population Prospects, it continues to grow at around 2.5% annually. The increased pressure on the

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[6] Pakistan Climate Change portal (CSCCC)

city's limited resources and infrastructure has made it a centre of heated discussion as it increasingly faces the brunt of climate change in terms of urban flooding and heat waves. Karachi serves to be an ideal setup for understanding the attitudes of its diverse demographics.

This survey uses primary level cross-sectional data which is both quantitative and qualitative in order to better understand the behavioural responses towards climate change and the intentions behind the actions taken by the people such as energy and water conservation and usage of cloth bags in place of plastic ones. Before the start of the survey, a pilot was conducted on 25 people. In total data was collected from 450 respondents but due to some responses not meeting the set criteria, they were rejected. The current research uses data of 398 respondents. The data collection period was from March to May 2022. An exponential non-discriminative snowball sampling method is used to fill questionnaires in an internet-based survey. Although it has the disadvantage that it 'increases the likelihood that the sample is not representative of the population' (Fricker, 2008); it is cost effective and respondents can answer questions at their convenience. The respondents are able to give better thought out answers and since the sharing of identity is not mandatory, they are more willing to share correct information. At the start of the survey their consent was taken to use their response for the purpose of our study. It was assured that their identities will not be made public.

There were 37 questions in total. Except two, all questions were closed-ended. These open-ended questions are "List two actions you usually take to conserve energy at home" and "In your opinion, whose responsibility is it to control climate change?" In order to analyse these qualitative questions, we used the qualitative software NVivo. This software did a thematic coding of the responses, which were then merged with the other quantitative data for analysis. The closed-ended questions were fixed-response ones. For example, "Do you turn off lights that you are not using?" If the response was yes, then the next question asked the respondent to

choose from the options given. These options were: convenience, to save money, habit, moral obligation, to reduce the heat in the atmosphere, or to save energy. The survey included specific questions to understand the intent behind the actions undertaken. For example, "Have you taken any specific action to mitigate the impact of climate change e.g. energy conservation?" If the response was yes, then the respondent was asked the open-ended question mentioned earlier which required listing of actions taken.

Further the surveyed were asked about their habits regarding usage of appliances and their reasons for switching off the air conditioner (AC) or heater; and do they feel that their measures taken at the individual level for example, of choosing to walk short distance instead of taking the car or keeping the AC thermostat at 22°C or above are helping the environment. As many as 95.2% of the respondents believed that climate change is real. But surprisingly only 35.9% of the respondents showed that they were satisfied with their own efforts to reduce climate change by engaging in any one of the mentioned activities. The results are shown in figure 3 below.

Figure 3: Satisfied as a citizen with habits to reduce carbon footprint, pollution, conserving water and energy
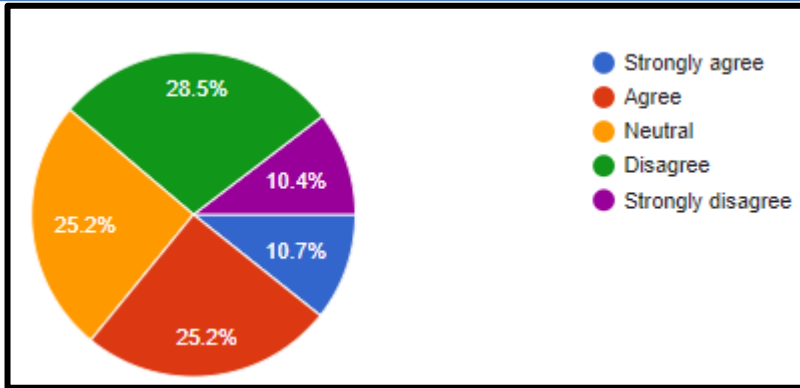
Source: Authors' own estimation (2022)

The data collected reflected the response from people belonging to various socio-economic groups; however, due to the design of the survey it was not possible to collect responses from the people who belong to the very lower spectrum of income group. Also a large number of respondents were university students. Since university students may be considered more aware of climate change it is expected that this may have given a biased result. Thus the results of this study must be taken with some reservations. 22.4% of the respondents were above 45 years old. Demographic details are given in table 1.

Table 1: Demographic profile of respondents

		Percentage of total
Gender	Male	42.7
	Female	55.8
	Prefer not to say	1.5
Age	18-24	48
	25-34	13.6
	35-44	11.8
	45-54	16.3
	55-64	6.3
	Above 64	3.8
Household Income	Up to Rs. 50,000	8.8
	Rs.51,000 - Rs100,000	18.4

	Rs. 101,000 - Rs. 150,00	17.6
	Rs.151,000 - Rs.200,000	19.9
	Above 200,000	35.3
Household size	1-2	3
	2-3	0.3
	3-4	29.4
	4-5	0.5
	5-6	45.5
	6-7	0
	7-8	12.6
	More than 8	8.8

Source: Authors' own estimation (2022)

Response to question regarding causes of climate change was used as a covariate. The survey also asked questions to determine the demographic profile of the respondent. These included questions related to gender, age, total household income, education of respondent, area of residence in the city and household size. We classify the variable 'area of residence' as part of any of the seven districts of Karachi. The respondents were also required to share if they believed climate change was a real threat or not and this was used as a control variable. The other relevant independent variables are opinions asked regarding 1) whose responsibility it is to mitigate climate change, 2) being affected by torrential rains of 2020 and heat wave of 2015, and 3) having suffered due to lack of fresh water supply and air pollution. The last two variables are binary in nature. Two regressions are run, one for each of the two dependent variables. The dependent variables include a) buying energy savers; and b) using cloth bag for shopping.

The third variable of interest for this study is conserving water. The reason for having conserving water as a variable is because the provision of fresh water requires energy. Water treatment, filter and pumping increases the carbon footprint and wastage leaves less for the ecosystem. Understanding the context and dynamics of the city where the survey was conducted is important to link it with the behaviour of the people. The city has been suffering with lack of fresh water supply in all its districts. Therefore, when

the survey asked if they conserve water each respondent stated in affirmation that they do so. Consequently, the analysis in the current study made an attempt to understand how the respondents conserve water and what they do when they face water shortages.

Due to the nominal nature of the first two dependent variables, logistic regression is used. For the second regression multinomial logistic regression is used since it has more than two categories whereas in the first one binomial logistic is used.[7] This is done following the methods adopted by Saguye, (2016); and Marie, Yirga, Haile, & Tquabo, (2020). For dichotomous outcome linear probability model and probit model can also be used. However, the disturbance term in the linear probability model does not have a normal distribution. This makes statistical inferences questionable. Additionally, the estimators are inefficient due to the heteroscedasticity issue in the error term. Another reason why linear probability model is not suitable is because in the absence of restrictions on the beta coefficients, the probabilities do not fall in the distribution. Probit model can also be used and the cumulative distribution function gives a sigmoid distribution. Probit model uses Maximum Likelihood Estimation instead of OLS, like the Logit model. But the logit model ensures that the probability stays in the limit of 0 and 1. Due to the weakness in the linear probability model and probit model, the logit model is used here. The functional form of logit model is selected using the specifications given in Gujrati and Porter (2003) in the context of climate change.

Logistic regression allows independent variables to be nominal and/or continuous. One of the assumptions of this regression is that dependent variable should have exhaustive categories. The logit model is specified as:

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[7] Other studies that have used this estimation strategy in climate change context are Ahmed, Ahmed, Chowdhury, & Atiqul Haq, (2022); Ahmed, Alam, Ahmed, Ambinakudige, Almazroui, Islam, ... & Mahmud, (2022); and Ahmed, & Atiqul Haq, (2019).

$$Logit\ (P) = \log\left(\frac{P}{1 - P}\right)$$

$$P_i = Pr\left(\frac{Y = 1}{X = x_i}\right)$$

$$Pr\left(y = \frac{1}{x}\right) = \frac{exp^x}{1 + e^x}$$

$$= \log\left(\frac{P_i}{1 - P_i}\right) = Logit\ (P_i) = \beta_0 + \beta_1 X_1 + \cdots + \beta_n X_n$$

$$+ e$$

$$\frac{P_i}{1 - P_i} = \exp(\beta_0 + \beta_i X_i)$$

Where the ratio of $\left(\frac{P_i}{1 - P_i}\right)$ is the probability of using anyone of the strategies. The βs are the parameters to be estimated, the Xs are the independent variables and the e is the error term. Details of all the dependent and independent variables are given in the next section. The independent variables are analysed to check for statistical issues. Absence of multicollinearity between the independent variables is checked which is also an assumption required for logistic regression. If the explanatory variables are highly correlated with each other than they do not provide any unique information in the regression model and can cause problems while fitting the model. It is done by the variance inflation factor (VIF). The correlation matrix checks the degree of collinearity between the variables and the variables are considered collinear if the coefficient correlation matrix is greater than 0.5. A value lower than this indicates absence of multicollinearity. A value of 1 indicates perfect collinearity. The correlation matrices for the variables used in the two logit estimations are given in appendix table A1 and A2.

4 Results

The regression results for energy conservation at home gauged through the usage of energy efficient bulbs is shown in table 2. The reference category is not buying energy efficient bulbs. The McFadden pseudo R-square shows that the full model represents a 9.4% improvement in fit in contrast to the null model. Since it is a logistic regression, the coefficients cannot be interpreted. Most of the control variables were found to be insignificant. That was quite a surprising result. It indicated that people's behaviour to use energy savers is not dependent on their gender, income, age, area of residence in Karachi and household size. The two variables that were found to be significant are the level of education and experience of heat wave. To further understand the reasons behind buying the energy efficient bulbs the respondents were asked to choose from given options. The findings are shown in table 6 and discussed that the main reason for buying energy efficient bulbs is to save money.

Table 2: Regression results related to energy conservation

Dependent variable: Do you buy energy efficient light bulbs?	**Prob>chi-square = 0.02** **Pseudo R2 = 0.17**
Independent Variables	Coefficient
Gender	0.33 (0.61)
District	0.20 (1.05)
Age	0.18 (0.61)
Education	1.1** (2.21)
Household size	0.03 (0.17)
Household income	0.07 (0.34)
Think climate change is real	0.04 (0.07)
Taken any specific action to mitigate the impact of climate change	0.45 (1.29)

Satisfied as a citizen with your habits to reduce carbon footprint, and energy use	0.17 (0.66)
Reasons to turn off extra lights	0.07 (0.29)
Participation in campaigns about climate change	0.25 (0.66)
Suffered from heat waves	1.30** (2.19)

Note: Figures in parenthesis indicates the value of z-statistics.
Significance levels: * p < .01, ** p < .05, *** p < .1.
Source: Authors' own estimation

Although 94.2% of the people stated that they believed that climate change is real and 4.8% showed uncertainty; 29.1% of the people believed that it is solely the government's responsibility to carry out climate change mitigation strategies. 56.3% of the respondents stated that it is both the government's and the individual's responsibility to adopt specific mitigation strategies. When asked if *they have taken any specific action to mitigate the impact of climate change,* only 43.7 % respondent said yes. Others either said no or showed uncertainty regarding their action. This indicates that most of the people believe that they are indeed being responsible citizens. However, when asked if they were satisfied as a citizen with their habits to reduce carbon footprint; pollution; and conserving water and energy, 34.8% agreed. This shows that people understand and realize that they are not taking sufficient actions towards mitigating climate change.

There was another question to better understand the behaviour of the people and this question asked *do you feel you are doing your level best to protect the environment and lessen the effects of climate change?* The response for this question showed that only 38.8% said that they were indeed putting in an effort.

Pakistan being a developing country does not have a proper recycling mechanism in place. There is no concept of sorting trash by the households

before discarding in the garbage. This sorting of garbage and then selling the garbage for recycling is done by untrained individuals who do this on their own accord with the sole purpose of earning cash. Thus there is no organized sector for recycling. And in connection to this there is no formal market for selling recycled products, like in the developed countries. Thus there is no concept by households to buy recycled products. However due to lack of resources people have the habit of reusing disposable items such as one-time use plastic bottles, which may in fact be detrimental to their health. In connection to this the respondents were asked if *they intentionally use/ purchase recycled items (such as recycled paper bags/cards/envelopes)*. Only 34.6% said that they do so. This indicates that even if they are using the recycled products, it is not due to concern for climate change. Out of the people that said that they recycle/upcycle products, 41.2% said that they do so in order to be environmentally friendly. A smaller number mentioned the reason behind this action so as to save money. Details are shown in table 4.

Further the question regarding plastic bag usage also shows little concern for the environment. Only 22.1% of the people make the additional effort of carrying cloth bag for shopping. While 27.1% said that they do not carry cloth bag for shopping, an additional 14.5% reported that they do not stop the shop keeper when the shop keeper hands their grocery in plastic bags. This shows that people are generally more inclined towards their own convenience. Multinomial logistic regression results for using cloth bags out of concern for climate change are shown in table 3. The reference category is not using cloth bag. The chi-square test shows that it is significant. The McFadden pseudo R-square shows that the full model represents a 9.4% improvement in fit in contrast to the null model.

Table 3: Regression results related to using cloth bags out of concern for climate change

Dependent variable: Using cloth bag for shopping Base outcome = 0	Prob>chi-square = 0.00

Independent Variables	Coefficient Comparison group 1	Coefficient Comparison group 2
		Pseudo R2 = 0.09
Gender	0.92* (3.27)	0.83* (3.10)
District	0.17** (2.24)	0.10 (1.27)
Age	0.12 (1.11)	0.11 (1.02)
Education	0.05 (0.27)	0.12 (0.70)
Household size	0.08 (1.04)	0.05 (0.64)
Household income	0.02 (0.23)	0.16 (1.50)
Think climate change is real	0.12 (0.36)	0.21 (0.69)
Taken any specific action to mitigate the impact of climate change	0.03 (0.18)	0.04 (0.25)
Satisfied as a citizen with your habits to reduce carbon footprint, and energy use	0.19 (1.52)	0.14 (1.12)
Participation in campaigns about climate change	0.35** (1.77)	0.20 (1.13)
Intentionally use/ purchase recycled items	0.05 (0.32)	0.27** (1.68)
Recycle/ upcycle (creative reuse of) items	0.67** (2.05)	0.68** (2.18)
Taken part in planting of trees around neighbourhood	0.55** (1.96)	0.61* (2.29)
Pollution has affected health	0.09 (0.50)	0.02 (0.18)
Feel irritated due to pollution	0.10 (0.56)	0.25 (1.28)
Constant	3.49 (2.92)	1.49 (1.28)

Note: Figures in parenthesis indicates the value of z-statistics.
Significance levels: * p < .01, ** p < .05, *** p < .1.
Source: Authors' own estimation

There is a significant association between usage of cloth bags and those who have been involved in campaigning for climate change and planting of

trees. The association is not significant for those who have been effected by pollution, who believe that climate change is real, household size, household income and education. The results indicate that those people who recycle or upcycle items are inclined to use cloth bags. This shows that the demographic variables do not significantly impact the behaviour towards taking actions to counter climate change. Rather the behaviour stems from other factors such as previous exposure to climate change issues and having an understanding of the importance of conserving resources and reducing wastage.

In the survey 40% responded that *they have at least once taken part in a campaign about an environmental issue.* Additionally, 40% of the respondents were directly affected by the heavy rains in August, 2020; and 42% have experienced the heat waves in Karachi. Heat waves have become specially frequent and intense after 2015. One of the questions encouraged them to think back to the year of 2015 when the city had the worst form of heat wave during the summers. The respondents recalled and 21.78% mentioned that they suffered immensely during that heatwave. There were three responses that even revealed having lost a close friend / family member due to the heat wave in 2015. Even though the respondents were impacted by these two major calamities due to climate change, the data shows that many did not make efforts to tackle the issue. For example, only half of the respondents stated that they have ever planted a tree. This is surprising when 95% respondent that their health has been impacted adversely due to air pollution in Karachi. 95.1% feel irritated by it. It is also more surprising when only 17.1% said that they prefer walking short distance instead of using a vehicle due to it being more environmentally friendly. More details on the reason for them walking over short distances is shown in table 4 below. This leads to some very important insights. Even though people feel the impacts of climate change, their behaviour is not motivated by a concern out of climate change.

The air conditioner consumes around 3000 to 5000 watts of electricity per hour. The lower the temperature setting, the more power is used. This increases GHG emissions in the form of hydrofluorocarbons (HFCs). Although newer versions of air conditioners now use HFCs (which is considered better than halons and chlorofluorocarbons which were used in older versions, contributing to the depletion of Earth's ozone layer). Keeping this information in mind, people were asked their preferred temperature setting of the air-conditioner, as lower settings demand more energy. The electricity distribution company of Karachi is K-Electric and it regularly advertises and encourages people to keep the setting of air-conditioners above 24 degrees. Yet 81.45% of the respondents stated that they keep the setting below 25 degrees. Further even if they are choosing a higher setting their main reason for choosing so is to save money and not out of concern for climate change. This is shown in table 4.

Table 4: Intentions behind actions

Actions taken by HH	Reasons for action (% of total respondents)							
	To be environment-friendly	Convenience	Save money	Health related	Habit	Moral obligation	Other reason	N.A./ I do not
A.C. temperature preference	17.7	19.3	38.9 *	7.7	12.5	1.9	--	1.9
Turning off extra lightings	3.5	1.3	51.3 *	0	20.9	22.9	0.3	--
Buy energy saver bulbs	0	2.9	81.3 *	--	0.7	2.2	8.6	4.2
Recycling/ upcycling	41.2*	7.9	12.9	0	8.2	3.4	0.8	25.6
Prefer walking over short distances	17.1	28.4*	5.7	17.1	17.3	1.3	1.8	11.4

Source: Authors' own estimation
*Note: * Most popular opinion*

Respondents were also inquired about their usage of heaters. But since Karachi is not a city with extreme winters, more than 70% said that they do not even own a heater. Out of those that do own the heater, only 1.7% said that they leave the heater running when they leave the room for a short while. Another interesting insight that we got from the survey was this that although only 1.3% mentioned that they do not turn off the lights that are not being currently used, 51.3% of the people mentioned their intention of switching off the lights is to save money. Only 3.5% said that they turn the lights off because they want to be environmentally friendly. It could be a possibility that the frequent encouragement by the K-electric had some impact on the people and therefore 22.9% of the people said that it is their moral obligation to save electricity and that is the reason that they turn off extra lights. Similarly, when inquired about their main reason to purchasing energy savers, they mentioned that it is in order to save money. Thus saving money seems to be the main reason for the actions taken by the people and these actions do not stem from out of concern for climate change.

Fresh water supply uses up energy and thus causing an increase in the carbon footprint. Conserving water can reduce this footprint. The city of Karachi is often faced with shortages of fresh water supply for the households. When inquired about lack of fresh water supply in the households, 97% showed that they feel extremely frustrated with this recurring issue; 71.2% resort to using tankers while 22.5% use the untreated well water. Further they were inquired about the specific actions they take to conserve water usage even when there is no water shortage. The most popular action is to turn the tap off while brushing teeth. However, other practices that can conserve water such as using a bucket for shower or using washing machines for full loads are not followed by the majority of the people. The responses related to washing machine and shower are concerning as both activities waste a lot of fresh water. Actions such as checking for water leakage requires additional effort is also done less frequently. Table 5 shows that only 3.3% of the respondents make an effort

to reuse the water for example the water left after washing vegetables. This indicates that they do not want to make an extra effort or go out of their way to conserve water. Only in dire circumstances when there is no water coming from the pipeline and water needs to be purchased from other sources, then the people conserve water properly.

Table 5: Water conservation

Actions taken to conserve water at home	Yes
Check toilet for leaks	66.89%
Turn off the water while brushing teeth	90.03%
Use bucket for shower	37.75%
Use automatic washing machine only for full loads	35.76%
When washing dishes, don't leave the water running for rinsing	73.84%
other(reuse water/ use aerorated shower)	3.31%

Source: Authors' own estimation

5 Discussion

The current study shows that 29.1% of the people believe that it is solely the government's responsibility to carry out climate change mitigation strategies while 56.3% of the respondents stated that it is both the government's and the individual's responsibility to adopt specific mitigation strategies. These findings support findings of previous studies such as Ahmed, & Atiqul Haq, (2019) which show that people expect the government to shoulder more responsibility towards climate change mitigation strategies. The current study shows that even though the respondents were impacted by two major climate change related calamities in the past decade, many did not make significant efforts. A probable reason being that they consider their actions small and believe that they cannot make a difference. Our study also indicates that most of the people have the perception that they are being responsible citizens and that they realize that their actions are not sufficient to mitigate climate change. They

believe that they need to change their behaviour and play a more active role. This is important to consider as people who believe in the urgency of responding to climate change are the ones who would undertake specific actions to mitigate the impacts (Bateman, & O'Connor, 2016; Mildenberger, et al., 2019).

Our findings show a significant association between usage of cloth bags and those who have been involved in campaigning for climate change and planting of trees. This shows that it is important to raise awareness and give green nudges on an ongoing basis. The role of teachers in this regard is especially important as discussed in Ahmed, et al., (2022) and also usage of social media. In a study in Bangladesh the results showed that 61% of the respondents agreed that there has been some change in the climate (Huda, 2013). And this awareness is dependent on other socio demographic characteristics (Hasan, & Akhter, 2011; Bayard, et al., 2007). In our study we found a strong relationship between awareness and the covariate for education; however, there was no association with other control variables such as the household size and household income.

Almost all the respondents in our study agreed that their health has been impacted adversely due to air pollution in Karachi and 95.1% feel extremely irritated by it. This is in line with another study in Bangladesh which shows that climate change has had adverse impact on health (Ahmed, & Atiqul Haq, 2019). But even though the people feel an adverse impact on their health, their behaviour is not motivated by a concern out of climate change. The findings of this study show that saving money seems to be the main reason for the actions taken by the people and these actions do not stem from out of concern for climate change. The results are in line with Whitmarsh, (2009) that people in Karachi are not taking actions such as energy conservation, recycling, decreasing plastic usage and water conservation due to a concern for climate change but mainly due to monetary concerns.

6 Concluding Remarks and Policy Implications

Pakistan is one of the ten most vulnerable nations suffering climate crisis. Frequency and intensity of rainfall have increased. Karachi's unplanned and unsystematic expansion has made it to the ten worst cities to live in, as per the Economist. The continuous increase in energy consumption along with invisible public mitigation efforts to control climate change, is a cause of serious concern. This study made an attempt to understand the intention behind the actions that people take. Although it seems that these actions are mitigation strategies, for example turning off extra lights, the survey results revealed that the true intention behind these actions is not what it seems. The results show that people are not willing to make personal sacrifices for the issue at hand. Although many claim that it is everyone's/ own responsibility; there are not many actions that they are willing to take out of their comfort zone. The people seem to underestimate the impact they are having. The results support the findings of Whitmarsh, (2009) that people in Karachi are not taking actions such as energy conservation, recycling, decreasing plastic usage and water conservation due to a concern for climate change. Rather the actions taken by the households reflect a concern for their own gain which mainly includes monetary concerns. This is in negation to literature that assumes that people resort to climate change mitigation strategies by decreasing their consumption of energy. This is an important dimension to consider for policy decisions. The government should adopt strategies for green nudges. These include revamping the energy sector, manufacturing industries, transportation and construction.

Radical actions must be taken, like introducing carbon pricing, that is impose carbon taxes or emissions trading, also known as 'cap and trade'. This can work as an incentive to various sectors of the economy (UN EMISSIONS GAP REPORT 2022). Another significant step in the right direction to lower emissions, will be to encourage usage of public transport, cycling, walking and discouraging usage of private vehicles (Climate

Change 2022: Mitigation of Climate Change (AR6 WGIII)). Pakistan government has taken some measures to provide electric public transport but there needs to be an aggressive policy action to increase the number and improve the quality of service of public transports. Correspondingly it is also important to ensure easy access and sufficient availability of other environmental friendly consumer products (Bonini, & Oppenheim, 2008; and Ottman, Stafford, & Hartman, 2006). It is important to change the behaviour of the people to transition them into adapting PEB (Taghikhah, Voinov, & Shukla, 2019). Thus a holistic approach is required to understand PEBs in order to change to a low-carbon society.

Year 2020 began with the Covid-19 pandemic which forced countries around the world to go into lockdown. Lockdown meant economic activity came to almost a standstill, and the welfare of people and the economy have suffered adversely. However, a massive reduction in economic activities led to cleaner air, much reduced global emissions and less air, water and noise pollution. Lessons can be learnt from the Covid-19 lockdown that in order to save the planet from environment degradation, less disruptive and more planned ways should be incorporated. The state and citizens can work together for a carbon resilient future. Post-Covid-19 world should engage citizens in their capacity to bring forth accepted, embedded and bearable behaviour changes in the context of climate change (Howarth, et al., 2020). For a significant reduction in our carbon footprint, it is imperative that we all work together. Each action matters and there is an urgent need to mobilize the people to take responsibility for their actions. Community level initiatives to change behaviours towards preservation of energy, water and reduction in the use of plastic is the need of the hour. It should be a mandatory part of school curriculum to instil environmentally responsible behaviour from the very beginning. Countries can benefit by incorporating climate change education in the curriculum and by promoting awareness about its adverse effects, and educating learners about mitigation and adaptation strategies (Ahmed, et al., 2022). School and college teachers have an idea what climate change is, and arming teachers with the

knowledge of climate change, its threats and how to mitigate and adapt will help students at an early age to understand the dangers, this in turn will encourage pro-environment behaviour (Chowdhury, et al, 2021). Also not just celebrating Earth day and Water Day for a week, but practicing environment friendly actions daily. Government and NGOs should campaign in a way that gives the message of "Are you doing your bit?" Increased public involvement by holding dialogue, and having community groups and consultation will create the right awareness and bring about long term behavioural change. Impactful media campaign is also needed to ensure people join hands to take the desired actions. Policy makers should design effective communication strategies and pair them with appropriate economic measures to have a significant behavioural change in the people. To bring about behavioural change people will require more and complete information regarding the environmental impact of their actions as suggested in a study by Li, Long, & Chen, (2017). Print, electronic and social media are powerful in creating awareness, starting trends and can be instrumental for environmental campaigning. Today's world follows what the media broadcasts and streams. Therefore, opinions are formed and shaped by the all-powerful social, electronic and print media. Thanks to the reach of media environmental issues have been highlighted. But the media has failed so far to bring forth actual changes in behaviour of the population. As a CSR, media can play its role in propagating environmental activism (Jiménez-Castillo, & Ortega-Egea, 2015).

This study is limited as the internet survey did not reach the length and breadth of Karachi. Therefore, considering the diverse population of this metropolis, the findings of this study should be taken with some reservations. Further, our findings reveal that a certain gender and age bias is there as more females and a younger population have filled the questionnaire. As a future work, data can be gathered which is more representative and surveyors may actually interview the respondents to explain the climate change related nomenclature like climate crisis,

mitigation, carbon footprint, GHG emissions, energy and water conservation, renewable energy etc.

Conflicts of Interest

None declared.

References

Ahmed, Z., Hussain, A. B., Ambinakudige, S., Ahmed, M. N. Q., Alam, R., Rezoan, H. A., ... & Mahmud, S. 2022. "Perceived human-induced causes of landslide in Chattogram metropolitan area in Bangladesh". Earth Systems and Environment, 6(2), 499-515.)

Ahmed, M. N. Q., Ahmed, K. J., Chowdhury, M. T. A., & Atiqul Haq, S. M. 2022. "Teachers' Perceptions About Climate Change: A Comparative Study of Public and Private Schools and Colleges in Bangladesh". Frontiers in Climate, 83.

Ahmed, M. N. Q., & Atiqul Haq, S. M. 2019. "Indigenous people's perceptions about climate change, forest resource management, and coping strategies: a comparative study in Bangladesh". Environment, Development and Sustainability, 21, 679-708.

Alvi, S., Nawaz, S. M. N., & Khayyam, U. 2020. "How does one motivate climate mitigation? Examining energy conservation, climate change, and personal perceptions in Bangladesh and Pakistan". Energy Research & Social Science, 70, 101645.

Bateman, T. S., & O'Connor, K. 2016. "Felt responsibility and climate engagement: Distinguishing adaptation from mitigation". Global environmental change, 41, 206-215.

Bayard, B., Jolly, C. M., & Shannon, D. A. 2007. "The economics of adoption and management of alley cropping in Haiti". Journal of environmental management, 84(1), 62-70.

Bonini, S., & Oppenheim, J. (2008). Cultivating the green consumer. Stanford Social Innovation Review, Fall, 56–61.

Ceglia, D., de Oliveira Lima, S. H., & Leocádio, Á. L. (2015). An alternative theoretical discussion on cross-cultural sustainable consumption. Sustainable Development, 23(6), 414-424.

Change, A. D. C., Blair, T., Pachauri, R. K., & Pachauri, R. 2006. "Avoiding dangerous climate change". Cambridge University Press.

Cheng, P., Wei, J., Marinova, D., & Guo, X. 2017. "Adoption of protective behaviours: Residents response to city smog in Hefei, China". Journal of Contingencies and Crisis Management, 25(4), 244-255.

Choi, D., & Johnson, K. K. (2019). Influences of environmental and hedonic motivations on intention to purchase green products: An extension of the theory of planned behavior. Sustainable Production and Consumption, 18, 145-155.

Chowdhury, M. T. A., Ahmed, K. J., Ahmed, M. N. Q., & Haq, S. M. A. 2021. "How do teachers' perceptions of climate change vary in terms of importance, causes, impacts and mitigation? A comparative study in Bangladesh". SN Social Sciences, 1, 1-35.

Civil Society Coalition for Climate Change (CSCCC). https://www.csccc.org.pk/
Climate Change 2022: Mitigation of Climate Change (AR6 WGIII). https://www.c40knowledgehub.org/s/article/Climate-Change-2022-Mitigation-of-Climate-Change-AR6-WGIII-IPCC

Climate Change Knowledge Portal For Development Practitioners and Policy Makers. https://climateknowledgeportal.worldbank.org/country/pakistan

Climate Risk Country Profile: Pakistan 2021: The World Bank Group and the Asian Development Bank

Elahi, E., Khalid, Z., & Zhang, Z. (2022). Understanding farmers' intention and willingness to install renewable energy technology: A solution to reduce the environmental emissions of agriculture. Applied Energy, 309, 118459.

Fricker, R. D. 2008. "Sampling methods for web and e-mail surveys". The SAGE handbook of online research methods, 195-216.

Gössling, S., Scott, D., Hall, C. M., Ceron, J. P., & Dubois, G. 2012. "Consumer behaviour and demand response of tourists to climate change". Annals of tourism research, 39(1), 36-58.

Gujarati, D. N. (2022). Basic econometrics. Prentice Hall.

Hanss, D., Böhm, G., Doran, R., & Homburg, A. (2016). Sustainable consumption of groceries: The importance of believing that one can contribute to sustainable development. Sustainable Development, 24(6), 357-370.

Hasan, Z., & Akhter, S. 2011. "Determinants of public awareness and attitudes on climate change in urban Bangladesh: Dhaka as a case". European Journal of Social Sciences, 21(1), 154-162.

Howarth, C., Bryant, P., Corner, A., Fankhauser, S., Gouldson, A., Whitmarsh, L., & Willis, R. 2020. "Building a social mandate for climate action: lessons from COVID-19". Environmental and Resource Economics, 76(4), 11071115.

Huda, M. N. 2013. "Understanding indigenous people's perception on climate change and climatic hazards: a case study of Chakma indigenous communities in Rangamati Sadar Upazila of Rangamati District, Bangladesh". Natural Hazards, 65, 2147-2159.

Hussain, M., Liu, G., Yousaf, B., Ahmed, R., Uzma, F., Ali, M. U., ... & 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.

Hussain, M., Butt, A. R., Uzma, F., Ahmed, R., Irshad, S., Rehman, A., & Yousaf, B. 2020. "A comprehensive review of climate change impacts, adaptation, and mitigation on environmental and natural calamities in Pakistan". Environmental monitoring and assessment, 192, 1-20.

IPCC, 2007: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Parry, M.L., O.F. Canziani, J.P. Palutikof, P.J. van der Linden, and C.E. Hanson, (eds.)].

Jang, S. M. 2013. "Framing responsibility in climate change discourse: Ethnocentric attribution bias, perceived causes, and policy attitudes". Journal of Environmental Psychology, 36, 27-36.

Jiménez-Castillo, D., & Ortega-Egea, J. M. 2015. "Too positive to change? Examining optimism bias as a barrier to media effects on environmental activism". Journal of Environmental Psychology, 43, 216-225.

Kenis, A., & Mathijs, E. 2012. "Beyond individual behaviour change: The role of power, knowledge and strategy in tackling climate change". Environmental Education Research, 18(1), 45-65.

Kent, J. C. 2012. "Climate change-whose responsibility? From the personal to the global" (Doctoral dissertation).

Lee, H., Kurisu, K., & Hanaki, K. 2013. "Influential factors on pro-environmental behaviours— A case study in Tokyo and Seoul. Low Carbon Economy", 2013, 4, 104-116. http://dx.doi.org/10.4236/lce.2013.43011 published Online September 2013

Li, Q., Long, R., & Chen, H. (2017). Empirical study of the willingness of consumers to purchase low-carbon products by considering carbon labels: A case study. Journal of Cleaner Production, 161, 1237-1250.

Mani, M., Bandyopadhyay, S., Chonabayashi, S., Markandya, A., Mosier, T. 2018. "South Asia's Hotspots: The Impact of Temperature and Precipitation changes on living standards". South Asian Development Matters. World Bank, Washington DC.

Marie, M., Yirga, F., Haile, M., & Tquabo, F. (2020). Farmers' choices and factors affecting adoption of climate change adaptation strategies: evidence from northwestern Ethiopia. Heliyon, 6(4).

Masud, M. M., Al-Amin, A. Q., Junsheng, H., Ahmed, F., Yahaya, S. R., Akhtar, R., & Banna, H. 2016. "Climate change issue and theory of planned behaviour: Relationship by empirical evidence". Journal of Cleaner Production, 113, 613-623.

Memon, F. S., Abdullah, F. B., Iqbal, R., Ahmad, S., Hussain, I., & Abdullah, M. 2022. "Addressing women's climate change awareness in Sindh, Pakistan: an empirical study of rural and urban women". Climate and Development, 1-13.

Mildenberger, M., Lubell, M., & Hummel, M. 2019. "Personalized risk messaging can reduce climate concerns". Global Environmental Change, 55, 15-24.

Nguyen, H. V., Nguyen, C. H., & Hoang, T. T. B. (2019). Green consumption: Closing the intention-behavior gap. Sustainable Development, 27(1), 118-129.

Ottman, J. A., Stafford, E. R., & Hartman, C. L. (2006). Avoiding green marketing myopia: Ways to improve consumer appeal for environmentally preferable products. Environment: science and policy for sustainable development, 48(5), 22-36.

Pakistan Economic Survey, 2021-2022. Government of Pakistan.

Peattie, K. (2010). Green consumption: behavior and norms. Annual review of environment and resources, 35, 195-228.

Piccolo, L. S., & Alani, H. 2015. "Perceptions and behaviour towards climate change and energy savings: the role of social media".

Saguye, T. S. (2016). Determinants of smallholder farmers' adoption of climate change and variability adaptation strategies: Evidence from Geze Gofa District, Gamo Gofa Zone, Southern Ethiopia. J. Environ. Earth Sci, 6(9).

Salman, A., ul Husnain, M. I., & Aneel, S. S. 2018. Community-based climate change adaptation. Issues old and new, 189.

Sharples, D. 2010. "Communicating climate science: evaluating the UK public's attitude to climate change". Earth and Environment, 5(1), 185-205.

Shuai, C. M., Ding, L. P., Zhang, Y. K., Guo, Q., & Shuai, J. (2014). How consumers are willing to pay for low-carbon products? –Results from a carbon-labeling scenario experiment in China. Journal of Cleaner Production, 83, 366-373.

Sreen, N., Purbey, S., & Sadarangani, P. (2018). Impact of culture, behavior and gender on green purchase intention. Journal of retailing and consumer services, 41, 177-189.

Stern, P. C. 2000. "New environmental theories: toward a coherent theory of environmentally significant behaviour". Journal of social issues, 56(3), 407-424.

Taghikhah, F., Voinov, A., & Shukla, N. (2019). Extending the supply chain to address sustainability. Journal of cleaner production, 229, 652-666.

Trivedi, R. H., Patel, J. D., & Acharya, N. (2018). Causality analysis of media influence on environmental attitude, intention and behaviors leading to green purchasing. Journal of cleaner production, 196, 11-22.

The World Bank Data. Electricity production from oil, gas, and coal sources (% of total) - Pakistan https://data.worldbank.org/indicator/EG.ELC.FOSL.ZS?locations=PK

UN Emissions Gap Report 2022. https://wedocs.unep.org/bitstream/handle/20.500.11822/40875/EGR2022_KR.pdf?sequence=3

Urban, J., & Ščasný, M. 2012. "Exploring domestic energy-saving: The role of environmental concern and background variables". Energy policy, 47, 69-80.

Wang, T., Shen, B., Springer, C. H., & Hou, J. (2021). What prevents us from taking low-carbon actions? A comprehensive review of influencing factors affecting low-carbon behaviors. Energy Research & Social Science, 71, 101844.

Whitmarsh, L. 2009. "Behavioural responses to climate change: Asymmetry of intentions and impacts". Journal of environmental psychology, 29(1), 13-23.

Whitmarsh, L., Poortinga, W., & Capstick, S. 2021. "Behaviour change to address climate change". Current Opinion in Psychology, 42, 76-81.

Wu, S. I., & Chen, J. Y. (2014). A model of green consumption behavior constructed by the theory of planned behavior. International Journal of Marketing Studies, 6(5), 119.

Appendices

Table A1: Correlation Matrix for independent variables in the first Logit regression for energy conservation

	Gender	District	Age	Edu.	HH size	HH income	Think CC real	Action to mitigate CC impact	Satisfied with habits	Turn off extra lights	Participation in campaigns	Suffered from heat waves
Gender	1.00											
District	0.04	1.00										
Age	-0.12	0.09	1.00									
Education	-0.06	0.01	0.46	1.00								
HH size	-0.01	0.07	-0.09	-0.02	1.00							
HH income	-0.01	0.09	0.02	0.07	0.02	1.00						
Think CC real	-0.02	-0.05	0.03	0.01	0.03	-0.13	1.00					
Taken action to mitigate CC impact	0.11	-0.07	-0.09	-0.16	-0.08	-0.08	0.13	1.00				
Satisfied with habits to reduce carbon footprint, and energy use	-0.01	-0.13	-0.25	-0.13	-0.09	0.23	-0.07	0.08	1.00			
Reasons to turn off extra lights	0.04	0.04	0.03	-0.03	-0.07	0.09	0.01	-0.03	0.01	1.00		

Participation in campaigns about CC	0.03	0.04	0.16	0.05	-0.08	0.00	-0.03	0.09	-0.01	0.01	1.00		
Suffered from heat waves	0.06	0.10	0.05	-0.01	-0.04	0.11	0.00	0.12	0.01	0.09	0.04	1.00	

Note: HH means household, and CC means climate change

Table A2: Correlation Matrix for independent variables in multinomial logistic regression related to using cloth bags out of concern for climate change

	use/ purchase recycled items	Recycle	campaigns about CC	Trees	Pollution affected health	Irritated by pollution	Gender	District	Age	Edu.	HH size	HH inc.	Think CC real	Mitigate CC	Habit
use/ purchase recycled items	1.00														
Recycle	0.03	1.00													

campaigns about CC	0.15	0.08	1.00												
Trees	0.07	0.13	0.12	1.00											
Pollution affected health	0.07	0.02	0.08	0.08	1.00										
Irritated by pollution	0.11	0.06	0.08	0.01	0.32	1.00									
Gender	-0.01	0.24	-0.03	-0.03	-0.12	0.01	1.00								
District	0.01	-0.00	0.03	-0.06	0.03	0.06	0.04	1.00							
Age	-0.03	-0.08	0.15	-0.04	0.00	0.06	-0.12	0.09	1.00						
Education	0.02	-0.05	0.05	-0.06	-0.02	-0.02	-0.07	0.02	0.46	1.00					
HH size	-0.04	-0.04	-0.09	-0.03	0.00	-0.02	-0.01	0.07	-0.07	-0.02	1.00				
HH income	0.07	-0.09	-0.00	-0.01	0.16	0.11	-0.01	0.08	-0.02	0.07	0.02	1.0			
Think CC real	0.04	0.10	-0.03	-0.03	0,07	-0,01	-0.02	-0.06	0.04	0.01	0.03	-0.1	1.00		
Action to mitigate CC	0.10	0.15	0.09	0.14	0.05	0.08	0.12	-0.08	-0.09	-0.16	-0.09	-0.1	0.13	1.00	
Satisfied with habits to reduce carbon footprint, and	0.07	0.04	-0.01	0.05	0.09	0.03	-0.01	-0.14	-0.25	-0.13	-0.09	0.22	-0.07	0.09	1.00

energ y use													

Note: HH means household, and CC means climate change
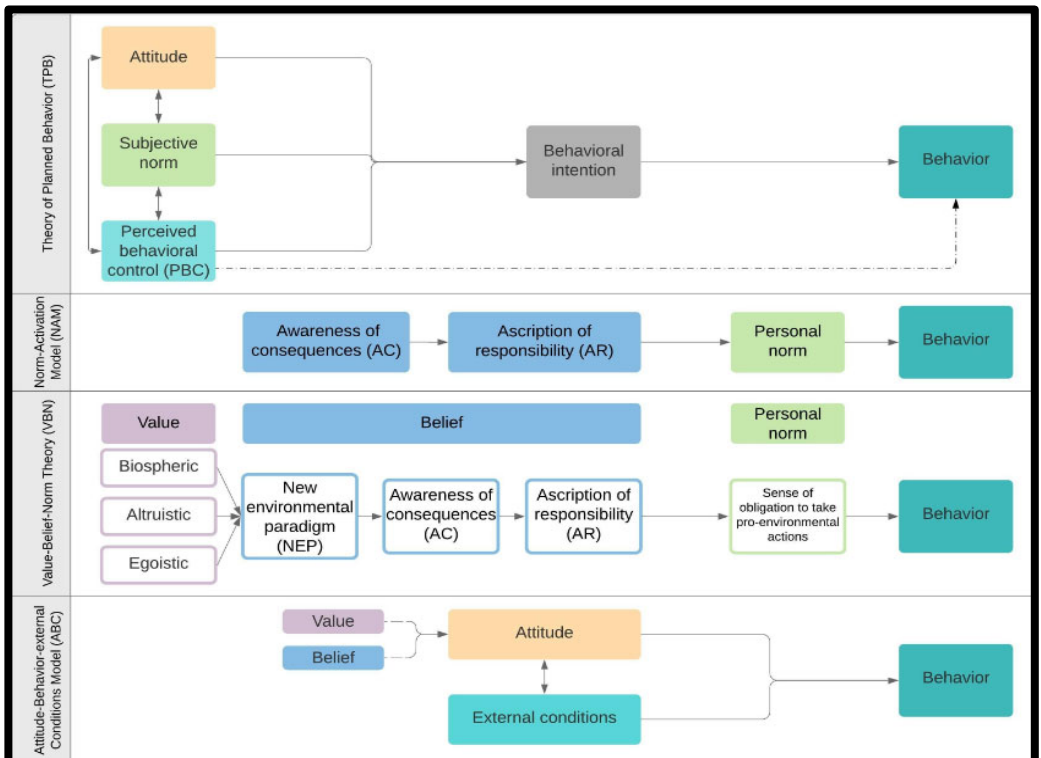
Figure A1: Comparison of theories

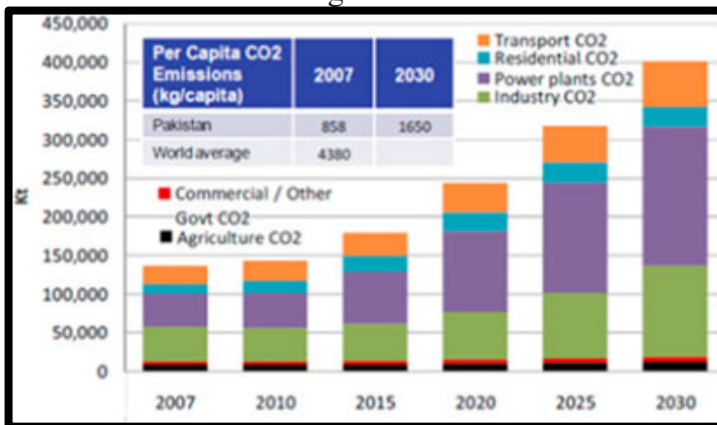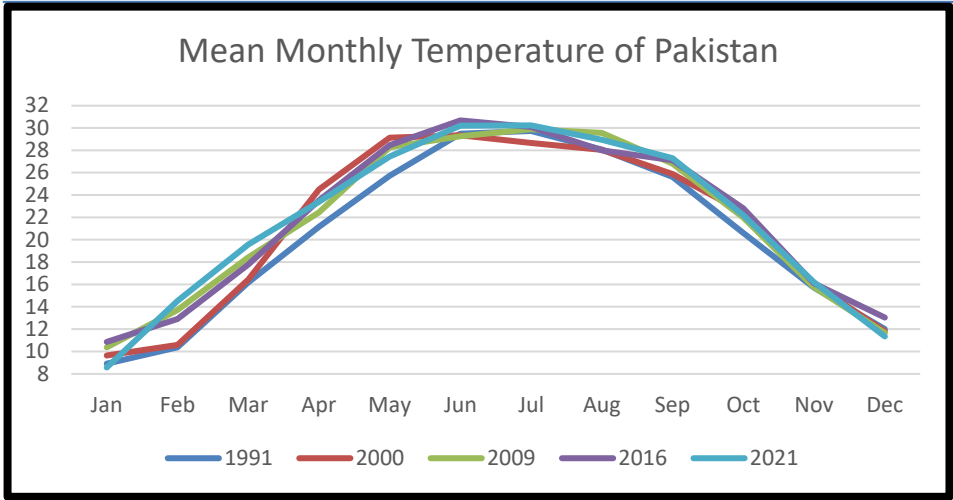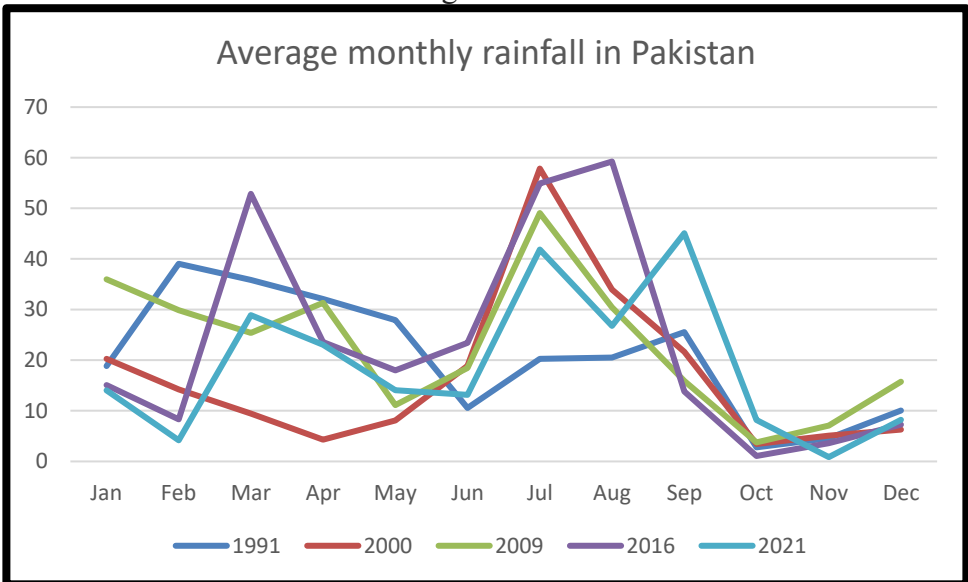Image Source: Wang, Shen, Springer, & Hou, (2021).

Figure A2

Image Source: Abas, Kalair, Khan, & Kalair, (2017).

Figure A3

Mean Monthly Temperature of Pakistan

Source: World Bank Climate Change Knowledge Portal
Note: This is only for selected years.

Figure A4

Average monthly rainfall in Pakistan

Source: World Bank Climate Change Knowledge Portal

Note: This is only for selected years.