Air Travelers' Environmental Consciousness:

A Preliminary Investigation at Benazir Bhutto International Airport, Islamabad

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16/M. Phil-ENV/PIDE/2013

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A dissertation submitted to Pakistan Institute of Development Economics (PIDE) Islamabad,

For the fulfillment of requirement of the Degree of Masters of Philosophy in Environmental Economics

2016

AUTHORSHIP STATEMENT

*I, **Sania sheikh**, declare and affirm on oath that I myself have authored this M. Phil Thesis with my own work and means, and I have not used any further means except those I have explicitly mentioned in this report. All items copied from internet or other written sources have been properly mentioned in quotation marks and with a reference to the source of citation.*

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Acknowledgement

With the name of Allah SWT the most beneficent and the most merciful, I want to dedicate my work to my beloved parents and family. Without their loving support I would never be able to accomplish my goals.

I find this opportunity to extend my deepest respects and gratitude to my teachers: Dr. Rehana Sidiqui, Dr. Asad Zaman sb, Dr. Usman Mustafa, Dr. Anwar Hussain, Dr. Khalid Mehmood, Dr. Muhammad Iqbal, Dr. Anil Salman and last but not least I am grateful to my supervisor, Dr.Iftikhar Ahmad, Assistant professor, Department of Environmental Economics, Pakistan Institute of Development Economics (PIDE), for his valuable help in finalization of my research. He has been a source of stimulation and guidance throughout my thesis.

I am also grateful to my classmates for being nice and supportive during the course of our studies. Finally, I also want to say thanks to the supportive staff of PIDE especially Mussawir bhai for his kind and timely updates.

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List of Abbreviations

IPCC	Intergovernmental Panel on Climate Change
ICAO	International Civil Aviation Organization
WTP	Willingness to Pay
CVM	Contingent Valuation Method
BBIAP	Benazir Bhutto International Airport
CO_2	Carbon Dioxide
IATA	International Air Transport Association
OCAC	Oil Company Advisory Council
PCAA	Pakistan Civil Aviation Authority
ATAG	Air Transport Action Group
ICCT	International Council on Clean Transportation

Abstract

A lot of efforts have been made to communicate individuals to assess their awareness about environmental problem and readiness towards solution. Several economic reviews reveal the cost of damage related to climate change. These reviews are limited to only expected damages of climate change, for motivation of action it is important to assess perception of risk of climate change and willingness to pay to avoid these risks. One such industry, which is a contributor to global GHG emissions leading to climate change has escaped from being noticed, is the aviation industry. Different measure have been taken to avoid and compensate for these emissions but due to aviation emission growth it has been proposed by International Air Transport Association has proposed "Consumer based offset programme" by which travellers can be charged extra price for travelling ,which can be used for carbon offsetting.

The study aimed to find out the willingness to pay of airline passenger at Benazir Bhutto International Airport as a compensation for their flight emissions. The study employs Contingent Valuation (CV) method. Primary data through was collected from Benazir Bhutto International Airport. The objective was to find out the mean willingness to pay of air travellers. The objectives of the study are to analyze air traveler's willingness to pay for climate change mitigation actions at Benazir Bhutto International Airport. Age of the respondent, Income, Education, Environmental education class of seat, ticket price and number of trips are important determinant of air travellers' willingness to pay. The study concludes that air traveler are willing to pay to offset their carbon emissions ,so it can be recommended that climate mitigation action programme can by launched in Pakistan by taking in consideration class of seat, ticket price and distance of trip .

Key words: Contingent Valuation Method, OLS Regression, Willingness to pay, Climate change mitigation, Benazir Bhutto International Airport, Islamabad.

Chapter 1

Introduction

For over a hundred years, global warming and climate change has been the subject of scholastic debate (Cameron, 2013). In recent years a strong link is experienced between accelerated human activities and an increase in global warming since the industrial revolution (Stocker, 2014). There are still a number of scholars and general public who contradict this phenomenon (Adger et al., 2009). Progress to decrease global green house gas emission, the major cause of global warming, is postponed due to failure to recognize its existence (Adger, 2010).

Global warming and climate change are generally used interchangeably, however they are significantly different. Gradual increase in global temperatures of the Earth's atmosphere over time is called global warming (International-Energy-Agency 2009). This is often coupled with the increase in greenhouse gases (GHG), such as Carbon Dioxide, Methane, CFC's and other pollutants (Montzka et al., 2011). Climate change is the change in climatic patterns globally due to global warming (IPCC, 2001). In recent years, climate change has become a key driver in government policies and subject of debate for policy makers (Whitmarsh, 2011).

Due to the adverse consequences of climate change on the planet, it is important to mitigate the global warming: that causes extreme weather conditions and areas becoming uninhabitable (Fankhauser, 2013). Climate change, until that time, produced more frequent and severe weather conditions in the last 30 years. Due to natural disasters between 1980 and 2012, a total of $3.8 trillion of losses are reported , 74% of them are that held responsible to extreme weather conditions (World-Bank, 2013).

One such industry, which is a contributor to global GHG emissions and has escaped from being noticed, is the aviation industry (Randles & Bows , 2009). To control and compensate for these emissions, various measures have been taken. These include improvements in air traffic management, changes in aircraft engine design, and operational efficiency (Hares et al., 2010). These measures have reduced the aviation industries emissions over the past twenty years (FAA , 2015). However , due to heavy reliance on fossil fuels of the airline industry such is not possible to reduce GHG emissions at present through operational efficiencies and technology only (Lawrence, 2009).

Due to the Air industry's emission, growth International Air Transport Association has proposed another programme "Consumer based offset programme" which will compliment other measures to reduce the impact of flying. Further, voluntary trades—known as voluntary carbon offsets—are also an option for companies or individual customers (MacKerron et al., 2009). Offsetting can be a significant tool to lessen aviation emission; it gives the chances to consumers for compensation of carbon emission generated by their Air travel. International civil Aviation Organization also stated that nowadays offsetting of emissions from aviation today is passenger based and on voluntary basis (ICAO, 2010). Air travellers can be charged extra price for travelling, which can be used for carbon offsetting actions for example reforestation, renewable energy, and energy efficiency projects (Boon et al., 2006).

1.1 Purpose of study

To explore whether there is a demand for climate change mitigation actions and to find out what are the motivation behind this demand. More specifically, to examine whether air travel passengers, such as polluters, are supportive of measure that increases the cost of their travel, through compensating the damage caused by their flights.

1.2 Objectives of study

The objectives of the study are to analyze air traveler's willingness to pay for climate change mitigation actions at Benazir Bhutto International Airport. Particularly,

- To test Polluter pays Principle at study area.
- To find out average willingness to pay of air travellers of per trip.
- To find out the relation between environmental awareness and willingness to pay.
- To assess the motivation behind climate change mitigation demand.

1.3 Research questions

- Are Airline passengers willing to pay any compensation against their premium mode of transportation which is a source of high CO_2emission?
- What are the key reasons which drive people to pay for offsetting CO_2emission?
- Is there any correlation between environmental awareness and Willingness to Pay?

1.4 Importance of study

So far, no study has been conducted, to estimate the willingness to pay of air trippers as a compensation for their flight emission in Pakistan and site specific to Benazir Bhutto International Airport Islamabad. This study will meet these criteria.

1.5 Scope of study

The study has been conducted to assess the willingness to pay through Contingent valuation method in the site specific Benazir Bhutto international airport.

1.6 Structure of study

Following the introduction, Chapter 2 covers the issues related to aviation and climate change, air traffic growth in world and Pakistan and lastly different studies related to air traveller's

awareness about environmental issues and willingness to pay to offset carbon emissions. Chapter 3 discusses sample and data source, data collection, design of questionnaire and methodology in detail. Chapter 4 presents the discussion and graphical representation on general information, tests commuter pays principle, find outs mean willingness to pay of passengers and correlation between important variables and WTP and lastly, motivations behind willingness to pay. Chapter 5 deals with results and discussion while conclusion and policy recommendation are given in the Chapter 6.

Chapter 2

Background and Review of Literature

This chapter has two sections. In the first section Problems related to aviation and climate change, air traffic growth in world and Pakistan are discussed. Different studies related to air travellers awareness about environmental issues and willingness to pay to offset carbon emissions, are reviewed in subsequent section.

2.1 Aviation and Climate Change

Global warming is unequivocal. Increase in air and ocean average temperatures globally; wide-ranging melting of snow and growing global average sea level are few of its consequences. The rise in global average temperatures is very likely due to the observed increases in anthropogenic greenhouse gas concentrations since 20^{th} century (Solomon et al., 2007). Different sectors i.e. residential and commercial buildings, transport, forestry, energy supply, waste and waste water and agriculture have 18, 13, 17, 28, 3 and14 percent share, respectively, in GHG emissions. Air transportation itself accounts for almost 2 percent of total GHG emissions among all transportation modes, not considerably large, but still significant (Penner, 1999).

Aircrafts discharge gases and particles directly into the upper troposphere and lower stratosphere where they have an impact on atmospheric composition. These gases and particles change the concentration of atmospheric greenhouse gases, which includes carbon dioxide, ozone and methane; that lead to formation of contrails and increases cirrus cloudiness, all of which contribute to climate change. From all human activities aircraft contribute in 3.5 percent of global warming (IPCC, 1999). On the whole, aircrafts emit their 10 percent of emission

,close to the surface of the earth[1] while 90 percent of aircraft emissions are emitted at altitudes above of 3000 feet (Simone et al., 2013).

In 2014 Worldwide airline industry produced 750 million tonnes of CO_2 and it is forecasted that it will increase by 5 % in 2015 (IATA, 2015). Continuous growth of Air traffic can rise 15 percent of total GHG emissions (Hares et al., 2010). Even though aviation is not one of the key drivers of global warming, but due to its momentous growth , it can be a major reason over the next decades (ICAO, 2010). Although efficiencies of aircraft have increased now ,due to technologies as compared to their counterparts of just 10 years ago (Lawrence, 2009) , the rapidly increasing number of flights are the central reason to make new efficiencies less effective in reduction of CO_2 emission (Budd et al., 2013).

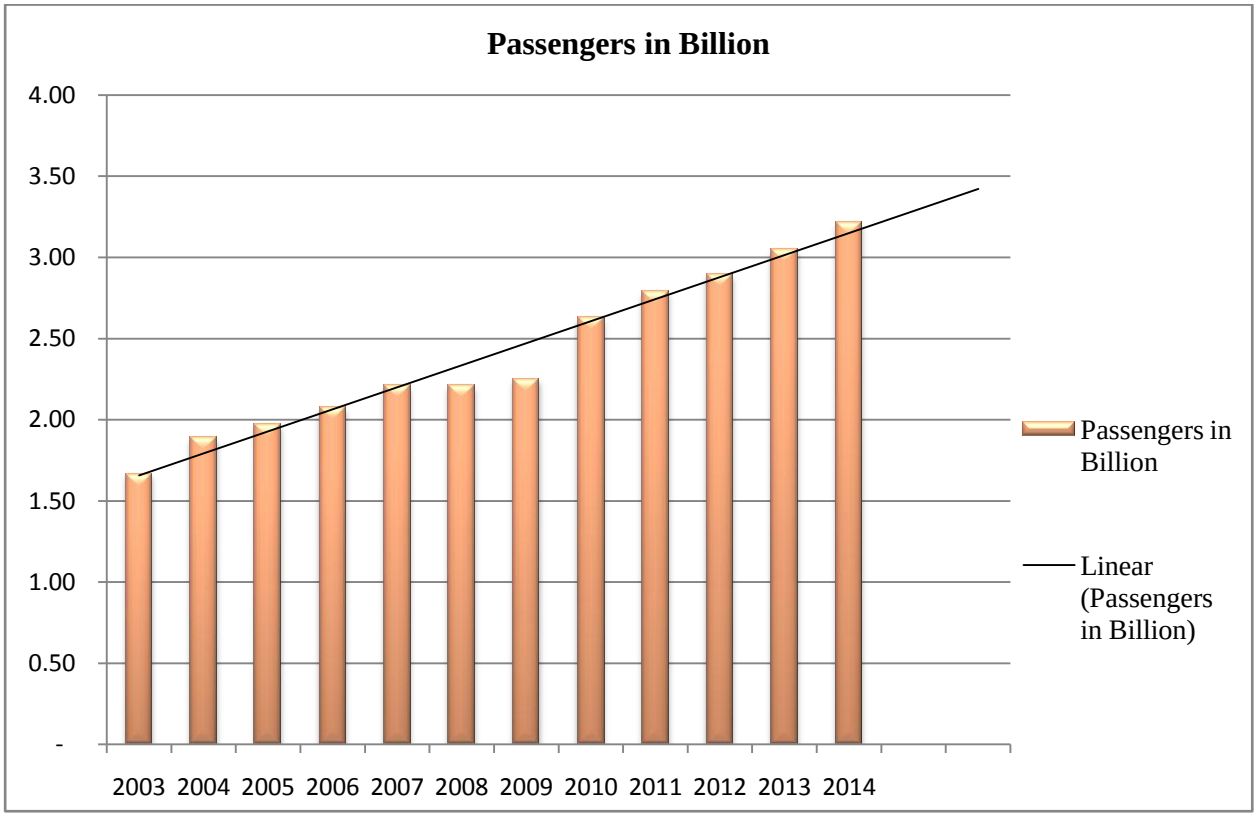
2.2 Worldwide Air travel Growth

Although aviation is a fast growing sector of the economy, but the development of civil aviation industry is poorly impacted by several crises, either they were directly or indirectly related to aviation in last 15 years. Overall profitability of aviation industry is impacted by The Asian crisis, terrorist attack on the U.S, the severe acute respiratory syndrome (SARS) outbreak and world financial crises in 1998, 2001, 2003, and 2008-2009 respectively. Aviation industry not only recovered from these crises while on the other hand world air traffic also increased at average growth rate of 5.0 percent (ICAO, 2014) . In 2014, Some 3.2 billion passengers used air transportation modes for their business needs and tourism and the number of annual total passengers carried was up by approximately 5 percent compared to 2013 depicted in figure 2.1.

[1] less than 3000 feet above ground level

Figure 2.1

World Air Traffic



Source:(Knoema, 2016)

It is forecasted that Air traffic will be ultimately double in next 15 years demand for 31,800 passenger aircrafts will also increase (Airbus, 2015). The International Air Transport Association also projected that passenger numbers are expected to reach 7.3 billion by 2034, twofold passengers of 2014 (IATA, 2014) . That represents a 4.1 percent average annual growth in demand for air connectivity that will result in more than a doubling of the 3.3 billion passengers expected to travel. Growth of Air travel is the vital reason of escalating consumption of fuel at worldwide airlines and eventually CO_2. Fuel consumption, aviation emission and aircraft noise are expected to increase with air traffic growth (ICAO , 2010) .It is forecasted that global aviation contribution in climate change will be triple by 2050 (ICCT, 2014).

Table 2.1

Fuel Consumption and CO_2 Emissions of system wide Commercial Global Airline

Year	Fuel Consumption (Billion gallons)	CO_2 Emissions(Million tonnes)
2004	66	620
2005	68	644
2006	69	651
2007	71	667
2008	70	664
2009	67	629
2010	70	658
2011	72	678
2012	73	683
2013	74	694
2014	77	724
2015	80	757

Source: (IATA, 2015)

2.3 Air travel growth in Pakistan

According to the Civil Aviation Authority, the numbers of domestic and international air travellers in Pakistan have reached to 18 million in fiscal year 2013-14.

Table 2.2

Air Travel Growth in Pakistan

Years	Passengers (in millions)	3 Years Moving Average of Passengers	Growth in Percent	3 Years Moving Average of Growth in Percent
2006_2007	14,199,431			
2007_2008	14,201,738	14,206,011	2.08%	
2008_2009	14,216,865	14,501,295	3.25%	3.10%
2009_2010	15,085,282	14,972,011	3.99%	3.48%
2010_2011	15,613,887	15,568,802	3.20%	4.12%
2011_2012	16,007,237	16,066,673	5.17%	4.21%
2012_2013	16,578,895	16,897,282	4.27%	
2013_2014	18,105,714	17,618,029		
2014_2015	18,169,479			

Source: (Pakistan-Civil-Aviation-Authority, 2015)

Table 2.2 shows the growth rate in the industry on the basis of 3 years moving average. According to the Pakistan Civil Aviation Authority, the numbers of domestic and international air travellers in Pakistan have reached to 18 million in fiscal year 2014-15. Table 2.3 shows fluctuations (Oil-Company-Advisory-Council, 2016) in consumption of jp_1[2] in Pakistan airline industry. Due to above mentioned crises Pakistan aviation industry is also impacted but in coming years, the consumption of jp_1 will increase (OCAC, 2016) .

[2] A type of aviation fuel

Table 2.3

Consumption of jp_1 in Pakistan Airline industry

Years	Consumption of JP_1 (Metric Tonnes)
2004_2005	923,571
2005_2006	1,100,744
2006_2007	1,012,109
2007_2008	927,792
2008_2009	1,042,936
2009_2010	1,305,415
2010_2011	1,340,558
2011_2012	816,684
2012_2013	668,305
2013_2014	765,340
2014_2015	686,402
2015_2016	451,985
2015_2016 projected	706,000
2016_2017	713,060
2017_2018	720,191
2018_2019	727,393
2019_2020	734,666

Source: (Oil-Company-Advisory-Council , 2016)

Data of jet fuel consumption (Internatioanal-Energy-Statistics, 2013) in Pakistan airline industry is also given in Table 2.4 Appendix 1.

2.4 Climate Action Framework of Aviation Industry

For the first time in the history, the aviation industry presented its first climate action framework in 2008 which is based on three goals and four pillars (ATAG) .

2.4.1 Goals of Climate action framework

Short term goal: To get better fuel efficiency of aircrafts by 1.5% each year until 2020

Medium term goal: Carbon-Neutral growth by stabilising net aviation emission until 2020

Long term goal: To reduce aviation emission by 50 percent until 2050.

2.4.2 Pillars of Climate action framework

Pillars of climate action framework are following:

Technological innovation: Developing Fuel efficient aircrafts and sustainable alternative aviation fuel.

Operational improvement: Self driving devices[3], less weight on board[4], continuous descent operations[5] help in reduction of fuel burn.

Infrastructure efficiency: The route an aeroplane takes also affects the quantity of fuel it burns, so aviation industry can improve its performance by making better design of airspace. Reducing congestion at runways and green terminals are other ways to get efficiency in infrastructure.

Economic measures: This pillar has temptations for economists particularly for environmental economists, because it talks about environment and economics simultaneously. Economic measures include carbon offset by airlines, fuel levies and green taxes on passengers.

[3] By self-driving devices driving devices makes aeroplanes capable to reach runway without using full power of engine

[4] .Due to the heavy weight on board plane uses more fuel

[5]Continuous descent operations allows jets to glide into airport .It not only saves fuel but reduces noise pollution

2.5 Research on Air traveller's Environmental Awareness

Assessing whether people have knowledge about environmental degradation is not a usual concern of such environmental economics studies. Now a day's focus is rather on (i) whether people have information and consciousness of aviation's impact on the climate, (ii) whether they have a sense of accountability and (iii) how they react to specific climate change policies? To find out the answers for such questions (Becken, 2007) undertook a study. Respondents showed a low consciousness of air travel's climate change impacts. They did not take the conscientiousness of mitigating the aviation emissions and tourists were not voluntarily supportive of mitigation policies that might restrain their ability to travel.

Dodds et al., (2008) conducted a study to find out responsiveness of climate change and aviation Carbon offsetting in the tourism industry, to whom the task for environmental Protection should be placed, travellers' willingness to participate in carbon offsetting programs, and initiatives to raise awareness .The results point out that there is low level of awareness of climate change and carbon offsets in tourism industry. Respondents firmly believed that government should take financial responsibility of environmental stewardship. The findings demonstrate that respondents are willingness to mitigate the effects of climate change. Respondents indicated that internet and Television advertising are suitable means to provide information to consumer.

There are many studies in contrast to what has already been mentioned. To examine air traveller's environmental knowledge, environmental attitudes, environmental behaviours, and pro-environmental air travel behaviour in Taiwan, taking a sample size of 300 persons, a face-to-face survey was conducted at the Taiyuan International Airport. According to authors participants had a quite positive attitude toward the environment. Authors did not find any significant difference in environmental knowledge, environmental attitudes and pro-

environmental air travel behaviour with respect to variable gender. In general, females were found to be more engaging in environmental issues as compared to male respondents. Folks with higher levels of education had more environmental knowledge and held a more affirmative attitude towards environment. Similarly older people had more interest in environment than the younger generation(Chen et al., 2011).

In recent times, tourists are becoming more cautious and anxious over air travel's CO_2 emissions. Survey of Swedish air travellers' knowledge and attitudes to air travel, climate change and voluntary carbon offsetting confirms that approximately a quarter of the respondents articulated a willingness to fly not as much of in order to mitigate emissions (Gössling et al., 2009).They conducted a quantitative survey at Gothenburg Landvetter airport to measure air travellers' awareness of and attitudes to aviation, climate change and voluntary carbon offsetting, Sweden. Sample size was 303. It showed that 71.3 Percent of respondents were worried about climate change on the other hand 82 percent agreed that flying contributes to climate change. A large number of respondents showed intention to compensate for their future flights. But to deal with environmental impact of aviation they place their responsibility at the end.

Peck & Heeding (2014) headed to explore the attitudes of domestic tourists in South Africa toward the preamble of a carbon tax[6], with their awareness and perception of climate change. They collected data by using a structured survey and involved two hundred air travelers at O.R. Tambo International airport, South Africa, who were selected by a random sampling technique. It is the first kind of study in South Africa , the study concludes that the average tourists have good knowledge regarding climate change, 84 percent believed climate change is a very serious issue and in need of attention and 63 percent were willing to pay a carbon tax in order

[6] A carbon tax is an environmental fee levied by governments .

to offset their contribution to climate change. In carbon tax payers on a voluntary basis, younger tourist, females and respondents with tertiary education were more expected to pay.

To participate in carbon offset schemes[7] is positively related with personal goals, desires and emotions. Individuals develop a desire to partake in carbon offset schemes, when they consider that environment is good thing to do (Chen, 2013). People's willingness to offset flight related carbon emission is a function of collective participation rate which can be regarded as a social norm headed for carbon offsetting. Araghi et al., (2014) designed discrete choice experiment and administrated among 261 air travellers. Results indicated that carbon offsetting gives utility when collective participation rate is high.

To explore the extent of ethical customers in the society with diverse demographics (Bindu, 2013) conducted a survey at the Dubai airport. Total of 300 respondents from Europeans, Asian and the Arab nationals were selected. The researcher concluded that a variety of attitudes, personality traits and interest affect the in general behaviour of particular consumer. Major factors that prevent consumer from sustainable buying decision are: lack of information, difficulty in changing their daily habit, higher costs, lack of confidence in the companies assuming it as their market trick. After analysing the questionnaires, the survey indicates that 60 % of respondents are aware about the impact of the actions on the environment. Out of total 78% of interviewees claimed that there are two environmental issues that impinge on the quality of their life: pollution and climate changes. A large number of respondents were largely concerned all those things that impact their each day lives were not prepared to do anything about it themselves. Among all respondents Europeans were more aware concerned and altruistic about environment. They were willing to incur additional costs and more optimistic about environment. Arab nationals were unaware, least bothered, hedonistic but not hesitant to

[7] Carbon credits for business

pay extra cost for environment. On the other hand Asians were aware but inactive. They were not concerned for environment and sensitive to pay high incurred cost.

2.6 Research on Air traveller's WTP to offset their Carbon Emissions.

To inspect what amount airline passengers are willing to pay for carbon offsets , (Lu & Shon, 2012) used primary data, collected from 1,339 Taiwanese air passengers at Taiyuan International Airport. They used Contingent valuation method to obtain willingness to pay and interval regression model to calculate approximately the determinants of the amount of WTP. Mean WTP of China, Northeast Asia, Southeast Asia, and Western countries were US$5.0, US$8.8, US$10.8, and US$28.6 respectively for the offset. Independent variables Business travelling, Frequency of trips, Travel cost, perceptions of the efficiency of the carbon offset scheme and the consciousness of their duty towards the environment were positively related with WTP but age was found to have negative implication for WTP.

Air travellers have a preference for renewable energy projects over reforestation and forest protection project, while projects located in their own state were superlative over projects in another state or abroad. Moreover education, age, income and membership with environmental organization were found positively related with WTP for diverse attributes of carbon offset project (Cheung et al., 2015). The aim of the study was to estimate Australian air travellers' WTP for different attributes of carbon offset projects. Sample size was 527 respondents. Choice Experiment Survey, CVM and Conditional Logit Model were used to estimate different attribute levels.

Jou & Chen (2015) investigated the willingness of economy class air passengers to pay to recompense for the CO_2 emissions and conducted a survey at Taiwan's international airport. The sample size was 505, CVM was used to elicit WTP while they applied Spike model to deal with the problem of zero willingness to pay (WTP). Independent variables were Socio

economic variables such as gender, age education, average yearly number of flights, average monthly income, reason of flight, association with airline frequent flyer program. Females had a relatively high WTP for carbon offsets but there were no significant difference is both sexes in Average WTP. Age, education, income number of flights have positive impact on WTP of respondents. Passengers with different trip purposes also had significantly different WTP. Those visiting for networking were willing to pay more amount of the carbon offset than business travellers. The average WTP was NT$[8]39.05 per flight.

MacKerron et al., (2009) only used a sample constrained to UK citizens between the age's of18 and 34 years for the analysis, and found that the average WTP for carbon offsets is about £24per person per flight. Sample size in the study was 321. They used CVM and Choice Experiment method, data was analysed by using logistic regression a mixed logit or random parameters logit (RPL) specification. C.V variables were income, gender, or donor of environmental organization while C.E variables included human development, conservation & biodiversity, technology & market development. Price and income were not significant while gender does appear to be significantly affecting the probability of accepting the offer, with females more likely to buy than males. They valued all co-benefits positively. Biodiversity is the highest valued co-benefit (£14.98 per ton CO_2 emission), and is significantly valued higher than technology development, which is the least significant.

Brouwer et al., (2008) used contingent valuation method to elicit respondents WTP to offset carbon emission. Survey was conducted at Amsterdam Schiphol airport. The researchers interviewed 400 Air travellers, to diminish necessary interview time; closed ended questions were asked. CVM was used to find out willingness to pay of airline passengers to offset carbon emission. To analyze factors that influence WTP interval regression technique was used. Disposable household income, number of times respondents fly, travellers' perception of their

[8] New Taiwan dollar as NT$. One Taiwan dollar is equal to 0.030 US dollar

own responsibility for climate change, the usefulness of the projected carbon travel tax and passenger consciousness of the impact of flying on climate change have a positive impact on Stated WTP. Other standard demographic and socio-economic characteristic variables of the respondent were also included in the CV research. Purpose of trip and class of sea did not have any influence on stated WTP either. Average willingness to pay per flight was €23.

Cheramakara et al., (2014) conducted a study at Bangkok's Suvarnabhumi Airport to acquire monetary valuations of aviation externalities, specifically noise, air pollution and carbon emissions using a stated choice approach (SC). At the first phase of his qualitative research author found that both passengers and residents identified three key environmental problems relating to aviation, namely, aircraft noise, air pollution around the airport and carbon emissions. The resident sample size was 206 and passengers sample size was 400. Residents were willing to pay to reduce aircraft noise by 1% of 8.73 Baht [9]a month and WTP to reduce local air pollution is 3.78 Baht a month. Residents were willing to accept compensation of 20.87/- Baht for every 1% increase of aircraft noise and 9.04 Baht for 1% improvement in local air pollution monthly, which means people prefer WTA values on WTP values. WTP for 1% reduction of aircraft noise WTP for 1% reduction in local air pollution is 27.29/- and 37.76/- Baht per flight. The author calculated per year passengers WTP 70.63 Baht for 1% reduction in Aircraft noise, 97.72 Baht for 1% reduction in Local Air Pollution and 1,244.80 Baht for carbon offsetting.

At the present time efforts are being made to go green via alternatives, but air travelers have limited alternatives readily available. As a result, a few of airlines are providing carbon offset program for air travellers to purchase back the carbon dioxide they emitted during their tour. Primary data was used to find out the willingness to pay and reasons for passengers/shippers to buy the offset. 1,089 questionnaires were collected from two airports each for each country in

[9] Baht is the currency of Thailand. One Thai Baht is equal to 0.028 US dollars.

East Asia region. The results indicate that only 8 percent respondents have experiences of buying the offset. Major reason was because they don't even about the purpose of programmes. A very few number of people were aware of carbon offsets programmes but never participated in such programs, because they think I is the responsibility of airlines to pay for GHG emission, but not passengers. There is only less than 1.4percent passengers who have the experiences of buying airline carbon offsets ,and the major reason for passengers to buy the offset is , passengers believe they have to do something for the environment (Chang, Shon, & Lin, 2010).

By applying Choice modelling , the monetary value of aviation carbon mitigation is measured and examined what are the major factor to influence air traveller's voluntary climate actions (Choi & Ritchie, 2014) . Respondents had mean WTP of AU$[10]21.38 per tonne of CO_2 reduced per person. Female travellers had higher economic value of carbon mitigation then male while climate sceptics who are less likely to be carbon offsets might in fact hold a higher WTP value then non-sceptical trippers. Airlines showed positive support for mitigation measures. Technological efficiencies were more supported then operational practices and bio fuels.

Perceiving the contribution of air travel to climate change, self perception and perception about behaving ecologically have significant positive impact on willingness to compensate. There is no direct link between perceived effectiveness of individual actions and willingness to compensate. Willingness to pay for short haul and long haul flight was €24 and €55 respectively (van Birgelen et al., 2011).

Reviewed literature covers awareness of environmental issues, perception of climate change and attitudes of air travellers towards these problematic areas. Studies have been conducted in different parts of world, to assess the environmental awareness and WTP of air travellers for

[10] Australian dollar ,One Australian dollar is equal to 0.72 US dollar

climate change mitigation activities by using Contingent valuation method. Air travellers showed profound interest in compensation for their flights emissions. Age, income, marital status, education, perception of climate change, ticket price and frequency of trips are found positively associated with willingness to pay.

Currently there is an increasing trend of air travel in Pakistan. Although global business and tourism play a vital role in facilitating economic growth, at the same time they have a negative impact on environment. There is no such study has been conducted yet in Pakistan to measure the willingness of air travellers for mitigating climate change. It is needed to analyze the willingness to pay of Pakistani air travellers before making it a part of IATA's policy, because, in other studies it is concluded that Asian people are not conscious about environmental concern .This study hypothesised that air travelers are willing to pay for offsetting of Carbon emissions.

Chapter 3

Data and Methodology

This chapter discusses sample and data source, collection of data, design of questionnaire and methodology in detail.

3.1 Sample and Data source

Data was collected at Benazir Bhutto International Airport, Islamabad, Pakistan (BBIAP). As it is situated in the capital of the country, it is one of the leading and busy airports of Pakistan. It not only serves government dignitaries and overseas delegates but also serves business communities, domestic and international passengers. As shown in Table 3.1 some 4.4 million commuters travelled through more than 35,227 flights scheduled at BBIAP in the year 2014–2015. It is pertinent to mention that 18 different flight operators were involved in the aforementioned scheduled flights (Pakistan-Civil-Aviation-Authority, 2015).

For the sake of making this study site specific to Pakistan, only those respondents were focused who were Pakistani nationals, irrespective of their travel destination[11], in order to compare their environmental awareness and consciousness with the intercontinental travellers of other nations which are focused in older studies on this subject.

This study is based on primary data. In person interviews were conducted at BBIAP. Due to time and financial constraints the study was restricted to 216 sample size. Interviews were conducted at lounges of BBIAP, Islamabad. Respondents were interviewed with the help of a pre-tested structured questionnaire attached as Appendix 2. Secondary data is also used in the study including findings from previous researches along with reports of international

[11] Domestic or international.

organization such as International civil aviation organization and International air transport association. Data of civilian passengers handled at Benazir international airport is collected from Pakistan civil aviation authority.

Table 3.1

Annually Scheduled Flights and Passengers

Year	Passengers	Flights
2014_2015	4,398,558	35,273
2013_2014	4,194,598	34,415
2012_2013	3,803,060	36,610
2011_2012	3,612,178	36,610
2010_2011	3,610,556	32,455
2009_2010	3,581,207	35,633
2008_2009	3,136,664	34,025
2007_2008	3,136,620	33,477
2006_2007	3,035,996	48,110

Source: (Pakistan-Civil-Aviation-Authority, 2015)

3.2 Data Collection

As described above, this study is based on primary data collected through questionnaire so field test of the questionnaire was inevitable to discover the flaws in questionnaire and to discover the perspective of respondents. Hence a pre-testing survey was conducted. In pilot

survey, all income groups, educated and uneducated respondents were considered. Open ended questions were asked related to the willingness to pay. The respondents stated different amount of willingness to pay according to their preferences and other socio-economic factors.

In the pilot survey, new questions surfaced and accordingly those minor amendments were made and a few new questions were incorporated. Questionnaire was re-designed in the light of pre-testing scenario and after that final survey was conducted in the month of February 2016. Data was collected at different times to interview passengers of diverse destinations.

3.3 Questionnaire design

The questionnaire had four parts. A series of open and closed ended questions were followed.

Part One: General information about respondent

In the first section the general information of respondent is asked including name, age, gender, marital status, employment status, monthly income and education.

Part Two: Information about Travel

In the second part of the questionnaire, travel information is gathered. Respondents were asked about their destination of travel, ticket price, sponsor of ticket, type of ticket, class of seat, purpose of trip and number of trips they made in last five years.

Part Three: Information about environmental awareness

The third part was designed to assess the respondent's awareness about environment and other related issues like contribution of aircrafts in CO_2 emission, so as to gauge their awareness.

Part Four: Willingness to pay

In the fourth and last part, respondents were given a ***hypothetical scenario*** to assign a numerical value to their preferences for air pollution mitigation activities. The hypothetical scenario was followed by structured questions enquiring about their willingness to pay range of 0.5 to 2.0 percent of their ticket price. Finally an open-ended question was asked from the respondents' in order to gauge their maximum/minimum willingness to pay. The statement presented in the questionnaire suggested:

"Consider a situation where an independent organization wants to launch a programme titled ***"Trees for Travel".*** Under this programme, trees will be planted to lower the temperature and reduce air pollutants that lead to climate change. To finance this mitigation activity, the airline passengers will be charged an extra price on their tickets to compensate for their flights emission. In such situation would you be willing to pay 1 percent extra on the ticket price to make the "Tree for Travel program" successful?

3.4 Methodology

Economists have long measured the value of market goods. But markets fail to perform for public goods especially those having environmental attributes due to the condition of non-rivalry and non-excludability. Hence, for decades economists are confronted with the challenge, how to value public goods. The Contingent Valuation (CV) is one of the numbers of ingenious ways which is developed by economists, to accomplish this challenging and significant task. The CV method uses survey questions to elicit people's preferences for Public goods. It is a social survey method in which individuals are presented with a hypothetical market in which they have the opportunity to buy the goods. Respondents are provided with information about particular environmental changes, the values of which are not accounted for or fully captured in economic markets through market-based instruments. Respondents are typically asked about their WTP and WTA in lieu of the compensation for the gains or losses

involved(Mitchell & Carson, 1989):(Howe, Bateman, & Durbin, 2002). Elicited WTP is contingent upon the particular hypothetical market described to individual, hence is called contingent valuation method (Brookshire & Eubanks, 1978).

Airline passenger's awareness and Willingness to Pay is crucial to offset emissions from air travel. There is a need to quantify airline passenger's readiness to offset carbon emission. Environmental economists adopt WTP method generally to discover, through a variety of methods including surveys and questionnaires, a person's maximum and minimum WTP in exchange for the premium commodity, good or service. This study, therefore, is intended to find out the awareness of the people and to quantify their WTP so as to enquire the possibility to offset carbon emission, by employing Contingent Valuation Method (CVM).

3.4.1 Model specification:

Once the respondents' WTP is obtained through primary survey, it is further of importance to find its determinants, the finding that will have policy implications. Hence the determinants of stated WTP will be derived from the conventional WTP function as discussed in the literature and is given as below:

WTP = f(Age, Education level**,** Environmental Qualification, number of kids, monthly Income, trip purpose, ticket price, frequency of travelling, class of seat i.e. business or economy)

$$WTP=\beta0+\beta1\ (AGE) + \beta2\ (EDU) + \beta3\ (ENV\_QUA) + \beta4\ (N\_KIDS) + \beta5\ (M\_INC) + \beta6(T\_PRI) + \beta7(T\_PRP) + \beta8(T\_NUM) + \beta9(C\_SEAT) + \varepsilon \quad \text{.....Eq (1)}$$

The detailed description of the variables involved is given below.

3.4.2 Variable construction:

3.4.2.1 Dependent variable:

WTP: Willingness to pay is the extent of showing maximum willingness to pay to offset CO_2 emission. This variable serves as a dependent variable in study. Respondents were asked for their maximum willingness to pay in correspondence with percentage of ticket price for mitigating activities. Maximum willingness to pay is different among different respondents so this variable is treated as a continuous variable.

3.4.2.2 Independent variables:

a. AGE:

Age of respondent, this variable is expected to have a positive sign because age usually brings awareness with time and exposure. As the age of folks increase they become more careful about environment and more specifically about adverse impact of environment on themselves and their future generation. Age brings maturity in people. This variable is coded as number of years.

b. EDU:

This variable shall mark the education level[12] of the respondent and is expected to have a positive relationship with WTP. Education promotes awareness regarding environmental issues , this is the reason as the respondents are getting more educated; they are expected to have better understanding regarding their future needs and social responsibilities hence towards environment, which is expected to be translated in to higher willingness to pay to offset Co_2 emission.

[12] Years of schooling

c. ENV_QUA:

Environmental qualification is represented by a dummy variable where its value is "1" if respondent have environmental qualification and "0" otherwise. Environmental education teaches about the function of environment that is how it can contribute towards sustainably. Students are taught about conservation of natural resources, importance of biodiversity, sustainability climate change and so on. It is a very vast field and covers many areas for example earth sciences, geology, chemistry, atmospheric sciences, climatology and environmental economics. Individuals having environmental education are assumed to be more aware and ready to tackle environmental challenges. This variable is defined as a person having a degree or studied a graduate course in environment. The variable should have a positive sign because.

d. N_KIDS:

As we know kids are physically more susceptible to climate change besides it affects them psychologically. Children belong to low socioeconomic status are affected by climate change more than others. Other than government and independent organization is the responsibility of parents to protect their kids from adverse impact of climate change. In this study number of kids is expected to have a positive sign because having kids is expected to generate more concern about their future among the respondents. This concern is then believed to result in higher WTP. It is treated as a continuous variable.

e. Monthly Income:

It is expected that income will have a positive relationship with willingness to pay. Available evidence also suggests that with an increase in income, demand for environmental quality increases. Although environmental quality is not a consumer good which is purchased in market, but people are getting more conscious about environmental attributes now a days. They prioritise environmental qualities for example clean air, trees, less noise and congestion while purchasing residence for them .As income of individual increases it is expected that the demand for environmental goods will also increase.

f. T_ PRICE:

It is difficult to judge how the ticket price shall impact one's willingness to pay, because on one side ticket prices indicates about affordability of a air travellers on the contrary as the price increases purchasing power of a consumer decreases So, the expected sign cannot be assumed. Hence the sign will educate us further about the positive or negative effects.

g. TOURISUM:

Trips usually have three main purposes: (i) business, (ii) visits to relatives and friends and (iii) tourism. If respondent is a tourist, he/she is the one who benefits most from the environment and therefore it is expected that tourists should be more concerned about its deterioration. Consequently, tourists are expected to have a positive WTP. Value of this variable is "1 "if respondent is a tourist otherwise "0".

h. CLASS:

Respondent who are travelling in business class are expected to be well off and would be able to afford more for environmental conservation. Generally it is true that commuters who have business class seat are very wealthy especially in Pakistan. It is not supposed in the study that they have environmental awareness also but they have money to spend on climatic problems that is the reason it is expected that this variable should have positive sign. A dummy variable would be used where "1" would represent the Business class travel and "0" otherwise.

i. N_ TRIPS:

Frequent travellers contribute more to upper atmospheric pollution and they are expected to have sense of responsibility to contribute more for environmental conservation as well. Hence, it is expected that number of trips shall have a positive correlation with WTP. Nevertheless, there can be negative or undesirable effects as well: more a passenger travels, higher would be the amount he or she will bear as a cost to rescue environment. Hence, this variable would help us finding the preferences of Pakistani travellers.

3.4.3 Empirical Estimation Technique:

This study uses ordinary least squares technique for the empirical estimation of the relationship between the commuters' willingness to pay and its determinants.

3.4.4 Summary of chapter

In this chapter we have discussed the methodological framework of our study, the way final questionnaire was designed through dichotomous and open ended questions. Then

the model specifications, along with the description of the variables used were discussed in order to achieve the objectives of the study.

Chapter4

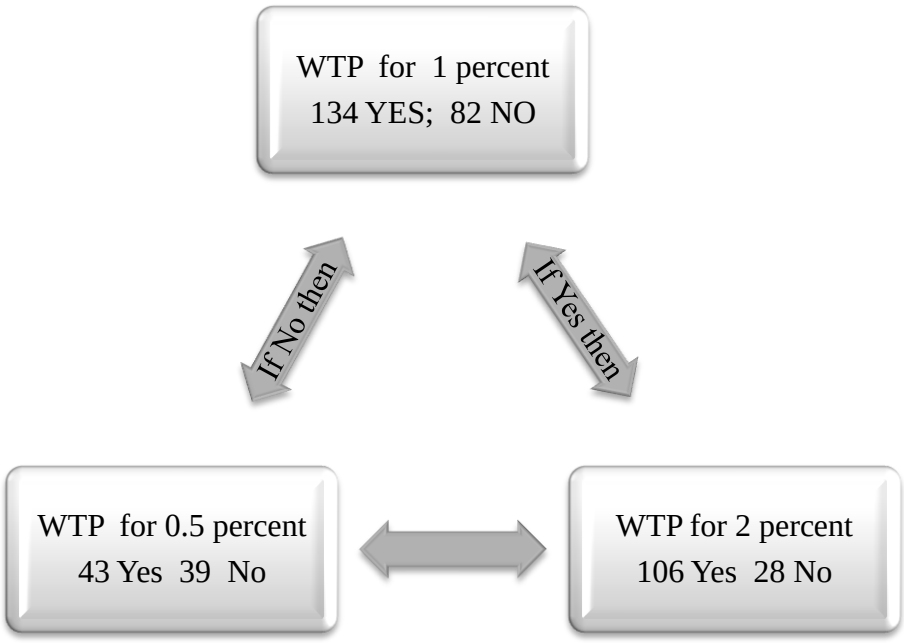
Descriptive Results

This chapter provides a descriptive analysis of the collected data. This chapter also includes discussion and graphical representation on testing polluter pay principle, mean willingness to pay of passengers, correlation between important variables and WTP and lastly motivations behind willingness to pay. Summary of collected data is given in Appendix-3. Information regarding destination, ticket type, class of seat and calculated CO_2 in kg and tonnes is given in Table 4.2 (Appendix _4).

4.1 Testing the commuter pays Principle

Polluter pays principle is tested in the fourth section of questionnaire. Results seemed promising as 80.6 percent respondents were willing to pay to offset their carbon emissions. Starting bid was 1 percent on ticket price which we offered to respondents so as to compensate their contribution in emission. Among 216 respondent 134 accepted the first bid. The respondents who refused to pay for 1 percent were offered a follow up bid of 0.5 percent of the ticket price. Again 43 respondents accepted the follow up bid. The respondents who accepted the start bid were also given a follow up bid of 2 percent of the ticket price. Out of 134 some 106 accepted the new follow up bid.

Figure 4.1: Summary of WTP Results



4.2 Mean Willingness to pay

Following the double bounded WTP questions, respondents were asked an open ended question inquiring about the maximum amount they were willing to pay, over and above their ticket price for compensating the emission caused by air travel. Respondents according to their own preferences elicited the amount they were willing to contribute (minimum or maximum from the mentioned 0.5 and 2 percent, respectively), in the form of percentage of their ticket price, for the above mentioned mitigating activity. Data of ticket prices and their respective WTP amount is given in Appendix-4. The information obtained was used to measure their mean willingness to pay. The average WTP per passenger, obtained from the mentioned exercise is PKR 1,302/- per trip. The average WTP of domestic travelers is PKR494/- while that of international traveler is PKR 1,509/-. The disparity is obviously due to the difference in the amounts of domestic and international airfare since the WTP is calculated as part and percentage of the ticket price.

Table 4.4

Mean willingness to pay of demographical and travel attributes

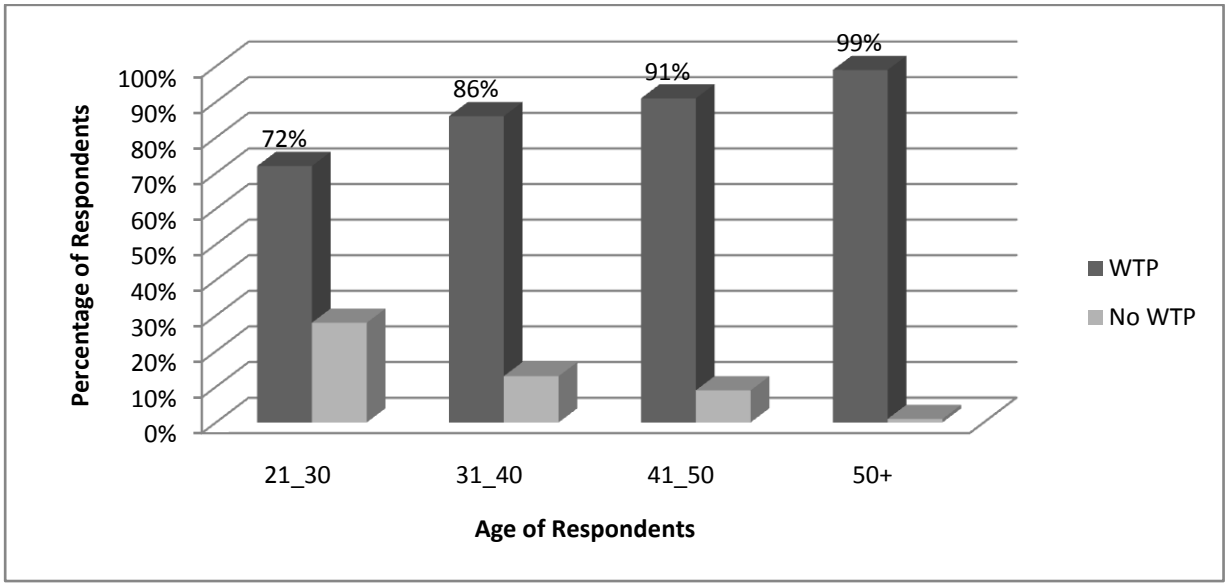
Description	WTP
Male	1,360
Female	1,046
Married	1,313
Unmarried	1,211
With Environmental education	1,491
Without environmental education	803
Business class	2,472
Economy class	832
Post graduate	1,792
Graduate	677
Intermediate	469
Metric	399
Tourists	1,785
Non tourist	1,093
Kids	1,337
No kid	1,138

4.4 Correlation between variables and WTP

4.4.1 Relation between Age and WTP

Data indicates that as the age of the respondents increases they are relatively more interested in environmental conservation. Figure 4.10 shows that with increase in age, the number of respondents that are willing to pay also increases. The potential reason behind this is expected to be the experience of respondents. Maturity, knowledge and awareness are expected to increase over time and this is reflected in their readiness to contribute.

Figure 4.2: Age and WTP

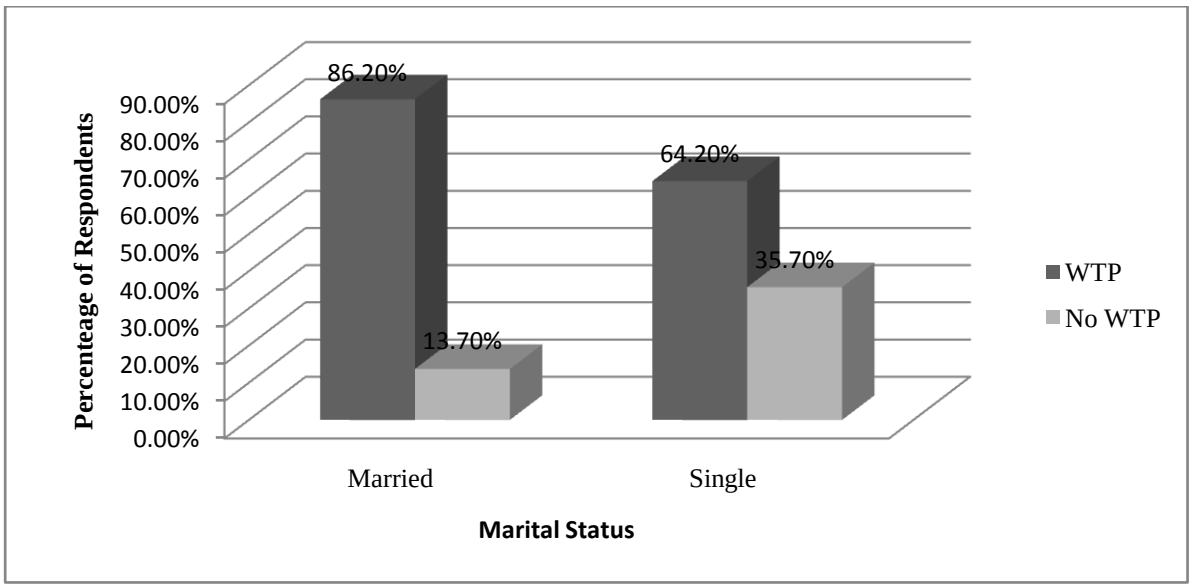


Source: Field Survey

4.4.2 Relation between marital status and WTP

It is generalized that the individuals who are married are more concerned about their future generations. They would not like that their off springs bear the cost of their actions. It is proved in this study that the frequency of married respondents is relatively greater than singles that are willing to pay (Figure 4.11).

Figure 4.3: Marital status and WTP

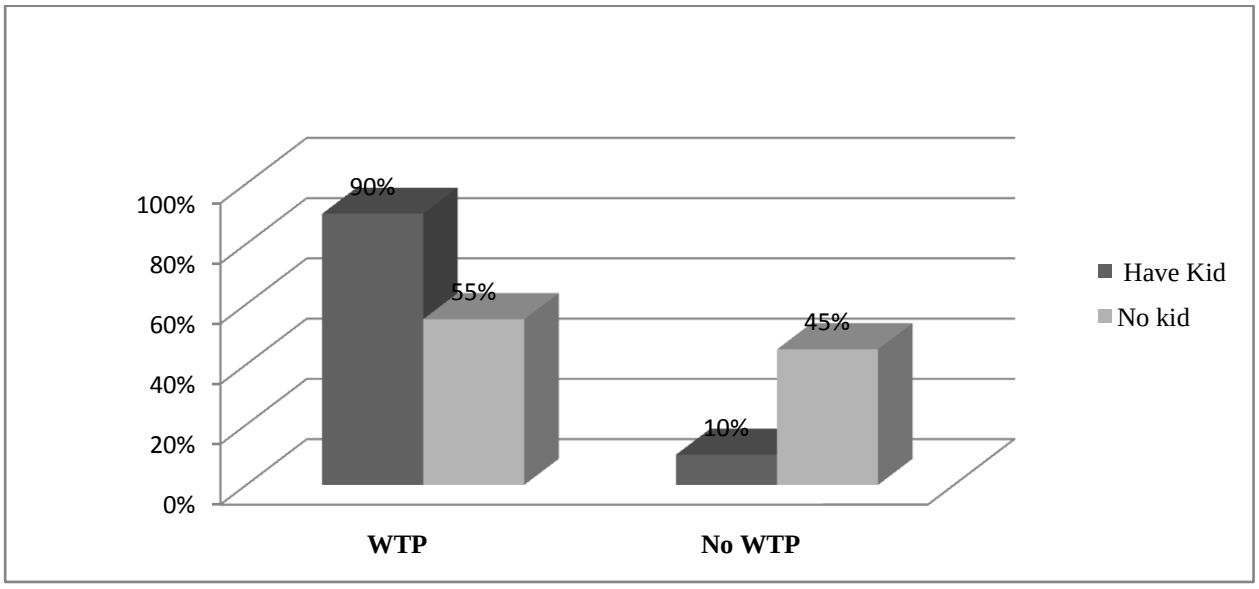


Source: Field Survey

4.4.3 Relation between Kids and WTP

Similarly, respondents who had offspring were more anxious about environment. Parents would not like their children to be left in a compromised environmental situation. It is depicted in Figure 4.12 very clearly that 90 percent respondents who have kids are willing to pay to offset their carbon emission. The reason is obvious, their "concern about betterment of future generation". There are 10 percent respondents with kids who are not willing to pay and this can be associated with their financial constraints or lack of awareness. However, this is encouraging to find that even out of those whom are not having kids at the moment, 55percent of the respondents were willing to pay for the betterment of the environment.

Figure 4.4: Kids and WTP

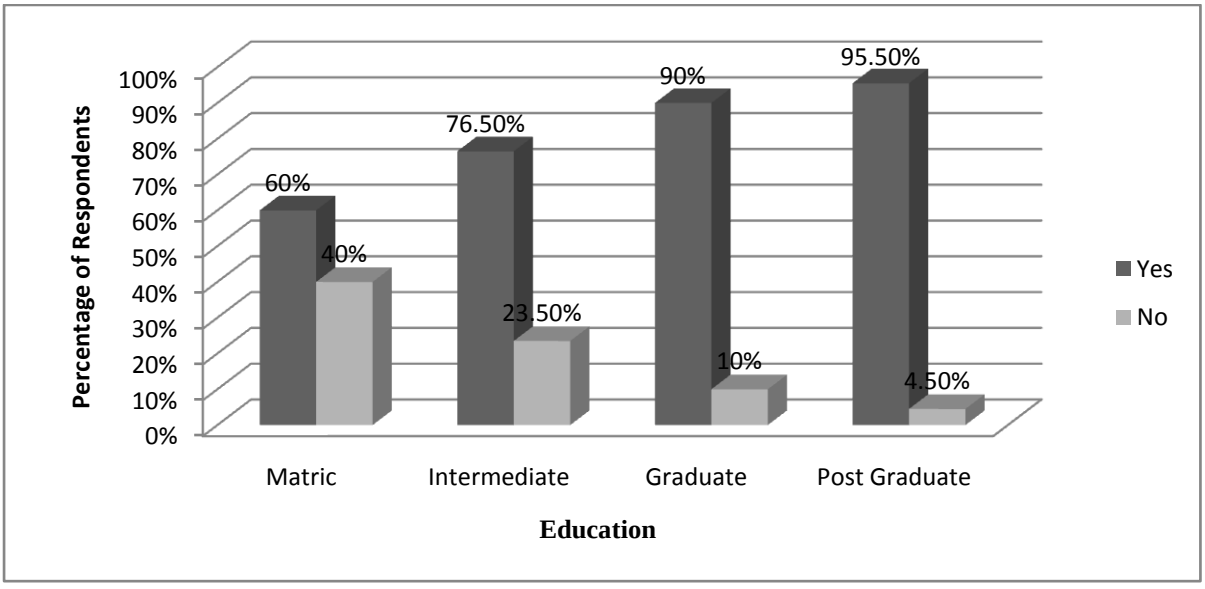


Source: Field Survey

4.4.4 Relation between education level and WTP

Education level affects respondents WTP positively. In this study, Passengers who are well educated are more concerned about environment as depicted in Figure4.13. Respondents with post graduate education have highest percentage in WTP. In Figure 4.13**,** on X-axis education level and on Y-axes percentage of respondents, is given. As the level of education increases the number of respondents, who are willing to pay for environmental improvement, also increase. We can see few respondents who are highly educated but they are not willing to pay for environmental perspective, might be having some other reasons i.e. financial and lack of trust on such programs. It is interesting to note here that the percentage of respondents, who are not willing to pay, is highest among the illiterate or lower education levels.

Figure 4.5: Education and WTP

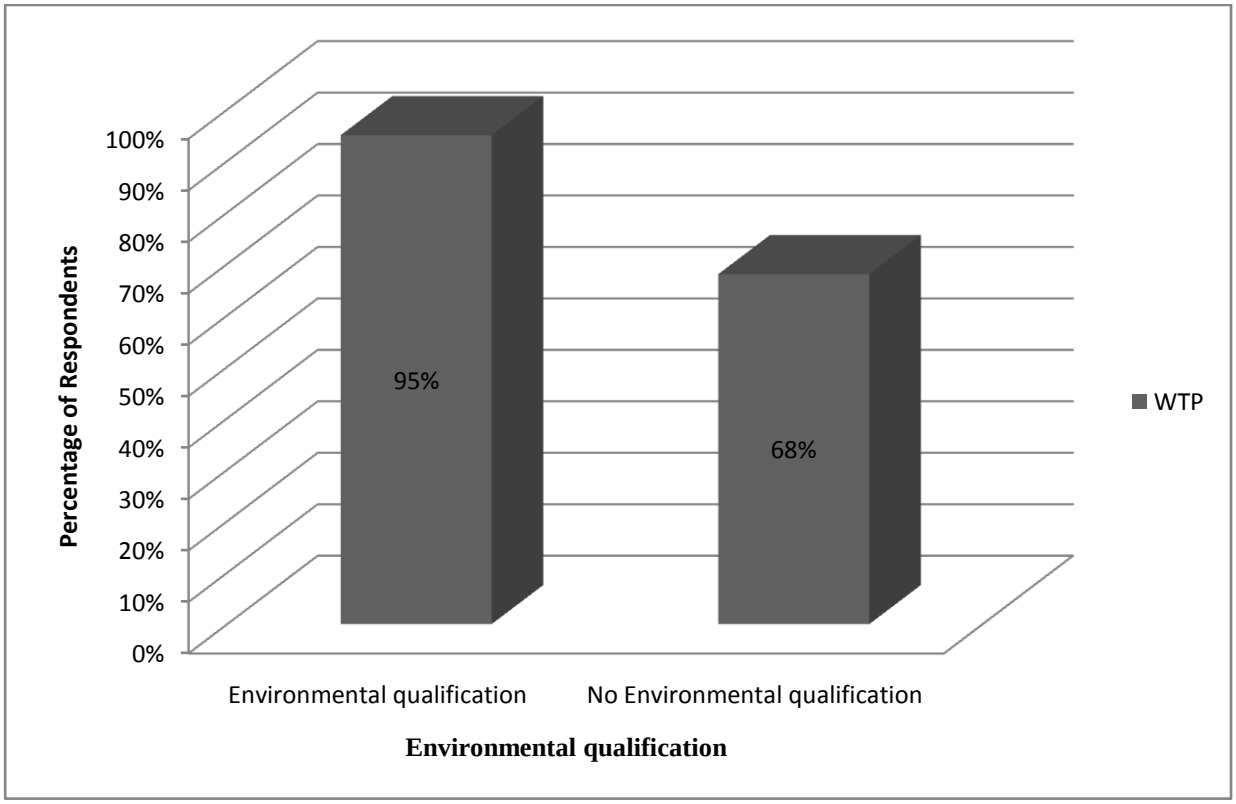


Source: Field Survey

4.4.5 Relation between Environmental qualification and WTP

Individuals with degrees or have attended courses in environmental studies are supposed to be more conscious about environment. They get the opportunity to look at the environmental issues like global warming, pollution, ozone depletion, deforestation and alike, very deeply so they become more sensitive towards such crucial issues. Figure 4.14 compared WTP of environmentally qualified respondents with those who have not obtained/studied any specific degree or course in environment. Among environmentally qualified respondents, 95 percent were willing to pay while the respondents who do not have any background in environmental studies, around 68 percent, were found willing to contribute to the pollution mitigating activities.

Figure 4.6: Environmental qualification and WTP

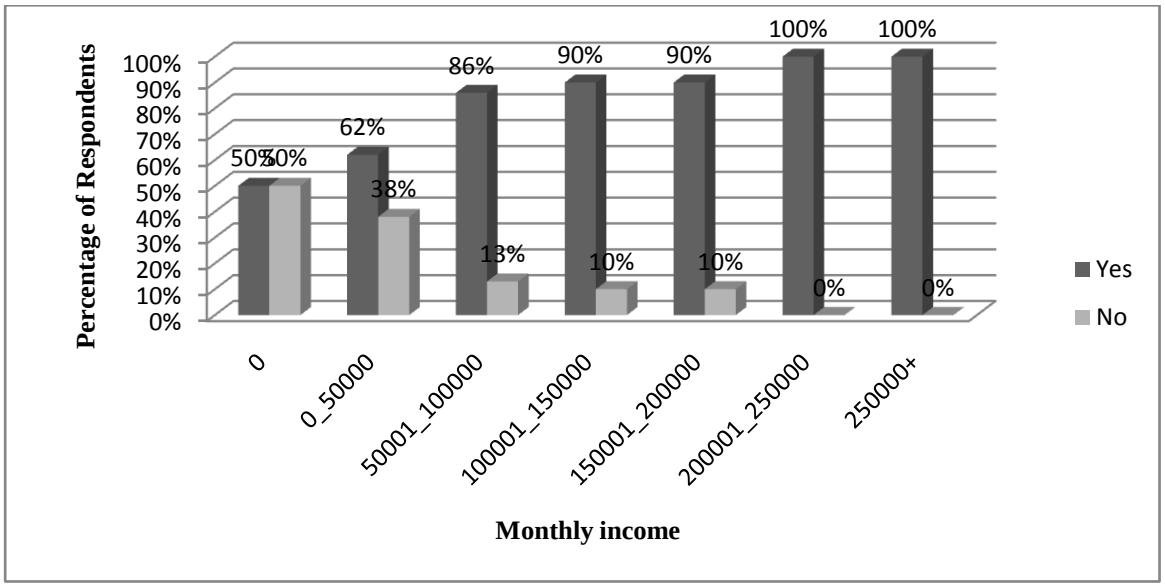


Source: Field Survey

4.4.6 Relation between Income and WTP

Consumption depends upon income. A person educated or uneducated, married or single, young or old, before spending will think about money in his/her pocket. Income is a very important factor in determining the WTP of a consumer. In Figure 4.15 the relationship between income and WTP for compensating flight emissions of respondents is shown. It is depicted very clearly in Figure 4.14 that as the income increases, higher number of respondents were willing to pay.

Figure 4.7: Monthly income and WTP

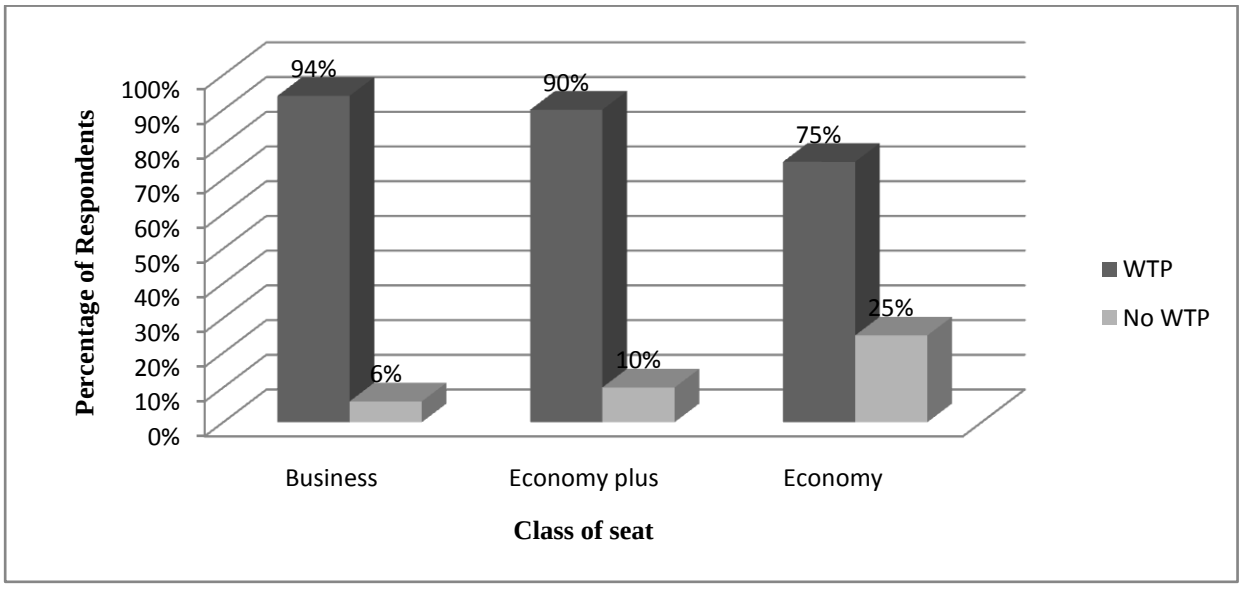


Source: Field Survey

4.4 .7 Relation between Class of Seat and WTP

It is rational to expect that a middle class consumer would not purchase a business class seat. Respondent who travel in business class are expected to be well off and able to afford even extra amount for environmental conservation. Respondents having Business class seats are relatively willing to pay more than economy class passengers (Figure 4.16).

Figure 4.8: Class of seat and WTP

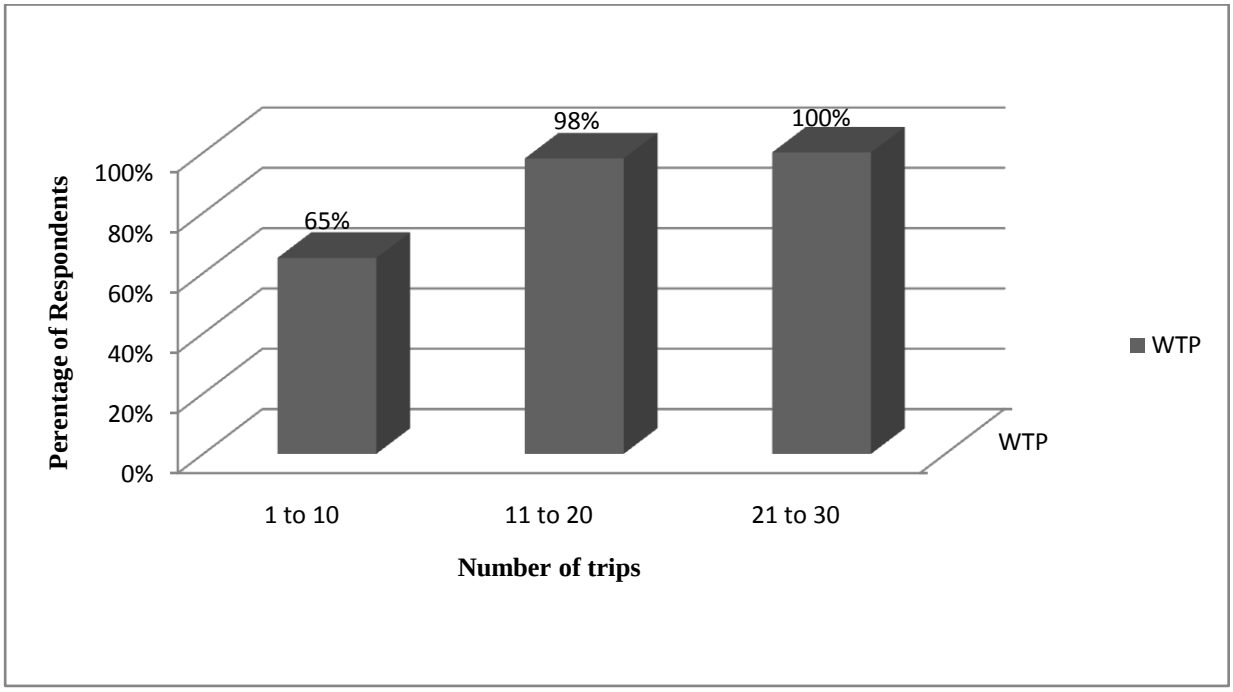


Source: Field Survey

4.4.8 Relation between Number of trips and WTP

Although frequent travellers contribute more in atmospheric pollution, they have also shown higher concern about climate. In Figure 4.17 we have revealed the relationship between number of trips and WTP. Numbers of trips are shown on X-axis and percentage of respondents on y-axis. Minimum number of trips in questionnaire is 1 and maximum trips are 30. Frequent travelers are willing to pay to offset their emission and vice versa.

Figure 4.9: Number of Trips and WTP

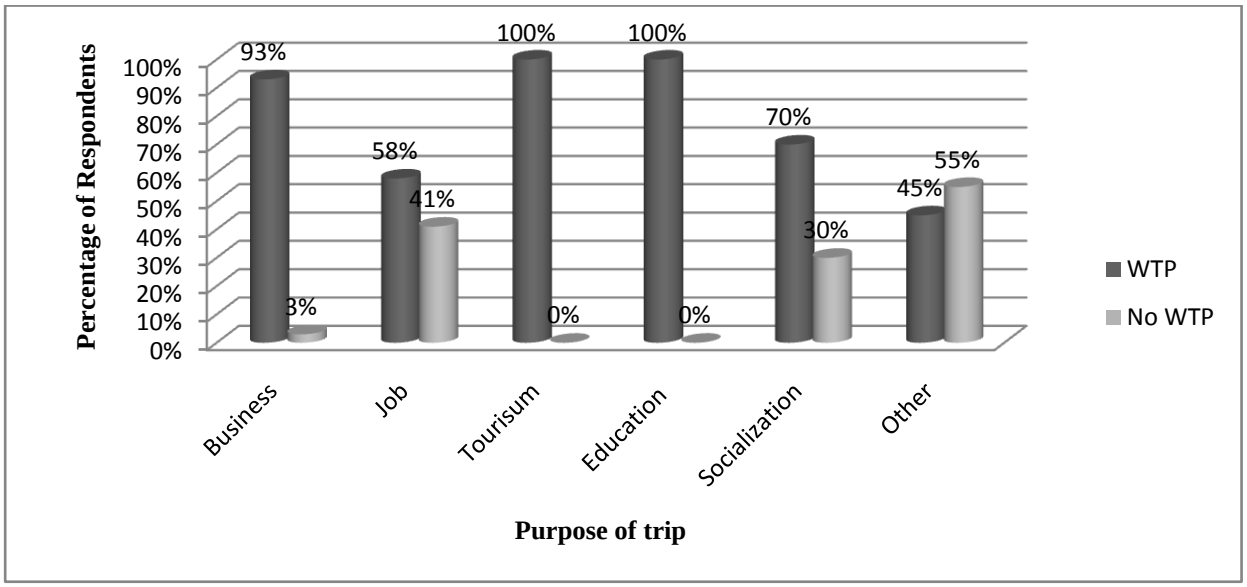


Source: Field Survey

4.4.9Relation between Trip purpose and WTP

Environment is important to everyone but more to tourists. All respondents whom trip purpose were tourism is willing to pay to protect environment. Nevertheless, respondents with trip purpose of education and business were also found willing to pay carbon premium (Figure 4.18).

Figure 4.10: Trip purpose and WTP



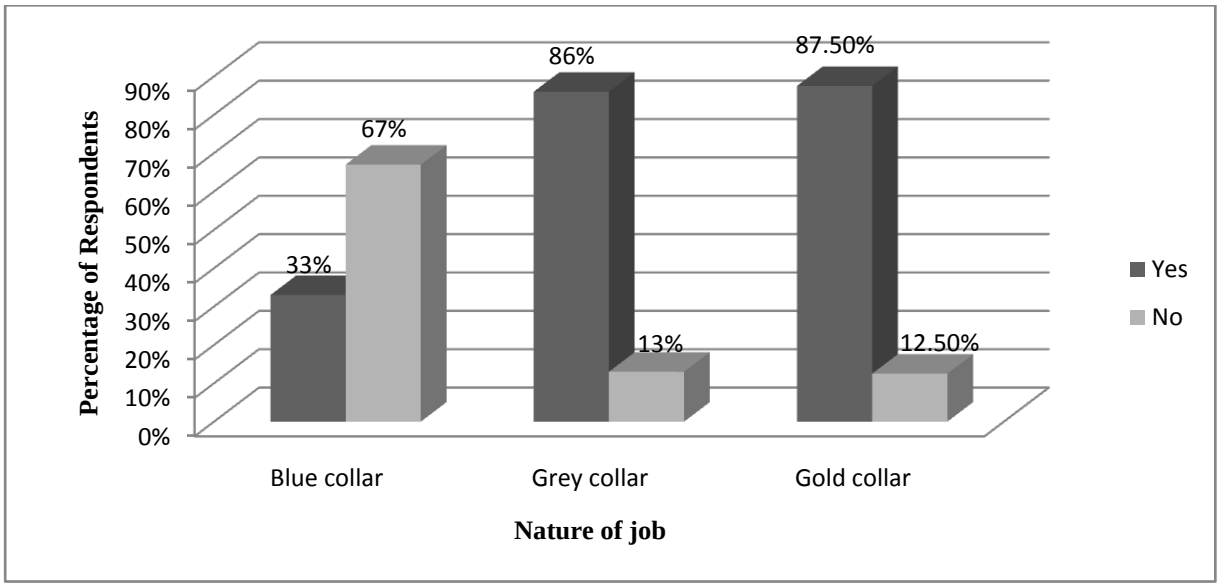
Source: Field Survey

4.4.10 Relation between job and WTP

There is an interesting relation in nature of job and willingness to pay of respondents. A large number of respondents have motive of job for travelling .Willingness to pay of respondents with different job varies. Frequency of Respondents with grey color[13] and gold color[14] for WTP is greater than blue colors[15]. The Potential reason is respondents with blue color job are earning less and they have not as much of years of schooling (Figure 4.19).

[13] IT employees, health care professionals and skilled technicians
[14] Highly skilled knowledge i.e. doctors, lawyers
[15] Labourer working on daily wages

Figure 4.11: Nature of job and WTP



Source: Field Survey

4.4.11Relation between environmental awareness and WTP

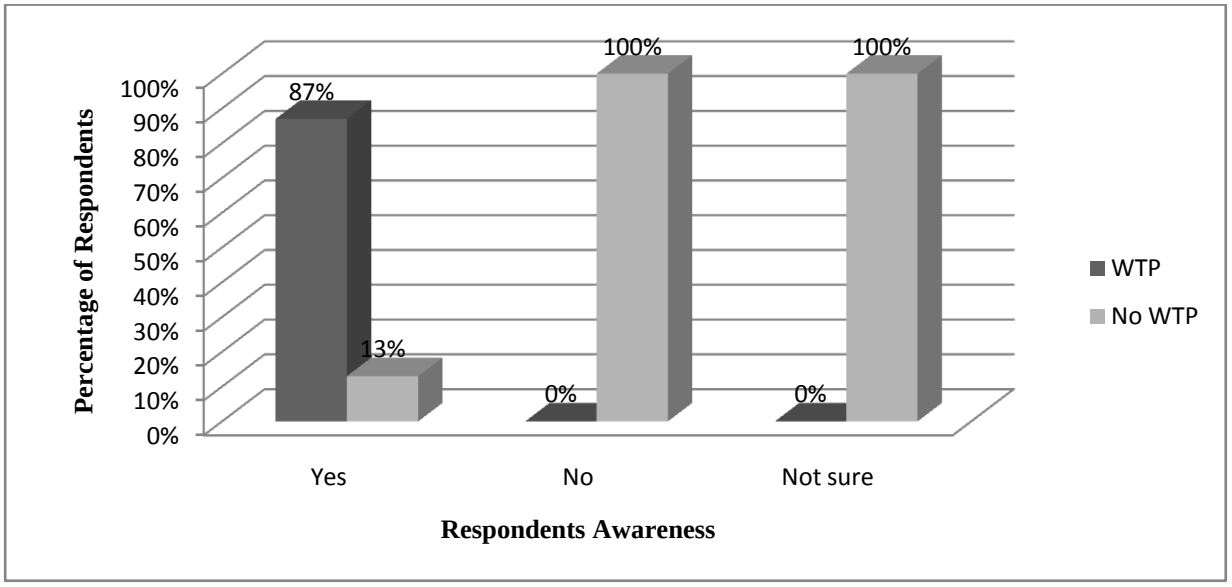
In this study we found a positive relation between environmental awareness and WTP. To assess the environmental awareness of respondents we asked them some close ended questions. Respondents were well informed about environmental issues of current period. Environmentally aware respondents are more interested in programs of climate change mitigation actions. Among environmentally aware respondents 89 percent are willing to pay. Respondents who are not willing to pay are constrained by many factors i.e. low income, distrust on such policies and infectivity of such programs.

4.4.12 Relation between perceiving the contribution of aircraft in climate change and WTP

It is apparent; a respondent who understands the impact of aircrafts on climate change will be more interested in mitigating activity. In this study respondents who don't consider that there could be any impact of flying on climate change are not willing to pay. Whereas out of those

who think aircrafts contribute in carbon emission 87 percent are willing to pay for mitigation actions (Figure 4.20).

Figure 4.12: Awareness of impact of flying on climate change and WTP

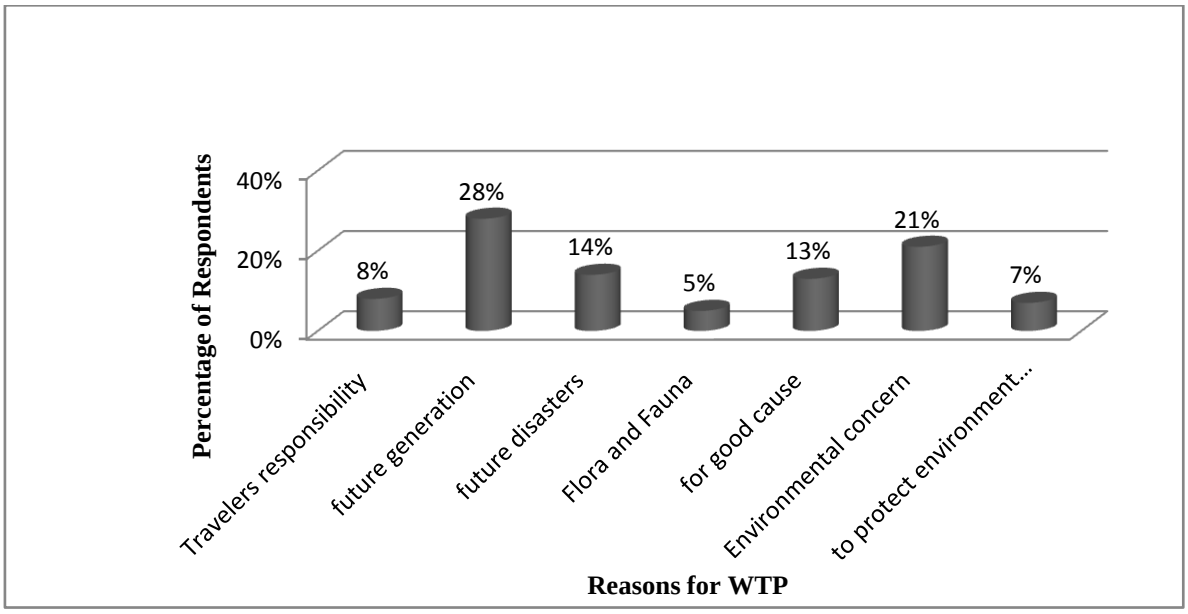


Source: Field Survey

4.5 Motivations behind willingness to pay

A fundamental feature of the survey is to determine the motivation of travellers towards Environmental protection through their WTP. The most important reason we found that traveller's feel responsible themselves is to protect future generation. According to them it is their moral obligation to avoid future damages, protect flora and fauna and compensate for their flight emission. A large number of respondents i.e. 21 percent indicated that they care about environment in general but there are only 7 percent respondents who also want to protect environment irrespective of cost (Figure 4.21).

Figure 4.13: Motivations behind Willingness to Pay



Source: Field Survey

Alternatively there are 20 percent respondents who are not willing to pay. The most important reasons described by respondents are low income and high prices of ticket. Respondents indicated that it is the responsibility of government to protect environment because they are already paying high taxes. They think that these carbon taxes will not be used effectively so it is useless to pay such type of carbon taxes. Another reason for not paying is respondents' belief that this programme would not have any real impact so they prefer to spent money on other things. There is another category of people who don't believe climate change and assume climate change does not affect them.

4.6 Summary

First section of chapter concludes general information about respondents. Age, income, number of kids, education, environmental qualifications, ticket price, frequency of travelling and tourism are positively related to WTP. To protect future generation is most important motivation for climate change mitigation actions. Then we have discussed various findings of this study and their relationships with other variables in an elaborative way. Lastly, the chapter highlighted some of the reasons due to which respondents are hesitant to pay for the environmental protection.

Chapter 5

Estimation Results and Discussion

5.1 Empirical Results

This chapter describes the regression estimates obtained with OLS. This section elaborates the relation between WTP and its determinants. Before discussing the coefficient, however, it is important to have a look at the diagnostics of the estimated model and the same are discussed here below.

Table 5.1: Summary Statistics of Estimated Model

Number of observation	**216**
F (9, 206)	58.65
Prob> F	0.000
R-squared	0.7193
Adjusted R-squared	0.7070
Root MSE	703.03

Table 5.1 reports summary statistics of estimated model. Total number of observation is 216.Coefficient of determination ($R^{2)}$ and F statistics are measured to assess the regression model fitness for data. Value of (Adjusted R^2) is 70% which implies that 70 percent of variation in WTP can be explained by the model. F-statistic value represents that overall model is statistically significant.

Table 5.2: OLS Regression Results (Dependent Variables-WTP)

Independent Variables	Codes	Coefficients
Age of the respondent	AGE	47.81 *** (0.000)
Number of Kids	N_KIDS	5.43 (0.898)
Log of income	In_ Income	32.29* (0.032)
Total years of education	EDU_YEARS	27.44 (0.135)
Environmental qualification	ENV_QUA	379.39*** (0.003)
Class of seat	C_SEAT	810.33*** (0.000)
Purpose of trip	TOURISM	338.76*** (0.009)
Number of trips	N_TRIPS	43.04* (0.011)
Log of Ticket price	In_ T_ PRICE	432.13 *** (0.000)
_cons		-6483.57 (0.000)

Ticket price and Monthly income of respondents are transformed in logarithms.

*, **, *** presents the statistical significance at 1, 5 and 10 percent, respectively.

Table 5.2 portrays the statistical relationship between independent and dependent variables of study. Air travellers' WTP[16] is the dependent variable while independent variables include; age of respondents (AGE), number of kids(N_KIDS), total years of education (EDU_YEARS), environmental qualification (ENV_QUA), purpose of trip (TOURISM), number of trips (N_TRIPS), ticket price of respondent (In_ T _PRICE) and monthly income of respondent (In _Income) .

AGE has a positive impact on WTP of air travellers. As the age increases people are supposed to be more environmentally conscious and concerned about future generation. The variable

[16] In rupees

named AGE is statistically significant at one percent level. Its coefficient is 47.81 which depict that, ceterisparibus, if age increases by one unit (i.e. by one year), the willingness to pay of air traveller increases by Rs 47.81. The study of (Chen et al., 2011) at Taiyuan International Airport also showed that older people are more interested in environment than the younger generation. (Cheung et al., 2015) also found in his study that people aged 45 were willing to pay more than other categories of age. More specifically, their WTP increased to $77.88.

Having offspring makes an individual more concerned and more worried about the future. Parents wouldn't like their kids to bear any economic and environmental loss associated with parents' generation activities. Though, as expected, results suggested a positive relationship between the number of kids and willingness to pay, however, this variable remained statistically insignificant.

Income is always an influential factor in willingness to pay of individuals. Economic theory also reveals that demand is a function of income. Demand for environmental attributes also depends upon income. Log of income is statistically significant. Willingness to pay of air travellers increases by 0.32 percent[17] as income increases by one percent. (Jou & Chen, 2015) also found the personal monthly income positive and statistically significant variable in determining the WTP of air travellers.

Education not only enhances the knowledge and skills of individuals but also aware them about the general and environmental concerns. It is assumed that an educated person might have a better understanding of current climatic issues. Education gives a sense of responsibility to tackle environment related problems. In this study education is positively linked with willingness to pay for mitigation action. As the education years increase willingness to pay increases by PKR 27.44, however, contrary to expectations, the coefficient remained

[17]Because the dependent variable is in level while the independent variable is in log form

statistically insignificant. This might be an indication that general education lacks promoting environmental responsibility in students. Cheung, et al. (2015) also found university education is positively related with WTP. In theior study, unviersity graduates were more WTP than non graduates.

Respondents having environment specific qualification are expected to have more concern about the climate change, knowing the full extent of environmental damages attached with environmental degradation. These aspects are significantly depicted in regression results as environmental qualification has a positive relation with willingness to pay for the compensation of flight emissions. Other things remaining constant, relative to a person who do not have any environmental education, one with environmental qualification is willing to pay PKR 379/- per trip. The result is highly significant at 1 percent level.

The variable labelled class of seat has the coefficient value 810.33 which indicates that a person travelling in business class seat is willing to pay more relative to an economy class passenger. WTP shows a positive relationship with class of seat. This variable is also statistically significant. Flying in economy class had a negative coefficient in study of (Lu and Shon 2012). This means business class travellers are more willing to pay then economy class travellers.

Another variable which affects the WTP of air travellers is their trip purpose. Tourism has a positive and significant effect on air travellers' WTP. Tourists are WTP PKR338.76 relative to non-tourists. The result is in conformity with expectations because tourists are the one who enjoy the environment the most and the same is reflected in the results. Tourist desire to protect the environment when they plan their vacation (McKercher, Prideaux, Cheung, & Law, 2010)

Frequency of trips has a positive influence on WTP of air travellers. Frequent travellers are willing to pay PKR43.04 more. The reason could be that they feel a sense of responsibility

towards environmental protection. Frequency of travelling is observed as an important determinant of WTP in study of Lu and Shon (2012).

It is a general assumption that ticket price has a negative impact on willingness to pay in case of air trippers as to compensate for their part of emission. It is proved wrong in this study; results indicate that ticket price has a positive relationship with WTP. Its coefficient is 432.13 and it is highly statistically significant. Here the coefficient means that one unit increase in ticket price will escalate WTP by 432.13 units. This suggests that once the air traveller is willing to pay, ticket price is not a significant obstacle to affect his/her WTP. The results are consistent with the study of (Lu & Shon, 2012). Air travel cost was estimated to be significant statistically yet has a positive impact on WTP of air travellers.

5.2 Robustness check:

Although, the results presented in Table 5.2 are, by and large, according to expectations, yet there is an important issue to highlight. Since the travellers are paying a specific percentage of the ticket price as part of their compensation and WTP figure is calculated by the multiplication of ticket price and the percentage (0.5, 1 and 2 or higher) a passenger is willing to pay. Therefore, there can be a potential issue of endogeneity, despite the fact that the respondents' have indicated different sacrifice level for even the same ticket price and there is no perfect correlation between WTP and Ticket price. Nevertheless, Table 5.3 in Appendix 6 presents the regression results without the ticket price variable. It can be observed that even after excluding the ticket price variable from the list of independent variables there was no significant change in the results and the results have remained robust.

Chapter 6

Conclusion and Policy Recommendations

6.1 Conclusions

In this study, Contingent valuation method has been used to measure the willingness to pay of air travellers for mitigation of climate change. Major findings of this study are as follow: Contrary to general assumption willingness to pay of air travellers may be much higher. The survey result shows 80 % of the passengers are willing to pay on average PKR 1302/- per trip to compensate for their flight emissions. Compensation of domestic and International passengers varies with their ticket price. The descriptive analysis along with regression results confirm that age, income, number of kids, education, environmental qualifications, ticket price, frequency of travelling and tourism are positively related to WTP. The major motivation for positive willingness to pay is not as the general desire of charity and good cause but rather their recognition of responsibility and accountability of climate change as well as its adverse effects on future generation.

6.2 Policy Recommendations

- Airline passengers are willing to pay to compensate their flight emission so pollution mitigation programs can be successfully launched in Pakistan by government or an independent organization.
- Carbon tax is an effective tool to control but a fair tax policy is required. Some are over compensated some are under compensated. It is important to keep in mind the class of seat, ticket price and distance of trip and while imposing tax in airline industry.

- The study showed positive association of individual's level of education, and environmental education to WTP for climate change mitigation. These variables should be addressed, when climate change mitigation programme is launched.

6.3 Limitation and Further prospects of the study

In current study, all passengers irrespective of their class of travelling have been regressed for their willingness to pay. However, for a future research these travellers can be regressed for WTP against respective class of travelling.

Moreover due to lack of resources only BBIAP Islamabad has been taken into account for conducting the study. In further extension to the study all international airport of Pakistan can be focused for an area wise analysis and outcomes connected to WTP.

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Appendices

Appendix - 1
Table 2.4
Consumption of Jet fuel in Pakistan Airline Industry

Years	Jet Fuel (Metric Tonnes)
1986	487,434
1987	517,812
1988	475,000
1989	529,641
1990	526,000
1991	506305
1992	412911
1993	261349
1994	683901
1995	637000
1996	585000
1997	594000
1998	597000
1999	758000
2000	744000
2001	760000
2002	846000
2003	779000
2004	986000
2005	922000
2006	887000
2007	740000
2008	788955
2009	892000
2010	158000
2011	200000
2012	184504

Source: (Internatioanal-Energy-Statistics, 2013)

Appendix_2
Survey Questionnaire
Air Travelers' Environmental Consciousness: A Preliminary Investigation at Benazir Bhutto International Airport, Islamabad

This survey is being conducted as part of an M Phil degree at the Department of Environmental Economics at PIDE, Islamabad and is mainly concerned with the Environmental consciousness of Air travelers. The following questions are thus purely for academic purposes and mainly concerned with passengers perception about the environmental impact of aircrafts and their readiness to compensate for it , Your input is highly valued and I will be grateful if you could please take few minutes out to express your views in this regard. This information and identity of respondent will be kept confidential. The information will only be used for this research and not for any other purpose. Your cooperation is highly appreciated.

General information:

1. Name: _____ 2. Gender: _____

3. Age: _____

4. Marital Status: Single ☐ Married ☐ Widowed ☐ Separated ☐

5. Do you have off springs? Yes ☐ No

6. Number of off springs

Boys_____ Girls _____

7. Employment Status: Job ☐ Self employed ☐ Dependent ☐ Student ☐ Other ☐

8. Nature of Employment:
_____

9. Monthly Income: _____

10. Last Completed Degree_____

11. Did you ever take a course on environment? Yes ☐ No ☐

12. If "yes "please specify education

Degree ☐ course ☐ Certificate ☐ On the job training ☐ other ☐

13. Working with any environmental organization

Yes ☐ No ☐

Information about Air travel:

14. Destination of travel: _____15. Ticket Price: _____

16. Ticket sponsor: Self ☐ Parents ☐ Company ☐ Financer ☐ Others ☐

17. Type of ticket: One way ☐ Round trip ☐ others ☐

18. Class of seat chosen: Business ☐ Economy + ☐ Economy ☐ Others ☐

19. Purpose of your trip: Business ☐ Job ☐ Tourism ☐ Family visit ☐
Training ☐ Education ☐ Others ☐

20. Nature of job: Labourer ☐ administration ☐ skilled technician
Highly skilled ☐ executive ☐

21. Are you a frequent flyer: Yes ☐ No ☐

22. Do you travel with your family? Yes ☐ Sometimes ☐ Usually ☐ No ☐

23. Please specify the number of trips you made in last 1 year: _____

24. Please write the origins and destinations of your last 5 air travels.

Sr.	Origin	Destination
1		
2		
3		
4		
5		

Information about environmental awareness:

25. Do you feel any change in environment? Yes ☐ No ☐

26. If "yes "what kind of change do you observe in environment?

Better ☐ worse ☐

27. What is the most important environmental issue you are facing?

Water pollution ☐ Poor air quality ☐ Increasing temperature ☐

Other _____ None ☐

28. If yes, what's your source of awareness?

Education ☐ Newspaper ☐ Magazines ☐ Internet ☐ Television ☐

Radio ☐ Self observation ☐ others _____

29. Do you think CO_2 emissions are responsible for environmental degradation?

Yes ☐ No ☐

30. Do you think aircrafts have some contribution in CO_2 emission?

Yes ☐ No ☐

Willingness to Pay:

With rising demand of air travel and hardly any compensation for the emissions caused by aircrafts, consider a situation where the Government of Pakistan wants to launch a programme titled **"Trees for Travel"**. Under this programme trees will be planted to lower the temperature and reduce air pollutants that lead to climate change. To finance this mitigation activity the airline passengers will be charged an extra price on their tickets to compensate for their flights emission. Assume that you have paid for your ticket:

31. Would you be willing to pay 1 percent extra on the ticket price to make the "Tree for Travel program" successful?

Yes ☐ No ☐

32. If "YES" Would you be willing to pay 2% of your ticket?

Yes ☐ No ☐

33. If "NO" Would you be willing to pay 0.5% of your ticket?

Yes ☐ No ☐

34. What is the Maximum/Minimum amount of money are you willing to pay?

_____

35. If you are willing to pay please specify the reason (***Please check as many options as applicable).***

- I feel myself responsible for my contribution to climate change. ☐
- I care regarding the environment generally. ☐
- To stay away from future natural disasters. ☐
- To protect future generations. ☐
- To protect flora and fauna. ☐
- For good causes ☐
- It is necessary to protect environment irrespective of the costs. ☐

- Other reason: _____

36. If you are not willing to pay specify the reason.

- Climate change is not believable for me. ☐
- I have low income. ☐
- Climate change does not have an effect on me or my family. ☐
- I like better to spend my money on other things. ☐
- Such a program would not have any real impact. ☐
- It is duty of government to protect. ☐
- We are already paying heavy taxes. ☐
- Carbon taxes will not be used effectively. ☐
- Ticket prices are too high. ☐
- Other reason: _____

_____

Appendix _3
Table 4.1
Summary Statistics of variables

Variable	Observations	Unit	Mean	Std. Dev	Min	Max
Age	216	years	33.3	9.622247	22	78
Number of kids	216	Number	1.8148	1.51672	1	5
Monthly income	216	Rupees	201171	263445	0	1500000.00
Education	216	years	14.3981	3.63559	0	21
Environmental qualification	216	Dummy	1.5370	.49978	0	1
ticket price	216	Rupees	54435	26945	6450.00	120000.00
class of seat	216	Dummy	0.3009	.45973	0	1
number of trips	216	number	2.7639	3.44320	0	1
Tourism	216	Dummy	.2454	.43131	0	1

Appendix _4

Table 4.2

Information Regarding Individual's Destination, Ticket type, Class of seat and Calculated CO_2 in kg and tonnes

Destination	No of respondents	Ticket type	Class of Seat	Kilometres	CO_2 (kg)	CO_2(tonnes)
Karachi	3	0ne way	Economy	1,125	332.64	0.33264
Karachi	2	One way	Business	_	221.64	0.22164
Lahore	1	One way	business	264	35.88	0.03588
Lahore	3	One way	Economy	_	107.64	0.10764
Multan	2	One way	Business	820	96.44	0.09644
Bahawalpur	2	One way	Economy	492	104.17	0.10417
Quetta	1	One way	Business	689	82.39	0.08239
Sukkur	2	One way	Business	772	152.69	0.15269
Sukkur	1	One way	Economy	_	76.84	0.07684
Rahim yar khan	3	One way	Business	639	199.95	0.19995
Rahim yar khan	1	One way	Economy	_	66.65	0.06665
D.I.Khan	1	One way	Economy	280	36.45	0.03645
Sakardu	2	One way	Business	293	81.39	0.08139
Sakardu	1	One way	Economy	_	40.69	0.04069
Dubai	2	One way	Business	1,947	305.89	0.30589
Dubai	3	One way	Economy	_	458.83	0.45883
Tokyo	3	One way	Business	5,991	5210	5.21
Tokyo	3	One way	Economy	_	1,470	1.47
Los Angeles	4	One way	Economy	1,24,01	1,01,40	10.14
Kualalampur	2	One way	Business	4513.9	7,070	7.07
Kualalumpur	5	Oneway	Economy	_	4,830	4.83
Paris	5	One way	Economy	5,906	1,907.77	1.90777
Copenhagen	2	One way	Business	5,163	1,333.22	1.33322
Copenhagen	2	One way	Economy	_	666.61	0.66661
Milan	5	One way	Business	5,515	3,596.10	3.5961
Milan	2	One way	Economy	_	713.82	0.71382

Appendix _4 (Continued)
Table 4.2
Information regarding Individual's Destination, Ticket type, Class of seat and Calculated CO_2 in kg and tonnes

Destination	No of respondents	Ticket type	Class of Seat	K.m	CO_2 (kg)	CO_2(tonnes)
London	2	One way	Economy	_	782.64	0.78264
Beijing	10	One way	Economy	7790	3228.34	3.22834
Doha	1	One way	Business	2,271	165.59	0.16559
Doha	4	One way	Economy	_	662.36	0.66239
Muscat	4	One way	Business	1,882	686.52	0.68652
Muscat	2	One way	Economy	_	343.62	0.34362
Australia	1	One way	Business	9,172	6160	6.16
Frankfurt	1	One way	Business	5444.	4600	4.6
Cape town	2	One way	Business	9,429	1,54,90	15.49
Moscow	3	One way	Business	3662.	14420	14.42
Multan	2	Round Trip	Economy	820	195.29	0.19529
Bahawalpur	3	Round Trip	Economy	984	312.5	0.3125
Quetta	1	Round Trip	Economy	1,378	164.72	0.16472
Sakardu	1	Round Trip	Business	586	81.39	0.08139
Sakardu	6	Round Trip	Economy	586	488.34	0.48834
Jeddah	1	Round Trip	Business	7,148	956.13	0.95613
Jeddah	17	Round Trip	Economy	7,148	9083.25	0.90833
Medina	1	Round Trip	Economy	6,756	430.05	0.43005
Riyadh	10	Round Trip	Economy	10,89	36,660	36.66
Abu Dhabi	6	Round Trip	Economy	4,114	1,905.64	1.9056
Tokyo	1	Round Trip	Economy	5,991	5,757	0.5757
L/A	1	Round Trip	Economy	24806	7,130	0.713
Mashhad	10	Round Trip	Economy	59,45	31,050	31.05
Muscat	4	Round Trip	Economy	3,644	1,372.09	1.37209
Australia	2	Round Trip	Economy	18344	1,37,40	13.74
Bahrain	10	Round Trip	Economy	9,220	3092.26	3.09226

Appendix-5
Table 4.3
Individual's Ticket Prices and Maximum Willingness to Pay (Pak Rupees)

Serial	Ticket Price	Max WTP Rupees	Serial	Ticket Price	Max WTP Rupees	Serial	Ticket Price	Max WTP Rupees
1	23,529	706	26	15,690	471	51	82,000	820
2	24,569	983	27	15,000	450	52	92,000	-
3	9,000	45	28	17,000	510	53	90,000	900
4	9,120	46	29	15,000	450	54	78,000	-
5	7,500	38	30	15,000	450	55	50,000	250
6	6,450	32	31	24,000	480	56	78,000	390
7	12,455	249	32	23,000	460	57	49,000	245
8	8,950	45	33	24,000	480	58	52,000	260
9	27,568	827	34	23,000	690	59	51,000	510
10	7,532	151	35	18,000	720	60	52,000	520
11	23,530	235	36	15,440	-	61	65,000	1,950
12	7,520	-	37	18,000	360	62	54,000	540
13	18,940	758	38	21,450	644	63	60,000	600
14	14,560	582	39	22,000	1,100	64	52,000	520
15	25,014	1,251	40	16,000	640	65	49,000	490
16	19,000	190	41	65,000	650	66	51,000	510
17	8,550	-	42	75,000	750	67	25,000	125
18	9,210	92	43	75,000	375	68	26,000	-
19	8,540	43	44	61,000	305	69	27,000	-
20	9,260	46	45	72,000	-	70	61,000	2,440
21	23,580	943	46	82,000	-	71	35,000	175
22	23,679	947	47	69,000	-	72	78,000	3,120
23	8,320	333	48	71,000	-	73	38,000	380
24	15,000	-	49	70,000	-	74	78,000	-
25	16,555	662	50	65,000	-	75	35,000	1,400

Appendix-5 (Continued)

Table 4.3

Individual's Ticket Prices and Maximum Willingness to Pay (Pak Rupees)

Serial	Ticket Price	Max WTP Rupees	Serial	Ticket Price	Max WTP Rupees	Serial	Ticket Price	Max WTP Rupees
76	78,000	2,340	101	54,000	1,620	126	30,000	300
77	90,000	2,700	102	55,000	-	127	28,000	280
78	92,000	2,760	103	80,000	3,200	128	26,000	260
79	92,000	3,680	104	45,000	1,800	129	27,000	135
80	95,000	4,750	105	44,000	-	130	27,000	-
81	55,000	275	106	90,456	2,714	131	80,000	2,400
82	55,000	275	107	90,455	3,618	132	80,000	3,200
83	57,000	285	108	91,000	4,550	133	80,000	2,400
84	56,000	280	109	92,000	4,600	134	80,000	3,200
85	55,000	-	110	93,000	3,720	135	82,000	3,280
86	40,000	400	111	54,000	540	136	79,000	3,160
87	38,000	-	112	53,000	265	137	70,000	2,100
88	32,000	320	113	80,000	3,200	138	80,000	2,400
89	40,000	-	114	95,000	4,750	139	76,000	3,040
90	35,000	350	115	82,000	4,920	140	78,000	3,900
91	66,000	660	116	55,000	275	141	55,000	-
92	60,000	600	117	45,000	225	142	55,000	-
93	65,000	650	118	35,000	175	143	56,000	-
94	69,000	690	119	46,000	230	144	57,000	-
95	65,000	650	120	47,000	235	145	58,000	580
96	60,000	600	121	35,000	175	146	55,000	550
97	64,000	640	122	35,000	175	147	54,000	540
98	65,000	650	123	37,000	185	148	55,000	550
99	67,000	670	124	34,000	170	149	55,000	550
100	60,000	600	125	35,000	175	150	55,000	550

Appendix- 5(Continued)

Table 4.3

Individual's Ticket Prices and Maximum Willingness to Pay (Pak Rupees)

Serial	Ticket Price	Max WTP Rupees	Serial	Ticket Price	Max WTP Rupees	Serial	Ticket Price	Max WTP Rupees
151	56,000	-	176	80,000	800	201	10,190	-
152	56,000	-	177	81,000	-	202	65,512	328
153	55,000	275	178	98,000	2,940	203	66,000	330
154	52,000	260	179	95,000	950	204	90,000	-
155	82,000	3,280	180	92,000	2,760	205	67,000	2,680
156	85,000	2,550	181	73,000	-	206	75,000	-
157	71,000	2,840	182	72,000	-	207	9,500	48
158	70,000	3,500	183	69,000	-	208	56,000	280
159	32,000	1,920	184	81,000	-	209	65,000	1,950
160	22,000	-	185	70,000	-	210	66,000	1,980
161	110,000	550	186	71,000	-	211	67,000	1,340
162	90,000	450	187	72,000	-	212	65,000	1,950
163	90,000	450	188	72,000	-	213	66,000	2,640
164	80,000	-	189	73,000	365	214	67,000	2,010
165	80,000	3,200	190	82,000	820	215	66,000	2,640
166	26,000	780	191	81,000	4,050	216	67,000	335
167	25,000	500	192	82,000	820			
168	26,520	796	193	92,000	2,760			
169	24,000	720	194	82,000	3,280			
170	27,000	1,080	195	86,000	4,300			
171	11,045	331	196	91,000	2,730			
172	120,000	4,800	197	92,520	3,701			
173	110,145	4,406	198	81,840	4,092			
174	55,000	1,650	199	91,350	2,741			
175	60,000	2,400	200	18,000	540			

Appendix _6
Table 5.3
Summary Statistics of Estimated Model

F (8, 207)	**53.92**
Prob> F	0.0000
R-squared	0.6757
Adj R-squared	0.6632
Root MSE	753.74

OLS Regression Results (Dependent Variables-WTP) Result 2

Independent Variables	**Independent Variables**	**Dependent Variables(WTP)**
Age of the respondent	AGE	56.706576*** (0.000)
Number of Kids	N_KIDS	16.05 0.725
Log of income	In Income	39.2** (0.015)
Total years of Education	EDU_YEARS	9.53621 (0.622)
Environmental qualification	ENV_QUA	496.33321*** (0.000)
Class of seat	C_SEAT	818.85727*** (0.000)
Purpose of trip	TOURISM	309.06305** (0.025)
Number of trips	N_TRIPS	51.836697*** (0.000)
	_cons	-2062.720 (0.000)

Ticket price and monthly income of respondents are transformed in logarithms.

* = Significance at 5 percent level.
** = Significance at 10 percent level.
*** = Significance at 1 percent level.